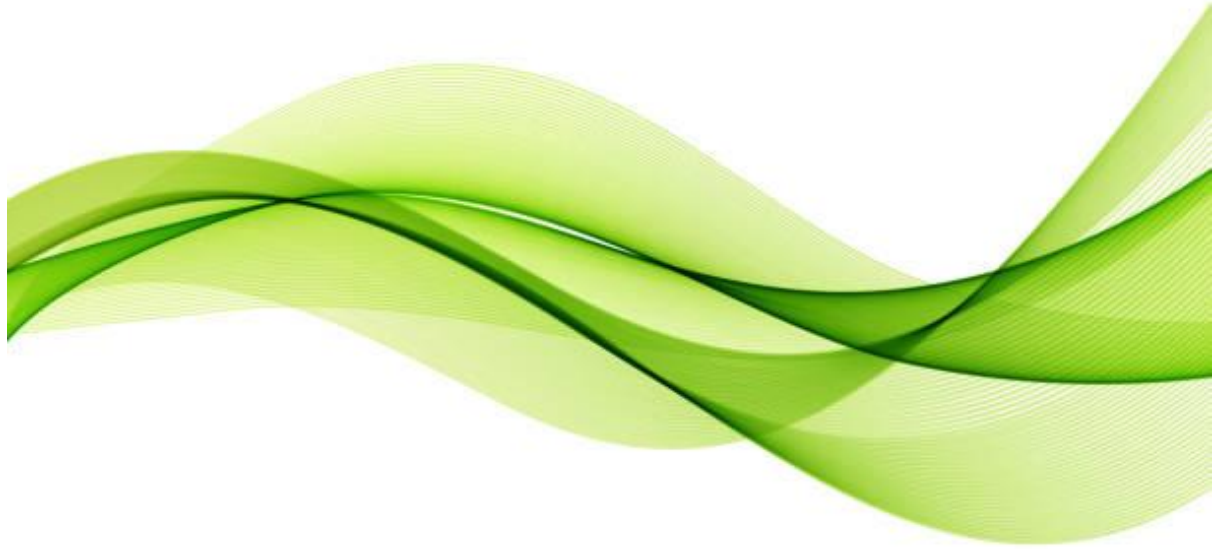




Report on the Achievements of Chinese Enterprises in Malaysia's Green Development and Digital Economy (2024–2025)

Joint Conference of Chinese Overseas Chambers of Commerce (JCCOCC)

China Enterprises Chamber of Commerce in Malaysia (CECCM)

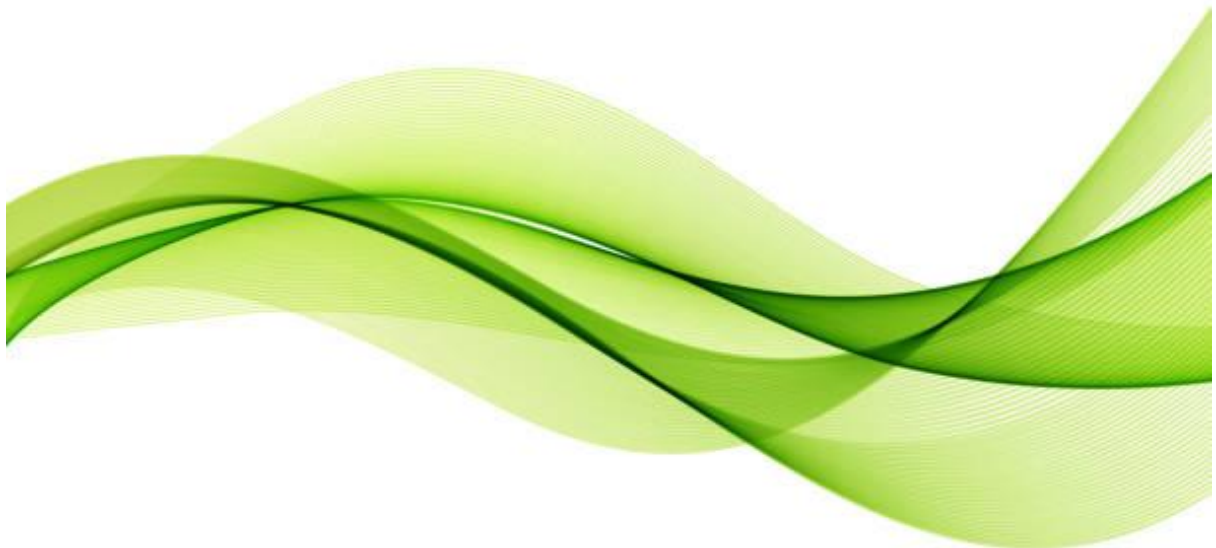


Table of Contents

Preface.....	1
Chapter 1: Building a China–Malaysia Green and Digital Community with a Shared Future..3	
1.1 Introduction.....	3
1.2 Objectives and Research Methodology	10
Chapter 2: Achievements of Chinese Enterprises in Advancing Green Development in Malaysia.....	11
2.1 Malaysia’s Green Development Policies and Overview.....	11
2.2 Building a Green Development Ecosystem for Chinese Enterprises in Malaysia.....	24
Chapter 3: Achievements of Chinese Enterprises in Empowering Malaysia’s Digital Economy	61
3.1 Malaysia’s Digital Economy Policies and Development Overview	61
3.2 Achievements of Chinese Enterprises in Empowering Malaysia’s Digital Economy ...	70
Chapter 4: Challenges Faced by Chinese Enterprises in Malaysia, Their Role in Green and Digital Ecosystem Development, and Recommendations	90
4.1 New Energy Vehicle Industry: Geely Automobile Holdings	90
4.2 Green Energy Industry: HQC Engineering Malaysia	91
4.3 Green Energy Industry: Power Construction Corporation of China (PowerChina)	93
4.4 Green Energy Industry: China Energy Engineering Corporation (CEEC)	95
4.5 Green Energy Industry: China City Environment Protection Engineering (CCEPC)	97
4.6 Green Energy Industry: Sinoma Energy Conservation Industrial & Engineering	100
4.7 Green Technology Industry: Dunham-Bush Industries	101
4.8 Green Building Industry: China State Construction Engineering Corporation (CSCEC)	103
4.9 Green Energy Industry: Sinoydro Corporation.....	107
4.10 Digital Economy Industry: Huawei Malaysia.....	109
4.11 Digital Economy Industry: ZTE Corporation	111
4.12 Digital Economy Industry: China Telecom	112
4.13 Digital Economy Industry: China Mobile.....	114
4.14 Digital Economy Industry: FiberHome	116
4.15 Digital Economy Industry: Hikvision.....	118
4.16 Digital Finance Industry: China Construction Bank (CCB).....	120
4.17 Digital Finance Industry: Industrial and Commercial Bank of China (ICBC)	122

4.18 Digital Economy Industry: Alibaba	124
4.19 Digital Aviation Industry: China Eastern Airlines	126
4.20 Chinese Enterprises' Common Challenges and Integrated Recommendations in Malaysia.....	128
Conclusion	132
Reference	133
Introduction to the China Enterprises Chamber of Commerce in Malaysia	137
Copyright Information	138

Preface

The enduring relationship between China and Malaysia has withstood the test of time, yielding fruitful outcomes and fostering a solid foundation of strategic mutual trust. Today, bilateral ties have entered a new stage characterized by higher-level engagement, broader scope, and deeper cooperation.

In April 2025, at the invitation of Malaysia, Chinese President Xi Jinping paid a state visit to the country. During the visit, President Xi held cordial talks with His Majesty Sultan Ibrahim, the Yang di-Pertuan Agong, and engaged in in-depth discussions with Prime Minister Anwar Ibrahim. Both sides reaffirmed their shared commitment to the principles of peaceful development and open, mutually beneficial cooperation, and jointly announced the establishment of a high-level, strategic China–Malaysia community with a shared future. They further agreed to enhance the quality of cooperation under the Belt and Road Initiative and to expand collaboration into emerging sectors such as green development and the digital economy.

In May of the same year, Chinese Premier Li Qiang also visited Malaysia to attend the ASEAN–China–GCC Summit. In his address, he remarked: *“While deepening cooperation in traditional sectors such as energy and agriculture, we must also intensify our collaboration in emerging fields including artificial intelligence, the digital economy, and green, low-carbon industries, in order to foster and strengthen new drivers of growth.”*

In the spirit of this major strategic consensus, the China Enterprises Chamber of Commerce in Malaysia (CECCM), with the guidance and support of the Joint Conference of Chinese Overseas Chambers of Commerce (JCCOCC), has prepared this special report — *Report on the Practices and Achievements of Chinese Enterprises in Co-building Green Development and the Digital Economy in Malaysia (2024–2025)*. The report provides a comprehensive overview of the practical contributions and innovative achievements of Chinese enterprises — particularly CECCM member companies — in promoting green development and digital transformation. It reflects the long-standing commitment of Chinese businesses to deep local engagement, joint contribution, and shared benefits.

In the green sector, Chinese enterprises have actively participated in clean energy, green manufacturing, new energy transportation, and environmental infrastructure, introducing advanced technologies and integrated solutions from China to accelerate Malaysia’s transition toward a low-carbon, high-efficiency economy. In the digital economy, they have leveraged strengths in 5G, artificial intelligence, the industrial internet, and smart city development to upgrade local industrial chains, enhance technological capabilities, and create an ecosystem that integrates employment, training, and collaboration. These achievements not only exemplify the sense of responsibility of Chinese enterprises going global, but also attest to the enduring vitality of the vision for a community with a shared future for mankind.

CECCM member companies remain steadfast in their commitment to the principle of *Co-creation, Co-development, and Co-prosperity*, supporting Malaysia in achieving its economic modernization and sustainable development goals, and serving as dedicated promoters of China–Malaysia friendship.

The publication of this report is both a reflection on past accomplishments and a forward-looking blueprint for future cooperation. CECCM will continue to serve as a bridge and a link, fostering consensus, pooling strengths, and working hand in hand to advance green and digital economic collaboration, thereby contributing to the building of a China–Malaysia community with a shared future, the great rejuvenation of the Chinese nation, and lasting peace and prosperity in the region.

Ni Qingjiu

President

China Enterprises Chamber of Commerce in Malaysia (CECCM)

Chapter 1: Building a China–Malaysia Green and Digital Community with a Shared Future

1.1 Introduction

In 2023, President Xi Jinping and Malaysian Prime Minister Anwar Ibrahim reached an important consensus on jointly building a China–Malaysia Community with a Shared Future, agreeing to deepen cooperation in key areas such as economic development, infrastructure, trade, and regional security. The two countries envisioned a future based on common interests that promotes sustainable development and growth, fosters cooperation in technological innovation and cultural exchange, safeguards regional peace and stability, advances shared prosperity, and addresses global inequality.

The *Five-Year Program for Economic and Trade Cooperation between the Government of the People's Republic of China and the Government of Malaysia (2024–2028)*, together with two Memoranda of Understanding on the digital economy and green development, has further deepened this long-standing economic partnership and demonstrated both sides' commitment to promoting an innovation-driven growth strategy.¹ These agreements build on the significant achievements of the first Five-Year Cooperation Program launched in 2013 and further consolidate China's position, held since 2009, as Malaysia's largest trading partner and one of its leading sources of foreign direct investment.

Between 1980 and 2023, China invested in 497 manufacturing projects in Malaysia, with a cumulative investment value of RM 74.2 billion and the creation of more than 82,000 jobs.² The two new MoUs focus respectively on the digital economy and green development. They aim to promote high-quality investment, prioritise the development of high value-added sectors, integrate industrial, supply, and talent chains, and attract participation from partners worldwide.

In the digital economy, cooperation will explore digital infrastructure projects including communication networks, smart infrastructure, and smart cities, as well as the application of advanced technologies such as artificial intelligence and 5G. These initiatives will drive digital transformation across industries including manufacturing, transportation, commerce, finance, education, and healthcare. In the area of green development, the two countries will work together in fields such as clean energy, new energy vehicles, green finance, sustainable infrastructure, and green technology. Joint efforts will promote research and development, establish science and technology innovation platforms, and accelerate the green transition in both countries.

According to reports released by the International Data Center Authority (IDCA) and the Digital Cooperation Organization (DCO), the digital economy accounted for between 15% and 21% of global GDP in 2024–2025, with a total value estimated at USD 16 trillion to USD

¹ BERNAMA. *Malaysia-China to Continue Boosting Economic, Trade Cooperation*. 2024

² The Star. *Tengku Zafrul: BRI Involvement Strengthens Malaysia-China Economic Partnership*. 2024

24 trillion³⁴. Asia, particularly its emerging markets, is becoming a key driver of global growth. In 2024, the region's economy grew by more than 5%, with a substantial portion of that growth driven by digital transformation.

Research reviews indicate that the digital economy has become an important engine for promoting innovation, enhancing competitiveness, and achieving economic growth. Digital technologies, as the core driver of the global technological revolution and industrial transformation, underpin an economic model that reorganises global resources, reshapes the structure of the world economy, and changes the global competitive landscape.

In terms of digital economy development, the *Global Digital Economy White Paper (2024)* released by the China Academy of Information and Communications Technology (CAICT) reported that in 2023, the combined digital economies of the United States, China, Germany, Japan, and South Korea exceeded USD 33 trillion, with an annual growth rate of more than 8%.⁵ Notably, the digital economies of these five countries accounted for approximately 60% of their respective gross domestic product (GDP), highlighting the pivotal role of the digital economy in driving economic growth. Among them, the United States and China remain the largest digital economies in the world.

The Annual Trends Report published by the Digital Cooperation Organization (DCO) consolidates insights from 300 chief technology officers and senior technologists, 60 policymakers, and 40 digital economy experts.⁶ The survey results show that respondents ranked artificial intelligence and advanced data analytics (68.8%) as the top priority for digital technology development, followed by encryption and cybersecurity (43.1%), digital connectivity (39.8%), and automation and robotics (36.8%). These priorities reflect the industry's urgent demand for robust, secure, and trusted systems.

One of the most significant trends in 2025 is the deployment of specialized, highly accessible, and localized artificial intelligence, which was identified as a priority by 60% of surveyed industries. Open-source models and edge AI are accelerating the democratization of AI, with the market expected to expand to USD 140 billion by 2032. At present, 59% of surveyed companies have deployed or are in the process of deploying proprietary AI solutions. The industries most likely to benefit include finance (49%), technology and media (41%), and healthcare (33%). Current investment priorities focus on strengthening digital communication capabilities (55%), enhancing workforce skills (41%), and improving cybersecurity (39%).

The *Digital Economy Report 2024* released by the United Nations Conference on Trade and Development (UNCTAD) notes that while the digital economy has created substantial value for the global economy, the rapid pace of digitalization has also led to sharply rising environmental and resource costs.⁷ As a result, there is an urgent need for countries to adopt

³ Roger Strukhoff, Global Digital Economy Report – 2025. <https://www.idc-a.org/insights/qUi9XgvyrzSkyDUy9Tqr>. 30 June 2025

⁴ Digital Cooperation Organization. The Digital Economy Trends 2025 [R] Saudi Arabia. Digital Cooperation Organization. 2024

⁵ Shuaizhen Li, Xing Wang, Tao Li, Unveiling the Digital Tapestry: A Review of Chinese and International Digital Economy Research, [J] Journal of Digital Economy, 2025

⁶ Digital Cooperation Organization. The Digital Economy Trends 2025 [R] Saudi Arabia. Digital Cooperation Organization. 2024

⁷ UNCTAD. The Digital Economy Report 2024. [R]. New York. United Nations Publications. 2024

digital development strategies that place equal emphasis on environmental sustainability and inclusiveness.

Empirical studies using China as an example demonstrate that digitalization can directly improve green total factor productivity (GTFP), stimulate green innovation, and support sustainable urban development.⁸

As of the first quarter of 2025, the global green economy was valued at USD 7.9 trillion, with revenues from green products and services surpassing USD 5 trillion for the first time.⁹ By market capitalization, this positions the green economy as the fourth-largest industry in the world, following technology, industrial goods and services, and healthcare. To address climate change, cumulative global investment needs are estimated at between USD 109 trillion and USD 275 trillion by 2050, with the majority of this capital expected to flow into the green economy.

The principal drivers of the green economy include the transition to renewable energy, the rapid adoption of electric vehicles, and the implementation of circular economy policies, particularly in Europe and China.¹⁰ Research by BCG shows that this green wave is fuelling global demand for a diverse range of green products and services, thereby creating new opportunities for economic growth in four key areas: critical minerals for the energy transition, green technology manufacturing, green industrial materials, and green services. The combined value of these opportunities is currently estimated at USD 2 trillion and is projected to exceed USD 11 trillion by 2040, based on the International Energy Agency's "Net Zero Emissions by 2050 Scenario" and other research data.¹¹

According to research by BCG, the current market value of critical minerals used for green applications, such as cobalt, copper, graphite, lithium, nickel, and rare earth elements, which are widely used in batteries, motors, power grids, and turbines, is approximately USD 100 billion. This figure is projected to grow to USD 700 billion by 2040. Major producing countries include Australia, Chile, China, the Democratic Republic of the Congo, and Indonesia. China holds most of the world's refining capacity for cobalt and lithium, with refineries typically located near domestic battery and electric vehicle manufacturing hubs to facilitate supply chain coordination.

In the green technology manufacturing sector, global output in 2024 was valued at approximately USD 800 billion and is projected to reach USD 4.6 trillion by 2040. China produces more than 80% of the world's solar panels and batteries and continues to expand its investment in the sector. In 2023, global investment in modular product manufacturing totalled USD 200 billion, of which China accounted for about three-quarters, while the European Union and the United States together accounted for around 16%.

⁸ Xiao Y, Wu S, Liu ZQ and Lin HJ. Digital economy and green development: Empirical evidence from China's cities. [J] *Front. Environ. Sci.* 2023. 11: 1124680.

⁹ Lily Dai et al. Investing in the green economy 2025: Navigating volatility and disruption [R] London. London Stock Exchange Group plc. 2025

¹⁰ Egamberdiyev Shavkatbek. Global Trends In The Green Economy. [J] *Modern education and development.* 2025. 19(4), pp. 26–30

¹¹ Sek-loong Tan et al. Economic Growth Opportunities in a Greening World. [Z] <https://www.bcg.com/publications/2025/economic-growth-opportunities-greening-world>. BGC. 16 January 2025

In the field of engineered products, supportive government policies and cost advantages in manufacturing enabled China in 2023 to surpass Japan and Germany to become the world's largest exporter of electric vehicles. The country has also attracted substantial investment into the production of electric vehicles and lithium batteries.

Green industrial materials currently represent only a small fraction of the overall market. Out of the USD 3.5 trillion global industrial materials market, green materials account for just USD 500 billion. However, as countries work toward their 2050 net-zero emissions targets, this market is expected to grow to USD 3.6 trillion by 2040.

The green transition will also significantly increase demand for green services, including financing services to support the transition, information technology services, eco-tourism, and low-carbon air travel. In addition, it will drive both public and private sector investment in climate adaptation and resilience projects, as well as in nature-based solutions. The current global green services market is valued at approximately USD 600 billion and is expected to exceed USD 2.2 trillion by 2040.

China has achieved remarkable progress in science and technological innovation over the past few decades. The results of research and development in digital enablement have been widely applied in areas such as artificial intelligence, the industrial internet, smart cities, cybersecurity, and energy management. As the world's largest producer of renewable energy technologies, including solar and wind power, China has delivered significant breakthroughs in the development, cost reduction, and efficiency of new energy worldwide. Chinese technological innovation is now deeply integrated into all aspects of daily life, supporting the transformation of traditional industries while creating new opportunities for emerging sectors.

According to data from the China Academy of Information and Communications Technology (CAICT), the value of China's digital economy grew from RMB 39.2 trillion in 2020 to RMB 54 trillion in 2023 (see Table 1-1), maintaining a high annual growth rate. This growth reflects sustained investment, the rapid application of technologies such as 5G and artificial intelligence, and the strong strategic priority placed on digital transformation at the national level.

Figures from the National Bureau of Statistics of China show that, as of the end of 2023, China's core digital economy industries generated operating revenues of RMB 48.45 trillion. These industries comprised 2.92 million enterprises and employed 36.16 million people. Among them, digital product manufacturing enterprises recorded the highest operating revenues in 2023, at RMB 20.48 trillion. Enterprises engaged in the application of digital technologies generated RMB 14.04 trillion, industries driven by digital factors reached RMB 9.74 trillion, and digital product service providers accounted for RMB 4.18 trillion.¹²

¹² Xinhua News. China unveils data on core industries of digital economy of 2023. [N] https://english.www.gov.cn/archive/statistics/202412/26/content_WS676d4383c6d0868f4e8ee49d.html. Xinhua News. 26 December 2024

Table 1-1 China's Digital Economy Scale (2018–2023)*Unit: RMB trillion*

Year	Scale of Digital Economy
2018	31.3
2019	35.8
2020	39.2
2021	45.5
2022	50.2
2023	54.0

Source: China Academy of Information and Communications Technology (CAICT)

In 2024, China's green economy reached 13.6 trillion yuan, accounting for more than 10% of GDP for the first time and becoming one of the core drivers of national growth. It contributed 25% of GDP expansion.¹³ The output value of clean energy grew by more than 20%, with wind and solar power, energy storage, and electric vehicles emerging as the dominant industries. In 2023, the green economy accounted for roughly 40% of GDP growth, and this share is expected to rise further in the coming years. China now accounts for 68% of global electric vehicle production, 86% of solar module production, and 74% of lithium-ion battery output.¹⁴

China's achievements in digitalization and green development are remarkable. As a global leader in computing power infrastructure, China provides a solid foundation for the advancement of artificial intelligence and big data. According to the *2024 Digital China Development Report*, the country's digital infrastructure has undergone significant upgrades, with total national computing power reaching 280 EFLOPS, ranking among the highest worldwide. At the same time, China has built 4.251 million 5G base stations, accounting for more than 60% of the global total. Notably, more than 60% of newly added computing power is concentrated in eight national computing hub regions, underscoring China's strategic focus on regional coordination and optimized resource allocation.¹⁵

In the field of artificial intelligence, by 2024 the total number of global patents related to generative AI reached 45,000, with China accounting for 61.5%. This underscores China's global leadership in AI innovation. Nationwide, national and provincial-level data nodes have achieved full provincial coverage, supporting more than 85% of industrial sectors. In terms of industrial integration, by 2022 the penetration rate of the digital economy had reached 24% in the industrial sector and 44.7% in the service sector. China already has more than 240 industrial internet platforms, connecting over 80 million devices and serving 1.6 million industrial enterprises. Digital twin technology, smart factories, and unmanned delivery have become mainstream applications in manufacturing and logistics. China has also become the world's largest robotics market. In 2022, sales of industrial robots in China reached 290,258 units, far

¹³ Lauri Myllyvirta, Qi Qin and Chengcheng Qiu. Analysis: Clean energy contributed a record 10% of China's GDP in 2024. [Z] <https://www.carbonbrief.org/analysis-clean-energy-contributed-a-record-10-of-chinas-gdp-in-2024/>. CarbonBrief. 19 February 2025

¹⁴ Yan Liang. Green growth, high-tech gains and hard truths for China's economy [Z]. East Asia Forum. EAF special feature series. 21 January 2025

¹⁵ Digital China Summit. Digital Achievements Unveiled at the Summit! Highlights of the 8th Digital China Summit. [N] https://www.szzg.gov.cn/2025/english/digitalnews/202505/t20250508_5015514.htm. Digital China Summit. 8 May 2025

surpassing Japan in second place with 50,413 units, giving China a 52.5% global market share.¹⁶ At the same time, China has maintained its position as the world's largest online retail market for 12 consecutive years (2013–2024). In 2024, China's online retail sales reached 15.52 trillion yuan, accounting for nearly 50% of global online transactions and continuing to grow faster than other major economies.¹⁷

Today, China has become the world's largest investor in renewable energy and the leading manufacturer of green industries, holding dominant market shares in wind power, photovoltaics, and electric vehicles. China's total investment in clean energy is estimated at 6.8 trillion yuan, accounting for nearly half of the growth in fixed-asset investment. Among the sub-sectors, electric vehicle production is the most valuable segment, followed by clean power generation, rail transit, power transmission and storage, and improvements in energy efficiency.

In 2023, China surpassed Japan and Germany to become the world's largest exporter of electric vehicles, while also attracting substantial investment in electric vehicle and lithium battery production. In 2024, electric vehicles and their batteries emerged as the largest contributors to China's clean energy economy, accounting for approximately 39% of its total value. The largest share came from the production of Battery Electric Vehicles (BEVs) and Plug-in Hybrid Electric Vehicles (PHEVs) — collectively referred to as “new energy vehicles” — whose combined market value exceeded 3 trillion yuan, followed by investment in the manufacturing of new energy vehicles and batteries.¹⁸

On the other hand, China has installed a cumulative 1,310 gigawatts of wind and solar power capacity, reaching its original target six years ahead of schedule. China also accounts for two-thirds of global wind and solar construction projects.¹⁹ China produces more than 80% of the world's solar panels and batteries, and continues to expand its investment in this industry.²⁰ In addition, power transmission and storage accounted for 9% of the total value of the clean energy sector in 2024, with an actual growth rate of 19%. The most valuable segment was grid investment, followed by energy storage, including expenditures on pumped hydro storage, grid-connected battery storage, and hydrogen production. By the end of 2024, China had completed and put into operation 42 ultra-high-voltage long-distance transmission lines, with a total length exceeding 40,000 kilometers and a transmission capacity of more than 300 gigawatts. Another 12 lines were under construction.

China and Malaysia are deepening their cooperation in the digital economy and green economy. Through high-level agreements, major investments, and concrete industrial and

¹⁶ Shi Dan, Zhang Qizi, Guo Chaoxian. Milestone Progress Achieved in the Transformation and Upgrading of China's Industries. [J] China Watch. April 2024. Vol. 4(7).

¹⁷ Xinhua News. China becomes largest online retail market for 12 consecutive years [N]. https://english.www.gov.cn/news/202501/25/content_WS6794249ec6d0868f4e8ef269.html. Xinhua News. 25 January 2025

¹⁸ Lauri Myllyvirta, Qi Qin and Chengcheng Qiu. Analysis: Clean energy contributed a record 10% of China's GDP in 2024. [Z] <https://www.carbonbrief.org/analysis-clean-energy-contributed-a-record-10-of-chinas-gdp-in-2024/>. CarbonBrief. 19 February 2025

¹⁹ Yan Liang. Green growth, high-tech gains and hard truths for China's economy [Z]. East Asia Forum. EAF special feature series. 21 January 2025

²⁰ Sek-loong Tan et al. Economic Growth Opportunities in a Greening World. [Z] <https://www.bcg.com/publications/2025/economic-growth-opportunities-greening-world>. BGC. 16 January 2025

technological projects, the partnership is not only reshaping Malaysia's economic landscape but also enabling both countries to achieve win-win outcomes in regional digital transformation and sustainable development, working hand in hand to become regional leaders.

In April 2025, Malaysia's Ministry of Digital and China's National Development and Reform Commission signed several Memoranda of Understanding (MoUs) to promote cooperation in the digital economy and artificial intelligence. The agreements cover areas such as policy coordination, regulatory alignment, industrial digital transformation, technological innovation, and talent development. A Joint Working Group on the Digital Economy was also established, co-led by China's National Data Bureau and Malaysia's Ministry of Digital. At the same time, multiple technology enterprises from both countries, including Huawei and Skyvast Cloud, signed six MoUs with universities to advance cooperation in artificial intelligence, cloud computing, and digital infrastructure development. These initiatives extend to sectors such as e-commerce, logistics, public services, and the construction of Malaysia's sovereign AI cloud platform. Furthermore, China and Malaysia signed agreements to promote the digitalization of cross-border trade. These include building a national single window platform to facilitate e-commerce, digital payments, and next-generation logistics systems. Both sides will also establish multiple joint laboratories and research centers, focusing on the development of key technologies such as machine learning, predictive maintenance, and AI-powered medical diagnostics.

In 2024, Chinese enterprises participating in the Malaysia Digital initiative committed investments totaling RM11.9 billion in Malaysia. During the same period, Malaysian digital enterprises exported RM503.4 million worth of goods and services to China, with exports concentrated in semiconductors, video games, and real estate technology.

On the other hand, China and Malaysia reached a consensus to expand cooperation in clean energy, electric vehicles, green finance, and green infrastructure. Representative cooperation projects include Zhejiang Geely Holding Group's Automobile High-Technology Valley (AHTV) industrial park in Perak, the Edra solar photovoltaic farm in Kedah, and renewable energy and grid modernization projects in Malaysia involving Chinese enterprises. The China Enterprises Chamber of Commerce in Malaysia is actively promoting investment projects in renewable energy, environmental protection technology, and sustainable development practices, supporting Malaysia in becoming a regional leader in green technology.

The joint construction of a green and digital community of shared future between China and Malaysia will unlock new development opportunities for Malaysia. Through resource sharing and cooperation in high-tech investment, research and development, commercialization, technological innovation and exchange, and talent training, Malaysia is expected to leverage China's mature technology, expertise, and capital to shorten the timeline of its digital economy transformation, while accelerating progress toward sustainable development goals.

This report is based on two bilateral cooperation frameworks — the *Memorandum of Understanding between the Government of the People's Republic of China and the Government of Malaysia on Strengthening Investment Cooperation in the Field of Digital Economy* and the *Memorandum of Understanding between the Government of the People's Republic of China and the Government of Malaysia on Promoting Investment Cooperation in the Field of Green Development*. Focusing on the two themes of green development and the digital economy, the report systematically reviews the active role of Chinese enterprises in

Malaysia, highlighting their contributions, practical achievements, and innovative experiences. By leveraging resource sharing and win-win cooperation, and drawing on the outcomes and expertise of Chinese enterprises in the green and digital economy, Chinese enterprises are supporting Malaysia in building a green and digital economic ecosystem and strengthening technological innovation capacity. This collaboration enables Malaysia to achieve “leapfrog development” in its economic transformation and industrial upgrading, delivering significant benefits for the country’s long-term economic development as well as in addressing social and environmental challenges, while advancing the joint construction of a China–Malaysia community of shared future in the green and digital economy.

1.2 Objectives and Research Methodology

Core Objectives of this Report

1. **Showcase Achievements:** Present sustainable development outcomes of Chinese enterprises’ investments in Malaysia through project results and case studies.
2. **Respond to Policy:** Demonstrate how Chinese enterprises actively align with and support the green and digital cooperation strategies of both China and Malaysia.
3. **Enhance Understanding:** Strengthen global recognition of Chinese enterprises’ overseas image, responsibility, and value in cooperation.
4. **Support Cooperation:** Provide references to facilitate further deepening of bilateral cooperation in green development and the digital economy.

Research Methodology

This report adopts both primary and secondary sources. Primary sources refer to original data collected directly for specific research purposes. Secondary sources refer to information gathered from third-party channels, such as reports, books, academic journals, government publications, media coverage, and online databases. Secondary sources provide background knowledge and support the analysis by consolidating established facts and trends. The combination of primary and secondary sources ensures the report is comprehensive, well-grounded, credible, and in-depth.

In this report, the China Enterprises Chamber of Commerce in Malaysia collected primary data through internal channels, reaching out to association members involved in green and digital economic sectors, particularly representative Chinese enterprises. These primary data reports provide an in-depth view of enterprises’ actual operations and tangible outcomes. They highlight the strategies and achievements of Chinese enterprises in advancing green development and the digital economy in Malaysia, and their roles and contributions in building a green and digital community of shared future.

Meanwhile, secondary sources such as reports, academic journals, government publications, and media coverage are also used. These provide context on Malaysia’s green development and digital economy, and complement the analysis of Chinese enterprises’ participation. Together, they support the comprehensiveness and reliability of the research findings in this report.

Chapter 2: Achievements of Chinese Enterprises in Advancing Green Development in Malaysia

2.1 Malaysia's Green Development Policies and Overview

2.1.1 Overview of Malaysia's Green Development

The outbreak of the COVID-19 pandemic in 2020 accelerated the development of the green economy both globally and in Malaysia, while also drawing greater attention to the critical role of green energy in supporting global sustainability. In response, the Malaysian government introduced a series of strategic frameworks. In 2021, it released the *Malaysia Renewable Energy Roadmap 2035*. This was followed in 2022 by the *National Energy Policy (2022–2040)*. In 2023, the government launched the *National Energy Transition Roadmap*, the *Hydrogen Economy and Technology Roadmap*, and the *New Industrial Master Plan 2030*. Together, these initiatives place the green economy and national economic transformation at the center of Malaysia's development agenda, opening up vast opportunities for green growth.

Although Malaysia attaches great importance to green development by advancing renewable energy projects and encouraging initiatives such as energy efficiency and green buildings, the share of renewables in the national energy supply remains relatively low. The country's energy system is still dominated by fossil fuels such as natural gas, crude oil, and coal. Natural gas accounts for 42.4% of the Total Primary Energy Supply (TPES), followed by crude oil and petroleum products at 27.3% and coal at 26.4%. In contrast, renewable energy sources, mainly hydropower, solar, and bioenergy, represent only 3.9%.²¹

As a core policy and action plan for green development, the **National Energy Transition Roadmap (NETR)** is designed to be implemented in two distinct phases.

Phase I (2023–2025): Foundational Development and Pilot Initiation

This initial phase focuses on laying the groundwork for the energy transition through key policy reforms and demonstration projects. Efforts include:

- Establishing policy and regulatory frameworks to drive energy market reforms and improve the renewable energy policy system;
- Launching the first batch of pilot projects in green technology and renewable energy, such as solar farms and green industrial parks;
- Attracting domestic and international investment by offering incentives and green financing tools to engage private sector and foreign capital;
- Enhancing talent and capacity-building through training and education programs to cultivate skills in new energy and green technologies;
- Upgrading infrastructure by initiating power grid modernization to enable renewable energy integration and storage systems.

²¹ Malaysian Government. National Energy Transition Roadmap [R]. Malaysia. Ministry of Economy, 2023.

Phase II (2026–2050): Accelerated Expansion and Structural Transformation

The second phase emphasizes a comprehensive transformation of the energy system to achieve the goal of net-zero emissions. The priorities include:

- Large-scale deployment of renewable energy to significantly increase the share of wind, solar, and biomass in the energy mix;
- Phasing out reliance on fossil fuels by gradually reducing coal-fired power and transitioning natural gas to the role of a “bridge fuel”;
- Promoting electric mobility and smart grids through the development of a nationwide smart grid system and widespread adoption of electric vehicles and charging infrastructure;
- Driving industrial decarbonization by encouraging manufacturing and industrial sectors to adopt green energy and improve efficiency;
- Advancing a green economy and a just transition to ensure that all social groups and regions benefit equitably from the energy transition, including retraining and economic support for affected workers.

Phase I specifically encompasses six strategic levers of energy transition—enhancing overall energy efficiency, advancing renewable energy, developing green hydrogen, expanding bioenergy, promoting green mobility, and strengthening carbon capture, utilization, and storage (CCUS). It also includes ten flagship catalytic projects (see Table 2-1). Implementation of this phase is anchored in financing and investment, policy and regulatory measures, human capital and just transition strategies, technology and infrastructure, as well as governance and execution.

Phase II will shift focus toward establishing the national energy mix and emission reduction targets, while outlining low-carbon pathways and specifying concrete measures required for transition. The government will step up deployment of priority investments, human resource strategies, and international cooperation plans, while continuing to refine regulatory frameworks and expand the development of talent, technologies, and infrastructure.

Successful implementation of the energy transition is expected to unlock new growth opportunities for Malaysia, raising the value contribution to GDP from RM 25 billion in 2023 to RM 220 billion by 2050, while creating 310,000 new jobs.²²

Table 2-1 National Energy Transition Roadmap: Energy Transition Levers and Flagship Catalytic Projects

Energy Transition Levers	Flagship Catalytic Projects
Energy Efficiency	High-Efficiency Switching
Renewable Energy	Renewable Energy Zones
	Utility-Scale Energy Storage Systems
	Energy Security
Hydrogen	Green Hydrogen
	Hydrogen and Ammonia Co-Firing Projects
Bioenergy	Creating Biomass Demand
Green Mobility	Future Mobility

²² Malaysian Government. National Energy Transition Roadmap [R]. Malaysia Ministry of Economy, 2023.

	Future Fuels
Carbon Capture, Utilization, and Storage (CCUS)	Industrial Carbon Capture and Storage (CCS)

Source: National Energy Transition Roadmap

As a core policy and action plan for green development, the *National Energy Transition Roadmap* (NETR) sets out a Responsible Transition Pathway 2050, aiming to gradually transform Malaysia’s oil-dependent energy system into a green and low-carbon energy system by 2050. This transition includes the complete phasing out of coal-fired power plants and reducing dependence on petroleum-based power generation, from 96% in 2023 to 77% by 2050.

By 2050, natural gas will continue to be the country’s primary source of Total Primary Energy Supply (TPES), accounting for 56%, while renewable energy (mainly solar, hydropower, and bioenergy) will increase its ratio to 23%. In terms of installed capacity, the ratio of renewable energy in the national electricity mix is projected to rise dramatically, from 23% in 2020 to 70% by 2050 (see Figure 2-1). Within this mix, solar photovoltaic (PV) is expected to become the largest source of electricity generation, with solar capacity accounting for 58% of total installed capacity, while hydropower will contribute around 11% (see Figure 2-2). In contrast, natural gas generation capacity will decline significantly, from 42% in 2025 to just 29% in 2050.

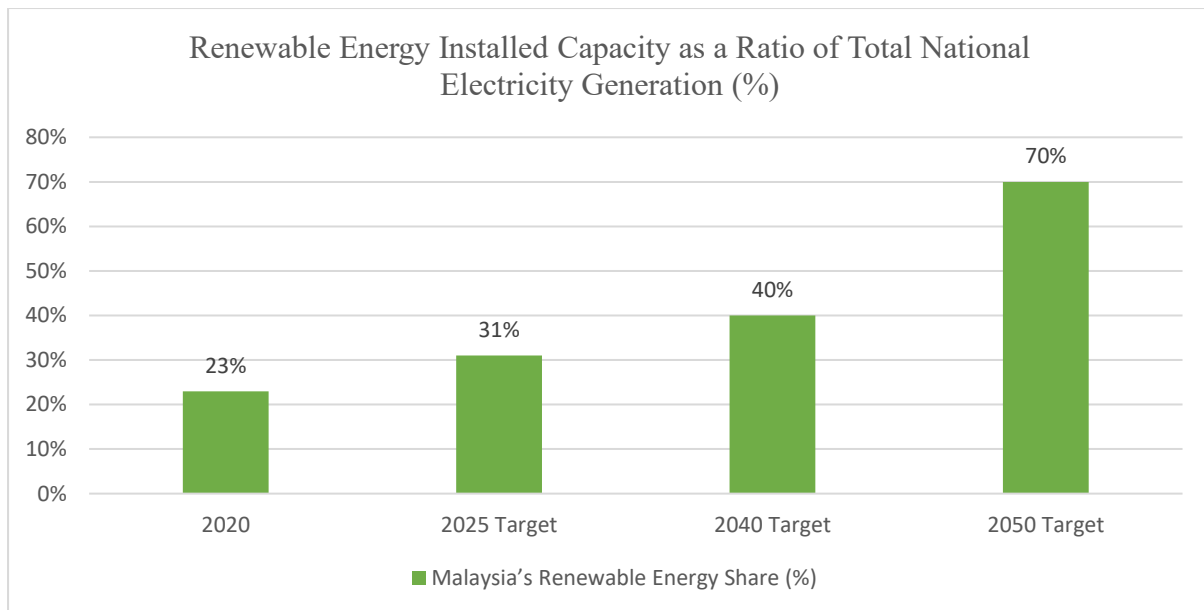
(1) Renewable Energy – Solar Power

Before 2016, solar development in Malaysia primarily focused on small-scale land-based, floating, and rooftop PV projects. In 2016, the Energy Commission introduced the *Large-Scale Solar (LSS)* program, which has since completed four development phases. At present, the Malaysian government is advancing solar power development through mechanisms such as the LSS program, the Net Energy Metering (NEM) scheme, and the Corporate Green Power Programme (CGPP), designed to accelerate renewable energy deployment.

As of the first quarter of 2024, LSS-driven projects had awarded a total of 2,445 MW of capacity, of which 1,822 MW has already been commissioned and 623 MW remains under construction. In December 2024, the government announced the fifth phase of the LSS program (LSS5) with a quota of 2,000 MW. Within a week, however, the government expanded the scheme to 4,000 MW, forming the “LSS5+” extension plan, thereby fast-tracking solar energy deployment.

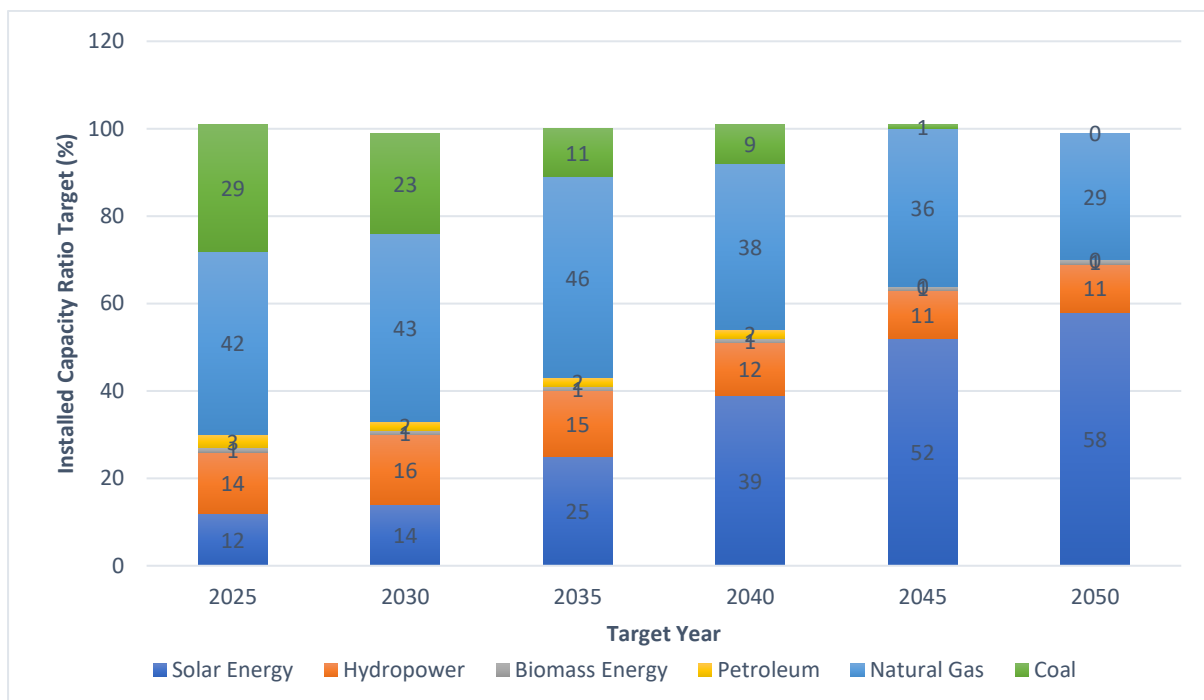
The LSS5, LSS5+, and the forthcoming LSS6 programs are expected to unlock contracts worth RM15 billion to RM18 billion over the next 24 months (2025–2027), fueling the growth of the domestic solar value chain. Beyond expanding installed capacity, these initiatives represent a cornerstone of Malaysia’s broader energy transition and green economy strategies. With strong policy backing, industry collaboration, and enterprise participation, the LSS programs will significantly accelerate Malaysia’s shift toward a low-carbon energy system, while also setting a benchmark for renewable energy development in the region.

Figure 2-1 Malaysia's Renewable Energy Installed Capacity Targets as a ratio of Total National Electricity Generation



Source: Data from Malaysia Renewable Energy Roadmap and National Energy Transition Roadmap

Figure 2-2 Malaysia's Installed Capacity Targets for the Energy System (2025–2050)



Source: National Energy Transition Roadmap

(II) Green Transport and Low-Carbon Energy Efficiency

According to the national energy transition targets set by the government, by 2050 urban public transportation in Malaysia is expected to account for 60% of mobility share, while electric vehicles (EVs) are projected to represent 80% of total vehicle use (see Table 2-2). In parallel, energy savings in the industrial and commercial sectors are targeted to reach 23%, while the residential sector is expected to achieve 20% savings. Maritime and aviation sectors will also experience significant green transformation, with the penetration rate of green fuels projected to reach 40% and 47% respectively by 2050. At the same time, the development of carbon capture, utilization, and storage (CCUS) projects will be accelerated. To achieve its net-zero ambition, the Malaysian government will promote energy efficiency, waste management measures, renewable energy adoption, and the establishment of a robust regulatory framework to lower carbon emissions in the industrial sector.

While expanding public transportation, the government is also actively advancing the adoption of EVs. However, Malaysia currently faces a shortage of rapid charging stations, resulting in long queues and waiting times. To support the sustainable growth of the EV industry, comprehensive infrastructure development and grid upgrades are needed, including the nationwide installation of 10,000 public charging facilities. With the expansion of charging networks and the introduction of new EV models, Malaysia's EV market is expected to undergo rapid growth.

This transition also presents growth opportunities for related industries, including charging infrastructure development, battery technology research, and EV manufacturing. Economists have pointed out that the government's proactive development of EVs can create spillover benefits across multiple sectors such as metals, electronics and electrical equipment, chemicals, digital and ICT solutions, as well as raw materials like steel, aluminum, and plastic composites.

Table 2-2: Benchmarked Areas of Energy Transition and Key Indicators

Energy Transition Benchmarked Area	Key Indicators	2018 Data	National Energy Policy: 2040 Target	National Energy Transition Roadmap: 2050 Target
Energy Efficiency	Industrial & Commercial Energy Efficiency Savings	< 1%	11%	23%
	Residential Energy Efficiency Savings	< 1%	19%	20%
Renewable Energy	Coal Installed Capacity Ratio	31.4%	19%	0%
	Renewable Energy Installed Capacity Ratio	23%	40%	70%
Hydrogen Energy	Hydrogen Production (MTPA)	—	—	Up to 2.5 MTPA
	Grey Hydrogen Feedstock Substitution Rate	—	—	100%

	Hydrogen Hubs	—	—	3
Bioenergy	Biofuel Production Capacity (Billion Liters)	—	—	3.5
	Bioenergy Production Capacity	—	—	1.4 GW
Green Mobility	Urban Public Transport Ratio	20%	50%	60%
	Electric Vehicle Ratio	< 1%	38%	80%
	Electric Two-Wheeler (E2W)	—	—	80%
	Fuel Efficiency of Light-Duty Vehicles	—	—	-30%
	Fuel Efficiency of Heavy-Duty Transport	—	—	-24%
	Heavy-Duty Transport Biofuel	—	B30	B30
	Heavy-Duty Transport Hydrogen Penetration Rate	—	—	5%
	Maritime Transport Liquefied Natural Gas (LNG) Penetration Rate as Alternative Fuel	—	25%	—
	Maritime Transport Green Fuel Penetration Rate	—	—	40%
	Sustainable Aviation Fuel (SAF) Mandated Share by 2050	—	—	47%
Carbon Capture, Utilization, and Storage (CCUS)	Number of CCUS Clusters	—	—	3–6
	CO ₂ Storage Capacity (MTPA)	—	—	40–80

Source: National Energy Transition Roadmap and National Energy Policy 2022–2040

(3) Green Hydrogen Energy

Green hydrogen refers to hydrogen (H₂) produced through the electrolysis of water (H₂O) using renewable energy sources such as wind, solar, and hydropower. This process emits no carbon dioxide, making green hydrogen a core component of future clean energy systems and a so-called “ultimate energy carrier” in the carbon-neutral era. However, it still faces significant challenges, particularly high production costs and insufficient infrastructure.

In sectors such as industry, transport, and power generation, hydrogen offers clear advantages over traditional natural gas, providing critical support for sustainable development. Over the next decade, driven by technological progress and government policy, green hydrogen is expected to achieve large-scale applications in heavy industry, long-duration energy storage,

and transportation. By around 2030, its cost is projected to approach that of grey hydrogen, positioning green hydrogen as a new commodity in global energy trade. According to the International Energy Agency, hydrogen will account for 24% of global energy consumption by 2050, with green hydrogen dominating the market.

Malaysia has set ambitious targets for hydrogen development. By 2050, the government aims to phase out fossil-fuel-based hydrogen production and generate up to 2.5 million tonnes of green hydrogen using renewable energy as feedstock, while also establishing three low-carbon hydrogen hubs. To advance its green hydrogen economy, Malaysia has outlined four major policy measures:

1. **Establishing low-carbon hydrogen standards** – Simplifying project approval processes and introducing hydrogen-specific regulations for transportation and storage.
2. **Building local manufacturing capacity** – Supporting domestic electrolyzer production and providing financial assistance for R&D in universities and the private sector.
3. **Developing hydrogen hubs** – Enhancing the economic value of low-carbon hydrogen while promoting technology transfer partnerships between local manufacturers and international technology providers.
4. **Exploring bilateral agreements** – Collaborating with major importing countries to develop a comprehensive low-carbon hydrogen value chain.

According to the *Hydrogen Economy & Technology Roadmap* (Ministry of Science, Technology and Innovation, 2023), Malaysia’s hydrogen economy is expected to generate RM 89 billion in revenue by 2050.

Table 2-3 Key Application Scenarios of Green Hydrogen

Sector	Application Scenarios
Industrial Sector	- Substitute for grey hydrogen: used in ammonia synthesis, oil refining, and steelmaking (Hydrogen Direct Reduction Iron, DRI) and other traditional high-carbon industries. - Chemical feedstock: production of methanol, synthetic fuels (e.g., e-Fuels).
Energy & Power	- Energy storage and peak shaving: converting surplus renewable electricity into hydrogen, and generating power through fuel cells during shortages. - Hydrogen blending in natural gas: injecting 5%–20% hydrogen into natural gas pipelines to reduce carbon emissions.
Transportation Sector	- Fuel Cell Electric Vehicles (FCEVs): applications in heavy trucks, shipping, and aviation for long-distance transportation. - Hydrogen refueling stations: supporting hydrogen-powered transportation infrastructure.
Export Market	Resource-rich countries (e.g., Australia, Middle East) exporting to energy-importing countries (e.g., Japan, South Korea, EU) in the form of green hydrogen or its derivatives (e.g., liquid ammonia).

Source: China Power Construction Comprehensive Data

(4) Green Financing

According to estimates from the *National Energy Transition Roadmap (NETR)*, Malaysia will require between RM 1.2 trillion and RM 1.3 trillion in investments by 2050 to achieve its national energy transition targets. Of this, around 18% of funds will be directed mainly toward the renewable energy generation and green transportation sectors.²³

Investments in renewable energy generation will focus on scaling up solar photovoltaics, hydropower, and strengthening grid infrastructure. Meanwhile, investments in green transportation will target the expansion of public transit, enhancement of domestic electric vehicle (EV) production capacity, and development of EV charging infrastructure. Additionally, hydrogen energy and carbon capture, utilization, and storage (CCUS) technologies will require substantial investment and wider promotion.

To address these needs, the government has proposed several financing and investment measures in the *National Energy Transition Roadmap* to accelerate energy transition development:

1. **Launch of the National Energy Transition Fund** – A RM 20 billion seed fund will be established to catalyze blended financing platforms. This aims to accelerate capital mobilization and deployment, improve access to financing, simplify investment processes, and ensure seamless allocation of funds toward energy transition projects.
2. **Attracting private capital** – The government seeks to mobilize private capital into the energy transition space by leveraging green Foreign Direct Investment (FDI), international and domestic capital markets, venture capital (VC), and private equity (PE). It will also promote the adoption of innovative sustainable finance instruments, such as green or Sustainable Development Goal (SDG)-linked financing, green bonds, sukuk (Islamic bonds), and blended financing structures.
3. **Implementation of a carbon pricing mechanism** – A phased carbon pricing mechanism will be introduced to support the achievement of carbon neutrality goals. This mechanism is also intended to create an additional pool of capital for investments in energy transition sectors.

2.1.2 Green Development Policies and Regulatory Framework

Malaysia's green development policies, regulations, and action plans are designed to promote the adoption of renewable energy and green technologies, maximizing the potential of clean energy as a crucial pillar for new economic growth. An overview of the country's related policies, regulatory measures, and action plans is provided in Table 2-4.

Table 2-4 Malaysia's Green Development-Related Policies, Laws, and Action Plans

No.	Green Development Policies, Laws, and Action Plans	Year of Issuance
1	National Green Technology Policy	2009
2	Renewable Energy Act 2011 & Renewable Energy (Amendment) Act 2023	2011 & 2023
3	National Renewable Energy Policy & Action Plan	2010
4	National Energy Efficiency Action Plan	2015

²³ Malaysian Government. National Energy Transition Roadmap [R]. Malaysia. Ministry of Economy, 2023.

5	The Green Technology Master Plan 2017-2030	2017
6	Malaysia Renewable Energy Roadmap (MyRER)	2021
7	National Energy Policy, 2022-2040	2022
8	National Energy Transition Roadmap (NETR)	2023
9	Hydrogen Economy & Technology Roadmap (HETR)	2023
10	New Industrial Master Plan 2030 (NIMP 2030)	2023

(1) National Green Technology Policy

In 2009, the Malaysian Government introduced the National Green Technology Policy, aimed at promoting green technology, renewable energy, and sustainable development. The policy seeks to minimize adverse environmental impacts while fostering the growth of a low-carbon economy.²⁴

The core objective of the policy is to integrate green technology into the national development strategy, striking a balance between economic growth and environmental conservation. It emphasizes the principles of sustainability, focusing on efficient resource utilization, environmental protection, and social responsibility.

Key measures include supporting the development and deployment of renewable energy in Malaysia, underlining the importance of improving energy efficiency, and encouraging innovation in green technology research and application. To this end, the government has introduced regulatory frameworks and incentive mechanisms designed to stimulate investment in green technology and renewable energy projects.

(2) Renewable Energy Act

Malaysia enacted the Renewable Energy Act 2011, later amended through the Renewable Energy (Amendment) Act 2023, to regulate and streamline the development of the renewable energy sector. The legislation underpins Malaysia's renewable energy policy and sustainable development goals by encouraging widespread adoption of clean energy, while at the same time creating new economic models and business opportunities.²⁵

The Act establishes a clear legal framework for licensing renewable energy projects, covering their development, operation, and power purchase agreements (PPAs). It sets national renewable energy targets, including increasing the share of renewable sources in the country's energy mix to reduce greenhouse gas emissions.

In addition, the Act imposes obligations on electricity providers, requiring them to purchase power generated from renewable sources. This mechanism ensures the alignment of market players with national renewable energy goals, thereby supporting Malaysia's transition towards a more sustainable energy future.

²⁴ Malaysian Government. National Green Technology Policy [R]. Malaysia. Ministry of Energy, Green Technology and Water, 2009.

²⁵ Malaysian Government. Renewable Energy Act 2011 [Z]. Malaysia. Parliament of Malaysia, 2011.

(3) National Renewable Energy Policy & Action Plan

In 2010, the Malaysian Government launched the National Renewable Energy Policy & Action Plan, with the goal of accelerating the development and utilization of renewable energy. A key national target was established: to raise the share of renewable energy capacity to 20% of total installed electricity capacity by 2025.²⁶

The plan promotes renewable energy projects across multiple sources, including solar, wind, biomass, and small-scale hydropower. Its scope covers energy production, distribution, and end-use. To support these developments, the action plan outlines regulatory frameworks, fosters a business-friendly environment, and emphasizes talent development, renewable energy R&D, and public awareness campaigns. In addition, the government introduced incentive mechanisms such as rewards and subsidies, encouraging both businesses and individuals to invest in renewable energy projects.

(4) National Energy Efficiency Action Plan

The Malaysian Government issued the National Energy Efficiency Action Plan in 2015, designed to improve energy efficiency, reduce energy waste, and strengthen the country's long-term energy sustainability.²⁷

The plan's central aim is to address supply-side challenges by managing energy demand more effectively. It identifies pathways to improve energy efficiency, which simultaneously tackles pressing issues such as energy supply security, environmental protection, and climate change mitigation. At the same time, it promotes sustainable development and opens new opportunities for economic growth.

Through structured management strategies and targeted measures, the plan seeks to resolve Malaysia's complex energy challenges, ultimately raising energy utilization efficiency and driving forward the country's sustainable energy agenda.

(5) Green Technology Master Plan 2017–2030

In 2017, the government released the Green Technology Master Plan 2017–2030, which provides a long-term roadmap for advancing green technology and sustainable development. It supports the implementation of green technology projects, urban greening initiatives, and the creation of a low-carbon, resource-efficient society.²⁸

The blueprint categorizes green technology into five focus sectors: energy, manufacturing, transportation, building, and waste. It is designed to steer Malaysia toward sustainable green development, enhance energy efficiency, and reduce greenhouse gas

²⁶ Malaysian Government. National Renewable Energy Policy and Action Plan [R]. Malaysia. Ministry of Energy, Green Technology and Water, 2010.

²⁷ Malaysian Government. National Energy Efficiency Action Plan [R]. Malaysia. Ministry of Energy, Green Technology and Water, 2015.

²⁸ Malaysian Government. Green Technology Master Plan 2017-2030 [R]. Malaysia. Ministry of Energy, Green Technology and Water, 2017.

emissions, while also stimulating economic growth and generating new employment opportunities.

According to projections, by 2030 the green technology sector will contribute RM60 billion to GDP, attract RM94.3 billion in green investments, and create approximately 221,500 new green jobs.

(6) Malaysia Renewable Energy Roadmap (MyRER)

In 2021, the Malaysian Government introduced the Malaysia Renewable Energy Roadmap (MyRER), developed by the Sustainable Energy Development Authority (SEDA). The roadmap sets out development plans and targets for renewable energy from 2022 to 2035, supporting Malaysia's transition to a low-carbon energy system.²⁹

The roadmap projects renewable energy capacity to increase from 8,450 MW (23% of total power capacity) in 2020 to 17,996 MW (40% of total power capacity) by 2035. With clear strategies to expand renewable energy deployment, the roadmap aims to stimulate new economic growth, attract up to RM33 billion in investments, and directly create nearly 47,000 jobs by 2035.

(7) National Energy Policy 2022–2040

In 2022, the Malaysian Government launched the National Energy Policy 2022–2040 to guide the country toward becoming a low-carbon nation by 2040. The policy is built around four strategic objectives:

1. Optimizing energy resources to drive sustainable economic growth.
2. Stimulating market opportunities, cost advantages, and competitiveness.
3. Strengthening environmental sustainability within the energy sector.
4. Ensuring energy security and sustainable financial support.³⁰

The policy includes 31 action plans, such as raising total renewable energy capacity to 18.4 GW by 2040, increasing the share of renewables in primary energy supply to 17%, expanding the share of electric vehicles (EVs) to 38%, and raising energy efficiency in households, industries, and commercial buildings from less than 1% to 10–11%.

It also emphasizes strengthening low-carbon policies and boosting investments in clean energy, with expanded financing and subsidies for energy efficiency improvements and EV adoption. These measures are expected to contribute RM13 billion annually to GDP, create 207,000 jobs, and attract RM9.2 billion in annual investments.

(8) National Energy Transition Roadmap (NETR)

In 2023, the government unveiled the National Energy Transition Roadmap (NETR), which outlines Malaysia's "2050 Responsible Transition Pathway" toward a green and low-

²⁹ Malaysian Government. National Energy Policy 2022-2040 [R]. Malaysia. Sustainable Energy Development Authority, 2021.

³⁰ Malaysian Government. National Energy Policy 2022-2040 [R]. Malaysia. Economic Planning Unit Prime Minister's Department, 2022.

carbon energy system. The roadmap sets ambitious 2050 goals, including raising renewable energy's share of total installed capacity to 70%, increasing renewables (solar, hydro, biomass) to 23% of the energy mix, establishing three low-carbon hydrogen hubs, and expanding bio-refining capacity to 3.5 billion liters with biomass and biogas generation capacity reaching 1.4 GW.³¹

The roadmap is structured into **two phases**:

- **Phase 1:** Focuses on six transition levers—enhancing energy efficiency, accelerating renewables, developing green hydrogen, expanding bioenergy, promoting green mobility, and strengthening carbon capture, utilization, and storage (CCUS).
- **Phase 2:** Concentrates on long-term energy structure reforms, low-carbon pathways, and emission reduction targets, supported by the necessary investment, regulatory, and policy frameworks.

The NETR emphasizes mobilizing strategic investments, human capital development, and international cooperation, while building the policies, technologies, and infrastructure required for the transition. By 2050, the roadmap envisions renewable energy investments between RM435 billion and RM1.85 trillion, GDP value creation rising from RM25 billion in 2023 to RM220 billion in 2050, and generating approximately 310,000 new jobs.

(9) Hydrogen Economy & Technology Roadmap (HETR)

In 2023, the Malaysian Government released the Hydrogen Economy & Technology Roadmap (HETR) as one of the core strategies under the *National Energy Policy 2022–2040*. The roadmap positions the hydrogen economy as a key enabler for Malaysia to achieve its net-zero emissions target by 2050.³² The roadmap highlights major challenges to be addressed, particularly the high production costs of hydrogen and the difficulties in transportation and storage, in order to establish hydrogen as a viable green fuel source. It sets out three critical objectives:

1. Position hydrogen as a cornerstone of Malaysia's new energy economy.
2. Promote hydrogen use in energy storage and fuel applications, such as combined-cycle gas turbines, to support a sustainable energy structure.
3. Invest in hydrogen technologies to tackle domestic consumption, energy security, international energy trade sustainability, and decarbonization.

According to projections, the roadmap could generate RM12.1 billion in revenue by 2030, contribute between RM49 billion and RM61 billion to GDP, and create more than 45,000 new jobs.

(10) New Industrial Master Plan 2030 (NIMP 2030)

In 2023, the Government of Malaysia launched the *New Industrial Master Plan 2030 (NIMP 2030)*, establishing four overarching goals and four key enabling factors to comprehensively advance the development of the manufacturing ecosystem and drive

³¹ Malaysian Government. National Energy Transition Roadmap [R]. Malaysia. Ministry of Economy, 2023.

³² Malaysian Government. Hydrogen Economy & Technology Roadmap [R]. Malaysia. Ministry of Science, Technology and Innovation, 2023.

industrial transformation. Among its core strategies is the transition towards renewable energy.³³

Malaysia's manufacturing sector remains heavily dependent on fossil fuels for power generation, which results in significant emissions of harmful greenhouse gases. Achieving a net-zero manufacturing industry requires renewable and clean energy to become the primary sources of power. To this end, the government has introduced two specific action plans under the NIMP 2030:

1. Enhancing Energy Efficiency and Promoting Renewable Energy Adoption

The implementation of energy efficiency measures, coupled with wider adoption of renewable energy, is designed to reduce carbon emissions while ensuring long-term cost savings. For example, companies are encouraged to retire outdated equipment in favor of newer, more energy-efficient machinery and to adopt comprehensive energy management systems. Renewable energy sources under this plan include solar photovoltaics, hydropower, and bioenergy derived from agricultural waste and palm oil by-products.

2. Accelerating the Availability and Accessibility of Renewable Energy for Manufacturing

Renewable energy constitutes a critical pillar of industrial decarbonization. Malaysia possesses significant potential to generate renewable power from solar, hydropower, bioenergy, geothermal, and hydrogen fuel cell technologies. Through this action plan, the government seeks to expedite the availability and accessibility of renewable energy for the manufacturing sector. Key initiatives include strategically scaling up large-scale solar deployment, expanding the exploration of bioenergy resources and hydropower potential, and advancing research and application of emerging technologies such as hydrogen fuel cells.

³³ Malaysian Government. New Industry Master Plan 2030 [R]. Malaysia. Ministry of Investment, Trade and Industry, 2023.

2.2 Building a Green Development Ecosystem for Chinese Enterprises in Malaysia

2.2.1 Empowering Green Development: Geely's Role in Advancing Malaysia's New Energy Industrial Chain

(i) PROTON e.MAS Electric Vehicles: Accelerating Malaysia's Entry into the New Energy Sector

Since the successful acquisition of a 49.9% stake in Malaysia's DRB-HICOM subsidiary PROTON Holdings Berhad (PROTON) in 2017, Geely Automobile Holding has consistently driven PROTON's transformation and upgrading. This has been achieved by introducing competitive product offerings, enhancing manufacturing standards, and bringing in global management expertise and research capabilities. As a result, PROTON's sales have steadily increased, growing from 64,000 units in 2018 to surpassing 150,000 units for three consecutive years between 2022 and 2024. For six consecutive years, PROTON has maintained its position as the second-best-selling automobile brand in Malaysia, with a market share of approximately 18.7% in 2024.

At the end of 2024, PROTON launched its first domestically produced strategic pure electric model, the e.MAS 7. Built on the GMA global new energy architecture jointly developed by PROTON and Geely, the e.MAS 7 integrates innovative *three-electric* technologies—battery, motor, and electronic control systems—with locally inspired design elements. The model was met with strong demand, receiving over 5,000 orders within the first month of its release. The launch event was personally attended and endorsed by Prime Minister Anwar Ibrahim, highlighting the model's milestone significance in advancing Malaysia's new energy strategy and marking a new chapter in the entry of national car brands into the new energy market.

In 2025, PROTON will continue this momentum by introducing the e.MAS 5, designed to meet Malaysia's increasingly diverse consumer demand. Moving forward, PROTON plans to release one new energy vehicle each year, progressively expanding the domestic portfolio of new energy offerings. In parallel, Geely is promoting joint ventures between leading Chinese enterprises specializing in core *three-electric* technologies and PROTON to establish local production of electric drive assemblies and battery pack systems. Preparatory work has already commenced, with localized production targeted for 2026. By leveraging PROTON as a strategic platform, Geely is helping to advance Malaysia's green development, fostering the growth and deepening of the new energy industrial chain, while creating greater high-value business opportunities and generating employment.



Picture Caption: On December 16, 2024, Malaysian Prime Minister Anwar attended the launch event of the Proton e.MAS 7.

(ii) Automotive High-Tech Valley Project: A New Energy Industrial City for Sustainable Development

The *Automotive High-Tech Valley (AHTV)* project represents a strategic expansion initiative jointly advanced by Geely Automobile Holding and its Malaysian partner DRB-HICOM, following the successful implementation of the PROTON transformation and upgrading plan. The project seeks to establish an international industrial cooperation base with the automotive sector as its core driver. It aims to explore new models of cross-border economic and trade cooperation that are led by private enterprises, involve international partners, integrate domestic and global resources, and comply with global investment and management standards.

The AHTV project is located in Tanjung Malim, Perak, approximately 85 kilometers from downtown Kuala Lumpur, and thus enjoys significant locational advantages. The planned development covers an area of about 30 square kilometers, including 5.2 square kilometers for the PROTON production base, 7.7 square kilometers for supporting industries and mixed commercial-residential use, and 3.1 square kilometers for university facilities. In the future, an additional 15 square kilometers of allocated land is expected to be incorporated into the project.

The AHTV project is designed to serve as a model of “industrial empowerment” that fully supports the development of Malaysia’s automotive industry. It seeks to establish a highland of industrial innovation centered on the integration of “industry, academia, research, and urban development,” with special focus on new energy research, intelligent manufacturing, and comprehensive talent training across the value chain. Through this initiative, Malaysia is expected to be positioned as a key automotive hub in the ASEAN region and as an international

science and technology industrial park, providing a benchmark example of “technology going global and ecosystem co-development” for Chinese automotive enterprises.

Currently, the supplier park within AHTV has received official development approval from the authorities in Perak. To further facilitate investment in the park, the Tanjung Malim municipal government has formally approved the establishment of a “green channel” to accelerate investor access. In supporting sustainable development, the AHTV project adopts the principles of “green, shared, and smart” urban development. From the planning stage, provisions for public facilities related to clean energy, pollution control, and shared infrastructure have been incorporated. For example, 47.88 acres of land have been designated for photovoltaic energy generation, enabling enterprises in the park to access clean renewable energy and thereby reduce carbon emissions. In addition, natural gas pipelines have been introduced, making AHTV one of the few industrial parks in Malaysia with direct natural gas supply, which further promotes the use of clean energy.

The project also includes the construction of municipal-standard sewage treatment facilities to ensure wastewater is treated in a scientific manner and the environment is safeguarded. Complementary public facilities, such as clinics, a fire and rescue station, schools, and mosques, have also been integrated into the development plan. Furthermore, centralized labor dormitories, heavy vehicle parking areas, and shared infrastructure for production and daily life are being established. These measures are designed to optimize resource allocation, improve logistics and transportation efficiency within the park, and reduce overall energy consumption.



Picture Caption: *Aerial View of AHTV*

2.2.2 Developing Green Mobility: Chery's Construction of a Comprehensive New Energy Vehicle Ecosystem in Malaysia

As one of the pioneers among Chinese enterprises advancing green development in Malaysia, Chery Automobile has undertaken a comprehensive set of initiatives covering new energy vehicles, green manufacturing, supply chain cooperation, and intelligent technologies. By gradually building a complete ecosystem for new energy vehicles, Chery is contributing to Malaysia's development of green mobility, supporting the attainment of sustainable development goals, and underscoring the proactive role of Chinese companies in facilitating ASEAN's green transition.

Chery's Malaysian subsidiary, *Chery Malaysia*, announced that it will establish the *Chery Smart Auto Industrial Park* within the Automotive High-Tech Valley (AHTV), creating a full industrial ecosystem for new energy vehicles in Malaysia. The industrial park, with an investment of RM 2.2 billion and a planned area of 200 acres, is scheduled for completion in 2026. Its initial production capacity will be 100,000 vehicles annually, with provisions for future expansion to 300,000 vehicles. The remaining land within the park will be reserved for parts suppliers as well as for facilities such as training and research centers.

In March 2024, Chery introduced its first all-electric SUV in Malaysia, the OMODA E5, which achieved local assembly. As the first Chinese electric vehicle to be locally assembled in Malaysia, with 99% of assembly workers recruited from the local workforce, the project not only elevated labor skill levels but also brought new technological value to Malaysia's manufacturing industry. This milestone marked a significant advance in the country's efforts to popularize electric vehicles. In recent years, Chery has further expanded its product portfolio in Malaysia, introducing both pure electric and plug-in hybrid models, thereby providing diversified green mobility options and accelerating adoption of electric vehicles in the domestic market.

(i) Building the New Energy Vehicle Ecosystem

While expanding the new energy vehicle market, Chery has placed strong emphasis on developing a localized system of green manufacturing and supply chain integration. In Shah Alam, the capital of Selangor, the company invested in its first local vehicle assembly plant, which officially commenced operations in June 2024. This facility, Chery's first vehicle assembly plant in the ASEAN region, initially produced the JAECOO J7 premium SUV and created 500 local jobs, with the goal of generating at least 1,000 local positions in the future. In addition to investing in its own facilities, Chery also utilizes the Inokom plant in Kulim, Kedah, for vehicle assembly. Several models, including the OMODA 5, Tiggo 8 Pro, Tiggo 7 Pro, and the electric OMODA E5, are now being assembled locally.

Through investments in localized production capacity and the construction of the Chery Smart Auto Industrial Park, Chery is steadily forming an integrated local green supply chain ecosystem that extends from production to sales. This ecosystem is strengthened by a "global technology combined with local support" model, under which Chery works closely with Malaysian suppliers. The localization rate of Chery's vehicle components in Malaysia has already reached approximately 57%, well above the 40% benchmark set under Malaysia's National Automotive Policy 2020. More than 15 local companies, including leading parts suppliers such as DRB-HICOM, have integrated into Chery's supply chain, thereby providing

effective support for its expanding product lineup. This approach not only reduces the energy consumption and carbon footprint associated with long-distance logistics but also stimulates the upgrading of Malaysia's domestic automotive industry.

In addition, Chery Malaysia has introduced a battery replacement program that allows consumers to exchange old batteries once their health falls below 70% of their original capacity. The program not only protects consumer interests but also ensures that used batteries are properly recycled and reused, thereby reducing environmental burdens. The Shah Alam plant is also equipped with a training center and an R&D hub, which provide both a platform for local employee skill enhancement and a capacity for indigenous research and innovation. By integrating production, education, and research, Chery is transferring advanced manufacturing concepts into the local industry, cultivating talent, and supporting the long-term momentum of Malaysia's green automotive transformation.

(ii) Joint Innovation in Green Technologies

Chery also emphasizes collaboration with Malaysian partners in advancing innovative green technologies. In December 2024, with the support of the Malaysian Investment Development Authority (MIDA) and the Malaysia Automotive, Robotics and IoT Institute (MARii), Chery launched a supply chain engagement program. This initiative brought 40 Malaysian automotive parts manufacturers to Wuhu, China, where they toured Chery's global R&D and production facilities and received technical training. The four-day program enabled direct exposure to Chery's advanced manufacturing technologies and focused specifically on next-generation vehicles and sustainable manufacturing practices. This action reflects Chery's determination to build a robust and inclusive supply chain ecosystem and demonstrates its commitment to working with Malaysian suppliers to drive innovation and sustainable development in the automotive sector. Through joint efforts between governments and enterprises, Chery has introduced China's advanced green manufacturing expertise and digital technologies into Malaysia, triggering technological upgrading and green innovation across the local automotive value chain.

(iii) Smart Manufacturing and Digital Technologies Empowering Green Goals

In Chery's green development ecosystem, smart manufacturing and digital technologies play a critical role. The company has integrated the principles of *Industry 4.0* into the construction and operation of its Malaysian plants. These facilities make extensive use of automated and digital production equipment and management systems in order to improve efficiency and reduce energy consumption. Its advanced production lines streamline manufacturing procedures, shortening traditional processes by 50%. Through a comprehensive set of environmentally friendly manufacturing methods, energy consumption has been reduced by approximately 80%.

The remarkable energy savings are made possible through the deep integration of digital technologies, such as intelligent control systems to optimize energy use and data analytics to minimize waste. Furthermore, Chery has introduced sophisticated smart inspection and quality assurance systems, which ensure both efficiency and product consistency. On the product side, Chery has simultaneously deployed digital technologies such as the Internet of Vehicles and intelligent driving systems. These innovations provide Malaysian users with smart mobility experiences while also improving vehicle energy efficiency and safety performance.

Through the empowerment of intelligent manufacturing, Chery has significantly enhanced the level of green production at its Malaysian facilities. This progress has not only lowered costs while improving efficiency but also achieved meaningful reductions in environmental impact. The result sets a new benchmark for the digital transformation and green upgrading of Malaysia's automotive industry.



Picture Caption: On 23 February 2025, Legenda Beringin Holdings Sdn. Bhd., the AHTV developer, officially signed an agreement with Chery Malaysia and held a symbolic groundbreaking ceremony, witnessed by Selangor Crown Prince Tengku Amir Shah and Selangor State Executive Councillor Ng Sze Han.

2.2.3 Building a Green East Coast Rail: CCCC's Role in Advancing Green Railway Transportation in Malaysia

China Communications Construction Company (CCCC) is a world-leading, large-scale integrated infrastructure service provider with more than a century of experience in infrastructure-related industries. CCCC's products and services reach over 150 countries and include the construction of numerous world-class transportation facilities, providing comprehensive and mature solutions to clients and developing a globally leading technology system. In 2023, CCCC ranked 63rd on the Fortune Global 500 list and has been included for eighteen consecutive years in the "China's Top 80 Contractors" and "Top 60 Design Enterprises" lists, occupying the top position among "Most Internationally Expansive Contractors."

The CCCC Malaysia East Coast Rail Link (ECRL) project is an EPCC turnkey contract that integrates design, procurement, construction, commissioning, and trial operations. The project holds significant strategic importance and has been designated as CCCC's "No. 1 Project." Spanning 665km, the railway begins in Kota Bharu, Kelantan, on Malaysia's east coast and terminates at Port Klang in the west, traversing the Malay Peninsula from the Pacific to the Indian Ocean. Running north to south, it passes through Kelantan, Terengganu, Pahang, and Selangor, linking economically lagging areas with developed regions and serving as a key component of the Trans-Asian Railway Network. Upon completion, it will become the main transportation artery connecting Malaysia's east and west coasts, helping to reduce regional development disparities, offering comfortable and convenient transportation for passengers and freight, fostering local and regional development, and enhancing industrial competitiveness. By linking rail and sea transport, it will also boost freight demand for east coast ports such as Kuantan, thereby strengthening port competitiveness.

Throughout the lifecycle of the ECRL project, CCCC has upheld green development principles, placing great emphasis on the ecological impact of construction and promoting integration between railway development and the natural environment. Together with its partners, CCCC is committed to protecting blue skies and clean waters in Malaysia by constructing a "green railway" that embodies ecological civilization and sustainable development at every stage.

CCCC adheres to its "Five-Green Construction" philosophy, rigorously implementing green planning, green design, green technology, green construction, and green collaboration, while steadfastly embracing the new development concepts of innovation, coordination, greenness, openness, and sharing. The company continuously advances top-level planning for "green railway" environmental management and has received Malaysia's highest "Sustainable Infrastructure" five-star certification, the Pahang State's Environmental Excellence Award, and Selangor DOE's Environmental Excellence Commendation, demonstrating official recognition of the project's outstanding environmental stewardship and contributions to sustainability.

(i) Green Planning

Since its inception, the ECRL project has unwaveringly pursued the new development concepts of innovation, coordination, greenness, openness, and sharing, constantly improving the top-level planning for "green railway" environmental management. In accordance with

Malaysia's environmental protection laws and regulations, the project comprehensively plans green construction and environmental management, establishing robust systems and preparing documents such as the Environmental Impact Assessment (EIA), Social Impact Assessment (SIA), Heritage Impact Assessment (HIA), Wildlife Management Plan (WMP), and Environmental Management Plan (EMP) for approval by environmental authorities. By forming joint compliance committees with project owners and convening regular meetings, the project conducts environmental risk and hazard assessments, providing top-level guidance and decision-making for environmental protection measures throughout the feasibility, design, construction, and operation phases, and offering technical references for green railway development.

(ii) Green Design

The East Coast Rail Link (ECRL) project is a prototypical long-distance linear transportation development, intersecting multiple environmentally sensitive areas across Malaysia. CCCC is committed to advancing green engineering design by integrating green development principles throughout project planning and design. Specific attention is given to route selection, protection of wildlife and ecosystems, and noise impact mitigation during the initial design phase, with the continual objective of minimizing the project's environmental footprint.

During route selection and alignment planning, CCCC places particular emphasis on maximizing the use of existing railway corridors and repurposing abandoned railway lines, repeatedly optimizing the design to bypass ecologically sensitive zones. Across the entire route, animal crossings, bridges, and culverts are incorporated to facilitate safe wildlife movements, resulting in a reduction of the impacted area within forest reserves by 89.2%. In addition, advance consideration is given to potential noise issues affecting nearby environments and communities. CCCC, in partnership with Universiti Teknologi Malaysia (UTM), has conducted specialized studies on noise impacts during both the construction and operational phases, developed comprehensive mitigation measures, and prepared detailed designs and installation plans for noise barriers, effectively minimizing the project's impact on surrounding areas.

(iii) Green Technology

CCCC consistently upholds low-carbon and environmentally responsible management standards, embedding green development principles in the use of equipment, construction methods, and raw material procurement. The company gives comprehensive consideration to environmental protection factors in equipment selection, technical solutions, and material sourcing, implementing advanced processes and emerging technologies to minimize potential pollution risks as much as possible. Concurrently, through systematic big data collection and scientific analysis of on-site challenges, CCCC reduces unnecessary resource consumption and provides timely, evidence-based support for key areas and priorities in site environmental management.

For instance, the Genting Tunnel, with a total length of 16.39km and a twin-bore single-direction design, traverses Bentong and Gombak. Once completed, it will be the longest tunnel in Southeast Asia and serves as a critical control project for the entire ECRL line. The tunnel is being constructed using two open-type hard rock tunnel boring machines (TBM), each with a main unit length of 25m, a weight of 900t, a cutterhead diameter of 8.98m, total machine

power of 7,099kW, and a total weight of 1,600t. These TBMs, independently researched and developed by CCCC, represent the largest diameter exported from China and set a global benchmark for technical advancement. The equipment is capable of increasing operational efficiency by a factor of two to three and currently constitutes the largest diameter and longest distance mountain tunnel TBM ever used in Malaysia, substantially overcoming ventilation and dust removal challenges inherent in traditional drilling and blasting methods for super-long tunnels.

During tunnel construction, the complexity of excavation procedures and blasting operations disrupts surrounding soil structures and may affect groundwater, producing significant quantities of wastewater and pollutants. Concrete batching plants also generate substantial amounts of wastewater during production, containing not only sand, gravel, and cement but also various concrete additives, which, if discharged directly, would severely contaminate the environment. The project mitigates these impacts by introducing environmentally friendly technologies and equipment, such as filter presses, slurry separation devices, and pH adjustment systems, thereby reducing adverse effects on surrounding water quality during tunnel excavation and batching plant operations, while achieving clear economic and social benefits.

(iv) Green Construction

The ECRL project passes through numerous forest reserves, water source areas, and local residential zones. The Gombak Tunnel segment, in particular, is located within Selangor, adjacent to Kuala Lumpur's pristine natural landscape and fresh air. It sits in the upstream catchment area of the Gombak River, which is a critical water source for Kuala Lumpur. The river system within the tunnel area predominantly flows down to reservoirs and water resources that supply the surrounding residential communities. Tunnel construction within such forest reserves requires utmost care, as the ecological environment is highly sensitive to disturbance.

CCCC places great emphasis on balancing environmental impact and resource efficiency. The company continually refines construction techniques and methodologies, diligently implements ecological restoration measures within work zones, and roots green construction requirements in every detail of the project. CCCC consistently fulfills its commitment to building a "green railway" by taking guidance from the approved Environmental Management Plan (EMP) and Erosion and Sediment Control Plan (ESCP), adopting these documents as the Best Management Practices (BMPs) for on-site water and environmental conservation to minimize project interference.

Key green construction measures include:

- Careful planning of water flow routes, on-site filtration and purification, off-site connections, and terminal drainage points to maintain wastewater at below Grade IV standards (which denotes purified, recycled water) and to increase the reuse rate of water resources. Sedimentation ponds and temporary drainage systems are established as required to prevent construction slurry from entering surrounding rivers and reservoirs.
- Segmental construction methods are employed to minimize the impact on surrounding residents and the natural environment. Slurry separators are equipped with grass mesh and geotextile covers for effective dust control at construction sites, and grass seeds are

promptly sprayed on excavated areas and slopes along the route to promote revegetation and reduce soil erosion.

- Solid waste generated from both construction and daily operations, as well as vegetation cleared during site preparation, is disposed of in designated storage areas. Recycling and processing of waste products and materials are managed by accredited professional companies, and open burning or other illegal practices harmful to the environment are strictly prohibited.
- Potentially hazardous chemicals involved in the project undergo advance risk assessment and must be approved by relevant authorities. Professional service providers manage all stages of production, transportation, storage, and emergency response, ensuring comprehensive green standards throughout the usage cycle.
- Third-party accredited environmental audit and monitoring agencies are engaged to periodically assess environmental parameters, including air and river water quality, vibration, and noise along the project corridor. Automated water quality monitoring equipment is installed in environmentally sensitive areas, such as around the Batu reservoir, to establish a strong safeguard for urban water safety—a measure that has earned unanimous approval from the respective state environmental departments, water authorities, and water supply companies.
- Campsite construction across the entire route is scientifically coordinated, with each division adapting to local conditions to create green, energy-efficient, environmentally friendly, and attractive living and working environments. Solar equipment is employed to create energy-saving campsites; oil purification systems are installed to ensure environmental protection; and existing palm trees are retained to create garden-style campsites.

(v) Green Collaboration

CCCC places significant emphasis on the impacts of railway construction and subsequent operation on the local natural environment, with a strong commitment to biodiversity protection. The company implements a comprehensive array of wildlife conservation measures, integrating animal protection awareness into daily operations to safeguard more than 30 species of active wildlife along the railway corridor, including tigers, Malayan bears, elephants, and tapirs. Various initiatives are taken to minimize the impact on local forests, with the affected area of forest reserves reduced from over 2,000 hectares to 216 hectares, achieving a reduction of 1,784 hectares, or 89.2%.

During project construction, route optimization is prioritized to reduce the number of railway segments passing through forest reserves. More than 20 animal crossings, bridges, and culverts have been incorporated across the entire line to facilitate wildlife migration and movement. In addition, CCCC actively invites local wildlife protection agencies to deliver specialized training, distributes the Wildlife Identification and Protection Handbook, installs signage and emergency guidance boards, equips wildlife with satellite tracking collars, expands habitats, establishes safety outposts, and conducts regular patrols at scheduled intervals.



Figure Caption: On 19 June 2024, Chinese Premier Li Qiang and Malaysian Prime Minister Datuk Seri Anwar Ibrahim jointly presided over the groundbreaking ceremony of the CCCC ECRL Project Gombak Station.

2.2.4 From Green Construction to Green Operations: Huanqiu Contracting & Engineering (HQC) Commitment to Low-Carbon Development in Malaysia

In 2018, the EPCC turnkey contract for the Malaysia Hengyuan Refinery Euro IV upgrading project was officially signed. This marked HQC's first overseas refinery EPC project, with HQC Southeast Asia serving as the general contractor, Huadong Company as the design subcontractor, and Sixth Construction Company as the construction subcontractor. The project became a flagship example of HQC's integrated coordination and internal collaboration among its business units. In November 2022, the project achieved successful start-up in a single attempt, delivering qualified products. The gasoline produced by the project upgraded the existing Euro II standard to the Euro IV standard, with provisions to further advance to Euro V in the future. Once operational, the project will make a notable contribution toward promoting clean energy utilization in Malaysia and advancing local efforts to achieve "dual carbon" goals.

Reflecting on the construction process, the Hengyuan Refinery project was implemented under the broader framework of the Belt and Road Initiative, fully advancing the new development strategy of "green and low-carbon" championed by HQC. The concept of "green" was systematically incorporated throughout every phase of the project lifecycle, including design, equipment procurement, material selection, construction, and operations and maintenance, striving to achieve high-quality development characterized by sustainability,

circularity, and low carbon emissions. Green, low-carbon practices and digital intelligence represent the core of HQC's forward-looking strategy, and constitute key advantages in production operations and project management for its Southeast Asia subsidiary. The company has both the capability and the confidence to create value for project owners through high-quality delivery, and to make a significant contribution to Malaysia's green and low-carbon development.

(i) Green Design: Emphasis on Source Control

Design is the foundation of engineering construction, and only by adopting green design principles from the outset can a solid basis for green and low-carbon project development be established. Design is also a core strength of HQC. During process package selection, the project adopted the advanced catalytic gasoline extraction and hydrodesulfurization process from Hebei Jingzhi Company, featuring its patented extraction solvent and catalyst technology from Topsoe. This combination was applied for the first time in projects of this type. Supported by this advanced process, the project achieved a 0.5% increase in catalytic gasoline yield and a 6.3% reduction in energy consumption compared to similar projects, thus attaining a leading position within the industry.

In the detailed design phase, green and low-carbon objectives were pursued across layout, materials, and structural metrics. Site master planning for buildings and process units prioritized optimized arrangement, enhanced safety and fire protection, and the creation of a green and comfortable environment. In the selection of bulk building materials such as pipes and steel structures, a strong emphasis was placed on choosing energy-efficient and environmentally friendly products to minimize adverse environmental impacts. Structural design and construction methods were holistically considered to maximize energy and water resource utilization, control air quality and noise, and prioritize energy conservation and emission reduction. The company fully embedded green, low-carbon, and energy-saving concepts throughout the engineering design process, implementing over ten design optimization measures to minimize energy waste and environmental pollution during subsequent construction and operation.

Green principles were reflected not only in design philosophy but also in specific requirements for the construction process. During procurement, the design team stipulated explicit standards for environmental protection and energy efficiency in MR documents to reduce energy consumption and pollutant emissions. During construction, on-site design representatives encouraged and guided the use of green construction techniques, emphasizing the segregation and recycling of construction waste. As the project progressed into the main procurement and construction phases, the project team maintained a strong focus on design optimization, ensuring close collaboration among design, procurement, and construction teams, and fully embodying the integrated approach of green project delivery.

Here is the formal, publication-ready English translation for “Green Construction: Emphasis on Process Control”:

(ii) Green Construction: Emphasis on Process Control

The Hengyuan project, an oil product upgrading initiative, involved construction activities carried out concurrently with the operation of the existing refinery. This dual-track approach imposed heightened requirements for site planning, organization, and operational

safety. Throughout project planning and execution, a variety of technical solutions and management measures were deployed to ensure environmentally sound, energy-efficient, and emission-reducing site operations, driving high-quality green construction through multiple coordinated actions.

The project actively implemented the “six standardizations” construction concept, utilizing standardized design and factory-prefabrication methods. Pipe prefabrication and anti-corrosion works were executed off-site, thereby minimizing both on-site environmental pollution and space usage. For temporary construction facilities, the project maximized the integration of permanent and temporary structures to reduce the environmental impact of onsite demolition and construction. Stringent controls over building materials, equipment, and wastewater helped advance green construction standards. Subcontractors were required to select durable, environmentally friendly construction materials in order to limit environmental pollution. Equipment such as scaffolding and formwork was reused to the fullest extent possible to minimize unnecessary waste. Sewage generated from construction and daily operations was pretreated prior to discharge, reducing impacts on local water resources. Measures such as dust covers and water mist were utilized to control air pollution, while noise barriers and acoustic materials helped to lower noise pollution. Lighting at construction sites was carefully managed to minimize disturbance to surrounding residents.

The EDMS integrated management platform is a powerful tool utilized by HQC Southeast Asia. During both project planning and execution stages, the project team fully leveraged the EDMS system to maintain comprehensive control over critical workflows such as contract administration, expenditure, and payments, with the continuous advancement of standardized work processes. Project management weekly reports and QHSE (Quality, Health, Safety, and Environment) dashboard modules allowed for real-time monitoring and management of the four major project controls, enhancing management efficiency, reducing waste of personnel and materials, and supporting the realization of green and low-carbon construction practices.

(iii) Green Operations: Emphasis on Long-Term Benefits

Project completion and commencement of operations mark only the initial step; it is green operations that deliver enduring value. In process and equipment selection, the Hengyuan project consistently prioritized low-carbon and environmentally friendly approaches, employing a two-pronged strategy to reduce carbon emissions. Advanced energy-saving technologies were applied, including energy recovery, catalyst regeneration, and heat exchangers, all designed to lower energy consumption and greenhouse gas emissions. Furthermore, the use of low-carbon feedstocks such as biomass and waste materials in processing provides an additional reduction in carbon emissions.

Throughout production and operations, strict adherence to Malaysia’s environmental regulations and standards is maintained, with measures implemented to limit emissions of noise, vibration, and dust. Paramount importance is placed on the protection of the surrounding ecological environment, especially in preventing pollution of water sources and soil. Wherever possible, waste gas and wastewater are repurposed as resources, further contributing to local environmental protection efforts.

Wang Youde, Chairman of Hengyuan Group, commented, “Hengyuan Group’s operations in Malaysia aim to drive comprehensive advancements in corporate management,

operations, and technology, achieving green and low-carbon development. This is our unwavering commitment and objective, and the essential path to enduring, healthy, and robust progress.”

As the first overseas refinery EPCC project for HQC, the Hengyuan project has consistently focused on green operations and long-term value. By emphasizing energy conservation, local ecological protection, achievement of “dual carbon” goals, and energy security, the project delivers sustainable and environmentally responsible hydrogenation solutions to its customers, making substantial contributions to local ecological protection, energy security, and Malaysia’s pursuit of carbon neutrality.



Picture Caption: *Hengyuan Refinery*

2.2.5 Three Decades of Green Power Development: Power China's Deep Commitment to Green Growth in Malaysia

Power Construction Corporation of China (Power China) is a globally integrated, large-scale construction group that provides end-to-end solutions across the energy, power, water resources and environment, infrastructure, and real estate sectors. Guided by its mission to be a global leader in the construction of clean and low-carbon energy, Power China is firmly oriented towards China's "dual carbon" targets and fully leverages its integrated strengths in planning, design, investment, construction, and operations. The group actively advances the "hydro-wind-solar-storage integration" model, participates in smart energy and smart grid development, and promotes the creation of a new power system centered on renewable energy.

As a wholly owned subsidiary of Power China, Power China (Malaysia) Sdn. Bhd. was established in Kuching, Sarawak, in March 1998. Over nearly thirty years of dedicated cultivation, the company has completed more than 180 power and infrastructure projects across Malaysia, including several highly representative green energy developments, making a significant contribution to the country's progress in sustainable development.

To date, Power China has completed or is undertaking numerous renewable and green energy projects in Malaysia, spanning three major areas: hydropower, photovoltaic power generation, and green hydrogen. The company is also actively exploring the potential of pumped-storage hydropower, supporting Malaysia's comprehensive implementation of the National Energy Transition Roadmap and its ultimate goal of achieving national carbon neutrality by 2050.

(i) Hydropower

1. Bakun Hydroelectric Plant, Malaysia (Completed)

The Bakun Hydroelectric Plant is situated on the Balui River in northern Borneo (Kalimantan), Sarawak, one of the world's three largest islands. The project consists primarily of a concrete-faced rockfill dam, an open spillway, and a diversion power generation system with an installed capacity of 2,400MW, making it the largest hydroelectric project in Southeast Asia to date. Construction, which lasted ten years, was completed in 2012. The plant is widely recognized as Malaysia's "Three Gorges Project," and represents a landmark achievement in contemporary dam engineering. With a dam height of 205m and a crest length of 740m, it is currently the second tallest completed concrete-faced rockfill dam in the world. As a vital component of Sarawak's Renewable Energy Corridor, Bakun substantially improved the region's electricity structure. Its annual generation capacity reaches 15.52b kWh, replacing the need for approximately 3.26m t of diesel and reducing CO₂ emissions by about 10m t, while providing clean energy and enhancing flood control downstream on the Balui River through its vast reservoir capacity.

2. Murum Hydroelectric Plant, Malaysia (Completed)

The Murum Hydroelectric Plant is a major hydropower project located in Sarawak, upstream from Bakun and within the Baram River basin. Developed and constructed by Sarawak Energy Berhad, the plant is a key element of the Sarawak Renewable

Energy Corridor, playing an important role in driving regional economic development and achieving energy self-reliance. With a total installed capacity of 944MW across four generating units and an annual output of approximately 5.6TWh, the facility utilizes a concrete-faced rockfill dam (CFRD) standing about 141m high and extending 473m in length. As Sarawak's second largest hydroelectric station, Murum's construction began in 2008 and it commenced full operations in 2014, substantially strengthening Sarawak's power generation capabilities. The project has contributed to Malaysia's potential for electricity exports to neighboring countries such as Indonesia and Brunei, supporting Sarawak's transition from an "energy importer" to an "energy exporter." It further spurred improvements in supporting infrastructure—including roads, telecommunications, education, and healthcare—and enhanced quality of life for indigenous communities in the region.

3. Hulu Terengganu Hydroelectric Plant, Malaysia (Completed)

The Hulu Terengganu Hydroelectric Plant is a prominent clean energy project located in the mountainous west of Terengganu State. Developed by Tenaga Nasional Berhad, it has a total installed capacity of 250MW supported by two generator units, with an average annual output of around 467GWh. The plant includes the Puah and Tembat dams and features more than 20km of diversion tunnels that convey water to an underground power station. Construction began around 2010, and commercial operations commenced in approximately 2015. As an essential hydropower development for Malaysia's east coast, Hulu Terengganu has improved the stability of local electricity supplies and contributed to water resource management and flood control. During construction, the project prioritized ecological conservation by implementing measures to mitigate the impact on tropical rainforest habitats and ensuring the proper resettlement of affected villages. The project not only supports regional development but also reflects Malaysia's strategic commitment to sustainable energy advancement.

4. Telekosang Hydro Power Station, Malaysia (Completed)

The Telekosang Hydro Power Station is a 40MW small hydropower project located in Tenom, Sabah. Jointly developed by Telekosang Hydro One Sdn Bhd and Telekosang Hydro Two Sdn Bhd, the project consists of two cascade stations—upstream and downstream. The upstream station (TH2) has an installed capacity of 16MW and successfully completed a seven-day stable trial run before officially commencing commercial operation on December 25, 2023. The downstream station (TH1), with a capacity of 24MW, began generation on February 15, 2023. As Malaysia's first hydropower station utilizing open channel diversion generation, Telekosang Hydro achieves an annual output of around 240GWh, significantly relieving power supply constraints in Sabah and providing a stable source of clean power to support economic and social development in the region. During construction, the project team overcame challenges such as transmission line damage caused by landslides, fully leveraging their technical strengths in hydropower development to achieve ahead-of-schedule completion and commissioning, thereby generating value for the owners and contributing to Malaysia's socio-economic growth.

5. Baleh Hydroelectric Plant, Sarawak, Malaysia (Under Construction)

The Baleh Hydroelectric Plant, developed by Sarawak Energy, is the largest hydropower project ever undertaken in Sarawak and forms a key part of the region's infrastructure and hydropower industrialization agenda. The project is designed to meet the increasing electricity demand of energy-intensive industries in the Sarawak Renewable Energy Corridor, to secure future supplies of renewable hydropower for Sarawak's ongoing development, and to satisfy regional requirements for reliable, sustainable energy in support of Sarawak's goal of attaining high-income developed status by 2030. The plant features a 225m high concrete-faced rockfill dam (CFRD) situated on the Baleh River, approximately 105km upstream from its confluence with the Rajang River, and will have an installed capacity of 1,285MW. Following a thorough social and environmental impact assessment (SEIA) and official approval, Sarawak Energy received government authorization to initiate the Baleh Hydropower project in 2016.

(ii) Photovoltaic Power Generation

1. Marang Photovoltaic Project, Malaysia (Completed)

The Marang Photovoltaic Project is located in Marang, Terengganu, and is currently one of the largest single-axis tracking solar power stations in Malaysia. The project has an installed capacity of 116MWp and occupies approximately 245ha. It commenced commercial operations in the first quarter of 2022 and delivers an annual power output of around 230GWh, sufficient to meet the electricity needs of approximately 55,000 households, while reducing CO₂ emissions by about 120,000t per year. The facility utilizes bifacial double-glass photovoltaic modules and a single-axis tracking system to maximize generation efficiency and is equipped with advanced drainage and water storage infrastructure to mitigate the impact of monsoon conditions. Developed by Coara Solar Sdn Bhd, in collaboration with Germany's ib vogt, and contracted for EPC works by PowerChina, this flagship project under Malaysia's Energy Commission LSS3 program embodies the depth of China-Malaysia cooperation in the clean energy sector, making a substantial contribution to Malaysia's green development progress.

(iii) Green Hydrogen Energy

1. Perak Floating Solar Power and Hydrogen Production EPC Project, Malaysia

In November 2023, PowerChina and Malaysia's Semarak Renewable Energy Sdn Bhd officially signed the EPC turnkey contract for the integrated floating photovoltaic power, green hydrogen production, and hydrogen storage project in Perak, Malaysia. This initiative plans the secondary utilization and redevelopment of decommissioned tin mining lakes, perfectly aligning with the ethos of "ecological prioritization and green development" and marking a significant step in Malaysia's green and low-carbon transformation. Located in Perak, the scope of work includes the design, procurement, and construction of floating solar arrays, hydrogen production units, and hydrogen storage systems. Once complete, it will become Malaysia's first large-scale green hydrogen facility powered by floating solar generation. The successful tender award and signing represent another breakthrough for PowerChina in Malaysia's solar and hydrogen energy markets and stand as a flagship achievement in advancing high-quality

Belt and Road cooperation. The project highlights PowerChina's industry-leading strengths in the integrated renewable energy value chain and reinforces its position as a global provider of comprehensive clean energy solutions.

(iv) Pumped Storage (Under Discussion)

At the end of 2023, PowerChina held a symposium with Tenaga Nasional Berhad (TNB), Malaysia's national energy company, to discuss the prospects for pumped storage projects. PowerChina presented its global business portfolio and competitive strengths in pumped storage solutions. TNB noted that the development of pumped storage in Malaysia has not yet reached a scalable level, and the current energy storage system predominantly relies on batteries and conventional hydropower.

The future trajectory for pumped storage in Malaysia will depend primarily on grid regulation requirements. As the proportion of photovoltaic installations increases (with the target of reaching 58% by 2050), growing pressure on grid stability may drive the demand for long-duration energy storage. Given that chemical energy storage projects feature shorter development cycles and faster construction timelines, they will remain the government's priority for energy storage initiatives in the near term, despite higher unit costs. In contrast, pumped storage projects offer advantages over chemical storage in terms of unit cost and project lifecycle. However, due to longer development timelines, larger capital investments, and the need for supportive government policies, pumped storage can realistically be considered only as part of Malaysia's medium- to long-term energy planning.



Picture Caption: *Bakun Hydroelectric Dam*

2.2.6 Renewable Energy Power Generation: China Energy Engineering Group (CEEC) Advancing Green Energy Development

(i) Kuala Ketil 50MW Photovoltaic Power Plant, Kedah, Malaysia

China Energy Engineering Group (CEEC) is recognized as a global leader in energy and infrastructure construction, having ranked among the Fortune Global 500 for 11 consecutive years and maintaining top positions in the ENR lists of the Top 150 Global Design Firms, Top 225 International Design Firms, Top 250 Global Contractors, and Top 250 International Contractors. CEEC was one of the first Chinese enterprises to participate in the large-scale ground-mounted photovoltaic power sector in Malaysia and has made important contributions to the advancement of renewable energy generation in the country, supporting Malaysia's progress towards its 2050 national carbon neutrality goal.

Constructed by CEEC subsidiary Tianjin Electric Power Construction Co., Ltd., the Kuala Ketil 50MW Photovoltaic Power Plant in Kedah was the only project among Malaysia's early large-scale solar plants to successfully complete the 50MW AC peak performance test on schedule and achieve Commercial Operation Date (COD) within the contractual timeline.

Located in the town of Kuala Ketil, Baling District, Kedah, on Peninsular Malaysia, the plant is approximately 515km from Kuala Lumpur by the longest route and about 70km from Penang International Airport. Covering a planned area of 263 acres (approximately 1.06 million square meters), Kuala Ketil features an installed capacity of 50MW AC in a string-type ground-mounted photovoltaic configuration, making it the largest facility among Malaysia's inaugural batch of solar power stations.

Construction commenced on March 27, 2018. Upholding the principles of "environmental protection first, safety foremost, and quality above all," the project team demonstrated exceptional dedication over 11 months, and the plant officially entered commercial operation (COD) on February 25, 2019. Once operational, the plant is projected to generate an average of 78,400MWh annually, sufficient to supply power to an average of 30,000 households over the next 25 years, while offsetting approximately 54,000t of carbon emissions each year.

The project includes a 30m buffer zone surrounding the site, which can be developed into a 40-acre fruit plantation. According to the plan, this area will be used for the cultivation of pineapples, with an anticipated harvest cycle of 14 months. The total income for local residents is expected to reach RM684,000, equivalent to RMB1,116,000, per harvesting period. This initiative provides residents not only with sustainable and substantial income, but also with more than 100 direct employment opportunities. Since its commissioning, the project has supplied Malaysia with clean energy, supported the industrial and agricultural activities of Kedah State, and generated significant economic benefits for the community, further contributing to Malaysia's progression toward national carbon neutrality.



Picture Caption: *Aerial view of the Tianjin Electric Power Construction – Kuala Ketil 50MW Solar Power Plant Project, Kedah, Malaysia*

(ii) Perak 24.5MW Hydropower Project, Malaysia

Malaysia, located across the sea from Guangxi, is not only a key member of ASEAN but also serves as a vital staging ground for China's "Go Global" strategy and the Belt and Road Initiative. As a former member of Asia's "Four Little Tigers," Malaysia enjoys a relatively high and stable level of economic development, with continuously growing demand for electricity. Its tropical geography provides abundant hydropower resources, lending tremendous potential for renewable energy development.

On June 30, 2024, at the Water Engineering Technology (WET) headquarters in Kuala Lumpur, representatives from China Energy Engineering Group Guangxi Electric Power Design Institute Co., Ltd. ("Guangxi Institute") and WET signed and sealed the last page of the EPC contract for the Perak 24.5MW hydropower project in Malaysia. On December 14, 2024, the joint venture consortium of China Energy International Group, Hunan Institute, and Guangxi Institute, serving as the EPC contractor, held a grand groundbreaking ceremony for the Perak project.

This new development is located in the upper basin of the Pelus River and Yum River, about 60km north of Kampar in Perak. It comprises the construction of a run-of-river diversion power station with four generating units totaling 24.5MW, a 21km long, 33kV double-circuit transmission line, and a 33kV/132kV substation. With a planned construction period of 32 months, the project is expected to be operational by 2027 and produce an estimated 168.8GWh of electricity annually. As China Energy's first hydropower project in Perak, it will be delivered to the highest standards, with rigorous performance management, and is intended to set the benchmark for future hydropower development in Perak, actively supporting Malaysia's green energy transition.

Malaysia is located in the southern region of the Indochinese Peninsula, marked by a hot, humid climate and rugged terrain, crisscrossed by countless fast-flowing rivers that contain abundant hydropower resources. The project site lies in the southeastern forests of Perak, characterized by dense vegetation and frequent encounters with venomous insects and wild

animals. Local villagers have repeatedly reported the presence of Malayan tiger families to the authorities, but their elusive nature in the remote mountains and jungles has made tracking impossible, leaving such accounts unresolved—making this truly a “den of dragons and tigers.”

The exploration team from the Overseas Department of Guangxi Institute, including Lu Chengsheng, Wu Xuebiao, and members of the survey company, undertook the challenge of surveying river conditions during the rainy season—precisely when locals avoid venturing into the wild. Persisting through consecutive days of rain, the narrow logging track to the site became exceedingly muddy, with the team’s pickup truck repeatedly stuck in deep ruts. Undeterred, the team adopted the motto “just get it done,” and chose to disembark midway, trekking along the muddy trail towards their target destination.

In temperatures exceeding 30°C, the exploration team pressed forward, their shirts soaked with sweat and shoes heavy with clay, progressing incrementally through the dense forest. Over six days of determined effort, they overcame harsh conditions and successfully completed their survey objectives, laying a solid foundation for the subsequent advancement of the project.

Meanwhile, the on-site team consisting of Su Yi, Wu Hongbin, and others were constantly shuttling between client meeting rooms and hotel suites, maintaining close communication with the project owner during the process of scheme revision. At the same time, more than 2,000km away in Nanning, the company’s second-floor offices often remained lit late into the night as the back-office commercial team tackled challenge after challenge in pursuit of optimal business solutions.

Throughout the optimization process, the project development team frequently encountered hurdles such as differences in technical standards, language barriers, and communication difficulties, which required the team to stay highly focused and approach every task with rigor and tenacity to continually refine and improve each solution. The overseas department team at Guangxi Institute fully recognized the significance and responsibility of their mission. Amid unfamiliar standards and linguistic obstacles, the team proactively assumed responsibility, continuously honed their professional abilities, and applied a meticulous and pragmatic spirit to complete the optimization work. Their dedication and perseverance earned high praise and recognition from the project owner, laying a solid foundation for the successful delivery of the project.

The Perak 24.5MW hydropower project represents both a new achievement and a new beginning in the company’s international business transformation. The “overseas pioneers” of the company will continue to lead with unrelenting resolve and the enterprising spirit of the times, contributing distinguished chapters from abroad to the construction of “Four New” Energy Engineering and to the high-quality growth of the company.



Picture Caption: *Signing Ceremony of the EPC Contract for the 24.5MW Hydropower Project in Perak, Malaysia*

2.2.7 Green Financing for Renewable Energy: China Construction Bank (CCB) Supports Malaysia in Achieving Carbon Neutrality

Founded in December 2002 and listed on the Shenzhen Stock Exchange in September 2010, Risen Energy Co., Ltd. is a high-tech enterprise specializing in the research, development, production, and sales of grid-connected photovoltaic power systems, stand-alone solar supply systems, solar cells, and modules. As early as 2019, Risen Energy entered the Malaysian market by supplying 150MW of photovoltaic modules to local solar power plants. In 2020, the company signed the world's first global order for 500W high-efficiency modules with local entity TOKAI, pioneering the Photovoltaic 5.0 era. Today, as Malaysia's most advanced manufacturer of photovoltaic modules, Risen Energy focuses on heterojunction technology as the next stage in photovoltaic industry upgrading, providing Malaysia with new opportunities for leapfrog advancement. Higher energy density delivers greater installation efficiency, while reduced BOS and levelized cost of electricity (LCOE) lower initial investment, enabling Malaysia to execute large-scale, high-quality solar installation campaigns more rapidly and accelerate its green transition toward carbon neutrality.

In May 2022, China Construction Bank Malaysia provided \$90m in export credit financing to Risen Energy Co., Ltd. for the construction of its photovoltaic module manufacturing project—the Risen Energy Malaysia Solar Module Factory. This landmark initiative was China Construction Bank's first green export credit project and the first time one of its overseas branches acted as the lead bank for export credit business. For this project, the bank's head office, domestic branches, and overseas institutions worked cohesively to deliver results efficiently. China Construction Bank Malaysia assumed the role of lead bank, with support from both Ningbo and Jiangsu branches to serve domestic client needs, ultimately ensuring the successful landing of the project. By extending financing to this project, China Construction Bank has demonstrated its active commitment to "new green finance," emphasizing support for carbon neutrality and the advancement of green manufacturing in Malaysia.

The Risen Energy Malaysia Solar Module Factory is Risen Energy's first overseas photovoltaic module production base, with an annual capacity of 3GW in high-efficiency solar cell modules and a total investment of \$298m. The facility manufactures globally leading 210mm bifacial modules; compared to traditional 156mm modules, these 210mm large-format silicon products offer absolute advantages in reliability, power generation efficiency, system cost, parts compatibility, land utilization, and installation, with effective reductions in production cost and a design power output reaching 600W, marking the factory's output as the most technologically advanced product in Malaysia's photovoltaic sector.

Furthermore, Risen Energy has achieved mass production and shipment of its next-generation heterojunction cell module—the Hyper-ion series delivering 730Wp+—which leads the industry in comprehensive power generation benefits. The facility is designed for easy retooling to manufacture the newest generation of heterojunction modules. With this technological edge, combined with an excellent product reputation and global brand strength, Risen Energy was awarded the “2022 Excellence in Solar Technology Award” at the 2022 Malaysia International Photovoltaic Conference. Overall, project implementation in Malaysia brings cutting-edge product technology to the domestic photovoltaic industry, establishes a benchmark for the sector, and will effectively drive technological innovation and industrial upgrading, supporting the advancement of Malaysia's solar manufacturing industry.

As a photovoltaic module manufacturer, the project's core assets are its solar cell and module production equipment, with equipment procurement exceeding \$100m. As a flagship “go global” Chinese enterprise, Risen Energy strongly supports domestic manufacturing; 90% of the equipment is produced in China, with all key manufacturing and testing devices independently developed and manufactured by Chinese companies. This initiative greatly increases Chinese photovoltaic equipment exports to the Malaysian market.



Picture Caption: May 25, 2022 – The first solar cell successfully rolled off the production line at Risen Energy's Malaysia Base

2.2.8 Waste-to-Energy Power Generation: CCEPC Helps Malaysia Achieve a Green Energy Milestone

China City Environment Protection Engineering (CCEPC) has officially commenced construction on the Selangor Renewable Energy Power Plant in Malaysia. As the country's first—and to date, largest—renewable energy generation project, the Selangor Renewable Energy Project marks Malaysia's pioneer venture into municipal solid waste incineration for power generation. It serves as a model project for green energy advancement and energy conservation, as well as emission reduction. This project is not only a crucial point in Malaysia's journey toward a greener, low-carbon future and a new milestone in sustainable energy, but also a vivid example of Chinese enterprise participation in global green development under the Belt and Road Initiative framework.

Applying its advanced large-scale clean municipal waste incineration and integrated distributed energy supply technology, CCEPC was awarded both Phase I and Phase II of the Selangor Renewable Energy Power Plant. Phase I features an installed capacity of 25MW, with a daily waste processing capacity of 1,400t. Phase II comprises an additional 26MW of generation capacity and processes 1,500t of waste per day. The total project construction period is expected to be 29 months. This technology delivers several advantages: it significantly boosts overall plant thermal efficiency, reduces in-house power consumption, enables near-zero secondary pollutant emissions, and ensures efficient land use.

This is CCEPC's first large-scale overseas municipal waste incineration power project, representing a significant milestone and breakthrough in its international market expansion. From its inception, CCEPC has adhered to an integrated approach focused on “meticulous management, international standards, and green philosophy” to create Malaysia's first model waste-to-energy plant. The project team has aligned with high international environmental standards from the outset, integrated local features into full-cycle green construction management, and has actively explored new pathways for Chinese enterprises to promote green development in overseas markets.

The project has consistently adhered to the core principles of “green design, green construction, and green operations” throughout its lifecycle. During the design stage, every effort was made to adopt environmentally friendly equipment and high-efficiency technologies, reducing the negative impacts on land, water resources, and air quality. In the construction phase, the project implemented comprehensive environmental measures, including:

1. **Dust Control:** Installation of spray systems and enclosure facilities on site, with regular water spraying on construction roads to suppress dust.
2. **Solid Waste Sorting and Resource Utilization:** Classification and treatment of construction waste to support maximum recycling and reuse.
3. **Energy and Noise Control:** Strict adherence to noise regulations during nighttime construction, with the use of low-noise, high-efficiency machinery.
4. **Separation of Rain and Sewage:** Establishment of rainwater collection and sedimentation systems to prevent overflow and environmental contamination during the rainy season.

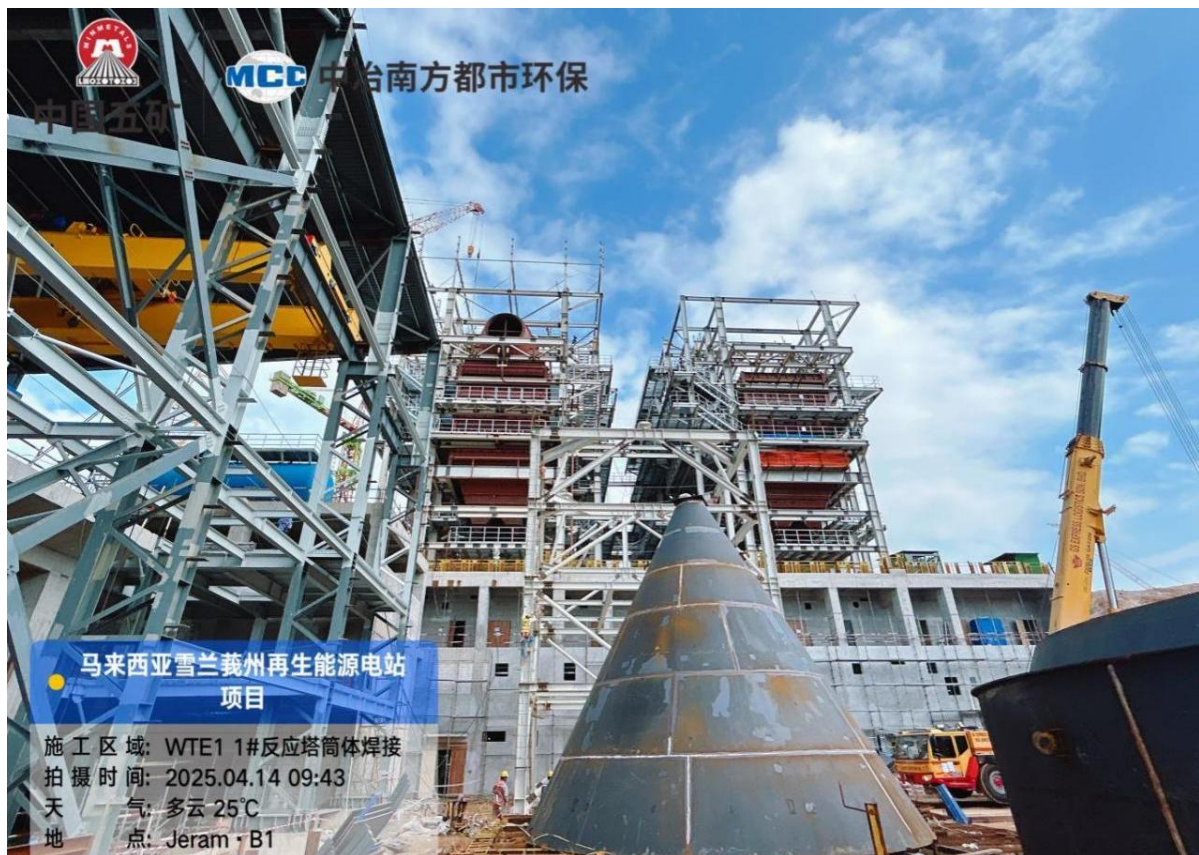
Additionally, in response to Malaysia's frequent rain and high temperatures, the project team developed a scientifically phased construction schedule, flexibly employing a

combination of “rain-avoidance construction” and “nighttime operations” to achieve a balance between efficiency and environmental responsibility.

Drawing upon resources and expertise from China, Vietnam, Indonesia, Bangladesh, Malaysia, and other countries, the project adopted a model of local employment combined with regional coordination, effectively reducing carbon footprint and transport costs, while boosting local employment rates. This approach achieved genuine “green construction and shared development.”

Throughout execution, the project team faced—and overcame—the stringent standards and requirements of international regulations and consulting agencies, breaking through technical, management, language, and cultural barriers. The quality and management standards of the project have earned unanimous praise from the owner and secured multiple international certifications for quality and safety compliance.

As the proverb goes, “No road is too distant if you keep walking; no task too daunting if you keep striving.” The Selangor Renewable Energy Project is not only a critical venture in Malaysia’s green energy transition, but also a flagship achievement in Chinese enterprises’ pursuit of global green cooperation. Moving forward, the project team will continue to carry out its responsibilities and uphold its sense of mission, advancing with determination and contributing both “Chinese wisdom” and “Chinese solutions” to global green and low-carbon development.



Picture Caption: Renewable Power Plant Project in Selangor, Malaysia – Constructed by China City Environment Protection Engineering

2.2.9 Renewable Energy and Efficient Gas Power Generation: Edra Drives Malaysia's Energy Transition Goals

Edra Power Holdings Sdn Bhd (“Edra”) is recognized as one of Southeast Asia’s leading international independent power producers (IPPs), consistently advancing sustainable energy solutions and green development. Under the stewardship of its shareholder, China General Nuclear Power Group (“CGN”), a globally renowned clean energy company, Edra demonstrates a firm commitment to efficient operations, renewable energy expansion, and corporate social responsibility as it moves toward a cleaner energy future.

Since becoming a CGN subsidiary in 2016, Edra has evolved into a key regional platform for CGN Energy International Holdings (Energy International), focusing on investment and management in non-nuclear clean energy. With China Southern Power Grid Co., Ltd. (“Southern Grid”) acquiring a 37% stake in Edra in 2018, the company further strengthened its strategic capabilities and market reach, solidifying its position in Asia’s rapidly changing energy landscape.

Edra’s core strength lies in gas-fired power generation, complemented by ongoing expansion in renewable energy investments. The company currently operates eight power generation and water desalination plants across Malaysia, Bangladesh, Pakistan, and the United Arab Emirates, with a total installed capacity of 7,684MW and effective capacity of 5,042MW. As Malaysia and neighboring countries embark on a new era of green development, Edra is well positioned to play a pivotal role, leveraging its expertise in renewable energy, advanced gas technologies, and energy storage to help advance Malaysia’s National Energy Transition Roadmap (NETR) and achieve broader regional green development goals.

The Edra Melaka Power Plant (EMPP), with a capacity of 2,242MW, is one of Edra’s flagship projects and stands as one of the largest combined cycle gas turbine (CCGT) power stations in Southeast Asia. As a low-emission plant, EMPP utilizes the world’s most advanced 9HA.02 gas turbine technology, achieving a generation efficiency exceeding 60% and an annual output of approximately 19.6b kWh. EMPP’s output accounts for 12% of Peninsular Malaysia’s electricity demand and is set to supply power to up to 4 million households over the next 21 years. The plant exemplifies Edra’s steadfast commitment to operating cleaner and more efficient energy projects.

In addition, Edra operates a 50MW solar photovoltaic power plant (KLSS) in Kuala Ketil, Kedah, Malaysia, which commenced commercial operation ahead of schedule and provides clean energy to local industrial and agricultural sectors. Around KLSS, Edra has reserved a 40-acre buffer zone for a zero-cost fruit planting program, directly supporting local communities. This initiative aligns with the United Nations Sustainable Development Goal 8, fostering local socioeconomic development, generating additional income for farmers, and making productive use of previously idle land resources.

In addition to EMPP and KLSS, Edra is implementing multiple green operation initiatives at its other subsidiary power plants, including:

- 1. Adoption of high-efficiency, low-emission technologies for gas-fired plants;**
- 2. Utilization of digital monitoring systems to optimize performance and reduce emissions;**

3. **Enhanced preventive maintenance to extend asset lifespans and minimize waste;**
4. **Proactive management of plant water use and overall resource efficiency.**

To institutionalize its sustainability strategy, Edra formally launched its Environmental, Social, and Governance (ESG) framework in November 2024. Authorized and promoted by Edra's shareholder, China General Nuclear Power Group, the framework is built around three core pillars: advancing green transformation, enhancing community well-being, and upholding responsible operations. It provides clear guidance for Edra to fulfill its sustainability goals and corporate citizenship responsibilities.

The first initiative under the ESG framework involved more than 100 Edra employees planting 500 mangrove saplings along the coastal area near the Jimah power station in Negeri Sembilan. This reforestation activity, conducted in partnership with the Negeri Sembilan State Environmental Department and the Malaysian Nature Society, demonstrates Edra's strong commitment to ecological protection.



Picture Caption: *Edra Melaka Power Plant (EMPP)*

2.2.10 Leading Green Innovation: HONOR Builds a Green AI Full-Value Chain Ecosystem

Founded in 2013, HONOR is a global leader in AI terminal ecosystem development. As the world enters the era of AI agents, HONOR is dedicated to forging close connections between the AI ecosystem and a broad consumer base, continuously expanding industry boundaries through openness, co-creation, and sharing, and collaborating with partners to build an integrated AI ecosystem. With a diverse product portfolio spanning smartphones, personal computers, tablets, and wearable devices, HONOR's mission is to empower every user—making entry into and enjoyment of the new smart world effortless for all.

In response to the severe challenge of global climate change, HONOR has announced its carbon neutrality plan, pledging to achieve carbon neutrality in its own operations by 2040, with self-owned factories using 100% renewable energy. The company is also actively engaged in value chain decarbonization, aiming for full value chain carbon neutrality by 2050 and setting emission reduction targets for its Top 100 suppliers by 2030, thereby contributing to industry-wide green transformation. HONOR adheres to the principle of “delivering high-quality products and services to hundreds of millions of consumers while minimizing environmental impact.” The company focuses on four core strategies—green products, green manufacturing, green operations, and green partnerships—leveraging technological innovation to drive green, low-carbon action and accelerating the transition to clean energy. Progress and achievements across these four pillars are regularly tracked and disclosed, furthering HONOR's contribution to building a sustainable future.

In February 2021, HONOR formally established HONOR Technology (Malaysia) Sdn Bhd. Over the past several years, HONOR has steadily deepened its market presence in Malaysia, becoming one of the leading local technology brands. The company has forged robust partnerships with local retailers, operators, and collaborators to advance the popularization of digital lifestyles across the country. At the same time, HONOR Malaysia actively responds to the group's directives on green development and diligently implements corresponding initiatives, contributing to HONOR's goal of achieving operational carbon neutrality in 2040.

(i) Product Decarbonization

Product decarbonization represents a core pathway by which HONOR seeks to achieve carbon neutrality across its entire value chain. To date, the company has scientifically quantified the environmental footprints of 36 product models, compiling and publishing environmental impact reports on the HONOR website. Raw material procurement and manufacturing are identified as the primary contributors to environmental impact. Accordingly, HONOR has concentrated efforts on the selection and use of raw materials, as well as on managing suppliers with higher carbon emissions in components such as chips and display screens, continuously refining product design and manufacturing processes to lower product carbon footprints.

In 2024, the company strengthened supplier greenhouse gas management by collecting emissions data and evaluating emission reduction results among suppliers. Over the year, more than 110 suppliers completed greenhouse gas inventory checks, with results verified by a third party.

During 2024, HONOR utilized recycled and renewable plastics or recycled ingredients with bio-based content (all exceeding 30%) in the internal components of eight major product lines, spanning 23 structural items and resulting in an approximate reduction of 54.72t of CO₂ equivalent. The company actively explored process improvements and validation for high-reliability exterior parts, pioneering the use of recycled plastics in protective cases for the Magic6 RSR Porsche Edition and Magic V2 RSR Porsche Edition, collectively reducing CO₂ emissions by 22.14t in 2024.

(ii) Innovative Green Packaging

HONOR adheres to principles of lightweight, compact, non-hazardous, and easily recyclable product packaging, striving to eliminate plastic use and increase adoption of green materials while maintaining the user experience. In 2024, HONOR's innovative green packaging initiatives contributed to a total reduction of 1,170t in carbon emissions. For example:

1. Notebook packaging adopted a streamlined, all-paper, one-piece foldable design, eliminating inner boxes and shipping products directly on pallets. This approach reduced paper consumption and lowered carbon emissions by 375.1t.
2. Digitalizing user manuals resulted in an estimated saving of 110 million A4 sheets, preventing the felling of approximately 3,817 mature trees and reducing carbon emissions by 454.89t.
3. Reliability validation for recycled plastic was completed, enabling mass use of recycled materials in mobile phones such as HONOR Magic 6 Pro and Magic 7 Lite, with an estimated reduction of 25.83t in carbon emissions.

(iii) Smart Energy Saving and High-Efficiency Technologies for Decarbonization

High-performance products not only enhance user experience but also minimize carbon emissions throughout their usage lifecycle. On the software side, intelligent energy-saving technologies analyze user habits and scenarios to optimize the status of mobile apps, improving overall energy efficiency. On the hardware side, product development incorporates more efficient chips and batteries, with advancements such as super-fast charging, adaptive refresh rate screen technology, and pulse width modulation dimming—all contributing to multi-dimensional improvements in product energy efficiency and environmental performance.

In 2024, HONOR launched its “third-generation Qinghai Lake battery” technology, pioneering silicon content above 10% in batteries, which increased energy density by 5.74% over the previous generation and reduced thickness by 4.4%. The battery's volumetric efficiency reached a record 24.7%, further improving performance and service life, offering users a thinner and longer-lasting battery experience, and reducing lifecycle carbon emissions.

(iv) Responsible Product Recycling and Disposal

HONOR's end-of-life product recycling and management system has been deployed in China, Europe, the Middle East and Africa, Southeast Asia—including Malaysia—and broadly covers global markets. Leveraging its sales network, HONOR has established a reverse logistics recycling system with online and offline channels for users, providing services such as device valuation, professional inspection, and secure data erasure.

For products no longer suitable for reuse, the company maintains a comprehensive waste management system. Discarded items are dismantled, sorted, and recovered according to material and component reuse value. Where feasible, old components are reconditioned for factory restoration or repurposed as internal assets—for example, certain adapters are reused for manufacturing tests—thereby maximizing the value recovered from waste. Components with no further use are managed under the supervision of a certified scrap supplier working group to ensure proper and compliant disposal. In 2024, HONOR cumulatively recycled 2,439t of electronic waste.

(v) Smart Manufacturing for Lower Carbon Footprint

In 2023, HONOR Smart Machines Co., Ltd. was awarded the “National Green Factory” designation by China’s Ministry of Industry and Information Technology. In 2024, the company completed rigorous accounting of its waste discharge, processing methods, and transfer rates, achieving TÜV Rheinland’s two-star certification for zero landfill waste management, underscoring its excellence in resource circulation and waste control. Its rooftop solar power plant, operational since 2023, is projected to deliver 700,000kWh of clean electricity annually. In 2024, HONOR was listed as a national “Green Supply Chain Management Enterprise.”

HONOR has automated 85% of its production processes, established a smart energy management platform to automatically collect, monitor, and analyze equipment energy consumption in real time, issuing early warnings for abnormal usage to enable rapid response and minimize energy waste. In 2024, the company flagged and addressed more than 3,000 incidents of abnormal consumption, effectively reducing daily production resource wastage.

HONOR also advances low-carbon storage and logistics systems, optimizing direct supplier delivery and reverse returns to minimize circuitous routes, which cut transport mileage by 500,000km and reduced carbon emissions by 643.5t. Vehicle load rates improved from 46% to 77%, resulting in 1,342 fewer transport trips and 80,000km less circuitous distance—saving another 104.2t in emissions. In 2024, HONOR began using sustainable aviation fuel for express shipments, supporting lower carbon emissions in transportation; delivery service now covers 59 countries, with an equivalent reduction of 130t in carbon emissions.



Picture Caption: Honor announces Carbon Neutrality Plan, targeting full value chain carbon neutrality by 2050.

2.2.11 Green Technology and Sustainable Practice: CSCEC Helps Malaysia Set the Benchmark for Green Buildings

(i) TRX106 Exchange Tower Project—Green Technology and Environmental Practices

Constructed by China State Construction & Engineering Malaysia (CSCEC Malaysia), the TRX106 Exchange Tower project is located within the core area of Kuala Lumpur's Tun Razak Exchange International Trade Center. With a total building area of approximately 400,000m² and a height of 452m, it is the tallest structure built overseas by a Chinese enterprise and set a global record for the fastest construction of a super tall's main structure over 400m. It is also the world's first super high-rise with a fully equipment-free facade and no post-construction structural modifications. The project has received numerous accolades including the Overseas Luban Prize and International Safety Award.

Throughout construction, CSCEC Malaysia consistently applied “green construction” principles across the entire project lifecycle. Leveraging successful implementation of innovative technologies, the project achieved remarkable performance in “Four Conservation and One Environmental Protection”—energy, land, water, materials, and environmental safeguarding. Key measures included:

1. **Energy Conservation:** Extensive use of LED lighting in construction, with more than 10,000 LED tubes installed. Formal lighting was activated early in basements and tower areas to save energy; heavy equipment was connected to municipal grid power in advance to minimize generator usage.
2. **Land Conservation:** Meticulous site management and use of detachable unloading platforms greatly reduced land required for construction activities.
3. **Water Conservation:** Water recycling technology was deployed, including sub-surface water recovery pipe systems to collect rain and process water across the project area. Concrete pouring and pipeline washing used special construction water tanks for circulation, saving more than 6m³ of water per casting cycle.
4. **Material Conservation:** Innovative application of high-strength rebar and structural steel saved more than 10,000t of steel input. Design optimizations replaced conventional splice connections with large-diameter straight-thread sleeve connectors, with each sleeve saving at least 1m of rebar. Custom welded mesh techniques dramatically reduced rebar usage in floor slabs.
5. **Environmental Protection:** Measures were taken for dust control, enclosure fencing, oil separation pools, multi-stage sedimentation, waste sorting and recycling. All construction phases met Malaysia's GBI (Green Building Index) requirements, with regular GBI reports submitted to authorities. Levels of pollution, noise, and other harmful environmental factors were strictly controlled.

(ii) Cyberjaya Infinaxis Data Center Project: Integrating Green Construction with Digital Building Practices

Located in Cyberjaya, widely known as Malaysia's "Silicon Valley," the Infinaxis Data Center project marks China State Construction Engineering Corporation Malaysia's (CSCEC Malaysia) first "Design + Build" contract in Peninsular Malaysia. Upon completion, the facility will serve as a standard Tier 3 data center platform. The project consistently applies a combined approach to green and digital construction, fully aligned with Malaysia's Green Building Index (GBI) certification, and exemplifies CSCEC's dual breakthroughs in the local digital and new energy sectors.

In terms of design optimization, the project team referenced outstanding domestic and international case studies and thoroughly considered energy efficiency, converting the traditional 2N power supply (multi-source redundancy) to a DR (distributed redundant) system. This change effectively reduces redundant energy consumption while improving power system reliability and environmental performance.

During green construction, strict monitoring for dust, noise, and pollutant emissions ensures minimal environmental impact. The use of prestressed rebar, eco-friendly high-formwork systems, and green concrete further minimizes material waste and carbon emissions from the outset, advancing green building principles.

In daily management, the team champions low-carbon lifestyles, actively applies for the use of groundwater to reduce reliance on municipal supplies, and promotes water, electricity, and energy conservation among staff. These "green" principles are woven into every operational detail of the project.



Picture caption: *TRX106 Exchange Tower*

2.2.12 Industrial Waste Heat Power Generation: Sinoma Energy Conservation Paves Malaysia's Path Toward Green and Low-Carbon Industrial Development

In 2012, Sinoma Energy Conservation signed a 12MW waste heat power generation EPC contract with Perak Hanjoong Cement, a subsidiary of Malaysia's YTL Cement Group, in Kuala Lumpur. This marked Sinoma's inaugural waste heat power generation project in Malaysia and the first such project in Malaysia's cement industry. In January 2015, the project was successfully connected to the grid and began generating electricity in a single attempt, operating reliably ever since. Each year, it saves 82 million kWh of electricity, 28,800t of coal, and reduces carbon emissions by 67,200t, becoming a key milestone for Malaysia's industrial sector on its green, low-carbon development journey.

In November 2022, Sinoma Energy Conservation continued its fruitful partnership with YTL Cement Group by signing a contract for Phase II—a new kiln-end boiler project for YTL Cement's waste heat power generation. In early 2024, the new boiler was integrated into the system, significantly lowering overall power consumption on the existing clinker production line and helping Perak Hanjoong Cement to enhance cost control and market competitiveness, achieving both economic and social benefits.

Adopting an EPC (engineering, procurement, construction) model, the project provides waste heat recovery systems for two cement clinker production lines (daily capacities of 4,000t and 5,000t), configured as four boilers and one turbine, with a 16.5MW steam turbine and an 18MW generator. It utilizes Sinoma's latest fourth-generation cement waste heat power technology, achieving seamless integration between waste heat recovery and clinker line operation. Upon completion, the project annually saves 112.75 million kWh of electricity, 39,600t of coal, and cuts carbon emissions by 92,400t—dramatically reducing energy consumption and bolstering CIMA Cement's cost efficiency and market competitiveness. At the same time, it curtails environmental pollution from exhaust emissions and supports Malaysian enterprises in adopting green, low-carbon production, making a positive contribution to efficient, eco-friendly industrial processes and energy utilization in the region.

In October 2023, the third Belt and Road Forum for International Cooperation was held in Beijing. Witnessed by Zhou Yuxian, Secretary of the Party Committee and Chairman of China National Building Material Group, Sinoma Energy Conservation and APMC, a subsidiary of YTL Cement Group, signed an EPC contract for a 10MW waste heat power generation project. Upon completion, the project is expected to save 68.16 million kWh of electricity, 23,900t of coal, and reduce carbon emissions by 55,900t annually, delivering significant economic, environmental, and social benefits to local enterprises and communities. It stands as a testament to Chinese expertise and responsibility in supporting Malaysia's green transformation.



Picture caption: *Malaysia YTL Cement 10 MW Waste Heat Power Generation Project*

2.2.13 Empowering Green Excellence: Dunham-Bush Sustainable Technology Solutions Set the Benchmark for Green Buildings

Located in Shah Alam, the headquarters building of Selangor State Development Corporation (PKNS)—Laman PKNS—has achieved prestigious green certifications, including the Green Building Index (GBI) and US Green Building Council LEED Platinum, as well as winning the ASEAN Energy Award (AEA) in 2018. These accolades highlight the building’s commitment to sustainability, energy efficiency, and environmental responsibility. A key factor in achieving these milestones was the integration of advanced Dunham-Bush variable frequency water-cooled screw chillers (WCFX-V) and air handling units (CS3), which play a crucial role in enhancing building energy performance and indoor environment quality.

Dunham-Bush, a global leader in HVAC systems, provided Laman PKNS with these state-of-the-art chillers and air handling units, aiming for optimal energy efficiency and minimal environmental impact. Highlights of these sustainable technologies include:

1. **Superior Energy Performance:** The Dunham-Bush chillers are equipped with advanced features such as variable speed drives (VSD) and economizer circuits, improving part-load efficiency and reducing energy consumption. The WCFX-V chillers are designed with a strong focus on energy efficiency, exceeding Malaysia’s standard design conditions at full load, and delivering even more outstanding performance at part load. This high efficiency directly supports the EE5 (Advanced Energy Performance—Building Energy Index, BEI) scoring under GBI, contributing up to 15 points.
2. **Environmentally Friendly Refrigerant:** The WCFX-V series uses R134a refrigerant, which has zero ozone depletion potential (ODP), qualifying for an additional MR6 (Green Products—Refrigerants & Cleaners) scoring point under GBI. The chiller’s pressure vessel design meets—and even exceeds—the stringent requirements of

Malaysia's Department of Occupational Safety and Health (JKKP) and surpasses international ASME standards in compliance and safety.

3. **Advanced Air Handling Units (AHU):** The CS3 series air handling units come factory-fitted with electronic air cleaners (EAC), which function both as pre-filters and secondary filters, substantially improving indoor air quality. Additionally, these units feature integrated VSD fan motors that optimize energy consumption and boost operational efficiency via precise speed control—delivering energy savings and further enhancing indoor air quality and user comfort.

Dunham-Bush's innovative HVAC solutions played a pivotal role in Laman PKNS's achievement of GBI Platinum certification. Their commitment to sustainability and energy efficiency not only elevated the overall performance of the building but also set a benchmark for Malaysia's future green building development. Dunham-Bush's HVAC system contributed to Laman PKNS's GBI Platinum status in the following key areas:

1. **Reduced Energy Consumption:** The system's high energy efficiency delivered significant energy savings, a critical factor in the GBI evaluation.
2. **Enhanced Indoor Environmental Quality:** Advanced air filtration and temperature control technology improved occupant comfort and productivity.
3. **Support for Sustainable Practices:** The use of environmentally friendly refrigerants and high-efficiency technologies met GBI's environmental assessment standards.



Picture caption: *Selangor State Development Corporation (PKNS) Headquarters Building*

2.2.14 Smart Travel, Green Flying: China Eastern Airlines Promotes a New Low-Carbon Flight Vision

Environmental protection and sustainability have become major themes in the global aviation industry, which accounts for approximately 2–3% of global CO₂ emissions. As international pressure for decarbonization intensifies, aviation is actively responding through various means, including the adoption of sustainable aviation fuel (SAF), fleet modernization to enhance fuel efficiency, the implementation of carbon offset mechanisms (such as the International Civil Aviation Organization’s CORSIA program), green airport initiatives, and digital transformation to optimize operational efficiency.

In this new era of digitization and sustainable development, China Eastern Airlines (hereafter “China Eastern”) is proactively embracing industry changes. In its operations in Malaysia, China Eastern has demonstrated robust technological innovation and a strong commitment to environmental protection, offering a new experience that combines “smart travel” and “green flight.” This initiative supports Malaysia’s journey toward technology-driven, low-carbon air travel. As technology evolves and environmental awareness deepens, China Eastern continues to empower operations through digital solutions and advocate for sustainable practices, contributing to the advancement of a greener aviation ecosystem both in Malaysia and globally.

China Eastern Airlines is committed to corporate social responsibility, advancing environmental protection in Malaysia through a range of sustainable actions that promote the concept of low-carbon flying. These measures include:

(i) Green Operations Across 79 Weekly Flights

China Eastern currently operates 79 flights per week in Malaysia, leveraging advanced flight scheduling and fuel optimization technologies for more energy-efficient and sustainable operations. As the largest SkyTeam member in Asia-Pacific, China Eastern actively participates in the alliance’s “Flight Challenge,” promoting the use of sustainable aviation fuel and encouraging low-carbon travel to enhance travelers’ awareness of green journeys and environmental responsibility. Additionally, to advocate for eco-friendly travel and minimize food waste, since June 1, 2024, China Eastern has been rolling out the “Light Fly & Dine On Demand” service across all flights. Unused in-flight meals are converted into reward points and credited to passengers’ accounts, allowing travelers to make green choices with tangible action.

(ii) Use of Eco-Friendly, Biodegradable Materials for In-Flight Catering

On China-Malaysia routes, China Eastern has widely adopted biodegradable materials and wooden utensils for in-flight catering, significantly reducing plastic use. These new materials are environmentally friendly and recyclable, aligning with modern travelers’ expectations for a greener, low-carbon travel experience.

Meanwhile, propelled by the digital economy, China Eastern is accelerating the adoption of information technologies in aviation services to optimize passenger experience and operational efficiency. Key digital measures include:

1. Air-Ground Connectivity: In-Flight Wi-Fi Across All Widebody Aircraft

China Eastern has fully equipped its widebody fleet with air-ground Wi-Fi connectivity. Whether for business needs or leisure, passengers enjoy stable and convenient wireless internet access while flying, marking major progress in “digital life aloft.”

2. Facial Recognition Boarding: Simplified Procedures, Enhanced Efficiency

At Shanghai Pudong International Airport, Beijing Daxing International Airport, and other domestic hubs, China Eastern is pioneering facial recognition boarding technology. Travelers can complete boarding with a simple facial scan, dramatically reducing wait times and streamlining the process. This touchless solution also boosts safety and convenience.

3. AI Smart Service System: Round-the-Clock Intelligent Assistance

China Eastern’s proprietary AI voice self-service inquiry system offers passengers 24/7 support—including flight information, guidance, and service reservations. At select airports, intelligent service robots (“Dongdong”) leverage multimodal interaction, big data, and internet technology to deliver truly smart, responsive, and personalized passenger experiences. With artificial intelligence, China Eastern achieves automated service upgrades, delivering faster and more precise assistance to travelers.



Picture caption: China Eastern Airlines operates 79 weekly flights, practicing green operations

Chapter 3: Achievements of Chinese Enterprises in Empowering Malaysia's Digital Economy

3.1 Malaysia's Digital Economy Policies and Development Overview

3.1.1 Overview of Malaysia's Digital Economy

Malaysia has made remarkable progress in digitalization, particularly in expanding nationwide internet access and increasing 5G broadband penetration. According to data from the Department of Statistics Malaysia, 96.4% of households have internet access, while 91.6% own a computer. In urban areas, internet penetration reaches 98.4% of households, compared with 89.8% in rural regions.³⁴ At the individual level, information and communications technology (ICT) usage data indicate that in 2023, 80.4% of individuals used a computer, with the rate standing at 86.0% in urban areas and 63.6% in rural areas. Notably, 5G coverage rose significantly from 47.1% in 2022 to 80.2% in 2023.³⁵

Malaysia also stands out as the Southeast Asian country with the highest internet and social media penetration, driven largely by widespread mobile connectivity supported by a well-developed national network infrastructure. In 2024, Malaysia recorded 33.59 million internet users, the vast majority of whom were also active on social media, with the number of social media users reaching 28.68 million.³⁶ The country registered 44.55 million mobile connections, equivalent to 129.2% of its total population, underscoring the central role of mobile connectivity in daily life.³⁷ Among internet users aged 16 to 64, 98.5% own a mobile device, indicating near-universal mobile phone penetration. This pervasive mobile adoption defines Malaysia as a “mobile-first” nation, a characteristic that will profoundly shape the country's pathway toward achieving full digitalization by 2050.³⁸

According to the *e-Conomy SEA 2024* report jointly released by Google, Temasek Holdings, and Bain & Company, Malaysia's digital economy reached a gross merchandise value (GMV) of USD 31 billion in 2024, marking a 16% increase compared with 2023.³⁹ The report projects that by 2030, the size of Malaysia's digital economy will expand to between USD 45 billion and USD 70 billion. The country's digital economy is driven by growth across four key sectors:

1. **E-commerce:** E-commerce continues to be the largest contributor to Malaysia's digital economy, with GMV rising by 17% in 2024 to reach USD 16 billion. This growth was propelled by reinvestment from major platforms and the rapid rise of video-based commerce.

³⁴ Malaysian Government. Malaysia Digital Economy 2024 [R]. Malaysia. Department of Statistics Malaysia, Ministry of Economy, 2024.

³⁵ Malaysian Government. Malaysia Digital Economy 2024 [R]. Malaysia. Department of Statistics Malaysia, Ministry of Economy, 2024.

³⁶ Sue Howe. Social Media Statistics for Malaysia [R]. Meltwater, 2024.

³⁷ Sue Howe. Social Media Statistics for Malaysia [R]. Malaysia. Meltwater, 2024.

³⁸ Khoo Wei Yang. What Household Connectivity Gaps Mean for a Digital Future [Z]. Kuala Lumpur: Khazanah Research Institute, 2024.

³⁹ Google, Temasek, and Bain & Company. *e-Conomy SEA 2024* [R]. Singapore. Google, Temasek, and Bain & Company, 2024.

2. **Online Travel:** Online travel emerged as the fastest-growing sector, expanding by 19% year-on-year to USD 8 billion in GMV. The strong rebound of international tourism in Malaysia is projected to exceed pre-pandemic levels in 2024, with outbound travel spending rising by 330% since 2020. Notably, 38% of this spending is concentrated within the Asia-Pacific region.
3. **Food Delivery and Mobility Services:** These two segments collectively grew from USD 3.66 billion in 2023 to USD 4.0 billion in 2024, reflecting a growth rate of 10%. The recovery of commuting demand and international travel provided strong momentum. Food delivery platforms enhanced profitability through tiered delivery options and subscription packages, while the ride-hailing market became increasingly competitive with new entrants and expanded service offerings.
4. **Online Media:** Malaysia's online media sector sustained robust growth, with GMV projected to expand from USD 3.5 billion in 2023 to USD 3.85 billion in 2024, representing a 10% increase. Growth was fueled by the rising popularity of digital content, gaming, and streaming services.

In addition, the rollout of digital banking services, offering attractive features and convenient user experiences, is expected to further catalyze the expansion of Malaysia's digital economy and reinforce its position as one of the most dynamic digital markets in Southeast Asia.

Table 3-1 Overview of Malaysia's Digital Economy Industry (USD billion)

Year	2022	2023	2024	2030*
Gross Merchandise Value (GMV)	220	260	310	450–700
E-commerce	130	130	160	250
Online Travel	30	60	80	130
Food Delivery and Mobility Services	30	36.6	40	60
Online Media	30	35	38.5	60
Digital Financial Services (E-payments)	1,520	1,640	1,720	2,500–3,500

Source: *e-Economy SEA 2024*

Malaysia's government is actively advancing the digital economy as one of the core pillars of national development. Anchored in high-tech capabilities associated with Industry 4.0, such as artificial intelligence, 5G, and cloud computing, Malaysia has prioritized the development of the digital economy and high-tech industries. Strategic focus is placed on digital manufacturing, digital agriculture, digital services, digital cities, digital health, digital finance, digital trade, digital content, digital tourism, and the digital Islamic economy, which are designated as high-growth strategic sectors.⁴⁰ Among these, the development of artificial intelligence is regarded as the key catalyst for the nation's digital economic transformation.

To achieve this vision, the Malaysian government has formulated and implemented major policy blueprints including the *Malaysia Digital Economy Blueprint*, the *National Fourth Industrial Revolution (4IR) Policy*, and the *National Artificial Intelligence Roadmap 2021–2025*. Building upon these three overarching policy frameworks, the government has since 2024 successively introduced four new AI-related roadmaps and action plans: the *AI*

⁴⁰ Telecom Review. Malaysia's Blueprint for AI Dominance in ASEAN [N].Telecom Review. 2025.

Technology Action Plan 2026–2030, the *AI Talent Roadmap 2024–2033*, the *Malaysia Artificial Intelligence Consortium*, and the *National Guideline on AI Governance and Ethics for Responsible AI*. These initiatives are further supported by fiscal policies, talent development programs, and governance mechanisms for the digital economy. Collectively, they provide comprehensive support for Malaysia’s digital transformation and aim to position the country as a regional hub for the digital economy, particularly in AI-driven industries.

The *National Fourth Industrial Revolution (4IR) Policy* emphasizes artificial intelligence as a critical driver of digital transformation, extending the core principles of the *National Policy on Science, Technology and Innovation 2021–2030 (DSTIN 2021–2030)*. By fostering the development of Industry 4.0 technologies such as artificial intelligence, the Internet of Things, blockchain, big data analytics, cloud computing, and robotics, the policy seeks to promote national economic growth and accelerate industrial digital transformation.⁴¹ Ten priority sectors have been identified for the deployment of Industry 4.0 technologies, including manufacturing, wholesale and retail, transportation and logistics, tourism, finance and insurance, professional, scientific and technical services, utilities, education, healthcare, and agriculture. Artificial intelligence is also recognized as a key enabler in the development of smart cities, with applications in enhancing transportation, safety, energy efficiency, and urban planning. Furthermore, government services are expected to leverage AI-powered automation and data analytics to enable more precise decision-making and greater public service efficiency.

The *National Artificial Intelligence Roadmap 2021–2025* serves as a vital strategic framework underpinning the *Malaysia Digital Economy Blueprint* and the *National Fourth Industrial Revolution (4IR) Policy*. Its objective is to accelerate the adoption of artificial intelligence across industries in order to drive economic growth and societal well-being, while positioning Malaysia as a regional hub for artificial intelligence.⁴² The roadmap prioritizes AI application in five key domains:

1. **Manufacturing:** AI-driven automation, predictive maintenance, and smart factories.
2. **Healthcare:** AI-assisted diagnostics, personalized treatment, and digital health solutions.
3. **Agriculture:** Smart farming, crop monitoring, and AI-powered yield prediction.
4. **Smart Cities and Transportation:** AI-based traffic management, public safety, and Internet of Things (IoT) integration.
5. **Education:** AI-enabled personalized learning, curriculum enhancement, and workforce upskilling.

Building on this roadmap, the Malaysian government launched the *MyDIGITAL Catalytic Project*, which establishes digitalization strategies for five priority sectors of the economy: agriculture, healthcare, manufacturing, transportation and logistics, and utilities. The project is designed to catalyze private sector investment in digital transformation, foster the development of digital ecosystems, and stimulate investment in critical digital infrastructure.⁴³ To advance these efforts, the government has identified five core digital technologies: artificial intelligence, the Internet of Things, blockchain, cloud computing and big data analytics, as well

⁴¹ Malaysian Government. National Fourth Industrial Revolution (4IR) Policy. [R]. Malaysia. Economic Planning Unit Prime Minister’s Department. Malaysia, 2021.

⁴² Malaysian Government. National Artificial Intelligence Roadmap 2021-2025 [R]. Malaysia. Ministry of Science, Technology and Innovation, 2021.

⁴³ Malaysian Government. MyDIGITAL Catalytic Projects Programme Report[R]. Malaysia. My DIGITAL Corporation, 2022.

as advanced materials and technologies. These serve as the technological foundation for digitalization initiatives in the targeted industries. Selected application scenarios of these digitalization projects are illustrated in Table 3-2.

Table 3-2 Application Scenarios of Digitalization Projects in Key Industries

Economic Sector	Selected Application Scenarios of Digitalization Projects
Agriculture	• Modernized agriculture using drone spraying technology to reduce costs by 30% and increase production and income by 20% • Application of IoT and real-time monitoring systems for plantation management • Application of precision technology to advance laboratory-based vertical agriculture
Healthcare	• Virtual healthcare services supported by 5G, AI, big data, and cloud computing solutions • Real-time data sharing between hospitals and specialist doctors • Promotion of telemedicine for consultation, diagnosis, and monitoring
Manufacturing	• Application of AI-driven robots in manufacturing production, transportation, and safety inspection • Implementation of IoT systems in modern manufacturing
Transportation and Logistics	• Deployment of electric vehicle infrastructure, targeting 10,000 charging stations • Application of AI technologies in smart transportation management
Utilities	• Use of drones, big data analytics, and cloud computing solutions for resource monitoring • Smart utility management, wastewater management, and urban management

Source: *MyDIGITAL Catalytic Projects Programme Report*

On the other hand, the National Artificial Intelligence Office established by the Ministry of Digital Malaysia has identified four priority industries as key focus areas for AI application scenarios. These industries are agriculture, transportation, healthcare, and public services. At present, the research and application efforts led by the National AI Office concentrate on four main areas:

1. **Healthcare:** AI-driven medical diagnostic systems and AI solutions that enhance the efficiency and intelligence of healthcare operations.
2. **Transportation:** AI-enabled traffic management systems, AI applications in traffic monitoring and toll collection, and AI-powered autonomous driving solutions.
3. **Agriculture:** AI solutions for early detection of pests.

4. **Public Services:** AI applications designed to improve the efficiency and productivity of public services, as well as solutions that accelerate decision-making within government agencies.

Specific application scenarios are illustrated in Table 3-3.

Table 3-3 AI Application Scenarios in Priority Industries and Sectors Identified by the National Artificial Intelligence Office

Sector	Application Scenarios	Outcomes
Healthcare	AI-driven medical diagnostic systems	• Faster and more accurate diagnoses: AI can detect diseases more quickly and precisely, reducing errors in pathology reports. • Greater efficiency: streamlines workflows, allowing medical staff to focus on critical cases. • Cost and time savings: reduces diagnostic turnaround time by 50% and operating costs by up to 30%. • Improved productivity: automation enhances staff productivity and responsiveness. • Better patient care: faster diagnoses enable timely treatment, leading to improved overall outcomes.
	AI-powered healthcare operations management	• Time savings: AI automates medical documentation, freeing up more time for patient care. • Multilingual support: AI facilitates communication with diverse patients by supporting multiple languages and specialties. • Seamless integration: interoperates with EMR systems to simplify workflows and reduce administrative tasks. • Enhanced decision-making: provides differential diagnoses and treatment suggestions to improve accuracy. • Voice-driven efficiency: captures notes during consultations or ward rounds, accelerating documentation.
Transportation	AI-enabled intelligent traffic management	• Reduced congestion: AI optimizes traffic light timing, enabling smoother traffic flow and shorter travel times. • Improved safety: real-time monitoring and automated violation detection enhance road safety.

		• Environmental benefits: more efficient traffic management lowers fuel consumption and carbon emissions. • Faster incident response: AI-driven systems enable quicker responses to accidents and disruptions. • Data-driven improvements: AI analyzes traffic patterns to support urban planning and long-term solutions.
	AI-powered traffic monitoring and toll management	• Automated traffic monitoring: AI-driven computer vision tracks and classifies vehicles, providing real-time traffic and congestion data across highways. • Improved tolling efficiency: AI-based automatic license plate recognition (ALPR) and vehicle classification replace manual processes, speeding up toll lane operations. • Enhanced traffic management: automated data collection and analysis improve traffic flow and reduce congestion. • Cost savings: minimizes reliance on manual toll operations, reducing operational costs.
	AI-driven autonomous driving solutions	• Improved urban mobility: AI enhances the efficiency and reliability of public transport, reducing travel time and congestion. • Increased safety: AI-powered autonomous driving reduces human error, making travel safer for passengers. • Sustainability: AI-enabled electric buses lower carbon emissions, contributing to a cleaner environment. • Cost efficiency: optimizes fleet operations and reduces the operating costs of public transport systems.
	Integration of AI in vehicle data and video intelligence	• Enhanced safety and security: AI provides real-time insights and proactive monitoring for road safety and threat detection. • Efficient investigations: accelerates incident analysis and video evidence review, enabling faster resolution. • Actionable insights: extracts valuable data to inform better decision-making and optimize operations. • Data integrity: ensures secure and tamper-proof processing of vehicle and video data.

Agriculture	AI applications in early pest detection	• Timely detection: enables farmers to identify brown planthopper infestations at an early stage. • Informed decision-making: equips farmers with data to make sound pest control decisions. • Reduced crop losses: helps prevent significant damage to rice crops caused by brown planthoppers. • Reduced pesticide use: minimizes excessive pesticide application, benefiting both the environment and human health.
Public Services	AI for enhancing public service efficiency (AI at Work 2.0 Program)	• Improved efficiency: increases productivity and reduces time spent by civil servants on research and analysis. • Optimized policymaking: enables rapid extraction and analysis of valuable data, providing insights on trends and potential solutions to support better policy formulation and operational improvements. • Fewer errors: minimizes human error and enhances the accuracy and quality of public services.

Source: National Artificial Intelligence Office official website, <https://ai.gov.my/applied-ai>

In addition, the National Artificial Intelligence Office has established strategic partnerships with both domestic and international collaborators in Malaysia to jointly implement public–private partnership projects based on AI application scenarios. Selected cooperation cases are presented in Table 3-4.

Table 3-4 Public–Private Partnership Projects on AI Application Scenarios by the National Artificial Intelligence Office

Partner	Cooperation Case
National Artificial Intelligence Office (NAIO), Youth Farmers Development Authority, and Toshiba	In collaboration with the Youth Farmers Development Authority, NAIO and Toshiba are implementing the <i>Projek Ladang Padi IR4.0</i> smart agriculture project in Kedah, integrating AI technology into rice farming.
National Artificial Intelligence Office (NAIO) and Global AI Village (established by US investment fund The Hive Global AI Fund)	Together with Global AI Village, NAIO is developing AI application solutions in the fields of energy, cybersecurity, agriculture, supply chains, transportation, and healthcare to provide enterprises and governments with highly efficient AI-driven solutions.
National Artificial Intelligence Office (NAIO) and YTL Power International Berhad	Development of a large-scale language model for Bahasa Malaysia.

National Artificial Intelligence Office (NAIO) and Microsoft	Microsoft and NAIO launched the AI Innovation Accelerator to expand the application of AI in critical public sectors. The initiative also seeks to establish a national AI governance framework.
National Artificial Intelligence Office (NAIO) and Amazon Web Services (AWS)	AWS and NAIO are collaborating to enhance Malaysia's AI capabilities and infrastructure, promoting both national and global ecosystem development.
Ministry of Digital Malaysia, National Artificial Intelligence Office (NAIO), and Google	Google, together with the Ministry of Digital Malaysia and NAIO, is advancing over 100 AI-driven projects to digitalize public services, streamline data, simplify workflows, and improve the efficiency and responsiveness of government services to citizens.

Source: National Artificial Intelligence Office official website, <https://ai.gov.my/thought-leadership>

3.1.2 Malaysia's Digital Economy Policies

1. Malaysia Digital Economy Blueprint

The vision of the *Malaysia Digital Economy Blueprint* is to transform Malaysia into a digitally driven, high-income nation. The blueprint identifies artificial intelligence as the central driving force for digital transformation and high-quality economic growth. By embedding artificial intelligence into diverse industries, Malaysia aims to foster innovation, enhance productivity and competitiveness, and accelerate its transition toward a high-income economy. Its core priorities include formulating a comprehensive digital economy framework, cultivating digital talent, building robust digital infrastructure, advancing the digitalization of government and public services, and catalyzing the digital transformation of key industries.

2. National Fourth Industrial Revolution (4IR) Policy

The *National Fourth Industrial Revolution (4IR) Policy* continues the core principles of the *National Policy on Science, Technology and Innovation 2021–2030 (DSTIN 2021–2030)*. It seeks to develop the national economy and drive industrial transformation through Industry 4.0 technologies such as artificial intelligence, the Internet of Things, and blockchain. Within this framework, AI, IoT, blockchain, big data analytics, cloud computing, and robotics are classified as emerging technologies that will fuel the realization of Industry 4.0. The policy identifies ten key sectors for the deployment of Industry 4.0 technologies, namely manufacturing, wholesale and retail, transportation and logistics, tourism, finance and insurance, professional, scientific and technical services, utilities, education, healthcare, and agriculture. In addition, the policy emphasizes encouraging small and medium-sized enterprises to adopt digital technologies in order to strengthen their digital capabilities.

3. National Artificial Intelligence Roadmap 2021–2025

The *National Artificial Intelligence Roadmap 2021–2025* is a critical strategic framework supporting the development of both the *Malaysia Digital Economy Blueprint* and the *National Fourth Industrial Revolution (4IR) Policy*. It seeks to accelerate AI adoption across industries to promote economic growth and social well-

being, while positioning Malaysia as a regional hub for artificial intelligence. The roadmap aims to stimulate AI-driven innovation and research, develop a strong AI talent pool, establish enabling infrastructure and ecosystems, and create a regulatory framework that ensures ethical and responsible AI development.⁴⁴ Priority areas for AI application are fivefold:

- Manufacturing, with AI-driven automation, predictive maintenance, and smart factories.
- Healthcare, with AI-assisted diagnostics, personalized treatment, and digital health solutions.
- Agriculture, with smart farming, crop monitoring, and AI-powered yield prediction.
- Smart cities and transportation, with AI-driven traffic management, public safety, and IoT integration.
- Education, with AI-enabled personalized learning, curriculum enhancement, and workforce upskilling.

4. AI Technology Action Plan 2026–2030

The *AI Technology Action Plan 2026–2030*, spearheaded by the National Artificial Intelligence Office, builds on the foundation established by the *National Artificial Intelligence Roadmap 2021–2025*. It aims to further consolidate Malaysia’s position as a regional hub for artificial intelligence. The plan outlines a roadmap for AI initiatives between 2026 and 2030, focusing on innovation, infrastructure, and cross-industry integration. The National AI Office serves as the central coordinating body, overseeing AI policy, strategic planning, and regulatory supervision to ensure coherence and effectiveness in national AI development. The plan also promotes public–private partnerships and collaboration with international technology companies to strengthen AI capabilities, infrastructure, and knowledge-sharing, thereby nurturing a robust AI ecosystem.

5. AI Talent Roadmap 2024–2033

The *AI Talent Roadmap 2024–2033* is a strategic initiative designed to cultivate a strong pool of artificial intelligence talent and ensure Malaysia’s continued competitiveness in the rapidly evolving digital economy. The roadmap sets out comprehensive short-, medium-, and long-term strategies for talent development to address both current and future needs in AI human capital. To this end, the government has established the Faculty of Artificial Intelligence (FAI) at Universiti Teknologi Malaysia (UTM), offering specialized AI programs. The inaugural Bachelor of Artificial Intelligence degree commenced in October 2024. In addition, AI-related courses have been introduced across a range of public and private universities to expand educational opportunities. Furthermore, the government has commissioned UTM to spearhead the creation of the Malaysia Artificial Intelligence Consortium (MAIC), a body comprising experts from academia and industry tasked with providing guidance for the development of AI talent cultivation.

⁴⁴ 参考 <https://mastic.mosti.gov.my/publication/artificial-intelligence-roadmap-2021-2025/>

6. National Guideline on AI Governance and Ethics

The *National Guideline on AI Governance and Ethics*, issued by the Ministry of Science, Technology and Innovation (MOSTI) in September 2024, aims to promote the responsible development and application of artificial intelligence. The guideline, which is voluntary in nature, applies to end users, policymakers, designers, developers, technology providers, and vendors. It seeks to ensure that the advancement of AI in Malaysia aligns with national core values and the Federal Constitution. Its overarching objective is to establish an ethical, transparent, and trustworthy AI ecosystem that benefits society, complies with moral standards, and operates under appropriate regulatory oversight.

3.2 Achievements of Chinese Enterprises in Empowering Malaysia's Digital Economy

3.2.1 “Digital + Green” Dual-Engine Development: Huawei Empowering the Comprehensive Advancement of Malaysia's Digital Economy

In recent years, Huawei has actively upheld the philosophy of “*In Malaysia, For Malaysia*”, taking deep part in Malaysia's digital economy development and green low-carbon transition. In collaboration with the Malaysian government and industry partners, Huawei has launched a series of initiatives to strengthen digital infrastructure, advance industrial digitalization, and cultivate multi-level local digital talent. These efforts have comprehensively supported the growth of Malaysia's digital economy and contributed to mutually beneficial outcomes.

(i) Digital Infrastructure Development

1. **5G Coverage on Cross-Sea Bridges:** In February 2025, Huawei, together with U Mobile, successfully completed a 5G coverage project on the Penang Bridge, marking Malaysia's first case of seamless 5G connectivity across a long-distance transportation hub. The project covered the full length of the 13.5-kilometer bridge, achieving an average download speed of 597 Mbps, with vehicles maintaining stable connections even while traveling at 80 km/h. This success was driven by Huawei's innovative MetaAAU antenna technology, which significantly enhanced 5G network performance and provided a replicable model for network deployment in complex environments such as highways and bridges. U Mobile emphasized that this collaboration enhances the provision of broader and more stable 5G service experiences, thereby supporting the development of Malaysia's smart transportation and intelligent infrastructure.
2. **Frontier 5G/5.5G Technology Trials:** Huawei has partnered with Malaysian operators to conduct advanced 5G trials, positioning Malaysia at the forefront of regional technological innovation. In February 2024, Huawei and Maxis jointly launched the first 5.5G experimental site in ASEAN. By deploying Huawei's MetaAAU and millimeter-wave products, the trial achieved a single-user peak downlink speed of 8 Gbps, significantly surpassing the performance of existing 5G networks. The trial showcased breakthrough applications of 5.5G technology in ultra-high-speed connectivity and massive device connections, including low-latency live streaming and

immersive AR/VR experiences. Malaysia's Minister of Communications and the Malaysian Communications and Multimedia Commission (MCMC) highly commended the initiative, recognizing that the 5.5G trial would accelerate the nationwide connectivity upgrade and unlock transformative opportunities for both industries and the general public.

3. **Cloud Infrastructure and Data Sovereignty:** Huawei is supporting Malaysia in building autonomous and secure cloud computing platforms to enhance the resilience of its digital economy. In collaboration with Telekom Malaysia (TM), Huawei developed the domestic public cloud service *Cloud Alpha Edge*, which ensures data sovereignty and compliance with data localization requirements. Launched in 2022, this platform became Malaysia's first locally operated public cloud system built on Huawei's technology, enabling sensitive data to be securely stored and processed within national borders. Leveraging this platform, Huawei has facilitated cloud transformation across key sectors such as finance. For instance, in partnership with Tune Protect, Huawei migrated the insurer's core systems to *Cloud Alpha Edge*, making it the first insurance company in Malaysia authorized to host core business operations on a local public cloud. By strengthening cloud infrastructure, Huawei empowers industries to accelerate digital transformation, providing secure and efficient computing capabilities while fostering the growth of a robust domestic digital services ecosystem.

(ii) Smart City and Green Energy Applications

1. Smart City Pilot and Digital Governance

In May 2024, Huawei Malaysia signed a cooperation agreement with Universiti Kuala Lumpur to establish the Huawei Smart Operation Center Laboratory on campus. The facility focuses on research and training in smart city development and urban flood management technologies. Leveraging Huawei's advanced IOC (Intelligent Operation Center) platform, the laboratory analyzes and interprets large-scale urban data to enhance emergency management and urban governance capacity. Through this collaboration, Huawei has transferred its expertise in smart city solutions to Malaysian universities, while both parties have also launched joint research on flood monitoring and early-warning systems. The project aims to cultivate local talent in smart city development, improve urban resilience, and support Malaysia's transition to intelligent urban governance.

2. State-Level Digital Transformation and Smart City Planning

In 2023, Huawei signed a memorandum of understanding with the Sabah State Government to support Sabah's digital economic transformation. Under the agreement, Huawei provided top-level consulting and technical support for smart city planning, covering digital infrastructure, e-government, smart agriculture, and smart tourism. Huawei also assisted in the planning of Sabah's data center and expansion of telecommunications coverage in remote areas, helping to narrow the digital divide between urban and rural communities. The Chief Minister of Sabah highly commended the cooperation with Huawei, emphasizing that it would strongly advance the state's digital transformation agenda, ensure the successful implementation of its smart city vision, and enhance public service delivery.

3. Clean Energy Solutions

In 2024, Huawei formed a strategic partnership with Solarvest to promote integrated solar photovoltaic and energy storage solutions. The collaboration applied Huawei's smart photovoltaic inverters and energy management systems to projects such as large-scale solar power plants (LSS) and the Corporate Green Power Programme (CGPP), significantly improving power generation efficiency and stability. Huawei also supported Solarvest in deploying Battery Energy Storage System (BESS) technologies in renewable energy projects, enabling more efficient use of clean energy and better grid regulation. Both parties plan to jointly cultivate local talent in green energy technologies.

In addition, Huawei signed a partnership in 2023 with Pantas, a leading Southeast Asian climate technology company, to provide enterprises with one-stop low-carbon energy transition solutions. Huawei contributed its expertise in smart photovoltaic, energy storage, and electric vehicle charging infrastructure, while Pantas offered customized decarbonization pathways through its AI platform. This cooperation aligns closely with the objectives of Malaysia's *National Energy Transition Roadmap*, helping small and medium-sized enterprises as well as industrial parks accelerate the adoption of solar power generation, energy storage for peak shaving, and electric mobility. These initiatives reduce carbon emissions while lowering operational energy costs.

(iii) Industrial Digitalization Cooperation

1. Innovation Hub and Industrial Application Incubation

In March 2022, Huawei, together with Malaysia's national applied research agency MIMOS and telecom operator Maxis, established the *5G and AI Innovation Centre* in Kuala Lumpur. Serving both as a testbed and incubator, the center focuses on applying next-generation technologies such as 5G, the Internet of Things, cloud computing, and artificial intelligence in industries including manufacturing, agriculture, and healthcare. The center provides local enterprises with access to advanced 5G networks and AI computing resources, supporting the development of solutions tailored to industrial scenarios, while also promoting successful use cases nationwide.

2. Empowering Digital Enterprises to Go Global

Huawei has partnered with the Malaysia Digital Economy Corporation (MDEC) to support the growth of local digital enterprises and their expansion into international markets. In December 2023, Huawei Malaysia, together with MDEC, launched the *Go Global Digital Accelerator Programme* to help Malaysian technology companies strengthen digital capabilities and tap into overseas opportunities. The programme provides comprehensive support for Malaysian small and medium-sized digital enterprises. Huawei contributed USD 5 million worth of cloud service resources, enabling participating companies to accelerate cloud adoption and reduce IT costs. Selected companies receive mentorship from Huawei cloud technology experts, connections to Huawei's global partner ecosystem, up to USD 50,000 in cloud service credits, and opportunities for joint international market promotion.

3. Artificial Intelligence Ecosystem Collaboration

In April 2025, Huawei Malaysia signed memoranda of understanding with several leading local enterprises to jointly develop intelligent solutions in sectors such as e-commerce, logistics, and public services. Huawei partnered with TOGL Technology to build an AI-powered e-commerce and loyalty platform, combining Huawei's AI platform capabilities with local industry expertise to enhance online consumer experiences. With Skyvast, Huawei co-developed a sovereign AI cloud infrastructure to provide Malaysia with high-performance AI computing power. In partnership with Tiong Nam Logistics, Huawei integrated AI and cloud technologies into warehouse and supply chain management to improve operational efficiency. Huawei also collaborated with HeiTech Padu and MYEG to optimize public service processes and user experiences through AI adoption. These projects were endorsed by Malaysia's Minister of Digital and are closely aligned with the strategic plans of the National Artificial Intelligence Office.

(iv) Talent Development and Digital Inclusion

1. Digital Leadership Excellence Programme (DLE)

In 2024, Huawei, in partnership with the Malaysian Communications and Multimedia Commission (MCMC), launched the *Digital Leadership Excellence Programme (DLE)* to cultivate core leaders in digital transformation across Malaysia's public and private sectors. Huawei designed and delivered training modules covering critical themes such as 5G, artificial intelligence, cloud computing, cybersecurity, digital governance, and ICT policy planning. The first cohort of 50 participants, drawn from government agencies, regulators, telecommunications enterprises, and universities, graduated in February 2025. The ceremony was officiated by Minister of Communications Fahmi Fadzil, who emphasized that the programme exemplifies the potential of public-private collaboration in advancing the national digital agenda. Over its three-year duration, the DLE programme will train 300 digital leaders by 2026, building a core talent pool that underpins Malaysia's *Digital Malaysia* strategic objectives.

2. Industry-Education Integrated Talent Base

In December 2024, Huawei, together with Malaysia's Ministry of Human Resources, established the country's first joint learning center at the Industrial Training Institute (ILP) in Kuala Lumpur. The center offers advanced training in 5G communications and other frontier technologies to engineers, subcontractors, TVET instructors, and students. The project is expected to cultivate 2,000 ICT specialists in areas including 5G, telecommunications networks, and artificial intelligence. This initiative addresses the shortage of highly skilled engineers and prepares the workforce for the hundreds of thousands of digital and green jobs projected to emerge in the future.

3. Digital Talent Ecosystem

Since 2021, Huawei has set a five-year goal of cultivating 50,000 ICT talents in Malaysia. To achieve this, Huawei established the ASEAN Academy in Malaysia and implemented a portfolio of talent development programmes, including the *Huawei ICT Academy*, the *ICT Competition*, the *Seeds for the Future* initiative, and the *Intelligent*

World 2030 programme. These initiatives have provided advanced ICT training for university faculty and students while selecting outstanding undergraduates for further study and training in China. To date, Huawei has jointly established 45 ICT Academies with Malaysian universities. In addition, Huawei set up its only overseas Global Training Center in Malaysia, providing ICT knowledge sharing and skills transfer to global clients and ecosystem partners. By 2024, Huawei had successfully achieved its target of training 50,000 ICT professionals one year ahead of schedule.

The above cases illustrate that Huawei has achieved substantial outcomes in Malaysia through its dual-driven model of “digital + green” cooperation. On one hand, Huawei has strengthened digital infrastructure and promoted industrial intelligence; on the other, it has advanced clean energy adoption and supported sustainable development. These efforts not only align closely with Malaysia’s national development strategies but also establish a model for deepening China–Malaysia cooperation in the fields of digital economy and green development under the Belt and Road Initiative. The experience accumulated provides valuable references for future endeavors of co-creation, co-construction, and shared gains.



Picture Caption: *On 31 May 2024, Huawei presented Malaysia’s first 5.5G-enabled smart city solution to Prime Minister Anwar in Labuan, Federal Territory.*

3.2.2 Co-constructing the Digital Economy: Geely Supporting Malaysia in Building a Model for Digital Transformation

(i) Geega: Digitalization and Intelligent Solutions

Geega Digital Technology Co., Ltd. (hereinafter referred to as “Geega”), a digital technology enterprise under Geely Automobile Holding Group, specializes in the field of industrial internet. Its Geega Industrial Internet Platform is the first industrial internet platform launched in the automotive sector to provide comprehensive digital transformation services

across industries. In the area of energy management and “dual carbon” solutions, Geega, guided by ESG principles, leverages a digital-native architecture to address enterprises’ energy consumption challenges in production, operations, and management. It offers full-lifecycle solutions for green and intensive production, dynamic energy allocation, as well as energy consumption and carbon emissions monitoring and control.

Through advanced energy optimization algorithms, Geega enhances production processes, improves energy efficiency, and achieves optimal equipment control while promoting energy savings and carbon reduction across the entire industrial chain. At the same time, digital tools are deployed to deliver end-to-end tracking services for enterprises’ carbon emissions data collection, accounting, management, and application. These capabilities enable businesses to conduct carbon inventories and manage carbon assets, thereby achieving precise and intelligent carbon reduction and fostering green industrial chains that contribute to the “dual carbon” goals.

In December 2023, Geega signed a comprehensive strategic cooperation agreement in Kuala Lumpur with ALTEL Group Sdn Bhd (AGSB), a subsidiary of Malaysia’s Albukhary Group. In 2024, the two parties established a joint venture, AGYTEK Digital Sdn Bhd, to roll out integrated digital services. With Geega’s support, Albukhary Group’s three major subsidiaries—DRB-HICOM, MMC, and TGM, with their vast industrial portfolios—are advancing large-scale digital transformation. The partnership aims to make them benchmarks for Malaysia’s digital transformation and intelligent solutions, while jointly expanding digital business in Malaysia and neighboring countries. Through this initiative, Geega seeks to export its “*Wide Wisdom, China Solution*” to ASEAN markets.

To date, leveraging Geega’s digital technology solutions, AGYTEK Digital has successfully provided several Malaysian original equipment manufacturers (OEMs) and component suppliers with one-stop, end-to-end digitalization solutions. It has also established a strategic partnership with the Malaysia Automotive, Robotics and IoT Institute (MARii) under the Ministry of Investment, Trade and Industry, launching the first round of digital capability assessments for small and medium-sized enterprises as well as smart factory pilot projects. In addition, drawing on the plantation resources of the TGM Group, AGYTEK Digital introduced an AI-based model for palm fruit ripeness detection and sorting, along with an industrial chain collaborative optimization solution, thereby advancing the intelligent transformation of agriculture.



Picture Caption: *Example of Geega's intelligent solutions for the electrolytic aluminum industry*

(ii) Geespace: Integrated Communication Services Combining Satellite and Terrestrial Networks

Zhejiang Geespace Technology Co., Ltd. (hereinafter referred to as “Geespace”) is a technology innovation enterprise under Geely Holding Group, established in 2018. It is committed to becoming a global leader in aerospace information and communication infrastructure and application solutions, with a focus on satellite constellation operations, satellite manufacturing, and satellite applications. Geespace is driving the commercialization of China's satellite industry chain and the application of China's space technologies. The company is planning to build a global low-Earth orbit communication constellation, known as the *Geely Constellation*, which will achieve rapid deployment through orbital-plane launches to enable global real-time data communications.

On 18 April 2025, Geespace and ALTEL Group Sdn Bhd (AGSB) formally announced the establishment of a joint venture, Altel Digital Integrated Sdn Bhd (ADISB), at a launch ceremony attended and supported by Malaysia's Minister of Communications Fahmi Fadzil. Through this joint venture, Geespace aims to deploy the Geely Future Mobility Constellation in Malaysia, integrating satellite products and application services with AGBS's LTE and 5G private networks. This integration will empower multiple sectors including maritime shipping, smart mobility, intelligent manufacturing, smart agriculture, smart energy, and consumer electronics.

With Geely's leading aerospace technologies and R&D capabilities, coupled with ADISB's frequency resources and operating licenses, Geely and AGBS are building a full industrial chain that spans from satellite constellations to end-user applications. This integrated communication system, combining satellite and terrestrial networks, will inject fresh momentum into mutually beneficial cooperation between Malaysia and China in the digital economy, while accelerating the formation of a new regional digital development framework oriented toward Southeast Asia.



Picture Caption: *ALTEL–Geespace joint venture launch ceremony*

3.2.3 Deepening the “Digital ICBC” Initiative: ICBC Supporting China–Malaysia Strategic Cooperation in the Digital Economy

To actively advance strategic cooperation between China and Malaysia in the digital economy and to strengthen the “five key areas” of digital finance, the Industrial and Commercial Bank of China (ICBC) is continuously deepening the development of the “Digital ICBC” initiative. Through innovative and intelligent digital financial services, ICBC promotes the integration of digital finance with the real economy, thereby contributing to a higher level of opening up. ICBC Malaysia has been vigorously implementing its digital transformation strategy, focusing on the diversified financial needs of customers seeking to “go global” and “bring in” overseas opportunities. By building a scenario-driven, technology-empowered, and innovation-integrated payment ecosystem, ICBC Malaysia continuously enhances the adaptability, competitiveness, and inclusiveness of its financial services. Acting as a digital bridge that facilitates bilateral economic and trade cooperation, ICBC Malaysia has contributed practical measures that support the joint pursuit of a prosperous future for China and Malaysia.

(i) ICBC Malaysia Launches ICBC PAY to Enhance Payment Convenience for Travelers to China

In 2025, ICBC Malaysia introduced *ICBC PAY*, becoming the first financial institution in Malaysia to provide WeChat QR code payment services. This innovation further enriches mobile payment options for foreign visitors traveling to China. ICBC PAY covers all merchants worldwide that support UnionPay standard QR codes and is also compatible with over 300 non-UnionPay QR code payment systems in China, including WeChat, Meituan, and Lakala. It is widely applicable across millions of merchants in catering, retail, and transportation sectors, enabling international customers visiting China for tourism, family visits, or study to enjoy “scan and pay” convenience.

ICBC PAY allows users to link overseas bank cards or e-wallets, creating seamless connectivity with China’s mainstream mobile payment systems. Foreign visitors can thus experience “paying as conveniently as locals” in supermarkets, restaurants, transportation, and other everyday scenarios. As the exclusive provider of this service in Malaysia, ICBC Malaysia’s innovative payment solution significantly facilitates bilateral cooperation in commerce, tourism, and cultural exchanges. ICBC PAY not only improves the payment experience for Malaysian tourists and business travelers in China but also fosters cross-border payment connectivity and economic interactions between the two countries. By pioneering this innovative payment channel, ICBC has further strengthened bilateral friendship and contributed to building a more prosperous future for China–Malaysia cooperation.

(ii) ICBC Malaysia Introduces “Renminbi Payroll Express” to Support Cross-Border Salary Payments for Chinese Enterprises

In 2023, ICBC Malaysia, in collaboration with ICBC Hengqin Branch, officially launched the *Renminbi Payroll Express* (Cross-Border e-Salary Payment) service, becoming the first financial institution in the Malaysian market to provide direct cross-border RMB salary transfer solutions for employees of Chinese enterprises stationed abroad. Leveraging ICBC Group’s global network advantages, this service enables Chinese employees to use mobile banking to instantly remit salaries to secondary accounts opened online in China, creating a

seamless “one-stop” process for automatic transfer and disbursement. The solution effectively resolves long-standing challenges of traditional cross-border remittances, such as cumbersome procedures and restrictions on foreign exchange quotas, thereby significantly enhancing efficiency in RMB cross-border services.

As a signature product of ICBC Malaysia, *Renminbi Payroll Express* has been continuously optimized through internal collaboration and technological innovation. Key enhancements include: extending service coverage through a dual cooperation model between Hengqin and Xiong’an; enabling 24-hour remittance services during working days; introducing a historical record recall function to simplify client operations; and refining system screening mechanisms to minimize delays caused by false blacklist matches. ICBC Malaysia will continue to expand the promotion of this service to better support Chinese enterprises “going global” and to provide high-quality financial services that drive the joint construction of the Belt and Road Initiative between China and Malaysia.



Picture Caption: *ICBC PAY*

3.2.4 Building Digital Financial Service Capabilities: CCB Malaysia Supporting Malaysia’s Economic Development

Malaysia, as part of the RCEP region, is a key area for China Construction Bank (CCB) in advancing its international development strategy. In 2024, taking the opportunity of the 50th anniversary of China–Malaysia diplomatic relations, CCB Malaysia fully aligned with Malaysia’s national digital development blueprint. Leveraging the group’s strength in financial technology, CCB Malaysia focused on technology finance and digital finance as its strategic direction. It made significant progress in strengthening customer settlement services, exploring digital transformation, and promoting a shift toward a light-capital, light-asset banking model, thereby establishing a competitive advantage in the field of digital finance.

Through continuous investment in the development of digital financial infrastructure, CCB Malaysia has effectively supported Malaysia’s economic growth. Its services in payments

and settlements, trade finance, foreign exchange transactions, and cross-border RMB clearing have all reached record highs. With strong operating performance, CCB Malaysia has become a large-scale and influential Chinese bank in the country.

CCB Malaysia places strong emphasis on building settlement and clearing channels, fully integrating into Bank Negara Malaysia's primary clearing system and developing comprehensive local and foreign currency settlement systems to support a wide range of client transactions and remittances. The bank actively promotes local RMB clearing services: CCB Labuan Branch is the first direct participant of the CIPS RMB cross-border clearing system in Malaysia, currently providing cross-border clearing services for 10 local indirect participants. In collaboration with Payments Network Malaysia (PayNet) and NetsUnion Clearing Corporation of China, CCB also launched the China–Malaysia cross-border QR code payment connectivity service. Since 2024, the bank has processed a cumulative 48,000 remittance transactions, marking a year-on-year increase of 40 percent. Its corporate online banking transactions exceeded 29,000 in volume and MYR 17.4 billion in value, both showing significant year-on-year growth.

(i) Harnessing Fintech Innovation to Build a Comprehensive Product System

In addition to strengthening settlement capabilities, CCB Malaysia has actively developed trade finance and supply chain finance, enhancing service capacity across the board. The bank promotes interbank asset transactions and has steadily expanded its correspondent banking network. CCB Labuan Branch serves as the group's overseas pilot institution for blockchain payment platforms, becoming the first overseas entity to launch the *Cross-Border Easy Pay* platform. To date, cumulative transactions processed through the platform have surpassed RMB 50 billion. In 2023, Labuan Branch, as the group's sole overseas pilot bank, successfully launched the innovative "Cross-Border Easy Pay Multi-Currency Payment" blockchain project.

In addition, CCB Malaysia has rolled out a range of fintech innovation projects and platforms, including the *BC TRADE* blockchain supply chain platform, the *CCB Global Match Plus* platform, and the *TRADE-GO* online bulk commodity trading platform. By the end of 2024, with its highlights in blockchain-powered innovation and strong operational performance, CCB Labuan Branch was awarded the *2024 Digital Financial Services Innovation Award* by the Labuan Financial Services Authority, making it the only financial institution in Labuan International Business and Financial Centre to receive this honor.

Leveraging the *CCB Global Match Plus* platform, CCB Malaysia helps enterprises address challenges in cross-border trade such as communication barriers, difficulty in securing orders, financing constraints, and circulation bottlenecks. The platform also promotes exchanges between the governments, business associations, and enterprises of both countries. In 2024, CCB Malaysia organized 22 cross-border matchmaking events through the platform, with participation from over 1,000 enterprises. For six consecutive years, it has hosted the China–Malaysia Enterprise Cooperation Matchmaking Conference, which has become a signature event at the China–ASEAN Expo.



Picture Caption: *First trial of China–Malaysia cross-border QR code payment interoperability, 18 September 2023*

3.2.5 Integrating Green and Digital Technologies: ZTE Empowering Malaysia’s Sustainable Digital Transformation

As a leading Chinese provider of information and communications technology (ICT) solutions, ZTE has been active in Malaysia since 2004, contributing to the local digital economy, particularly in 5G network construction, green energy efficiency, smart manufacturing, and talent development. Through close collaboration with the Malaysian government and telecom operators, ZTE integrates digital and green technologies to empower Malaysia’s sustainable digital transformation.

(i) Building Green and Energy-Efficient Infrastructure

ZTE has partnered extensively with CelcomDigi, Malaysia’s largest mobile operator, to modernize and enhance the energy efficiency of wireless networks. Between 2023 and 2024, both parties jointly deployed energy-saving technologies and upgraded equipment by introducing next-generation high-efficiency RRU/AAU devices, reducing annual carbon emissions by an average of 6,300 tons per year. In addition, by applying the AI-driven PowerPilot Pro platform, ZTE dynamically optimized base station operations, further reducing carbon emissions by 3,630 tons annually. The introduction of the Virtual Drive Test (VDT) automated platform replaced traditional manual drive testing, lowering carbon emissions by more than 510 tons per year. These solutions have been deployed across multiple regions in Malaysia, significantly improving network operational efficiency while reducing overall energy consumption in the telecommunications sector.

(ii) Developing Green Data Centers and Promoting Renewable Energy

In the data center domain, ZTE promotes modular data centers and advanced liquid cooling technologies, reducing the Power Usage Effectiveness (PUE) value to as low as 1.1 and thereby greatly improving energy efficiency. The company has also implemented renewable energy initiatives at its overseas manufacturing parks. For example, its local facility in Malaysia generates more than 5.36 million kWh of solar power annually. ZTE further deploys SmartLi intelligent lithium battery storage systems and green power modules with 98 percent efficiency, advancing base stations toward self-sustaining green energy solutions and enabling operators to build more stable and low-carbon communication infrastructure.

(iii) Empowering 5G Network Development and Smart Manufacturing

ZTE is a key partner in building Malaysia's first nationwide 5G network. Since 2022, the company has collaborated with Digital Nasional Berhad (DNB) to deploy indoor 5G networks across the country. In April 2025, ZTE began cooperation with U Mobile to construct Malaysia's second 5G network, with a goal of achieving 80 percent population coverage within 12 months. ZTE also assisted CelcomDigi in completing commercial verification of 5G-Advanced (5G-A), achieving peak speeds of 28 Gbps, setting a national record.

In terms of industrial digitalization, ZTE has worked with CelcomDigi to implement 5G + industrial internet solutions, providing local manufacturers with applications such as digital twins, 5G automated guided vehicles (AGVs), and intelligent safety helmets. These technologies enable enterprises to achieve automation, remote visualization, and data-driven operations. Demonstration factories adopting these solutions have saved a cumulative 44 million kWh of electricity within two years, underscoring the significant energy efficiency benefits brought by digital transformation.

(iv) Deepening Local Collaboration and Talent Development

ZTE places long-term emphasis on localized development. The company has announced plans to invest MYR 200 million in Malaysia to establish two innovation centers that will serve as regional centers of excellence, providing trial scenarios for 5G, AI, and big data solutions for local operators and industry clients. At the same time, through partnerships with local universities and research institutions, ZTE has already trained hundreds of engineers in Malaysia. As early as 2016, ZTE co-founded an ICT training center with Multimedia University (MMU) to offer specialized courses and practical opportunities for local communications talent.



Picture Caption: ZTE and U Mobile signed a strategic cooperation agreement to jointly advance 5G-Advanced technologies, independent networks, and 5G commercial applications, witnessed by Malaysia's Minister of Communications Fahmi. The signing ceremony took place in February 2024 during MWC 24 in Barcelona, Spain.

3.2.6 Empowering Digital Transformation: China Telecom Driving New Momentum for Digital Economy Development

Since the establishment of its Malaysian subsidiary in 2011, China Telecommunications Corporation (China Telecom, CT) has adhered to the development philosophy of *innovation, green growth, cooperation, and shared gains*. The company has been deeply engaged in building Malaysia's digital infrastructure, supporting enterprise digital transformation, advancing green development, and fulfilling social responsibility. China Telecom is committed to serving as both a bridge and a leader in China–Malaysia cooperation on the digital economy. Over the years, it has empowered industrial digital transformation through technological innovation and localized services, creating new momentum for Malaysia's digital economy, supporting Chinese enterprises' investment in Malaysia, and demonstrating the sense of responsibility and positive image of Chinese state-owned enterprises.

(i) Strengthening Digital Infrastructure to Consolidate the Foundation of Malaysia's Digital Economy

Digital infrastructure is the cornerstone of digital economy development. Since entering the Malaysian market, China Telecom has prioritized the construction of interconnectivity capabilities by building high-quality, wide-coverage, and low-latency communication networks, thereby upgrading Malaysia's digital ecosystem. In particular, China Telecom has established strong partnerships with Telekom Malaysia, TIME, and other major local operators to jointly participate in the construction and operation of multiple international submarine cables.

At present, China Telecom, through both independent and cooperative initiatives, has secured access to several major international submarine cable systems, including SMW-5, ASE, and APG, significantly enhancing Malaysia's connectivity with China and the wider global network. Among these, the *Asia Link Cable (ALC)* project, currently under construction, is of strategic importance. Jointly led by China Telecom and regional operators, the ALC will connect Hong Kong, Hainan, Vietnam, Malaysia, Brunei, Singapore, and the Philippines, and is expected to be operational in the third quarter of 2025. The project will further solidify Malaysia's role as a Southeast Asian network hub, while improving the quality and stability of cross-border data transmission, creating new opportunities for local enterprises and regional collaboration. At the same time, China Telecom is expanding cloud-network integration resources locally, drawing on its data centers in Hong Kong, Singapore, and its global backbone resources, to provide Malaysian enterprises with reliable integrated cloud-network services that support digital transformation and international business expansion.

(ii) Enabling Industrial Digital Transformation to Create New Drivers of Growth

In response to the digital transformation targets set out in Malaysia's *MyDIGITAL Blueprint*, China Telecom has developed comprehensive enterprise digitalization solutions leveraging its global network resources and advanced technologies in cloud computing, big data, IoT, and AI. These solutions enable both Chinese and Malaysian enterprises to achieve transformation, upgrading, and high-quality development.

China Telecom has successfully implemented digital solutions in Malaysia across finance, manufacturing, logistics, education, and healthcare. For instance, in smart manufacturing, CT has deployed 5G private networks and industrial IoT platforms to create low-latency, highly reliable communication environments for factories, enabling remote equipment control, real-time data collection, and intelligent analysis—effectively improving production efficiency and product quality.

In smart industrial parks, China Telecom provides end-to-end ICT solutions ranging from network infrastructure, smart security, and energy monitoring to data platforms. This has supported nearly 100 Chinese enterprises in Malaysia in rapidly completing intelligent infrastructure deployment and achieving early commencement of production. In cross-border e-commerce, China Telecom has enhanced digital infrastructure through stable cloud platforms, dedicated international lines, and global CDN acceleration, ensuring high-concurrency access, transaction security, and supporting the growth of bilateral trade.

In 2025, China Telecom further enhanced its product and service capabilities in two key areas: intelligent computing power and information security.

In terms of intelligent computing power, China Telecom's *Xirang Integrated Intelligent Computing Platform* has developed a “five-in-one” service framework that integrates computing power, platforms, data, models, and applications, which has now become the core of cloud services in the era of artificial intelligence. Through the Xirang computing cockpit, users are able to visualize the full landscape of computing power resources, including access to resources, the number of service providers, and transaction dynamics. Building on Xirang, China Telecom has established a nationwide integrated computing power system that consolidates its own, cross-domain, heterogeneous, and multi-provider computing resources. By introducing the *Triless architecture*, the platform achieves independence from resource types, frameworks, and tools, enabling customers to access AI computing power without the

need to manage resource allocation, training architectures, or development tools. This significantly lowers the barrier to AI adoption and efficiently addresses the challenges of “finding, allocating, and utilizing” computing resources.

In terms of information security, China Telecom has launched a new generation of solutions, including the *Xingchen–Jianwei Security Large Model*, *Lingxi Threat Intelligence*, and *CloudPulse SASE*, alongside a comprehensive “cloud–network–edge–device–application–data–space” multi-layer security defense system. To better safeguard the use of AI services, China Telecom has built an all-encompassing security framework and introduced the industry’s first high-quality large model security dataset. By establishing a five-dimensional defense system covering network security, environmental security, data security, model security, and application security, the company has created a closed-loop mechanism for evaluation and protection. Through its one-stop AI security hosting services, China Telecom is enabling the secure application of AI across diverse industries. Looking ahead, China Telecom will progressively introduce these advanced products and capabilities in Malaysia, thereby contributing to the development of the country’s digital economy.



Picture Caption: *China Telecom’s Xirang Integrated Intelligent Computing Platform*

3.2.7 Industrial Digital Transformation: China Mobile Empowering Malaysia’s Digitalization Process

China Mobile International Limited (CMI), a wholly owned subsidiary of China Mobile, is responsible for the group’s international business expansion. With multiple branches worldwide, CMI is committed to delivering high-quality communications services to global customers. China Mobile International Malaysia was established in 2015, initially providing services primarily for local operators before gradually expanding into the enterprise market. In

2019, CMI set up its Global Shared Services Centre (GSSC) in Cyberjaya, Malaysia, offering financial, legal, and human resource support for its overseas units worldwide.

In Malaysia, China Mobile International Malaysia has successfully supported the digital transformation of multiple industries, including retail, education, and healthcare. Through smart networks, e-commerce platforms, and smart campus projects, the company has demonstrated innovative strategies for advancing the digital economy.

(i) Supporting Green and Smart Campus Development

China Mobile International Malaysia provided a comprehensive Wi-Fi 6 network solution for a private university in Malaysia with a campus area of 105 acres. The solution included wireless access points, core switches, DIA dedicated lines, and firewall systems. By enhancing campus network efficiency and reducing the need for physical on-site server infrastructure, the project achieved optimal resource utilization and promoted a green transformation of the campus environment.

(ii) Building Digital Infrastructure

Leveraging China Mobile International's global network, the Malaysian subsidiary benefits from extensive cross-border terrestrial and submarine systems, including 15 self-built submarine cables, 23 terrestrial cables, and 230 Points-of-Presence (PoPs) connecting major global hubs. In Malaysia, local PoP nodes further optimize data transmission efficiency between Malaysia and the rest of the world.

(iii) Smart Connectivity and Intelligent Network Projects

First, the company deployed an SD-WAN solution for a leading Southeast Asian luxury retail group, connecting its branches in Malaysia, Singapore, and Indonesia to enhance stability and efficiency across the region. Second, it provided a cross-border SD-WAN solution for a Swiss multinational's branches in China and Malaysia, resolving transmission performance issues and improving overall connectivity.

(iv) Empowering Smart Retail and E-Commerce Platforms

For a retail supermarket group in Malaysia, China Mobile International Malaysia delivered an integrated e-commerce platform, including public cloud architecture design and implementation, secure payment systems, and integration of website and mobile applications, thereby accelerating the company's digital transformation.

(v) Global Data Roaming Services: Enabling Seamless International Connectivity

Since its launch in 2017, China Mobile International Malaysia has served more than 25,000 Malaysian customers through its *CMLink Global Data Card*, providing data roaming services in over 190 countries and regions. The product offers diverse formats—including physical SIM cards, eSIM, and SoftSIM—that are plug-and-play, convenient, and efficient. Supported by China Mobile International's self-built core and IPX networks, the CMLink Global Data Card ensures high-quality global network coverage and seamless connectivity.

Customers can flexibly select packages based on destination, duration, and data requirements, enhancing their cross-border communication experience. In terms of ecosystem partnerships, CMLink has collaborated with smart device manufacturers, travel agencies, and airport Wi-Fi rental companies to provide Malaysian residents, international students, and cross-border business travelers with convenient global internet solutions. Its 24/7 customer service system and multi-channel support platforms further ensure a premium user experience.

Looking ahead, China Mobile has pledged to continue deepening its presence in the Malaysian market, driving digital transformation across additional industries and sectors, including smart manufacturing and smart cities. At the same time, it will strengthen its commitment to green development by promoting green data center construction, contributing to both economic and environmental transformation in Malaysia.



Picture Caption: *China Mobile International Malaysia supporting digital transformation in traditional industries*

3.2.8 Building Digital Infrastructure: FiberHome International Supporting Malaysia in Strengthening Its Digital Foundation

FiberHome Technologies Group is a globally renowned provider of information and communications network products and solutions. It is the only enterprise in China's optical communications sector recognized by the Ministry of Science and Technology as both an industrialization base and an innovation base under the National High-Tech Research and Development Program (the "863" Program). The company holds a vast portfolio of core technologies in optical communications and has participated in the formulation of more than 200 national and industry standards. As a mainstream supplier of China's national backbone network, its core products span three major segments: optical networks, broadband data, and optical fiber and cables.

FiberHome established its subsidiary **FiberHome International Malaysia**, which actively participates in Malaysia's major digital infrastructure projects. By strengthening the country's digital foundation, FiberHome contributes to the long-term growth of Malaysia's digital economy. The subsidiary has been involved in several landmark projects, including:

1. **HSBB Malaysia National Backbone Broadband System:** In collaboration with Telekom Malaysia, FiberHome helped build the country's national backbone transmission network, consisting of more than 300 core sites. This network forms a critical infrastructure for Malaysia's digitalization and 5G development.
2. **SUBB Malaysia Broadband Access Project:** Working with Telekom Malaysia, FiberHome supported the metropolitan access network fiberization project, which represents a key infrastructure initiative for expanding Malaysia's fixed broadband penetration.
3. **Optical Cable System Construction:** FiberHome has supplied optical cables to Malaysia's major telecom operators, including Maxis, CelcomDigi, and Telekom Malaysia. These supplies have supported the fiberization, digitalization, and 5G network rollout across the country.
4. **CNC Malaysia Telecom Turnkey Project:** In partnership with Telekom Malaysia, FiberHome has delivered fiber-based infrastructure to support 5G base station access and household broadband connectivity.
5. **NGT Malaysia Next-Generation Transmission Network System:** FiberHome has provided Telekom Malaysia with a transmission network designed to carry future 5G backhaul services, serving as a vital component of Digital Nasional Berhad's (DNB) forthcoming 5G rollout.
6. **POP2 and JENDELA Projects:** In cooperation with local Malaysian operators, FiberHome has expanded wireless and optical fiber coverage in rural and remote regions, building more than 350 core sites. These projects form an integral part of Malaysia's national digitalization strategy.



Picture Caption: *Construction site of wireless and fiber networks in rural Malaysia, enhancing local connectivity capacity*

3.2.9 Artificial Intelligence and Big Data Analytics: Hikvision Enabling Industrial Digital Transformation

(i) Industrial Digital Transformation – Smart Manufacturing

Hikvision has served more than 50 local and foreign-invested manufacturing enterprises in Malaysia, helping to enhance management efficiency, promote industrial upgrading, and advance digital transformation. This has been achieved through solutions such as intelligent management of personnel and vehicles in industrial parks, AI-driven safety production analysis, and compliance monitoring of production processes. Successful cases include Sime Darby (a Malaysian state-owned enterprise), Taiyo Yuden (one of the world's top five passive electronic component manufacturers), Top Glove (the world's largest glove producer), IN-TECH, and DB.

Hikvision's digital technology solutions for smart manufacturing include:

- **Intelligent Security and Safety Management:** Using a variety of AIoT devices and technologies, such as thermal imaging for warehouse fire detection, fiber optic perimeter applications with audio-vibration sensing, and AI-based abnormal behavior analysis from CCTV video feeds, to achieve intelligent security management in manufacturing parks.
- **High-Efficiency Personnel and Attendance Management:** Facial recognition technology integrated with ESD (electrostatic detection) and X-ray security equipment to facilitate rapid personnel access control while ensuring compliance with safety production standards, widely applied in smart manufacturing factories.
- **Parking, Vehicle, and Dock Management:** Intelligent vehicle management solutions covering the full cycle of registration, access verification, speed monitoring, and exit weighing, thereby improving the efficiency and compliance of vehicle entry and exit in industrial parks.
- **Process Monitoring and Quality Control:** Leveraging multispectral technology and AI-driven analysis to detect product quality during the production process.

(ii) Industrial Digital Transformation – Digital Retail and Cross-Border E-Commerce

Hikvision has served more than 20 leading retail companies and mainstream e-commerce and logistics enterprises in Malaysia. Through technologies such as business intelligence (BI) analytics, intelligent loss prevention, dock management, and parcel tracking, it has significantly improved operational efficiency, reduced internal losses, and accelerated the digital transformation of new retail and cross-border e-commerce.

Representative applications include:

1. **BI Smart Analytics:** Using BI analysis to evaluate key retail metrics such as customer flow, store entry rates, purchase conversion, VIP customer alerts, returning customer reminders, heat-mapping of store areas, and queue detection, thereby greatly enhancing operational efficiency.
2. **Loss Prevention and Remote Audit:** Enabling digitalized loss prevention and remote store auditing, ensuring higher compliance in retail operations and facilitating the transition from offline to online management.

3. **Dock Management and Parcel Tracking:** Serving leading e-commerce and logistics firms including Flash, Lazada, Shopee, J&T, GLP, and Ninja Van, with AI-driven dock management. The system dynamically analyzes dock occupancy and vehicle loading rates while enabling full-cycle visibility of parcel status, thereby improving timeliness and efficiency in goods transportation.

(iii) Digital Infrastructure – IDC Data Centers

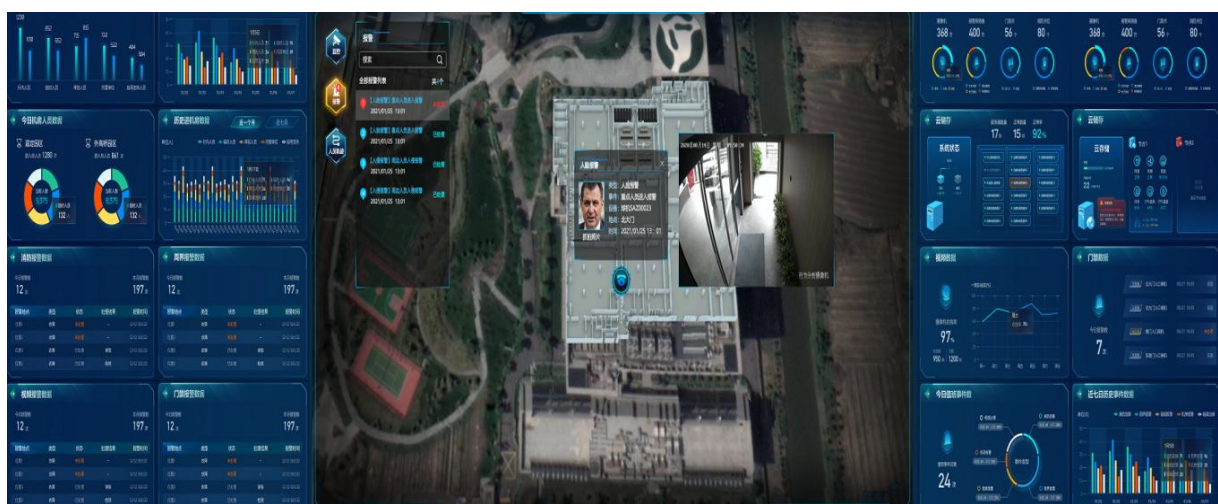
Hikvision has actively participated in the development of data centers in southern Malaysia, including projects with Chinadata, DGS, and YTL. By deploying AI and multi-dimensional sensing technologies, Hikvision enhances personnel and vehicle management efficiency, strengthens overall security safeguards, and provides multi-layered protection to ensure the safety of staff, vehicles, and facilities within data centers.

(iv) Digital Finance – Commercial Banks and Financial Institutions

Hikvision has provided services to numerous commercial banks, insurance companies, and financial institutions. By combining video networking with AI analytics, it not only delivers security protection but also extracts valuable perception data. Features such as VIP recognition and customer flow analysis help financial institutions improve operational efficiency while maintaining safety.

(v) Smart Cities

Hikvision has supported multiple states and cities in Malaysia in planning and implementing smart city solutions. These initiatives include urban public safety, city governance (such as flood monitoring and urban appearance monitoring), traffic management (such as law enforcement detection and integrated traffic signal systems), digital upgrades of government facilities, and digital twin applications. Together, these solutions enhance urban governance capacity, safety standards, and traffic management efficiency.



Caption: Application case of intelligent security and personnel–vehicle management, improving safety and management efficiency in industrial parks

Chapter 4: Challenges Faced by Chinese Enterprises in Malaysia, Their Role in Green and Digital Ecosystem Development, and Recommendations

4.1 New Energy Vehicle Industry: Geely Automobile Holding

4.1.1 Operational Challenges in Malaysia

In advancing green development projects in Malaysia, Geely Automobile Holding has encountered several challenges:

1. **Uneven supplier capabilities:** In supporting Malaysia's national carmaker Proton to develop its supplier ecosystem, Geely encounter the challenge of working with suppliers of varying quality and capacity.
2. **High Supply Chain Costs:** The overall competitiveness of Malaysia's automotive industry is constrained by relatively high supply chain costs. Geely's internal benchmarks show that the cost of auto parts in Malaysia is about 30 percent higher than in China and 10 percent higher than in Thailand.
3. **Incomplete Local Supply Chain:** Although the AHTV project has introduced measures to strengthen the supply chain, many local parts manufacturers have yet to reach the standards required for mass production, potentially affecting future capacity expansion.
4. **Licensing and Import Tariff Issues:** Mechanisms for phasing out older locally assembled vehicles and supporting new energy vehicles remain under development. Geely must navigate licensing approval processes and joint venture equity requirements for CKD imports and local assembly.
5. **Divergence in ESG Regulations:** Environmental standards in Malaysia differ from those in China. Geely must invest in environmental assessments, green factory construction aligned with PUE standards, and environmental certifications, increasing compliance costs.
6. **Shortage of Talent in New Energy Vehicles:** There is a marked shortage of talent in EV research and development, local assembly, after-sales servicing, and sales and marketing teams, all of which are still in training phases.
7. **Brand Recognition and After-Sales Trust:** Competitors such as BYD and Tesla, both domestic and international, have already established an early presence in Malaysia. While Geely positions itself with a cost-performance advantage, it must still contend with brands that enjoy greater influence. Building consumer trust in Geely's EV brand will also take time, particularly in terms of after-sales service and spare parts availability.

4.1.2 Contribution to Malaysia's Green and Digital Ecosystem

Through Proton, Geely has advanced its new energy strategy in Malaysia, empowering the country's green development, deepening the EV industrial chain, and creating more high value-added business activities and employment opportunities. The development of the AHTV project reflects Geely Group's commitment to building an integrated hub combining industry, academia, research, and urban development, with a focus on new energy R&D, intelligent manufacturing, and talent development across the industrial chain. This initiative is expected

to position Malaysia as a key automotive hub in ASEAN and an international technology and industrial park.

From the planning stage, the AHTV industrial park has incorporated public facilities for clean energy, pollution control, and shared infrastructure. The park promotes the use of green energy among enterprises to reduce carbon emissions and support Malaysia's sustainable growth.

4.1.3 Recommendations

Drawing on its experience in advancing green development projects in Malaysia, Geely proposes the following recommendations:

1. **Strengthen Localization Strategy:** Deepen joint development with Proton by leveraging its brand trust and distribution channels to accelerate market penetration. In particular, by reinforcing Proton's status as the national car brand, Geely can launch localized models suited to the Malaysian market (such as Proton e.MAS platform vehicles). Coupled with government EV subsidies, this could support the rollout of affordable EVs priced in the RM100,000–RM150,000 range.
2. **Build a New Energy Vehicle Ecosystem:** Use the AHTV industrial park as the core to establish a comprehensive EV ecosystem in Malaysia. The goal is to transform AHTV from a CKD assembly base into a regional hub for EV manufacturing and exports, attracting upstream and downstream suppliers to co-locate. Local parts manufacturers should be encouraged to upgrade technologies, increase localization rates, and reduce vehicle costs. In addition to meeting local demand, AHTV can export EVs and parts to other ASEAN countries, leveraging regional integration advantages to make Malaysia a key EV hub in the region.
3. **Develop a Talent Training Platform for New Energy Vehicles:** Collaborate with Malaysian universities to offer specialized EV courses, establish Geely scholarships and overseas internship programs, and address shortages of local engineers and technicians. A dedicated EV talent training center should be set up within AHTV to serve Geely and its upstream and downstream partners, ensuring a steady pipeline of skilled personnel.

4.2 Green Energy Industry: HQC Engineering Malaysia

4.2.1 Operational Challenges in Malaysia

In the course of implementing green and digital economy–related projects in Malaysia, HQC Engineering Malaysia has encountered several challenges:

1. **Regulation and standards:** Regulatory policies and requirements—particularly in areas such as taxation and environmental protection—are becoming increasingly stringent, inevitably increasing compliance risks and operational costs for projects.
2. **Digital and green transition:** Limited broadband coverage in remote areas has increased the difficulty of promoting the digital economy. At the same time, Malaysia's heavy reliance on fossil fuels complicates the green transition, as projects with low investment returns or insufficient government subsidies and policy support face difficulty in achieving scale.

3. **Policy approvals and work permits:** Project approvals often depend on coordination through local intermediaries, leading to additional costs.
4. **Insufficient local technical capacity:** Malaysia still faces gaps in renewable energy innovation, with photovoltaic and wind power technologies in particular requiring further enhancement.
5. **Policy restrictions:** Certain projects are subject to Malaysian government policies, such as foreign investment entry barriers.

4.2.2 Contribution to Malaysia's Green and Digital Ecosystem

1. HQC Engineering Malaysia introduces advanced green energy technologies into Malaysia through technology transfer and output. It actively participates in the formulation of technical standards, enhancing project standardization and operability. The company also strengthens industrial chain coordination by integrating upstream and downstream resources, optimizing project implementation processes, and promoting localization through talent development and capacity-building to support Malaysia's sustainable green economy.
2. In the areas of carbon reduction and energy efficiency, the company contributes by promoting renewable energy adoption, optimizing energy utilization, and pursuing efficiency improvements through technological upgrades and management optimization, thereby reducing overall energy consumption.

4.2.3 Recommendations

Drawing on its operational experience in Malaysia, the company emphasizes the need for proactive and in-depth research into local policies and regulations, with close attention to policy dynamics and built-in flexibility to address uncertainty. It also stresses the importance of strengthening communication with government agencies and local communities, promoting localization and talent development, ensuring compliance with data and privacy regulations, and enhancing transparency and internal communication. In addition, the company advocates embedding sustainability into project planning, establishing emergency response mechanisms, respecting local culture, and actively fulfilling corporate social responsibility.

The company's recommendations include:

1. **Policy and Regulatory Coordination:** Establish regular communication mechanisms, streamline approval processes, and issue joint policy guidelines.
2. **Investment and Trade Facilitation:** Implement trade agreements to reduce operational costs for enterprises.
3. **Technology and Standards Alignment:** Promote mutual recognition of technical standards and conduct joint research and development.
4. **Talent Development and Exchange:** Launch joint training programs and facilitate talent mobility.

5. **Environmental and Sustainability Cooperation:** Strengthen collaboration on environmental policies and develop joint demonstration projects.

4.3 Green Energy Industry: Power Construction Corporation of China (PowerChina)

4.3.1 Operational Challenges in Malaysia

In the course of implementing green development projects in Malaysia, PowerChina has faced several key challenges:

1. **Government Policies and Regulations:** A notable challenge lies in the inconsistent execution of federal government policies by the state governments. For instance, although the National Energy Transition Roadmap (NETR) was launched by the federal government in August 2023, its implementation standards vary across states, with renewable energy project approvals particularly lengthy.
2. **Shortage of Skilled Professionals:** Malaysia suffers from a structural shortage of talent in areas such as low-carbon construction and renewable energy operations. The local training ecosystem remains underdeveloped. Recruitment is also difficult, as many of Malaysia's capable professionals seek employment opportunities in Singapore, Australia, and Western countries. Local recruitment processes therefore require significant time and resources, and challenges such as high salary demands, frequent job-hopping, and low work efficiency persist.
3. **Barriers to Technology Localization:** PowerChina also faces obstacles in localizing Chinese technologies. For example, in certain EPC power project, the client recognized only European or American standard products while rejecting Chinese products of equal performance and lower cost. Despite the fact that certain European products had already been discontinued for years, the client insisted on their procurement, leading to delays in project progress.
4. **Trust and Contractual Risks:** The company also encountered challenges related to partner defaults and trust. Malaysia's highly developed construction industry has resulted in an abundance of project information and intermediaries, which often creates information asymmetry during project promotion, thereby leading to trust concerns. In addition, some project owners and subcontractors in Malaysia have demonstrated a record of defaults, further complicating cooperation.

4.3.2 Contribution to Malaysia's Green and Digital Ecosystem

1. PowerChina has operated in Malaysia for over 28 years, undertaking a wide range of large-scale power, energy, housing, and infrastructure projects. Through these projects, the company has cultivated a substantial pool of technical talent, including specialists

in green energy, while building strong partnerships with local enterprises and fostering industrial chain synergies.

2. The company's green power projects in Malaysia, primarily undertaken on an EPC basis, have contributed significantly to environmental improvement, green transition, and carbon reduction. For example, the Marang solar project in Terengganu provides 220 million kilowatt-hours of clean electricity annually, meeting the needs of 200,000 households while reducing standard coal consumption by 80,000 tons and cutting carbon emissions by 200,000 tons per year. The Bakun Hydropower Station in Sarawak, built by PowerChina, offsets nearly 10 million tons of carbon dioxide annually compared to coal-fired power plants. Similarly, the Kidurong Combined Cycle Gas Power Plant in Sarawak emits only 50–60 percent of the carbon dioxide of a coal-fired plant, thereby reducing the region's overall carbon intensity in power generation.

4.3.3 Recommendations

Based on its operational experience in Malaysia, PowerChina proposes the following recommendations:

1. **Mitigating Trust and Contractual Risks:** To address issues of contractual breaches and credibility, PowerChina emphasizes proactive risk control. Upon receiving project information or proposals, the company engages legal and accounting firms to conduct thorough due diligence, verifying the validity of project details and partner backgrounds. All agreements with external parties must undergo legal review by professional counsel to minimize legal risks. In the event of breaches during project execution, legal measures are promptly pursued to safeguard legitimate rights. In addition, closer cooperation on fraud prevention should be encouraged, such as the establishment of an information database to blacklist individuals or companies that spread false project information or commit fraud, thereby preventing “dual scams” or “chain scams.”
2. **Green Finance and Capital Market Innovation:** Malaysia has pioneered a unique model integrating Islamic finance with ESG principles. Through the Sustainable and Responsible Investment (SRI) Sukuk framework, the country combines Islamic financial principles such as prohibition of interest and risk-sharing with green project financing. The government further incentivizes green bond issuers with tax relief and grants, driving the issuance of over RM 3.5 billion in green bonds within five years, covering sectors such as solar power and education. This model is particularly applicable to Southeast Asian and Middle Eastern markets, where Islamic financial practices prevail, and helps address financing constraints in green projects.
3. **Differentiated Subsidies to Stimulate the Solar Industry:** Malaysia has promoted the solar sector by exempting equipment imports from tariffs and granting ten-year income tax holidays. This policy has boosted installed solar capacity to 9 GW, representing 60 percent of the country's renewable energy mix. Meanwhile, the green certificate trading mechanism has connected domestic renewable energy with international demand. In 2023, Malaysia led Southeast Asia in I-REC (International Renewable Energy

Certificate) cancellations, totaling 28 TWh, driven by RE100 companies' procurement. Malaysia's pricing model for green certificates—ranging from USD 0.5 to 5.8 per MWh depending on hydropower projects—offers a viable pathway for multinationals to source renewable energy.

4. **Promoting Green Cooperation under the Belt and Road Initiative:** Malaysia's successful practices can be replicated in countries with similar policy environments, such as those in the Islamic financial sphere or resource-based economies. By advancing joint R&D (e.g., hydrogen electrolyzers), mutual recognition of standards (e.g., I-REC), and integrating industry with finance (e.g., SRI sukuk issuance), emerging markets can reduce trial-and-error costs and achieve a “soft landing” for green technologies.

4.4 Green Energy Industry: China Energy Engineering Corporation (CEEC)

4.4.1 Challenges in Operations in Malaysia

In implementing green development projects in Malaysia, China Energy Engineering Corporation (CEEC) has encountered several challenges:

1. **Complex resource allocation.** Unlike projects in China, undertaking projects in Malaysia involves more complex conditions, requiring careful and efficient resource coordination. From early-stage market intelligence to bidding and contract execution, the company must demonstrate strong capabilities in mobilizing both internal and external resources. For instance, in its 24.5 MW hydropower project in Perak, the company had to conduct internal coordination for market information during the preliminary stage, consolidate subsidiary resources at the bidding stage, coordinate local resources during negotiations, and manage both internal and external resources during execution. The quality of coordination at each step directly impacts overall project delivery. Continuous experience accumulation, framework building, and process optimization are therefore critical to improvement.
2. **Challenges in land acquisition, technology localization, and talent recruitment.** Malaysian laws provide strong protection for individual and organizational land rights, making land acquisition difficult and complex. Projects can only proceed once the owner has completed and handed over the acquired land. Technology localization requires the introduction of local consulting firms and employees, which raises new demands in terms of management, communication, and costs. Strict local labour policies limit the proportion of foreign workers, while work permit processing is lengthy and complicated, requiring advance human resources planning. Recruiting local staff further entails managing religious customs, environmental standards, and community relations within Malaysia's multicultural context, where any oversight can result in legal disputes or project delays. Hence, companies must conduct thorough research on cultural, labour, and environmental risks at the planning stage, develop

cross-cultural management capabilities, and foster a multicultural corporate culture to build trust with local stakeholders.

3. **Policy volatility risks.** The energy construction industry is highly policy-driven, and regulatory changes in Malaysia can pose significant risks. For example, while participating in a self-consumption rooftop photovoltaic project, CEEC faced sudden regulatory changes in 2025 when the Energy Commission mandated that all projects be completed by December 31, failing which they would be required to include storage facilities and pay grid capacity charges. Such abrupt adjustments force major project redesigns. Without flexible strategic planning, companies may struggle to effectively respond to rising costs or unforeseen changes in project execution.

4.4.2 Contribution to Malaysia's Green and Digital Ecosystem

CEEC has undertaken a number of renewable and hydropower projects in Malaysia, fostering local green economy ecosystems, creating employment opportunities, and significantly contributing to sustainable development.

For example, the Kuala Ketil 50MW solar power plant in Kedah, which began commercial operations in February 2019, generates an average of 78,400 MWh annually. It supplies power to 30,000 households over 25 years and offsets approximately 54,000 tons of carbon emissions annually. A 30-meter buffer zone around the plant was converted into a 40-acre fruit plantation, creating more than 100 direct jobs and providing sustainable income for local communities.

Similarly, the Batang Ai 50MW floating solar project in Sarawak produces over 100 million kWh of clean electricity annually, reducing about 40,000 tons of CO₂ emissions and optimizing the region's energy mix.

The 24.5MW Perak hydropower project, undertaken by CEEC International Group together with Hunan Institute and Guangxi Institute, is scheduled for operation in 2027. It is expected to generate 168.8 GWh annually, equivalent to saving approximately 54,860 tons of standard coal and reducing 130,000 tons of CO₂ emissions.

4.4.3 Recommendations

Drawing on its operational experiences in Malaysia, CEEC proposes the following recommendations:

1. **Advance planning and flexible strategies:** Efficient allocation of resources, particularly localized ones, must be planned well in advance. Companies should also adopt flexible strategies to cope with frequent policy shifts, including establishing rapid response mechanisms and revising project layouts in a timely manner.
2. **Institutionalized mechanisms:** China and Malaysia should establish regularized policy-alert and coordination mechanisms, particularly in green energy and digital economy sectors. Early notifications of regulatory changes and reasonable transition periods would help companies adapt. Joint dispute-resolution platforms and compliance

information databases could reduce cross-border legal risks. Furthermore, joint working groups should be set up to resolve bottlenecks such as land acquisition disputes and environmental standard harmonization.

3. **Strengthen localization:** This includes introducing local resources and intensifying government engagement to ensure compliance and long-term stability. Bilateral mutual recognition of professional qualifications and talent mobility facilitation should be promoted, simplifying cross-border work permits for skilled professionals. Companies must also cultivate multicultural awareness internally, respect local customs, and actively foster inclusivity to attract and retain local talent.

In addition, CEEC identifies several practices from Malaysia with strong potential for replication in other Belt and Road countries and Southeast Asian markets:

- **Localized resource integration and efficient coordination:** Establishing strong networks of legal, consulting, subcontracting, and community-relations experts, together with clear internal coordination mechanisms, is crucial. This ensures seamless operations across all stages from tendering to execution, shortens project cycles, and enhances efficiency.
- **Deep cultural integration and proactive adaptation:** Companies must go beyond compliance by fully integrating into Malaysia's multicultural context. Embedding respect for local religious practices, environmental values, and community concerns into project management strengthens trust and reduces conflict.
- **Policy monitoring and adaptive mechanisms:** Companies should set up systematic policy-tracking channels with local think tanks, law firms, and chambers of commerce, and incorporate this into strategic planning. At the project level, modular designs, budget flexibility, and fast decision-making mechanisms should be developed to mitigate risks.
- **Dual-support model of strong headquarters and strong localization:** Combining robust support from headquarters (for strategy, technology, and risk management) with empowered local teams (for compliance, community engagement, and rapid response) ensures effective operations. CEEC's decision to relocate its Southeast Asia regional headquarters to Malaysia has significantly improved its support and coordination capacity, demonstrating the effectiveness of this model.

4.5 Green Energy Industry: China City Environment Protection Engineering (CCEPC)

4.5.1 Challenges in Operations in Malaysia

China City Environment Protection Engineering (CCEPC) has faced several challenges while implementing green development projects in Malaysia:

1. **Policy challenges.** At the early stages of projects, Malaysia’s policy approval processes still have room to improve. High coordination costs among multiple levels of government departments often lead to project delays, particularly in waste-to-energy projects that involve approvals from multiple ministries.
2. **Barriers to technology localization.** Localizing technologies has proven difficult, as certain key equipment and systems require technical support from headquarters in China, while local teams face a long learning curve. Talent recruitment is also challenging: Malaysia lacks specialists in the environmental sector, and engineering staff turnover rates are relatively high.
3. **Regulatory uncertainty.** While regulations are frequently updated, their implementation often lags behind. This has included repeated changes to environmental approval standards, inconsistent interpretations of data localization requirements for digital projects, and ad hoc updates to foreign business license rules—all of which drive up compliance costs.
4. **Cultural and communication differences.** Differences exist between Chinese and Malaysian working styles, languages, and rhythms. Furthermore, environmental awareness in Malaysia is still developing, requiring high levels of market education.
5. **Financial and currency risks.** Long project payment cycles expose the company to fluctuations in the Malaysian ringgit, creating financial uncertainty.
6. **Issues of trust and contract compliance.** Some subcontractors have weak delivery capacity, leading to delays and breaches of contract.

4.5.2 Contributions to Malaysia’s Green and Digital Ecosystem

As a key Chinese practitioner in the environmental protection sector, MCC Southern Urban Environmental Protection plays an important role in Malaysia’s green development projects, particularly in waste-to-energy (WtE) and wastewater treatment technologies. Through technology transfer and talent cultivation, the company has significantly enhanced Malaysia’s environmental governance capacity while supporting the creation of sustainable green urban ecosystems.

The company has introduced China’s mature “waste incineration + resource utilization” model into Malaysia, tailoring it to local climate conditions, waste composition, and regulatory requirements. This has enabled the construction of high-efficiency, low-carbon, and intelligent green facilities. In wastewater treatment, it has applied the “zonal governance + intelligent monitoring + ecological restoration” model, providing a replicable paradigm for improving water quality and ecosystem rehabilitation.

MCC also emphasizes local talent development. To date, it has trained over 50 environmental management professionals in Malaysia, covering WtE plant operations, wastewater system management, carbon emission monitoring, and green factory management, thereby strengthening local technical and operational capacity.

One of its flagship initiatives is the Selangor Renewable Energy Plant, a joint Sino-Malaysian project in environmental protection and green energy. Employing high-temperature incineration and waste-heat power generation technology, the plant processes over 500,000 tons of municipal solid waste annually, generating 200 million kWh of electricity per year. It is one of Malaysia's first plants to adopt international advanced incineration technologies.

The project's **green ecological contributions** include:

1. **Reducing landfill waste and secondary pollution:** Incineration reduces the volume of waste by over 90%, easing pressure on land resources and lowering risks of groundwater contamination.
2. **Lowering greenhouse gas emissions:** The plant reduces more than 120,000 tons of CO₂ equivalent emissions annually, directly supporting Malaysia's commitments under the Paris Agreement and the National Energy Transition Roadmap (NETR).
3. **Promoting circular economy and green energy integration:** By treating waste as a renewable resource and combining power generation with waste heat utilization, the project provides reliable urban green energy supply.
4. **Enhancing public awareness:** An environmental education center is integrated into the facility to showcase the WtE process to the public, raising environmental awareness and promoting sustainable lifestyles within local communities.

4.5.3 Recommendations

Based on its operational experiences in Malaysia, MCC Southern Urban Environmental Protection provides the following recommendations:

1. Promote the localization of technical standards and conduct dedicated training programs to strengthen local workforce capabilities.
2. Establish joint ventures or strategic partnerships with major Malaysian state-owned enterprises and research institutes.
3. Begin early engagement in project feasibility studies and compliance reviews, at least six months before launch.
4. Emphasize not only "going global" with technology but also "integrating locally", ensuring deeper early-stage localization efforts that yield significant long-term benefits.
5. The Malaysian government should establish a special task force for the green industry to unify policy guidelines and streamline project approval procedures.
6. The Malaysian government should also optimize labour policy implementation, including clearer provisions for foreign expert visa channels, to better support international expertise in green development projects.

4.6 Green Energy Industry: Sinoma Energy Conservation Industrial & Engineering

4.6.1 Challenges in Operations in Malaysia

Sinoma Energy Conservation Industrial & Engineering has faced the following challenges while implementing green development projects in Malaysia:

1. **Approval procedures and technical standards differ:** The efficiency of local project approval processes varies, and technical standards—such as grid connection requirements—are not aligned with China’s certification system
2. **Talent recruitment difficulties:** Malaysia lacks specialized engineers in waste heat power generation, requiring the dispatch of key personnel from China, which increases visa costs and lead times.
3. **Data compliance requirements:** The requirement mandate that operational data be stored on MyGovCloud (the government cloud), increasing system adaptation and integration costs.
4. **Immature business environment:** The local supply chain for green projects is underdeveloped, forcing reliance on high-cost imports of critical equipment.

4.6.2 Contributions to Malaysia’s Green and Digital Ecosystem

Since 2012, Sinoma Energy Conservation Industrial & Engineering has pioneered the introduction of waste heat recovery power generation (WHRPG) in Malaysia by completing the country’s first cement kiln WHRPG project, filling a technological gap in the local cement industry. To date, the company has successfully completed three WHRPG projects, with another under construction, establishing a benchmark for “green factory” development.

These projects use advanced waste heat recovery technologies to convert high-temperature exhaust gases from cement production into clean electricity for in-plant use. This not only reduces dependence on external grids but also significantly lowers carbon emissions from the cement industry, making outstanding contributions toward Malaysia’s 2050 net-zero target.

Key contributions include:

1. **Supporting Malaysia’s 2050 net-zero emissions goal:** By lowering carbon intensity in cement production, the projects align with the National Energy Transition Roadmap (NETR) and the National Climate Change Policy.
2. **Driving industrial green transformation:** These projects establish a pathway of “producing, generating, and reducing emissions simultaneously,” enhancing sustainability and competitiveness of Malaysia’s manufacturing sector.
3. **Promoting localization and capacity building:** Sinoma Energy Conservation Industrial & Engineering conducts extensive local employee training, technology

transfer, and industry-academia collaboration, building Malaysia's technical expertise and talent pool in green energy while fostering upstream and downstream industry development.

4.6.3 Recommendations

Based on its operational experience, Sinoma Energy Conservation Industrial & Engineering proposes:

1. **Deep localization:** Strengthen the cultivation of Malaysian technical talent (currently 75% of its project teams are localized) to reduce dependency on expatriates.
2. **Policy risk budgeting:** Reserve at least 10% of project budgets to manage unexpected regulatory changes.
3. **Simplification of procedures:** Advocate for streamlined work visa processes and reduced administrative costs to improve project execution efficiency and shorten delivery timelines.

4.7 Green Technology Industry: Dunham-Bush Industries

4.7.1 Challenges in Operations in Malaysia

In the course of implementing green and digital-related projects in Malaysia, Dunham-Bush has encountered the following challenges:

1. **Intense Price Competition:** The market is highly competitive on pricing, and in some cases, developers delay payments.
2. **Market Access and Policy Approvals:** Obtaining work permits and other necessary approvals is often complex and time-consuming.
3. **Land Acquisition:** The application and approval process for land use is complicated and lengthy.
4. **Talent Recruitment:** Skilled technical professionals are scarce locally. Frequent adjustments to minimum wage and working-hour policies increase labour costs.
5. **Non-Uniform Technical Certification Standards:** Malaysia has its own environmental protection and energy efficiency certification systems, which differ from those in mainland China, raising the learning curve and compliance costs.
6. **Labour Policies:** There are restrictions on the employment of foreign workers. The approval process for work visas is complicated, creating challenges in recruiting technical workers.
7. **Financial and Exchange Rate Volatility:** Fluctuations in the exchange rate between the Malaysian Ringgit and the Chinese Yuan affect profit settlement, cost accounting, and price competitiveness.
8. **Complex Customs Clearance and Import Approvals:** Certain critical components may require special approvals or additional certifications.
9. **Port Congestion or Delays:** For example, Port Klang faces peak-period backlogs, disrupting production schedules.
10. **Lack of Local Alternative Suppliers:** Over-reliance on single suppliers increases supply chain risks.

11. **Institutional Differences:** Malaysia follows common law while China follows civil law. This creates challenges in areas such as environmental regulations, data protection, labor rights, and contract enforcement.

4.7.2 Contributions to Malaysia's Green and Digital Ecosystem

Dunham-Bush has played a pivotal role in introducing advanced green building technologies to Malaysia. A flagship case is the Laman PKNS headquarters project in Shah Alam, Selangor, where Dunham-Bush supplied state-of-the-art WCFX-V variable-speed water-cooled screw chillers and CS3 air handling units. These systems enhanced the building's energy efficiency and indoor environmental quality, enabling it to achieve both Green Building Index (GBI) and LEED Platinum certification, and earning the ASEAN Energy Award (AEA) in 2018.

The WCFX-V chiller incorporates cutting-edge technologies such as variable speed drives (VSDs) and economizer circuits, delivering annual energy savings of 15%–25% in HVAC consumption. It uses the R134a refrigerant with zero ozone depletion potential (ODP), helping the project gain additional sustainability credits under GBI standards. This solution demonstrates quantifiable advantages in green certification scoring (GBI, LEED), positioning Dunham-Bush to expand its footprint in Malaysia's large-scale public and private green development projects.

4.7.3 Recommendations

Dunham-Bush offers the following recommendations based on its operational experience in Malaysia:

1. **Trade and supply chain facilitation:** Establish “green channels” for expedited clearance of high-tech components; leverage RCEP origin rules for tariff reductions.
2. **Standards harmonization:** Develop a China-Malaysia green manufacturing standards cooperation framework to promote partial mutual recognition of certification results, reducing redundant testing costs. Pilot mutual recognition in energy efficiency ratings.
3. **Talent policy reforms:** Create fast-track visas for high-end technical staff; clarify localization requirements for procurement and hiring to improve predictability for enterprises.
4. **Local talent development:** Establish in-factory training centers; collaborate with local universities to offer internships and joint programs.
5. **Supply chain restructuring:** Identify local substitutes for raw materials where feasible to reduce lead times and improve production stability.
6. **Currency risk management:** Promote local currency settlement mechanisms and adopt forward FX contracts for hedging.

7. **Social responsibility and public engagement:** Enhance community reputation by sponsoring local environmental initiatives (e.g., beach clean-ups) and collaborating with universities on talent programs, which also helps mitigate recruitment challenges.

4.8 Green Building Industry: China State Construction Engineering Corporation (CSCEC)

4.8.1 Challenges in Operations in Malaysia

In advancing green and digital economy-related projects in Malaysia, CSCEC faces significant challenges, primarily stemming from differences between local policies and Chinese technical standards. These gaps create difficulties in adaptation, prolong approval cycles, and increase compliance costs. While green and digital construction concepts have become mainstream trends, their overseas implementation requires balancing standards integration, localization, and local partnership building, which remain key challenges.

CSCEC has actively promoted green building certifications such as the Green Building Index (GBI) and the application of BIM and digital construction platforms. However, Malaysia's green building evaluation systems, energy efficiency standards, and data platform interfaces are not fully compatible with mature Chinese systems. This often necessitates repeated design adjustments, re-evaluations, and additional adaptation efforts during design, construction, and approval stages. Limited local technical resources and uneven supplier capacity further add to project costs and execution risks.

Key operational challenges include:

1. **Complex and lengthy approval processes:** Projects seeking green building certifications (such as GBI), integrating renewable energy systems (such as solar PV), or adopting new building materials often require coordination with multiple government agencies. As a result, approval procedures are time-consuming and project timelines are easily delayed.
2. **Localization challenges arising from differing technical standards:** In fields such as digital construction (e.g., BIM collaboration and smart site platforms) and green design (e.g., energy consumption modeling and energy-efficient equipment selection), China's mature solutions are widely applied. However, discrepancies in Malaysian regulations and technical parameters frequently necessitate repeated design revisions or partial system redevelopment, increasing costs and reducing overall efficiency.
3. **Difficulties in Recruiting Skilled Local Talent:** In emerging fields such as green buildings and digital construction, Malaysia has limited talent pool of qualified technical professionals, making it difficult to meet project demands promptly. At the same time, slow work visa approvals for foreign specialists further complicate deployment.
4. **Challenges in Land Acquisition and Usage Rights:** In certain industrial park or urban redevelopment projects, land-use adjustments, environmental assessments, and land title verifications are highly complex. Inconsistent documentation and repeated approval procedures often delay project commencement.
5. **Barriers to Market Entry:** For some green energy-saving equipment and intelligent systems, CSCEC faces cumbersome import certification processes and underdeveloped

local distribution channels. Requirements such as CIDB registration and restrictions on local supplier selection for green building materials also hinder supply chain efficiency.

6. **Frequent Changes in Environmental Regulatory Standards:** Discrepancies between central and state-level enforcement add further complexity. For example, when applying for green building certifications or renewable energy projects, companies must comply with multiple provisions under Malaysia's Environmental Quality Act. However, interpretations vary across state environmental departments regarding emissions, noise levels, and construction hours, leading to inconsistent approval requirements for the same type of project.
7. **Unclear Compliance on Digital Data and Data Sovereignty Policies:** The use of BIM, smart construction platforms, and cloud-based data management involves uploading significant amounts of design drawings, construction progress reports, and workforce management information to servers. Yet, there is no clear guidance on whether cross-border data transfer is permitted or whether local servers must be used, increasing compliance risks in system deployment.
8. **Lack of Clear Guidance on Localization Requirements:** Some large-scale government or semi-government projects mandate the use of a certain percentage of local labor, materials, and subcontractors. However, detailed implementation rules on how "localization compliance" is defined remain unclear, requiring repeated clarifications with authorities and affecting both bidding and contract execution efficiency.
9. **Frequent Adjustments in Labour Policies and Instability in Foreign Worker Approvals:** The recruitment of foreign workers—particularly from countries such as Bangladesh and Indonesia—is subject to multi-agency approvals involving the Immigration Department and the Ministry of Human Resources. In recent years, frequent policy shifts, such as temporary suspensions of applications or reductions in quotas, have significantly reduced predictability in workforce deployment.

4.8.2 Contributions to Malaysia's Green and Digital Ecosystem

In the implementation of green projects, CSCEC has played a critical role in the following areas:

1. **Technology Transfer:** Introducing China's advanced green building design concepts, BIM-based full-cycle project management platforms, and energy-saving system solutions, such as high-efficiency photovoltaic systems, intelligent lighting control, and rainwater harvesting.
2. **Standards Alignment and Localization:** Promoting the integration of China's green construction practices with Malaysia's GBI and MyCREST standards. The company has developed localized green construction guidelines that support integrated green processes across design, construction, and operations.
3. **Industry Chain Synergy:** Facilitating the entry of Chinese green building materials, energy-efficient equipment, and smart monitoring technologies into the Malaysian market, while working with local subcontractors to enhance local capacity in green construction practices.

In addition, CSCEC has explored several **replicable models of green practices**, including:

1. **"China Design + Local Construction + Policy Coordination" Green Building Model:** Combining China's mature green technologies and management systems with

local consultants and design firms to achieve effective localization. This model has been applied across industrial, residential, and park projects, demonstrating scalability and cross-sector replicability.

2. **Localized Talent Training and Standardized Toolkits:** Developing a set of green construction operation manuals and BIM technical training modules tailored to Malaysian construction personnel. These resources are now being reused in new projects to sustainably strengthen local green construction capacity.
3. **Government-Enterprise Coordination Mechanisms:** Actively engaging in early-stage planning and green certification processes, while building structured communication channels with agencies such as the Malaysia Green Building Council (MGBC) and the Construction Industry Development Board (CIDB). This approach has helped pave clearer approval pathways, providing valuable references for other Chinese enterprises undertaking green projects in Malaysia.

4.8.3 Recommendations

Drawing on its accumulated experience in advancing green and digital projects in Malaysia, CSCEC puts forward the following recommendations:

1. **Prioritize localization of regulatory frameworks during planning:** Project planning should not simply replicate domestic practices. Instead, early involvement in local policy review, approval pathway simulation, and certification standards comparison is essential. This ensures that design and construction plans comply with local regulations from the outset, avoiding rework and approval delays.
2. **Strengthen localization of talent and resources as a key success factor:** Local technical experts and consultants play an irreplaceable role in areas such as green building, BIM applications, and government coordination. Rather than relying on temporary third-party assistance, enterprises should invest early in building talent reserves and partnership networks to establish stable, long-term operational capacity.
3. **Establish project-level compliance and communication mechanisms:** Companies must proactively adapt to regulatory uncertainty. Dedicated personnel should be assigned to monitor policy updates, while regular reporting, pilot demonstrations, and technical presentations should be used to build trust with government agencies and secure greater flexibility and support.
4. **Raise standards for partner selection and contract enforcement:** Local suppliers or subcontractors should not be chosen solely based on cost. Their track record in integrity, performance, and experience with green/digital projects should also be evaluated. Contracts should include clear provisions on timelines, quality, penalties for non-performance, and dispute resolution to mitigate risks.
5. **Enhance localized teams and institutional adaptability:** Establish local technical and compliance support units, supported by Malaysian consultants, GBI-certified assessors, and BIM coordinators, to handle approval processes, green certification, and local standards. Strengthen engagement with key agencies such as the Construction Industry

Development Board (CIDB) and the Department of Environment to improve regulatory responsiveness.

6. **Restructure supply chains and cultivate local networks:** Prioritize subcontractors and equipment suppliers with experience in green construction and digital delivery, adopting a “China-led + local-supported” model to gradually integrate them into management systems. For critical equipment, establish local warehousing and fast-track certification mechanisms to mitigate import delays and approval uncertainties.
7. **Adjust organizational and project management structures:** Optimize internal workflows to address long approval cycles and coordination needs in overseas projects. Designate specialized modules for “government coordination” and “localized design,” staffed by personnel familiar with the local environment. At the same time, strengthen collaboration between headquarters and overseas projects to enable faster policy, design, and compliance responses.
8. **Promote dialogue and collaboration with government and industry bodies:** Actively engage with platforms such as CECCM and the Malaysia Green Building Council (MGBC) to monitor policy trends and secure pilot project opportunities. For key projects, invite government representatives to technical briefings and trial runs to reduce uncertainty caused by policy changes.

To further facilitate the successful implementation of green and digital projects in Malaysia, CSCEC also recommends that the governments of China and Malaysia strengthen cooperation in the following areas:

1. **Promote mutual recognition of green building and digital construction standards:** Establish bilateral mechanisms for comparing and recognizing standards in green building certification, energy efficiency, and BIM applications. This will provide a legal framework for adopting proven Chinese technologies and solutions while minimizing redundant design and certification efforts.
2. **Create a bilateral project approval coordination mechanism:** Explore the establishment of joint approval bodies for priority projects, industrial parks, or pilot zones, coordinated by both governments to address land use, permitting, environmental assessments, and energy integration. This would reduce corporate coordination costs and improve approval efficiency.
3. **Strengthen rules for cross-border data flows in the digital economy:** For BIM platforms and cloud-based project management systems involving data transmission and storage, establish clear boundaries for data security and compliance, providing enterprises with legal certainty and regulatory clarity.
4. **Support the development of local green talent and technical capacity:** Promote bilateral cooperation in vocational training, engineering education, and green construction standards. Encourage the creation of joint training centers and certification

programs to ensure localized workforce development and sustainable green building capabilities.

4.9 Green Energy Industry: Sinoydro Corporation

4.9.1 Challenges in Operations in Malaysia

In promoting green energy and infrastructure-related projects in Malaysia and across the region, Sinoydro Corporation faces the following challenges:

1. **Global geopolitical adjustments:** The deep restructuring of international political and diplomatic landscapes has intensified deficits in global governance. The declining effectiveness of multilateral cooperation mechanisms has weakened support for addressing global issues such as climate change and energy security. Rising unilateralism and protectionism in the region, combined with escalating geopolitical rivalry, have significantly increased political risks for projects.
2. **Weak economic momentum limiting infrastructure financing:** With the global macroeconomy remaining sluggish and the U.S. Federal Reserve tightening monetary policy, international infrastructure markets face constrained liquidity. Financing channels are limited, project financing costs remain high, and this has severely impacted the pace and scale of green infrastructure development.
3. **Complex and volatile overseas security environment:** Traditional security risks (such as terrorism and political instability) are compounded by non-traditional threats (such as natural disasters and public health crises). These overlapping challenges place higher demands on safeguarding the security of overseas personnel and assets, requiring substantial investment in security management.
4. **Stricter international compliance requirements:** The risk of economic sanctions targeting Chinese enterprises by Western countries is increasing. At the same time, multilateral financial institutions have tightened their due diligence standards, creating additional pressure for compliance in project implementation and transparency in fund execution. This requires the establishment of systematic compliance management capabilities.
5. **Intensifying industry competition and market saturation:** Traditional Western contractors are re-entering the Asia-Pacific construction market, while companies from countries such as Turkey and India are leveraging cost advantages to actively capture market share. Meanwhile, many Chinese construction enterprises are expanding abroad simultaneously, leading to intensified competition in Southeast Asia, shrinking profit margins, and greater difficulty in securing projects.

4.9.2 Contributions to Malaysia's Green and Digital Ecosystem

Despite multiple external challenges, Sinoydro Corporation has identified a number of positive opportunities under the broader context of green infrastructure and energy transition. These opportunities are expected to drive deeper cooperation with Malaysia and other regional countries in the field of sustainable development:

1. **Global infrastructure investment recovery:** Since 2023, many Asia-Pacific countries, including Malaysia and Indonesia, have positioned infrastructure investment as a key

lever for stimulating economic growth and job creation. This has led to an overall rebound in the engineering market, with green energy and digital infrastructure emerging as priority investment areas.

2. **Integration of green, digital, and intelligent development creating new growth drivers:** As global decarbonization efforts accelerate and energy structures shift, demand in developing countries for green, low-carbon, and intelligent infrastructure has grown rapidly. This opens broad opportunities for Sinoydro Corporation to export its technical expertise and engineering capabilities in areas such as renewable energy and smart grids.
3. **Enhanced multilateral and bilateral cooperation mechanisms:** Strengthened collaboration frameworks between China and ASEAN, Central Asia, BRICS, and APEC have created greater momentum for regional connectivity projects. These mechanisms provide policy and diplomatic support for enterprises to participate in cross-border infrastructure development.
4. **RCEP-driven investment facilitation:** As the world's largest free trade agreement, the Regional Comprehensive Economic Partnership (RCEP) does not include a dedicated chapter on engineering. However, its provisions on zero tariffs for goods, liberalization of trade in services, and improved investment access indirectly benefit green energy projects by facilitating the import of equipment and materials, easing service delivery, and supporting financing arrangements. This helps expand openness in overseas infrastructure markets.
5. **Global carbon neutrality targets driving green energy momentum:** With carbon peaking and carbon neutrality becoming international consensus, green investment policies, decarbonization technologies, and low-carbon financing channels are increasingly converging. This provides sustained growth opportunities for Sinoydro Corporation in hydropower, wind power, solar energy, and integrated energy projects.

4.9.3 Recommendations

Drawing on its accumulated experience from projects in Malaysia, Sinoydro Corporation offers the following recommendations:

1. **Enhance risk identification to navigate complex geopolitical dynamics:** Project siting and deployment should be closely aligned with regional political and security conditions. This requires strengthening forward-looking risk assessments, improving contingency management, and establishing robust mechanisms for safeguarding overseas personnel and assets.
2. **Diversify financing mechanisms to improve capital accessibility:** Expand collaboration with multilateral banks, policy-based financial institutions, and local consortia, while exploring diversified financing models such as PPP and BOT structures to ease funding constraints.
3. **Strengthen compliance systems:** Establish a dual-track compliance management mechanism between headquarters and local operations to address increasingly stringent requirements related to international sanctions, antitrust, and anti-corruption reviews, thereby ensuring regulatory stability and project integrity.
4. **Optimize localization strategies to remain competitive:** In an environment of intensifying market competition, it is critical to highlight green expertise and localized delivery advantages. This can be achieved by forming joint ventures with local partners, building local teams, and embedding corporate responsibility practices to enhance overall competitiveness.

5. **Leverage regional agreements and green policy opportunities:** Fully capitalize on policy dividends offered under RCEP and other regional cooperation mechanisms, including tariff reductions and investment facilitation provisions, to actively promote the rollout of green energy projects.

4.10 Digital Economy Industry: Huawei Malaysia

4.10.1 Operational Challenges in Malaysia

Huawei's primary challenge in advancing green and digital economy projects in Malaysia lies in the geopolitical uncertainty arising from U.S. trade policies during the Trump administration, which continues to cast long-term risks for Chinese enterprises' digital and green investments overseas. This uncertainty is particularly significant as Huawei explores ecosystem expansion in areas such as artificial intelligence (AI) and computing power.

Other key risks include:

1. The uncertainty of future regulatory and legislative frameworks governing AI, cloud adoption for government and enterprises, and computing services;
2. Potential changes to Malaysia's 10% import tax incentives for data center equipment, which could alter project cost structures.

4.10.2 Contribution to Malaysia's Green and Digital Ecosystem

Huawei has made significant contributions to Malaysia's green and digital ecosystem through both policy engagement and project implementation. The company has worked with the Ministry of Energy Transition, Fire Department, Standards Department, and Sustainable Energy Development Authority (SEDA) on standards for solar-plus-storage and green data center solutions, while also supporting local talent development and workforce training in the green sector.

In collaboration with Penang and Sabah state governments, Huawei has deployed power station energy storage projects to stabilize local grids and reduce peak demand charges for utilities. It has also installed rooftop solar solutions at the National Zoo panda enclosure and factories in Johor to reduce carbon emissions. In 2022, Huawei partnered with the Sarawak Multimedia Authority and Forestry Department to launch the TECH4ALL Rainforest Guardians Project, applying cloud and AI technologies to protect Sarawak's ancient rainforests from illegal logging, deforestation, and plantation encroachment.

Huawei has also formed a strategic partnership with Solarvest to promote solar PV plus energy storage solutions. This includes deploying Huawei's smart PV inverters and energy management systems to enhance generation efficiency and stability, alongside Battery Energy Storage Systems (BESS) for grid regulation, while jointly training local talent in green energy technologies.

In 2023, Huawei signed a cooperation agreement with Pantas, a leading Southeast Asian climate-tech company, to deliver one-stop low-carbon energy transition solutions for enterprises. This initiative directly aligns with Malaysia's National Energy Transition

Roadmap (NETR), supporting SMEs and industrial parks in adopting solar power, peak-shaving storage, and e-mobility solutions to reduce carbon emissions and lower energy costs.

4.10.3 Recommendations

Based on its experience advancing green and digital projects in Malaysia, Huawei has identified a set of recommendations that are also transferable to other Belt and Road Initiative (BRI) and Southeast Asian markets:

1. **Strengthen Government Engagement Mechanisms** – Proactively align with national policies and contribute to the development of green standards. Huawei actively participates in the formulation of Malaysia’s NETR and MyDIGITAL Blueprint, providing technical input to the Ministry of Digital, Ministry of Science, Technology and Innovation, and Ministry of Natural Resources and Environment, to support the development of a national green ICT framework and clean energy guidelines.
2. **Advance Digital-Green Integration Policies** – Support national initiatives such as “Green 5G,” “Zero-Carbon Parks,” and “Low-Carbon Data Centers.” Huawei has assisted the government in establishing PUE standards for green data centers, guiding industry upgrades toward low-carbon development.
3. **Promote Collaborative Governance** – Work with the Malaysia Digital Economy Corporation (MDEC), Malaysian Green Technology and Climate Change Corporation (MGTC), and clean energy associations to foster cross-sector adoption of green ICT, advocating a government-enterprise-society tripartite governance model for sustainable ecosystems.
4. **Build Zero-Carbon ICT Parks** – Develop benchmark projects in Malaysia such as green data centers and smart energy parks, integrating solar power, modular UPS systems, and advanced liquid-cooling technologies to achieve an average PUE below 1.3, setting a regional standard for sustainable ICT infrastructure.
5. **Deploy 5G + Green Energy Solutions** – Collaborate with Telekom Malaysia (TM), U Mobile, and other local operators to roll out energy-efficient 5G base stations, leveraging AI-powered energy scheduling, low-carbon material cabinets, and distributed energy solutions at the edge to reduce power consumption without compromising network quality.
6. **Strengthen Green ICT Education** – Partner with universities such as the University of Malaya (UM) and Universiti Teknologi Malaysia (UTM) to establish the “Huawei Green ICT Academy,” offering courses on 5G energy efficiency, green data center operations, and carbon emissions accounting to build local talent pipelines.
7. **Build Localized Green Operations Teams** – Establish on-the-ground teams of green engineers in Malaysia to manage infrastructure O&M, implement energy-saving initiatives, and conduct green audits. These teams will also serve as a talent pool for BRI countries, offering bilingual capabilities and localized experience for regional project deployment.

4.11 Digital Economy Industry: ZTE Corporation

4.11.1 Operational Challenges in Malaysia

In advancing digital economy projects in Malaysia, ZTE faces several key challenges:

1. **Limited Digital Applications:** Although the Malaysian government launched the MyDIGITAL Blueprint in 2021 to accelerate digital transformation and has attracted multibillion-dollar data center investments, ICT development still remains largely focused on telecommunications and basic information infrastructure. Industry-wide and government-level digital applications remain underdeveloped and lack comprehensive planning.
2. **Risks and challenges related to local partners:** In green infrastructure projects and government-led digital development initiatives, foreign companies are typically required to form partnerships or consortia with local firms. This arrangement exposes foreign investors to risks of non-performance or breaches of trust by local partners. If a local partner fails to deliver the agreed services, the foreign company may incur significant losses as a result.

4.11.2 Contribution to Malaysia's Green and Digital Ecosystem

ZTE has contributed to Malaysia's green and digital transformation primarily through technology transfer, energy-efficient ICT solutions, and talent development initiatives.

On the technology front, ZTE deploys green energy-saving technologies to optimize operator sites, reducing energy consumption and operating costs.

On the talent side, ZTE has established a multi-dimensional training ecosystem:

- **Internal workforce development:** Combining regular training with self-learning programs, reinforced with long-term incentives that encourage staff participation.
- **Government official training:** In partnership with Malaysian ministries, ZTE has organized two batches of returnee training programs for government officials, offering practical exposure to digital technologies and solutions.
- **Academic cooperation:** Collaborating with leading local universities, ZTE integrates industry technologies and solutions into professional curricula. The company provides lecturers for regular training, contributes to course design, and offers scholarships to outstanding graduates annually. This effort strengthens Malaysia's ICT talent pipeline for long-term sustainability.

4.11.3 Recommendations

Drawing from its operational experience in Malaysia, ZTE proposes the following recommendations for advancing digital economy initiatives:

1. **Scenario-Driven Pilot Projects** – Collaborate with digitally progressive state governments (e.g., Selangor, Penang, Johor) to implement “small but high-impact” smart city pilot zones, such as smart lighting systems, digital parking platforms, and city security solutions. These moderately scaled projects are easier to replicate, fostering scalability and driving local supply chain participation.
2. **Data-Sharing Mechanisms** – Foster partnerships with government agencies to develop secure and standardized data-sharing frameworks. By providing “data middle-platform” consulting services, ZTE can help government departments—such as transportation, taxation, and city management—enhance system interoperability, optimize existing digital infrastructure, and lay a robust foundation for future digital economy applications.
3. **Risk Mitigation Strategies** – Given ZTE’s core focus on ICT infrastructure, collaboration with major local telecom operators is essential. To mitigate risks, ZTE should clearly define roles and responsibilities within project partnerships, ensure complementary strengths, and proactively manage risks associated with local partner performance.
4. **Strengthening Local Teams** – Continue building and institutionalizing a local training and development ecosystem to cultivate Malaysian engineers and project management professionals. This enhances project stability, supports long-term localization goals, and positions ZTE as a reliable partner in Malaysia’s digital transformation journey.

4.12 Digital Economy Industry: China Telecom

4.12.1 Operational Challenges in Malaysia

In advancing green and digital economy projects in Malaysia, China Telecom faces several significant challenges:

1. **Licensing and Market Entry Barriers** – Malaysia enforces strict local equity requirements for telecom enterprises, typically capping foreign ownership at 49%. As a foreign-invested company, it is highly challenging for China Telecom to directly apply for local licenses such as Network Service Provider (NSP) and Network Facility Provider (NFP). Entry often requires partnerships through qualified joint ventures or special approval pathways.
2. **Incomplete Network Infrastructure** – The existing gaps in Malaysia’s network infrastructure create bottlenecks for digital economy advancement. While the government has made progress, coverage remains uneven. To support industrial digitalization, the Malaysian government might consider to increase investment in nationwide high-speed network coverage, ensuring reliable access for every industrial park rather than relying solely on privatized operators.

4.12.2 Contribution to Malaysia's Green and Digital Ecosystem

Leveraging its strong R&D capabilities and global project experience, China Telecom actively promotes solutions in AI, big data, cloud computing, green and energy-efficient data centers, smart cities/parks, and cybersecurity to accelerate Malaysia's digital and intelligent economic development.

- Through **green data center solutions**, China Telecom helps enterprises reduce carbon emissions and achieve energy efficiency during digital transformation.
- By deploying **AI-based smart building management systems**, the company enables enterprises to optimize energy usage for HVAC, lighting, and other facilities, reducing building energy consumption.
- At the same time, China Telecom emphasizes **local collaboration**, working with Malaysian partners to jointly deploy advanced solutions while cultivating a pool of ICT and communications talent.

4.12.3 Recommendations

Based on its operational experience in Malaysia, China Telecom provides the following recommendations to accelerate the development of Malaysia's digital economy:

1. **Promote a "Park-Level Digital Infrastructure Co-Building" Model** – Collaborate with state governments and development agencies (e.g., Iskandar Regional Development Authority, Invest Selangor) to jointly build edge nodes, micro data centers, and backbone networks within industrial parks and smart city pilot zones. Under a "co-investment and joint operation" model, China Telecom invests in selected core network facilities while local partners contribute land, power, and other essential resources.
2. **Deploy Smart Park and AI Building Management Systems** – Actively participate in the planning of emerging smart parks in Kuala Lumpur, Johor Bahru, and Penang, introducing AI-powered energy monitoring, intelligent security, and smart lighting systems to enhance operational efficiency and sustainability.
3. **Establish an Edge Cloud Node Alliance** – In partnership with state governments, universities, and technology firms, set up edge computing pilot networks to provide shared 5G edge capabilities and China Telecom cloud access nodes. These deployments should prioritize strategic scenarios such as manufacturing parks, smart ports, and logistics hubs, addressing connectivity gaps and enabling AI and IoT applications to scale more effectively.

4.13 Digital Economy Industry: China Mobile

4.13.1 Operational Challenges in Malaysia

In advancing localized green and digital economy projects such as smart campuses, data centers, and MVNO (Mobile Virtual Network Operator) services, China Mobile faces several key challenges:

1. **Technology Localization** – China Mobile must align with the Malaysian Communications and Multimedia Commission (MCMC) requirements on data localization. Certain government-led projects imply “technology sovereignty” considerations.
2. **Technology Localization** – China Mobile must ensure compliance with data localization requirements set by the Malaysian Communications and Multimedia Commission (MCMC). In addition, certain government-led projects involve considerations related to “technology sovereignty”.
3. **Data Privacy and Compliance Differences** – Malaysia’s Personal Data Protection Act (PDPA) diverges from China’s Personal Information Protection Law (PIPL) on issues such as data sovereignty, cross-border data flows, and the handling of sensitive information. In particular, differences in outbound data approval, user consent mechanisms, and storage compliance create inefficiencies in cross-border data exchange and service interoperability.
4. **Talent Recruitment** – Malaysia faces a shortage of professionals familiar with China–Malaysia bilateral telecom regulations and advanced technologies such as cross-border SD-WAN, limiting local workforce capacity for high-tech operations.
5. **Fragmented ESG Evaluation Systems** – Standards for registering green data centers remain unclear, as Malaysia’s ESG frameworks are still lack unified benchmarks, increasing compliance uncertainty.
6. **Cultural and Market Perception Gaps** – Notable differences exist in business pace, risk appetite, and digital culture between China and Malaysia. In addition, some local end-users have limited familiarity with Chinese service brands, requiring customized localized marketing strategies to strengthen brand recognition and acceptance.
7. **Government Communication Barriers** – Coordination between federal and state governments can be complex, often necessitating the engagement of third-party consultants to facilitate cross-departmental communication and address licensing and regulatory challenges.
8. **Incomplete Network Infrastructure** – In Malaysia’s interior regions, underdeveloped network infrastructure still constrains enterprise-level connectivity quality, creating bottlenecks for service delivery.

4.13.2 Contributions to Malaysia's Green and Digital Ecosystem

China Mobile actively promotes the concept of “green data usage” in products such as global data SIM cards and MVNO services, with the aim of driving a low-carbon transformation of the telecommunications industry through technological optimization and service innovation. This approach emphasizes maximizing energy efficiency across the entire lifecycle of data transmission, network utilization, and terminal management, thereby reducing resource consumption and carbon footprints while building a green digital infrastructure.

In Malaysia, China Mobile has partnered with local stakeholders to promote green communications through energy-efficient network deployments, cloud node consolidation, and end-user energy-saving configurations. For instance, in the Malaysia GDS Data Center Project, the company has prioritized low-energy servers, renewable energy-powered systems, and smart cooling technologies, significantly reducing PUE and providing strong green support for Chinese enterprises' digital business expansion in Malaysia.

Additionally, China Mobile, in collaboration with the China Academy of Information and Communications Technology (CAICT) and other institutions, has taken the lead in drafting the “Green Standards Proposal for Overseas Communications Facilities of Chinese Enterprises”. Malaysia was selected as the first pilot country for implementation. Covering the entire lifecycle—from site selection and network construction to operations and end-of-life recycling—the standards have already gained support from multiple Chinese enterprises operating in Malaysia and are expected to be incorporated into the broader China–Malaysia cooperation framework in green and digital economy initiatives.

To further advance bilateral green and digital cooperation, China Mobile has also introduced several initiatives:

1. **Launching green MVNO services**, providing Malaysian enterprises and users with environmentally friendly mobile communication solutions;
2. **Supporting ESG compliance** for Chinese enterprises in Malaysia through carbon monitoring and green IT consulting services;
3. **Participating in national digital transformation programs** such as JENDELA and MyDIGITAL, as well as Malaysia's green technology initiatives, by co-developing green communications demonstration zones;
4. **Establishing a “5G + AI Laboratory”** in partnership with Malaysian universities and Digital Nasional Berhad (DNB) under a public–private partnership (PPP) framework.

Through these multi-level, multi-dimensional collaborations, China Mobile not only helps Chinese enterprises achieve “green globalization” in Malaysia but also injects new momentum into the Belt and Road Initiative, advancing both the Green Silk Road and the Digital Silk Road.

4.12.3 Recommendations

Drawing on its experience in advancing digital economy and green development projects in Malaysia, China Mobile proposes the following recommendations:

1. **Strengthen localization in organizational structure** by introducing more local management personnel and establishing independent procurement and project implementation teams;
2. **Enhance communication with coordinating bodies**, including the China Enterprises Chamber of Commerce in Malaysia and the Malaysia Digital Economy Corporation (MDEC), to ensure policy alignment;
3. **Develop multi-tiered cooperation models**, such as collaborating with Malaysian universities on ICT talent development and co-investing with local operators in PoP nodes to reduce costs;
4. **Accelerate the establishment of unified green evaluation standards**, ensuring ESG frameworks are integrated into public projects;
5. **Establish “China–Malaysia pilot parks”** for cross-border data flows and green investment, making green ICT infrastructure a standard pre-condition for Chinese industrial parks expanding overseas;
6. **Promote joint laboratories** with Malaysian state-owned enterprises and research institutes to enhance R&D collaboration;
7. **Adopt a “dual-center” model**, combining localized operations with technical support from headquarters to balance adaptability and efficiency;
8. **Prioritize deployment of low-carbon communication solutions** such as eSIM and remote operations platforms across Malaysia and other Belt and Road markets.

4.14 Digital Economy Industry: FiberHome

4.14.1 Operational Challenges in Malaysia

In advancing digital economy projects in Malaysia, FiberHome has encountered several key challenges:

1. **Market access barriers:** Local customers show an excessive reliance on Western-led technical standards, creating implicit entry barriers for Chinese products. Although FiberHome offers world-class ICT solutions and green technologies, some projects dominated by Western enterprises or consortia in Malaysia mandate the procurement of Western-branded equipment, resulting in non-technical restrictions on Chinese products. These barriers are mainly reflected in:
 - **Biased tendering:** Some projects include brand-specific or country-of-origin requirements that exclude Chinese enterprises.

- **Exclusive technical clauses:** Certain projects adopt European and American standards that inherently reject compatibility with Chinese products.
 - **Politicized procurement tendencies:** Some Western enterprises operating in Malaysia, influenced by their home-country policies, partially practice “de-Sinicization” in their supply chains.
2. **Approvals uncertainty:** For projects involving digital infrastructure and 5G equipment deployment, FiberHome must obtain multiple permits (e.g., network access licenses, construction permits, electromagnetic compatibility certifications). In practice, the company faces:
- **Lengthy processes:** Multi-tiered approval systems involving numerous departments.
 - **Opaque standards:** Inconsistent application of approval criteria for foreign vendors.
3. **Data localization and cross-border restrictions:** According to the latest requirements from Bank Negara Malaysia and the National Cyber Security Agency (NACSA), core customer data in sectors such as finance, telecommunications, and e-commerce must be stored in local data centers, with cross-border transfers subject to case-by-case approval. This presents multiple challenges:
- Increased costs from mandatory local data storage deployments.
 - Cloud service architectures must be split or restructured, reducing operational efficiency.
 - Rising compliance pressure, requiring dedicated local compliance teams to track regulatory updates.

4.14.2 Contributions to Malaysia’s Green and Digital Ecosystem

FiberHome not only drives digital infrastructure upgrades in Malaysia but also contributes significantly to building a green communications ecosystem through continuous product energy-efficiency optimization, green technology transfer, and participation in standards development.

1. **Localized green optimization of ICT products:** FiberHome integrates green design principles across its Malaysian ICT portfolio, particularly in data transmission, optical fiber communications, and 5G base stations. For example, its routers and switches marketed in Malaysia adopt high-integration chipsets and intelligent cooling designs, reducing overall power consumption by 15%–30%. The company has also introduced modular, liquid-cooled micro data center solutions with PUE values below 1.3, far outperforming traditional data centers.
2. **Supporting local green standards and co-development:** FiberHome actively participates in the development of Malaysia’s green communications standards,

aligning Chinese best practices with local policies to help achieve Malaysia's carbon neutrality goals. The company also assists local operators in benchmarking against international standards in areas such as green assessments, energy consumption monitoring, and carbon asset management, thereby strengthening Malaysia's capacity for green ICT governance.

3. **Strengthening the local green value chain:** Through technology transfer and localized service networks, FiberHome trains Malaysian engineers in operating and managing green communications equipment. The company also engages in smart park and smart city initiatives, advancing low-carbon digital applications in transportation, education, and energy sectors.

4.14.3 Recommendations

Based on its experience in implementing digital economy projects in Malaysia, FiberHome proposes the following recommendations:

1. **Enhance communication mechanisms:** Establish institutionalized communication channels with Malaysian regulators through industry associations and commercial representative offices to improve policy transparency and secure equal treatment for Chinese enterprises.
2. **Strengthen risk management and project flexibility:** Introduce an early-stage “compliance risk alert + policy adaptation” mechanism to anticipate regulatory changes, engage clients early, and maintain resilience in complex environments.
3. **Build a “trusted supply chain” model:** Expand localized production, services, and data management capabilities to address trust-related concerns, thereby increasing acceptance among the Malaysian government and local clients.

4.15 Digital Economy Industry: Hikvision

4.15.1 Challenges in Operating in Malaysia

Hikvision faces the following challenges when implementing green or digital economy-related projects in Malaysia:

1. **Localization and adaptation challenges:** Products must meet Malaysia's multilingual and multicultural requirements. For instance, user interfaces must support Malay, English, and Chinese, while also complying with Islamic cultural requirements for multilingual systems. In addition, products must obtain local certifications such as wireless approvals or accreditation by the Standards and Industrial Research Institute of Malaysia (SIRIM).
2. **Data security and compliance risks:** Malaysia's data compliance framework contains ambiguities. For example, the Personal Data Protection Act (PDPA) does not clearly define whether security surveillance footage or facial recognition data qualifies as

“sensitive data,” creating legal uncertainty and potential exposure to heavy fines. Some government projects also require product source code disclosure or mandate compliance with regulations such as the NDAA. Furthermore, cloud-related products must comply with data localization requirements.

3. **Talent recruitment constraints:** IT companies must prove that certain roles cannot be filled by local talent before applying for Employment Passes (EP) for foreign workers, creating a high entry threshold. At the same time, large-scale projects often require 24/7 technical support, which conflicts with Malaysia’s more relaxed work culture. This necessitates building dedicated local teams or working closely with local partners.

4.15.2 Contribution to Malaysia’s Green and Digital Ecosystem

In advancing green development projects, Hikvision has played a pivotal role in supporting Malaysia’s green ecosystem through the following contributions:

1. **AIoT-enabled industry solutions:** Leveraging Artificial Intelligence of Things (AIoT) technologies, Hikvision enhances the efficiency of renewable energy system management, promotes low-carbon mobility in urban transport, and reduces energy consumption and emissions in green buildings.
2. **Renewable power plant monitoring:** Provides AI-powered video monitoring systems for solar and wind farms in Malaysia, enabling real-time monitoring of equipment operations and preventing theft or vandalism.
3. **Low-carbon smart city initiatives:** Deployed intelligent cameras to analyze traffic congestion in Kuala Lumpur and integrated with traffic light systems to reduce vehicle idling emissions.
4. **Green building and park management:** Implemented intelligent building projects in numerous commercial complexes and industrial parks, such as systems that link air-conditioning controls to meeting room occupancy data, and integrating security with Building Management Systems (BMS), thereby improving energy efficiency and emissions reduction in green buildings.
5. **Wildlife conservation:** Supported initiatives such as the Usukan Bay rainforest monitoring project, a public-interest program that applies AI monitoring to protect biodiversity.

4.15.3 Recommendations

Based on its experience in implementing digital economy and green development projects in Malaysia, Hikvision has summarized the following recommendations:

1. **Prioritize compliance to mitigate policy risks:** Ensure product certification (e.g., SIRIM), adapt products to local requirements (such as multilingual and cultural compliance), and achieve data localization through local partners for deployment and service.

2. **Strengthen localized operations:** Establish local technical teams supported by Chinese experts, complemented by localized repair and inventory centers to improve service delivery. Deepen cooperation with local partners across technical, project, and team collaboration.
3. **Enhance information-sharing mechanisms:** Leverage platforms such as Chinese business associations, embassies, and local partners to stay informed of policy updates and adjust strategies in a timely manner.
4. **Promote mutual recognition of technical standards:** For example, advance the mutual recognition of China's GB/T 28181 surveillance standard with Malaysia's SIRIM certification to reduce repetitive testing costs.
5. **Advocate for dedicated EP visa quotas:** Establish special employment pass quotas for high-skilled security industry roles (e.g., solution engineers, AI product specialists).

4.16 Digital Finance Industry: China Construction Bank (CCB)

4.16.1 Operational Challenges in Malaysia

In carrying out digital and green finance projects in Malaysia, China Construction Bank (CCB) has encountered the following challenges:

1. **Lack of clear green credit standards:** The Malaysian government has yet to provide explicit guidelines for defining and classifying green credit. Local enterprises show uneven acceptance of green technologies; some, due to cost concerns, have limited demand for green transition. Meanwhile, Malaysia does not have a formal industry classification for green credit. At present, progress toward green transition relies largely on directives from Bank Negara Malaysia (BNM) requiring financial institutions to channel credit into green sectors, indirectly guiding enterprises toward transformation. Moreover, when introducing innovative financial products, CCB must align with Malaysia's compliance framework, which extends the product design and implementation cycle.
2. **Physical and transition risks:** CCB faces both physical and transition risks in its business operations. Physical risks include short-term extreme weather events and long-term shifts in climate patterns. Transition risks involve the introduction of new regulatory standards, carbon pricing, rising demand for advanced and low-carbon technologies, evolving customer preferences, structural shifts in the national economy, and stakeholders' changing perceptions.
3. **Differences in regulatory requirements compared to China:** Malaysia's regulatory requirements differ from those in China. For example, BNM mandates that all financial institutions offering mobile banking services must incorporate malware-scanning functions. While this strengthens customer data and privacy protection, it significantly increases financial institutions' operational costs.

4.16.2 Contributions to Malaysia's Green and Digital Ecosystem

China Construction Bank (CCB) plays a key role in supporting Malaysia's green development through the following initiatives:

1. **Strengthening product innovation to support green manufacturing enterprises:** CCB provides diversified financial services to green manufacturers by establishing "green financing channels" that ensure efficient and rapid access to funding. Support includes bilateral loans, syndicated loans, export credits, and supply chain financing, helping enterprises secure the capital required for project development.
2. **Promoting industrial chain collaboration:** CCB tailors supply chain financing solutions to meet the funding needs of enterprises across the value chain, with a focus on supporting core enterprises in the green manufacturing sector and enhancing the financial resilience of their upstream and downstream partners.
3. **Applying stringent industry classification standards:** In addition to complying with Bank Negara Malaysia's CCPT (Climate Change and Principle-based Taxonomy) classification, CCB applies the China Banking and Insurance Regulatory Commission's (CBIRC) green industry classification system. This ensures stricter client and project assessments by further clarifying industry standards and enhancing oversight of eligible sectors.

4.16.3 Recommendations

Drawing on its accumulated experience in advancing digital and green finance projects in Malaysia, China Construction Bank (CCB) proposes the following recommendations:

1. **Comprehensive risk management:** CCB integrates climate-related risks into its overall risk management framework, covering enterprise-wide material risk assessments, the Internal Capital Adequacy Assessment Process (ICAAP), credit guidelines, and loan reviews. The Bank has also established a robust monitoring and control framework to ensure climate-related risks are effectively managed across all organizational levels. By clearly defining transmission channels, CCB translates both physical and transition risks into identifiable financial risk types to facilitate recognition and control. In addition, the Bank has linked its compensation system to sustainability-related key performance indicators (KPIs).
2. **Optimizing the banking system's green financing capacity:** CCB recommends that the Malaysian government strengthen policy incentives to mobilize private capital for green projects. Bank Negara Malaysia could, for example, introduce preferential risk weights for green assets to reduce capital costs for banks, thereby enabling financial institutions to expand their support for green project development.
3. **Establishing bilateral green finance regulatory agreements:** Promote the signing of bilateral agreements on green finance supervision between the central banks of China and Malaysia, alongside the creation of "white lists" for cross-border data flows. Such

arrangements would facilitate cross-border pilot projects and accelerate the implementation of key bilateral initiatives.

4. **Developing standardized joint mechanisms:** Strengthen the credibility of green projects by partnering with independent third-party certification bodies. At the same time, establish clear and detailed standards for green industries to ensure consistency and enforceability.
5. **Advancing ASEAN supply chain green finance:** Replicate the “supply chain green finance” model across Southeast Asia, leveraging leading enterprises in upstream and downstream segments to drive the green transition of small and medium-sized suppliers throughout the value chain.

4.17 Digital Finance Industry: Industrial and Commercial Bank of China (ICBC)

4.17.1 Operational Challenges in Malaysia

In carrying out digital economy–related projects in Malaysia, ICBC has faced the following challenges:

1. **Low local market acceptance:** Elderly groups show low trust in digital wallets, increasing offline service costs by 25%. Although Malaysia enjoys extensive 4G and 5G coverage and mobile payment (particularly e-wallet) penetration has reached 67%, many customers still prefer using bank cards and cash. Local regulations also require financial institutions to provide tailored products and services for vulnerable groups, further increasing operating costs.
2. **Data security and cyber risks:** Online financial fraud cases are rising by 30% annually, with anti-fraud system localization R&D expenses exceeding budget. In the first quarter of 2025 alone, Malaysia recorded over 10,000 fraud cases—a 53% year-on-year surge. Regulators impose strict anti-fraud requirements on financial institutions, particularly for e-banking, such as mandating the discontinuation of SMS payment authentication, enforcing “cooling-off” periods, and adding fraud detection models. These requirements demand significant investment in technology, manpower, and financial resources, driving regulatory costs higher.
3. **Standards gap:** Malaysia’s environmental protection standards differ from those in China, requiring projects to undergo renewed environmental assessments (e.g., ESG metrics), which prolongs financing cycles. At the same time, SMEs have strong financing demand for green transition but often lack compliant collateral, raising risk management challenges.
4. **Market entry barriers:** Services such as digital wallets require multiple financial licenses, such as electronic money issuance permits.

5. **Talent recruitment:** Local talent with combined expertise in bilingual communication and green finance remains scarce in Malaysia.
6. **Restrictions on cross-border data flows:** Bank Negara Malaysia requires certain categories of customer data to be stored locally, limiting data transfer efficiency.

4.17.2 Contribution to Malaysia's Green and Digital Ecosystem

ICBC has introduced a diverse range of cross-border payment products. These include UnionPay dual-currency cards and a mobile banking app that supports QR code payments. Customers can seamlessly use Malaysia's DuitNow QR payment system for local transactions, while also enjoying compatibility with UnionPay, WeChat Pay, Meituan, and other QR-based payment systems within China. This significantly enhances the cross-border payment experience, promoting smoother financial connectivity between Malaysia and China.

4.17.3 Recommendations

Drawing on its experience in advancing digital finance projects in Malaysia, ICBC has outlined the following recommendations:

1. **Community-based financial education initiatives:** Collaborate with local community groups, temple associations, and rural councils to organize "Silver Age Finance Classes," conducted in both Chinese and Malay, to raise awareness of digital payment safety among senior citizens.
2. **Develop local joint ventures/partnership platforms for technology:** Partner with Malaysian AI and cybersecurity companies to co-develop anti-fraud models, enhancing local adaptability while reducing R&D costs. Introduce tiered mechanisms for different levels of transactions (e.g., large-value transfers, cross-border payments) by combining dynamic "cooling-off periods" with risk alerts, thereby meeting regulatory requirements. By integrating headquarters' expertise with local practices, ICBC can establish a replicable regional risk control model and real-time response system, reducing the need for market-specific investment.
3. **Establish a green loan risk compensation fund:** Jointly set up a dedicated risk subsidy scheme with local development banks to provide guarantees for green SMEs lacking sufficient collateral.
4. **Promote ESG capacity-building:** Align with Bank Negara Malaysia's Green Financing Taxonomy (GFT) to assist clients in achieving ESG compliance upgrades and securing proper sustainability ratings.
5. **Advance regional "data mutual recognition mechanisms":** Leverage ASEAN's Framework on Digital Data Governance to support Malaysia's participation in cross-border data trust pilot projects, thereby facilitating smoother data flows, with China providing corresponding technical support.

4.18 Digital Economy Industry: Alibaba

4.18.1 Challenges in Operating in Malaysia

Alibaba has encountered several challenges in advancing green and digital economy-related projects in Malaysia:

1. **Limited participation of local merchants in exports:** Although Malaysia's economy is highly export-oriented, most export activities are concentrated in resource-based industries or dominated by large foreign enterprises. Many local SMEs have yet to make cross-border exports a core part of their business strategies, leaving the market participation base relatively weak.
2. **Strong reliance on traditional trade pathways:** Many Malaysian companies still prefer acquiring clients and orders through trade fairs, distributors, and other conventional channels. The perceived value of digital trade platforms is still in the process of being established, which results in organizational inertia, investment hesitancy, and learning costs when firms consider digital transformation.
3. **High logistics costs impacting order structures:** Exporters in Malaysia face elevated air freight and courier costs when handling sample orders or small-batch shipments. This limits the feasibility of frequent, small-scale trial orders, thereby slowing customer conversion and reducing willingness to experiment.
4. **Uneven compliance thresholds across industries:** While basic import-export qualifications in Malaysia are relatively easy to obtain, certain sectors—such as food, beverages, and agricultural products—require multiple inspection and certification procedures. This complicates export processes, lengthens fulfillment cycles, and raises the professional competency requirements for enterprises.
5. **Lagging development of digital marketing systems:** Many traditional manufacturing-oriented business owners are still at the early stages of understanding e-commerce platforms. Internal mechanisms and collaborative processes for online operations have yet to be fully established, leaving organizational transformation in an exploratory phase.
6. **Shortage of cross-border e-commerce talent:** There is an insufficient supply of professionals in Malaysia with both international trade expertise and digital operations skills. The relevant talent development systems and career pathways remain underdeveloped, making it challenging for companies to recruit and retain qualified specialists.

4.18.2 Contributions to Malaysia's Green or Digital Ecosystem

To address the above challenges, Alibaba has explored a sustainable operational model centered on “local collaboration”, supporting Malaysian SMEs in accelerating digital transformation and building cross-border capabilities. The company's efforts are reflected in the following areas:

1. **Building local channel partnership networks:** Since 2009, Alibaba.com has adopted the strategy of “leveraging local partners for deep market reach,” progressively establishing a service network across Malaysia’s major commercial regions. Through a joint “platform + local partner” service mechanism, combining central platform support with local team collaboration, Alibaba has significantly enhanced the responsiveness of its services and improved SMEs’ user experience.
2. **Enhancing market awareness and participation:** The platform has partnered with the Malaysia External Trade Development Corporation (MATRADE) and local industry associations to carry out integrated online and offline promotional campaigns, consistently strengthening brand recognition and credibility. By identifying and cultivating exemplary local merchants, the platform has encouraged more SMEs to engage with and experiment in digital transformation.
3. **Driving digital skills training and capacity building:** Alibaba has established a regular training framework offering online courses, offline workshops, and tailored advisory services to help businesses master key skills such as cross-border platform operations and digital marketing. In collaboration with Malaysian universities, the company also launched cross-border e-commerce certification programs and talent-matching initiatives to train and supply digital professionals for local enterprises.
4. **Developing a comprehensive service ecosystem:** Alibaba.com has introduced cross-border trade service partners in Malaysia to provide end-to-end consulting support from customs clearance and logistics to settlement of payments. These efforts help SMEs establish local operational entities or production nodes, promoting the shift from single transactions to localized operations.

4.18.3 Recommendations

Drawing on its practices in Malaysia, Alibaba has outlined the following recommendations, which may serve as a reference for other digital platform enterprises seeking to expand internationally:

1. **Strengthen local partnership networks:** Establishing collaborative mechanisms with local distributors, government agencies, and industry associations helps improve local enterprises’ understanding and acceptance of platform-based models.
2. **Foster tiered flagship clients:** By adopting a “key merchants + demonstration cases” approach, platforms can gradually build market trust and acceptance while lowering the barriers for digital transformation.
3. **Develop a systematic training framework:** Introduce multi-dimensional training pathways tailored to enterprises at different stages and to staff in various roles, addressing gaps in local e-commerce operational capabilities and promoting the shift from awareness to actionable skills.
4. **Advance joint talent development programs:** Collaborate with local universities to establish talent pipelines through co-training, internships, and certification programs,

ensuring a steady supply of professionals who understand both digital platforms and international trade.

5. **Enhance comprehensive service ecosystems:** Localize integrated service providers to support SMEs across critical stages such as logistics, customs clearance, and financing, thereby offering an end-to-end support system for cross-border operations.

Alibaba believes that genuine “going global” is not simply an extension of platform services, but rather a process of **co-creation and co-growth** with local markets—in terms of awareness, capabilities, and value.

4.19 Digital Aviation Industry: China Eastern Airlines

4.19.1 Challenges in Operations in Malaysia

In advancing green development and digital economy-related projects in Malaysia, China Eastern Airlines faces several challenges:

1. **Regulatory and policy uncertainty:** Beyond the underdeveloped digital infrastructure, Malaysia’s digital related regulatory and policy framework requires further improvement. For example, in promoting digital transformation projects such as AI-powered customer service, issues related to cross-border data transfer, network transmission, and passenger identity verification involve sensitive areas where Malaysia currently lacks a clear regulatory framework. In addition, the coverage of high-speed and stable mobile networks remains limited, increasing uncertainty in project implementation.
2. **Data security and cyber risks:** With Chinese airlines accelerating the deployment of digital services overseas, greater demands are placed on local network infrastructure and compliance with cross-border data transfer regulations. Malaysia’s Personal Data Protection Act (PDPA) contains gaps and lacks clear boundaries for foreign enterprises in terms of implementation guidelines and regulatory enforcement. This is particularly evident in the area of cross-border data transfers, where no explicit guidance exists for alignment with Chinese enterprises, leaving Chinese airlines without a clear compliance pathway when deploying digital products in Malaysia.

4.19.2 Contribution to Malaysia’s Green or Digital Ecosystem

Through its green development initiatives, China Eastern Airlines has introduced green operational standards into Malaysia. These include promoting the use of eco-friendly materials in inflight catering, cabin services, and ground operations—such as replacing disposable items with biodegradable alternatives and implementing recycling and waste-sorting practices. As the largest SkyTeam member airline in the Malaysian market, China Eastern provides a reference model for the alliance’s other 10 member carriers.

In addition, China Eastern promotes green collaboration across the supply chain by giving preference to ground service providers and catering partners with environmental

certifications, thereby encouraging upstream and downstream partners to transition toward low-carbon operations.

The company also integrates environmental awareness training for local employees into its daily operations management, fostering the local dissemination of green practices and enhancing staff responsibility toward environmental sustainability.

4.19.3 Recommendations

Drawing on its experience in advancing digital and green aviation initiatives in Malaysia, China Eastern Airlines proposes the following recommendations:

1. **Establish a China–Malaysia Civil Aviation Policy Dialogue Mechanism:** Regular policy exchanges between the civil aviation authorities of both countries are recommended, focusing on key issues such as route approvals, airspace allocation, ground resource guarantees, and cooperation in green air travel.
2. **Enhance Coordination on Talent Visas and Labor Policies:** Streamline the approval process for long-term work visas for airline-assigned staff, thereby improving workforce allocation flexibility.
3. **Increase Support for Green Aviation Projects:** Provide policy guidance and fiscal incentives—such as tax breaks or subsidies—in areas including carbon-reduction initiatives, sustainable aviation fuel (SAF) promotion, and green airport construction, encouraging high-quality Chinese enterprises to establish operations in Malaysia.
4. **Adopt a Dual Approach to Cross-Cultural Management:** Combine localized practices with Chinese management experience. Avoid directly transplanting domestic models; instead, respect local religious and cultural customs, such as the observance of Ramadan in Muslim communities and traditional practices of Indian-origin groups, while adjusting operations accordingly.
5. **Promote a Policy–Technology Synergy Mechanism:** Work with government agencies and industry associations to align regulatory frameworks with green transformation efforts. Establish regular communication channels to prevent project delays caused by regulatory uncertainty.
6. **Leverage Systematic Green Flight Management Practices:** Introduce best practices such as fuel optimization, lightweight materials in aircraft, and carbon-emission monitoring systems, which can help airlines in emerging markets improve energy efficiency and reduce costs.
7. **Develop a Green Supply Chain Certification Mechanism:** Encourage the creation of local supplier certification standards for green operations, guiding the broader regional aviation ecosystem toward low-carbon development.
8. **Promote Green Culture and Public Awareness:** Utilize the airline’s brand visibility and frequent passenger engagement to spread the concept of “sustainable travel,” thereby complementing policy measures with public participation and awareness.

4.20 Chinese Enterprises' Common Challenges and Integrated Recommendations in Malaysia

Based on research and interviews with multiple Chinese enterprises operating in Malaysia, this report identifies a set of recurring challenges beyond firm-specific issues, as well as summarizes their contributions to green and digital ecosystem development. On this basis, it provides integrated recommendations to support future investment and operational decision-making.

4.20.1 Common Challenges

A review of the surveyed enterprises' operations in Malaysia reveals a number of representative and recurring challenges. These not only reflect the difficulties faced by individual firms in day-to-day operations but also highlight broader issues encountered by foreign enterprises within Malaysia's business environment:

1. Regulatory and Compliance Environment

Malaysia's legal and policy frameworks exhibit a degree of uncertainty in certain sectors. In practice, enterprises often face lengthy and complex approval processes, which raise compliance risks and operating costs. Furthermore, restrictions on foreign equity ownership and market entry in specific industries create significant barriers to entry.

2. Human Resources and Talent Structure

Highly skilled local talent remains scarce in certain specialized fields, making recruitment for technical or managerial roles difficult. At the same time, differences in cultural background, management philosophy, and work practices between Chinese and Malaysian staff pose challenges for cross-cultural team building and management.

3. Supply Chain and Operating Costs

Malaysia's supply chain ecosystem is not yet fully developed, leading to higher logistics and raw material costs. Foreign enterprises often have to balance policy-driven requirements with efficiency considerations when selecting partners, which further complicates operational decision-making.

4. Financial and Taxation Management

Enterprises generally face a heavy tax burden, while cross-border capital flows are subject to foreign exchange controls. Some firms also report limited access to local financing channels, particularly new entrants, which amplifies financial pressure.

5. Market Access and Competitive Landscape

Chinese enterprises in Malaysia often have relatively low brand recognition and customer loyalty. Market expansion and after-sales service capabilities need

strengthening. Meanwhile, local competitors frequently benefit from stronger policy resources and established relationship networks, intensifying competitive pressures.

6. Digitalization and Technological Transformation

While digital transformation has become an inevitable trend, some Chinese enterprises still face challenges such as insufficient local IT support, divergent standards for data security and compliance, and gaps in digital infrastructure. These issues hinder the pace of technological upgrading and digital ecosystem integration.

4.20.2 Contribution to Green and Digital Ecosystem Development

Despite the challenges outlined above, Chinese enterprises have actively advanced green development and digital transformation, generating a significant impact on Malaysia's socio-economic progress and industrial upgrading:

1. Driving Green Transition

By introducing clean energy, green manufacturing practices, and environmental protection technologies, Chinese enterprises have enhanced the sustainability of relevant industries and contributed to the improvement of Malaysia's green industrial ecosystem.

2. Advancing Digital Empowerment

In fields such as e-commerce, financial technology, and smart manufacturing, Chinese enterprises have introduced advanced digital expertise and management models, accelerating Malaysia's broader industrial digitalization.

3. Strengthening and Upgrading Industrial Chains

The participation of Chinese enterprises has driven improvements in supply chain management, operations, and technical services, thereby enhancing industrial collaboration and overall competitiveness.

4. Talent Development and Knowledge Transfer

Through training initiatives, localization efforts, and cross-cultural management practices, Chinese enterprises have played an active role in cultivating local talent and facilitating knowledge transfer.

4.20.3 Integrated Recommendations

Drawing on the challenges identified and the practical experiences of Chinese enterprises in Malaysia, this report proposes the following recommendations for Chinese companies already operating in or planning to enter the Malaysian market:

1. Policy Compliance and Risk Management

- Conduct systematic legal and policy due diligence in advance, and establish a comprehensive compliance management framework.
- Strengthen collaboration with local government agencies, industry associations, professional consultants, and legal service providers to enhance adaptability and compliance with local regulations.

2. Human Resources and Localization

- Invest in local talent development by exploring joint training programs with universities and vocational institutions.
- Place emphasis on cross-cultural communication and management training to improve integration between Chinese and Malaysian teams and enhance operational efficiency.

3. Supply Chain Optimization and Cost Control

- Build diversified supply chains to reduce dependency on single sources of supply.
- Actively participate in local industrial collaboration and establish mutually beneficial partnerships with Malaysian enterprises.

4. Finance and Capital Arrangements

- Optimize tax structures within the compliance framework to improve financial efficiency.
- Leverage Chinese financial institutions and bilateral cooperation platforms to expand financing channels and ease funding constraints.

5. Market Expansion and Brand Building

- Conduct in-depth research on local consumer needs and tailor products and services to fit the Malaysian market.
- Strengthen channel cooperation with local businesses to improve brand recognition and market reach.

6. Digitalization and Green Development Strategies

- Align with Malaysia's national strategies on digital economy and green transformation, and increase participation in these areas.
- Ensure data compliance while promoting the integration of digitalization and green development, and explore new low-carbon operating models.

In conclusion, the challenges faced by Chinese enterprises in Malaysia are widely shared, but they also present opportunities for growth in green and digital transformation. By adopting systematic strategies and phased implementation, Chinese enterprises can not only optimize their own development but also contribute to Malaysia's economic greening and digitalization, achieving mutual benefits and win-win outcomes.

Conclusion

As China–Malaysia economic and trade relations continue to deepen, Chinese enterprises rooted in Malaysia are playing an increasingly significant role in supporting the country’s green and digital economic development.

In the area of green development, Chinese enterprises have delivered tangible results and driven industrial transformation across multiple sectors, including the new energy vehicle industry, renewable and clean energy, sustainable infrastructure, green buildings and construction materials, green technology, green finance, green transportation, and green innovation. These efforts are helping Malaysia progress towards its national vision of becoming a net zero–carbon country by 2050.

In the field of the digital economy, Chinese enterprises have generated important achievements in the digital transformation of Malaysia’s key economic industries. Through advancements in artificial intelligence, telecommunications networks, digital infrastructure, smart cities, intelligent manufacturing, smart transportation, digital finance, digital education, digital healthcare, and innovative digital services, Chinese enterprises are empowering Malaysia’s long-term and sustainable digital economic growth.

By drawing on the practical achievements and innovative experience of Chinese enterprises in both the green and digital economies, Malaysia can better leverage and integrate these resources and advantages to accelerate economic transformation and industrial upgrading. This will enable the country to achieve “leapfrogging” development, rapidly build a comprehensive green and digital economic ecosystem, and enhance its capacity for technological innovation, thereby ensuring the realization of its sustainable development goals.

Reference

- [1]BERNAMA. Malaysia-China to Continue Boosting Economic, Trade Cooperation[N]. <https://www.bernama.com/en/news.php?id=2309231>, 19 June 2024.
- [2]Digital China Summit. Digital Achievements Unveiled at the Summit! Highlights of the 8th Digital China Summit. [N] https://www.szzg.gov.cn/2025/english/digitalnews/202505/t20250508_5015514.htm. Digital China Summit. 8 May 2025
- [3] Digital Cooperation Organization. The Digital Economy Trends 2025 [R] Saudi Arabia. Digital Cooperation Organization. 2024
- [4]Egamberdiyev Shavkatbek. Global Trends In The Green Economy. [J] Modern education and development. 2025. 19(4), pp. 26–30
- [5]Google, Temasek, and Bain & Company. e-Conomy SEA 2024 [R]. Malaysia. Google, Temasek, and Bain & Company, 2024
- [6]Khoo Wei Yang. What Household Connectivity Gaps Mean for a Digital Future [Z]. Kuala Lumpur: Khazanah Research Institute, VIEWS 51/24, 18 December 2024.
- [7]Lauri Myllyvirta, Qi Qin and Chengcheng Qiu. Analysis: Clean energy contributed a record 10% of China's GDP in 2024. [Z]. CarbonBrief. 19 February 2025. <https://www.carbonbrief.org/analysis-clean-energy-contributed-a-record-10-of-chinas-gdp-in-2024/>.
- [8] Lily Dai et al. Investing in the green economy 2025: Navigating volatility and disruption [R] London. London Stock Exchange Group plc. 2025
- [9] Malaysian Government. Malaysia and China Inks Mous in Economy and Trade, Digital and Green Economy; Effect Single-window Customs cooperation to Enhance Cross-border Trade[Z]. Malaysia. Ministry of Investment, Trade and Industry, Malaysia, July 2024.
- [10] Malaysian Government. National Energy Transition Roadmap [R]. Malaysia, Ministry of Economy,August 2023.
- [11] Malaysian Government. National Energy Policy 2022-2040 [R]. Malaysia, Economic Planning Unit Prime Minister's Department, 2022.
- [12] Malaysian Government. National Fourth Industrial Revolution (4IR) Policy [R]. Malaysia, Economic Planning Unit Prime Minister's Department, 2021.
- [13] Malaysian Government. Hydrogen Economy & Technology Roadmap [R]. Malaysia.Ministry of Science, Technology and Innovation,, 2023.
- [14] Malaysian Government. National Artificial Intelligence Roadmap 2021-2025 [R]. Malaysia, Ministry of Science, Technology and Innovation, 2021.

[15] Malaysian Government. National Energy Policy 2022-2040 [R]. Malaysia, Sustainable Energy Development Authority (SEDA), 2021.

[16] Malaysian Government. National Energy Efficiency Action Plan [R]. Malaysia, Ministry of Energy, Green Technology and Water, 2015.

[17] Malaysian Government. Green Technology Master Plan 2017-2030 [R]. Malaysia, Ministry of Energy, Green Technology and Water, 2017.

[18] Malaysian Government. National Green Technology Policy [R]. Malaysia, Ministry of Energy, Green Technology and Water, 2009.

[19] Malaysian Government. National Renewable Energy Policy and Action Plan [R]. Malaysia. Ministry of Energy, Green Technology and Water, 2010.

[20] Malaysian Government. Renewable Energy Act 2011 [Z]. Malaysia. Parliament of Malaysia, 2 June 2011.

[21] Malaysian Government. Malaysia Digital Economy 2024 [R]. Malaysia. Department of Statistics Malaysia, Ministry of Economy, December 2024.

[22] Malaysian Government. MyDIGITAL Catalytic Projects Programme Report[R]. Malaysia, My DIGITAL Corporation, February 2022.

[23] Malaysian Communications and Multimedia Commission (MCMC). First Cohort Graduation of Digital Leadership Excellence Programme [Z]. Kuala Lumpur: MCMC News, 18 February 2025.

[24] Malaysian Government. MyDIGITAL – Malaysia Digital Economy Blueprint [N]. Malaysia. Economic Planning Unit, 2021. From <https://www.malaysia.gov.my/portal/content/30998>

[25] Malaysian Investment Development Authority (MIDA). China-based ZTE to invest RM200m in Malaysia for development of innovation centres [N]. <https://www.mida.gov.my/mida-news/china-based-zte-to-invest-rm200m-in-malaysia-for-development-of-innovation-centres>, 9 April 2024.

[26] Malaysian Investment Development Authority. Chinese automotive giant Chery to invest RM1.4 billion in advanced energy-efficient vehicle (EEV) facility and R&D centre in Malaysia [N]. <https://www.mida.gov.my/press-release/chinese-automotive-giant-chery-to-invest-rm1-4-billion-in-advanced-energy-efficient-vehicle-eev-facility-and-rd-centre-in-malaysia/>, 6 October 2023.

[27] Malaysian Investment Development Authority. Automotive Industry in Malaysia – Sector Overview [R]. <https://www.mida.gov.my/industries/automotive/>, January 2024.

[28] Ministry of Investment, Trade and Industry, Malaysia. New Industry Master Plan 2030 [R]. <https://www.nimp2030.gov.my/>, 2023.

[29]Ministry of Investment, Trade and Industry, Malaysia. Speech by Deputy Minister Liew Chin Tong at the Launch of Chery OMODA E5 [N]. <https://www.miti.gov.my>, 7 March 2024.

[30]Ministry of Human Resources Malaysia. MoHR and Huawei launch first national TVET Learning Centre [Z]. Kuala Lumpur: MoHR Press Release, 27 February 2025.

[31]Ministry of Economy Malaysia. National Energy Transition Roadmap (NETR) [R]. Government of Malaysia, 2023.

[32] Roger Strukhoff, Global Digital Economy Report – 2025. <https://www.idc-a.org/insights/qUi9XgvyrzSkyDUy9Tqr>. 30 June 2025

[33]Sek-loong Tan et al. Economic Growth Opportunities in a Greening World. [Z] <https://www.bcg.com/publications/2025/economic-growth-opportunities-greening-world>. BGC. 16 January 2025

[34]Shi Dan, Zhang Qizi, Guo Chaoxian. Milestone Progress Achieved in the Transformation and Upgrading of China's Industries. [J] China Watch. April 2024. Vol. 4(7).

[35]Shuaizhen Li, Xing Wang, Tao Li, Unveiling the Digital Tapestry: A Review of Chinese and International Digital Economy Research, [J] Journal of Digital Economy.2025

[36]Sue Howe. Social Media Statistics for Malaysia [R]. Meltwater. <https://www.meltwater.com/en/blog/social-media-statistics-malaysia>, 3 May 2024.

[37]Telecom Review. Malaysia's Blueprint for AI Dominance in ASEAN [N]. <https://www.telecomreviewasia.com/news/interviews/4791-malaysia-s-blueprint-for-ai-dominance-in-asean/>, 3 February 2025.

[38]The Star. Tengku Zafrul: BRI Involvement Strengthens Malaysia-China Economic Partnership [N]. <https://www.thestar.com.my/business/business-news/2024/07/15/tengku-zafrul-bri-involvement-strengthens-malaysia-china-economic-partnership>, 15 July 2024.

[39]The Star. Tengku Zafrul: Chery's Investment Has Begun to Bear Fruit [N]. <https://www.thestar.com.my/news/nation/2024/03/22/tengku-zafrul-cherys-investment-has-begun-to-bear-fruit>, 22 March 2024.

[40]The Edge Malaysia. Chery to Build RM2.2bil EV Assembly Plant in Selangor [N]. <https://www.theedgemaalaysia.com/node/696496>, 24 January 2024.

[41]UNCTAD. The Digital Economy Report 2024. [R]. New York. United Nations Publications. 2024

[42]Xiao Y, Wu S, Liu ZQ and Lin HJ. Digital economy and green development: Empirical evidence from China's cities. [J] Front. Environ. Sci. 2023. 11: 1124680.

[43]Xinhua News. China unveils data on core industries of digital economy of 2023. [N]

https://english.www.gov.cn/archive/statistics/202412/26/content_WS676d4383c6d0868f4e8ee49d.html. Xinhua News. 26 December 2024

[44]Xinhua News. China becomes largest online retail market for 12 consecutive years [N].

https://english.www.gov.cn/news/202501/25/content_WS6794249ec6d0868f4e8ef269.html. Xinhua News. 25 January 2025

[45]Yan Liang. Green growth, high-tech gains and hard truths for China's economy [Z]. East Asia Forum. EAF special feature series. 21 January 2025. From <https://eastasiaforum.org/2025/01/21/green-growth-high-tech-gains-and-hard-truths-for-chinas-economy/>

Introduction to the China Enterprises Chamber of Commerce in Malaysia

The China Enterprises⁴⁵ Chamber of Commerce in Malaysia (CECCM) (*Malay: Dewan Perniagaan dan Perusahaan China di Malaysia*) was established in 2002 as a legally registered, non-profit business association in Malaysia.

CECCM brings together a broad spectrum of member companies spanning infrastructure, finance, manufacturing, telecommunications, and energy, reflecting its wide representation and strong industry influence. Guided by its mission to promote the healthy and orderly development of Chinese enterprises in Malaysia, the Chamber actively safeguards members' legitimate rights and interests, advocates for a fair and transparent business environment, and serves as a vital bridge for bilateral economic and trade engagement.

The Chamber's core objectives include enhancing communication and cooperation among Chinese enterprises in Malaysia; fostering mutual understanding and trust with Malaysia's business community; expanding bilateral trade and investment channels; and providing guidance for compliance and fair competition through coordination mechanisms. When members encounter major operational challenges, CECCM acts as a collective representative, engaging with relevant stakeholders to protect and advance shared interests.

Over the years, CECCM has maintained close collaboration with the Embassy of the People's Republic of China in Malaysia, various Malaysian government ministries and agencies, as well as local industry associations and business chambers. By building robust platforms for government–enterprise dialogue, business-to-business cooperation, and cross-border exchanges, the Chamber has played an active role in deepening China–Malaysia economic and trade relations. At the same time, CECCM provides essential information services and facilitation support for Chinese enterprises seeking to invest in Malaysia, and for Malaysian institutions and individuals aspiring to expand their business footprint in China.

⁴⁵ China enterprises” refers to companies or institutions that are funded, controlled, or majority-owned by legal entities or citizens of the People's Republic of China

Copyright Information

Report Title:

Report on the Practices and Achievements of Chinese Enterprises in Co-Building Green Development and the Digital Economy in Malaysia (2024–2025)

Issuing Institutions:

Joint Conference of Chinese Overseas Chambers of Commerce (JCCOCC)
China Enterprises Chamber of Commerce in Malaysia (CECCM)

Content Editing Unit:

Southeast Asia Research Centre for Humanities (SEARCH)

Publication Date:

September 2025

Edition:

First Edition

Copyright: © 2025 China Enterprises Chamber of Commerce in Malaysia

Address:

Level 10, CCCC Tower, Corporate Tower 8, Pavilion Damansara Heights,
No. 3, Jalan Damanlela, Bukit Damansara, 50490 Kuala Lumpur, Malaysia

Telephone: +6012-578 1449 / +6012-545 1449

Email: admin@ceccm.com.my

Website: www.ceccm.com.my

This report is jointly issued by the China Enterprises Chamber of Commerce in Malaysia together with relevant institutions, and compiled by the Southeast Asia Research Centre for Humanities. Without prior written consent from the copyright holder, no organization or individual may reproduce, reprint, excerpt, distribute, or use this report for commercial purposes in any form. Any citation of the report's content, data, or charts must clearly indicate the source, and must not distort or alter the original meaning.

All third-party materials cited in this report are duly referenced and are provided for reference only. The content of this report reflects the analysis and judgments available at the time of writing. The issuing institutions shall not be held liable for any direct or indirect consequences arising from the use of this report.

For authorization requests or further information regarding this report, please contact the China Enterprises Chamber of Commerce in Malaysia.