PENANG

SEED

Strategy for Economic Ecosystem Development

PENANG 2030

PENANG

SEED

Strategy for Economic Ecosystem Development

2023 - 2028

Whilst every care has been taken in the preparation of this document, the Penang State Government cannot be held responsible for any inaccuracy. All information is correct at the time of preparation.
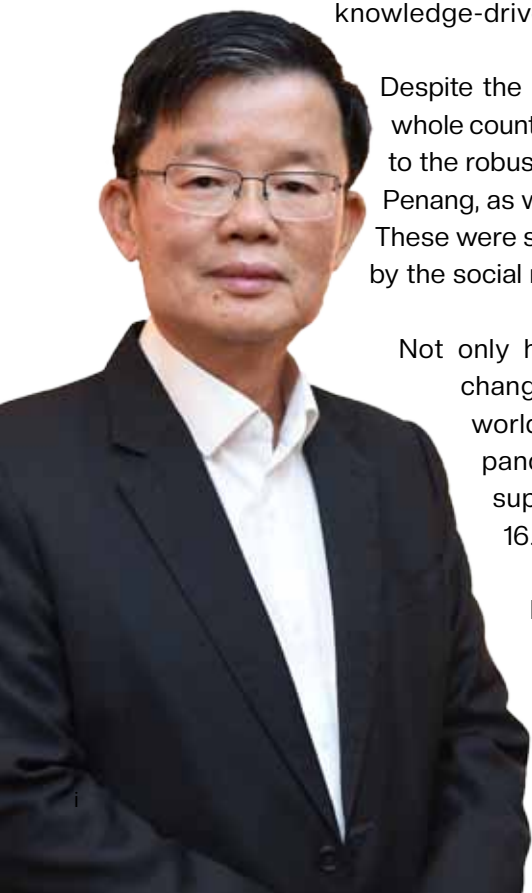
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Preface

MY ADMINISTRATION IS pleased to introduce to the public the Strategy for Economic Ecosystem Development (Penang SEED). It is our response to the new socio-economic reality we live in. Penang SEED builds on the foundation of the Penang2030 vision for a family-focused, environmentally-aware and technologically driven state to achieve dynamic, equitable and inclusive prosperity. The Strategy is formulated with the realisation that resilience to crises and the proactive management of risks are vital to the socio-economic well-being of the people of Penang.

Penang SEED emphasises the role of talent, infrastructure and transport in catalysing Penang's dynamic economic ecosystem. The idea is to place Penang firmly on the trajectory towards a high-income and knowledge-driven economy.

Despite the Covid-19 pandemic and the political uncertainties that hit Penang and the whole country in early 2020, Penang has managed surprisingly well. This was mainly due to the robustness of the manufacturing ecosystem, the diversity of economic activity in Penang, as well as the commitment of civil society organisations and society as a whole. These were supported by the various arms of the Penang State Government and buoyed by the social responsibilities shown by many companies in Penang.

Not only has Penang survived the tribulations of the last three years, but the changing geopolitical situation and shifts in supply chain alignments in the world have also favoured it. Penang's economy rebounded well from the pandemic, outpacing growth of all other states in Malaysia in 2021. This was supported by bullish growth in the manufacturing sector, which experienced 16.5% growth in E&E output.

Penang's standard of living continues to rise amid this strong recovery, with its GDP per capita growing by about 8% to RM59,685 between 2019 and 2021. The labour market has gradually normalised to pre-

pandemic levels, with the unemployment rate moderating to 2.3% in the last quarter of 2022. The recently approved LRT project and conditional approval of Penang Silicon Island will add to Penang's growth momentum.

Indeed, Malaysia, especially Penang, is now playing a more geopolitically strategic role in the Chips War that has reshaped global E&E supply chains. Despite the pandemic, there has been an encouraging rise in approved Foreign Direct Investments into Malaysia, targeting Penang. However, the state remains cautious about the subsequent impacts in our region of the massive job cuts carried out on the US tech market.

As a response to the evolving socioeconomic landscape, Penang SEED is a whole-of-society strategy meant to improve the quality of life of the people in Penang. It extends the Penang2030 approach and continues to enhance ties between the State Government and its people, federal agencies, local councils and industry through placemaking, community building and industry engagement initiatives.

Penang's economic future depends on empowering every Penangite to build collaborative relationships with their communities, the region and the world at large. It calls for a revitalised growth agenda that enhances the resilience of Penang while lifting all boats with the rising tide that is Penang's economy. Penang SEED is conceived to guide and facilitate them on this journey.

Lastly, I would like to thank Penang Institute for its help in preparing Penang SEED. I am also most grateful to the various state agencies whose invaluable feedback has been essential to this project, in particular InvestPenang for serving as its strategic partner.

I am convinced that Penang SEED will accelerate the economic development of the state, and I invite every Penangite to join the government in this endeavour. Working together, we can sow the seeds for a prosperous and exciting future.

YAB Chow Kon Yeow
Chief Minister of Penang

Introduction

The Penang Strategy for Economic Ecosystem Development (henceforth Penang SEED or "the Strategy") adopts a comprehensive approach and repositions Penang's economy to achieve greater growth momentum over the next five years. It highlights Penang2030's Theme B: Upgrade the Economy to Raise Household Incomes. This five-year plan spanning from 2023 to 2028, charts short and medium-term measures to address the key economic challenges faced by industries, workers, civil servants, young children and senior citizens, as well as the international community.

Penang's transformational journey has solidified its position at the forefront on the map of the global manufacturing supply chain in the electrical and electronics (E&E) industry, despite being the second-smallest state in Malaysia. Anchored by the Eight Samurai — pioneering companies from the US, Germany and Japan, with more than 50 years of manufacturing excellence, Penang has evolved from export-led manufacturing in the 1970s to today's value-creating export manufacturing, which has driven down a historically double-digit high unemployment to a consistent record of full employment. The state's GDP per capita multiplied by 59 folds from RM987 in 1970

to RM58,527 in 2021, a rate higher than the national average of 48 times. These remarkable achievements were guided by the second Penang Master Plan (or The Nathan Report), along with committed initiatives by and collaborations between industry players, the state and federal governments, scholars and researchers, and civil society organisations.

More recently, the state's economy recovered stronger than many would have expected from the Covid-19 pandemic, despite geopolitical uncertainties and national political challenges. But while Penang may have achieved the country's highest GDP growth rate in 2021, the state is at a critical juncture where it has to rethink its catalytic growth agenda and re-examine existing economic strategies. There is a need to align local policies to meet present global headwinds, and benchmark them against the national development agenda, local needs and the experiences of other countries; Penang needs to embark on bold and renewed pathways to steer the state through the challenging future and attain sustainable economic development for its people.

Penang SEED therefore takes on a whole-of-society approach to address urgent challenges in the talent pipeline, infrastructure resilience and the transport and logistics services; these are important in how they affect the key economic drivers in the state, i.e. the manufacturing sector, tourism, business services and agriculture. The development of *key policy enablers* has been assessed based on the state's economic performance, and in consultation with key stakeholders.

To accelerate the development of the different economic sectors in 2023-2028, Penang SEED examines the following questions:

01 How will Penang's socio-economic landscape be like by 2028?

02 What are the driving forces for Penang's future economic development?

03 What segments in Penang's economic ecosystem offer significant opportunities for economic advancements?

04 What strategies are needed to address these challenges across key economic drivers?

05 How can we navigate and take full advantage of opportunities generated by global events?

06 How do we build economic resilience that protects the well-being of the people in Penang?

Accelerating Penang's Growth Momentum

Policy Framework, Scope and Coverage

Policy Framework

The Strategy focuses on Theme B of Penang2030, with supporting measures addressing critical development enablers, namely talent and skills development, infrastructure resilience, and transportation and logistics. These enablers are developed to advance the growth of the key economic sectors identified under the overarching Theme B sectors, namely (1) Manufacturing, (2) Tourism, (3) Creative industries and niche business services, and (4) Agriculture. Apart from Penang2030, the Strategy seeks alignment with major national policies such as the Twelfth Malaysia Plan 2021-2025 and other key federal policies such as the National Policy on Industry 4.0 – Industry4WRD.

Penang2030
Strategic
Sectors

Manufacturing
Advance readiness of local manufacturing for the digital age and the green economy

Tourism
Create a variety of quality tourism products across the island and mainland

Creative industries and niche business services
Foster an ecosystem that nurtures creative industries and niche business services

Agriculture
Modernise and diversify sustainable agriculture

State government policies and policy discussions, including deliberations at the Penang Socio-Economic Recovery Consultative Council (PSERCC) held throughout the pandemic period, are used as the main references in the preparation of the Strategy.

Additionally, the Penang Regional Industrial Support Measures (PRISM), a set of targeted actions developed at Penang Institute, is an integral part of the Strategy. Other reference materials include investment strategies, the state of ESG practices, and industry-related information as shared by InvestPenang[1]. This Strategy considers the policy challenges raised by state agencies, industry associations, businesses, companies and individuals to ensure participation of key players and the feasibility and relevance of the measures.

For ensuring resilience and growth, three policy enablers have been identified by the State to encourage synergy across industries and strengthen the economic ecosystem in Penang. These enablers consider the interconnectedness of all economic sectors and national economic policies across multiple authorities and agencies.

1   InvestPenang is elected as Strategic Partner for Penang SEED.

Framework of Penang SEED 2023-2028
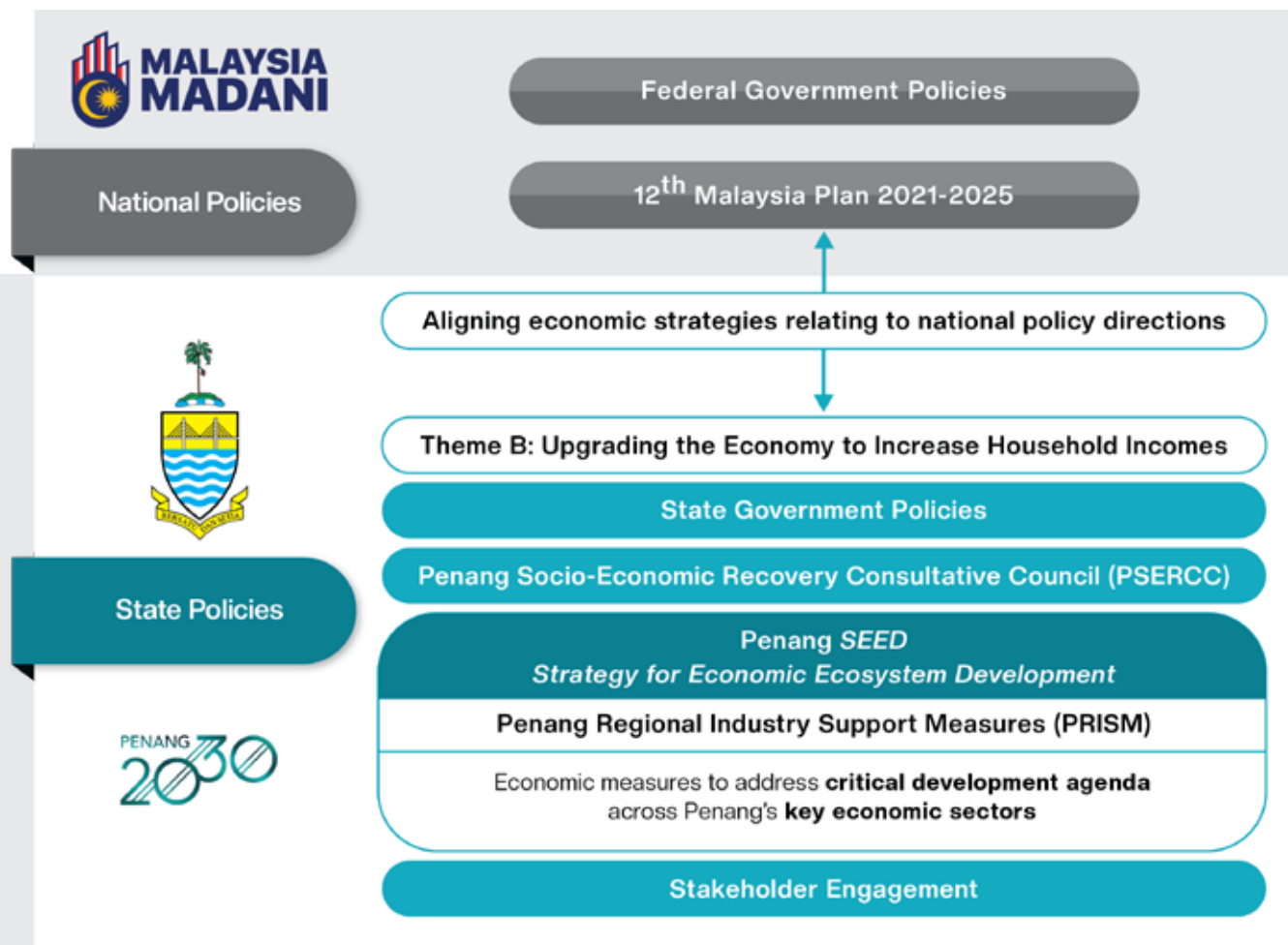
Scope and Coverage

The key policy enablers are identified based on previous studies, interviews and stakeholder engagements. These enablers will define and develop Penang's future economic ecosystem through the Strategy.

Penang SEED policy enablers

Talent pipeline, skills and development

Investing in our people

- Enhance skills matching
- Develop new skills
- Support mid-career transition

Infrastructure resilience

Support for businesses

- Enhancing quality of life
- Rejuvenate utility and spatial efficiency

Transport and logistics

Scaling up the services sector

- Improve public transportation, road and traffic conditions
- Enhance the delivery of logistic services

Penang2030 identifies four strategic economic sectors, and Penang SEED expands on these to provide a more comprehensive vision for achieving Theme B: Upgrading the economy to increase household incomes, and as guidance in charting the next phase of growth.

Summary of Penang SEED sectoral measures

| Penang2030 Strategic Sectors	Penang SEED Strategies	Penang2030 Strategic Initiatives
Manufacturing	**Advancing the manufacturing sector towards high-value manufacturing** To grow Penang's manufacturing output, widen high value-added activities, and for Penang to become a global business, innovation and talent hub for advanced manufacturing.	Advance readiness of local manufacturing for the digital age and the green economy
Tourism	**Strengthening the competitiveness of sustainable tourism** To diversify tourism products and services, create unique tourism offerings through supporting local trades, develop the skills of hospitality workers, generate a collaborative system of partnerships for Penang to become a leading destination for sustainable tourism.	Create a variety of quality tourism products across the island and mainland
Creative industries and business services	**Nurturing creative industries and business services with enhanced digital capabilities** To build and sustain a vibrant ecosystem of creative enterprises and start-ups in Penang that are future-ready and globally competitive in innovation and digitalisation.	Foster an ecosystem that nurtures creative industries and niche business services
Agro-based and agritech	**Boosting agricultural resilience, growth and productivity** To raise agricultural productivity, increase mechanisation of agricultural processes and diversify measures to protect plants from pests and diseases and to enhance food and nutrition security.	Modernise and diversify sustainable agriculture
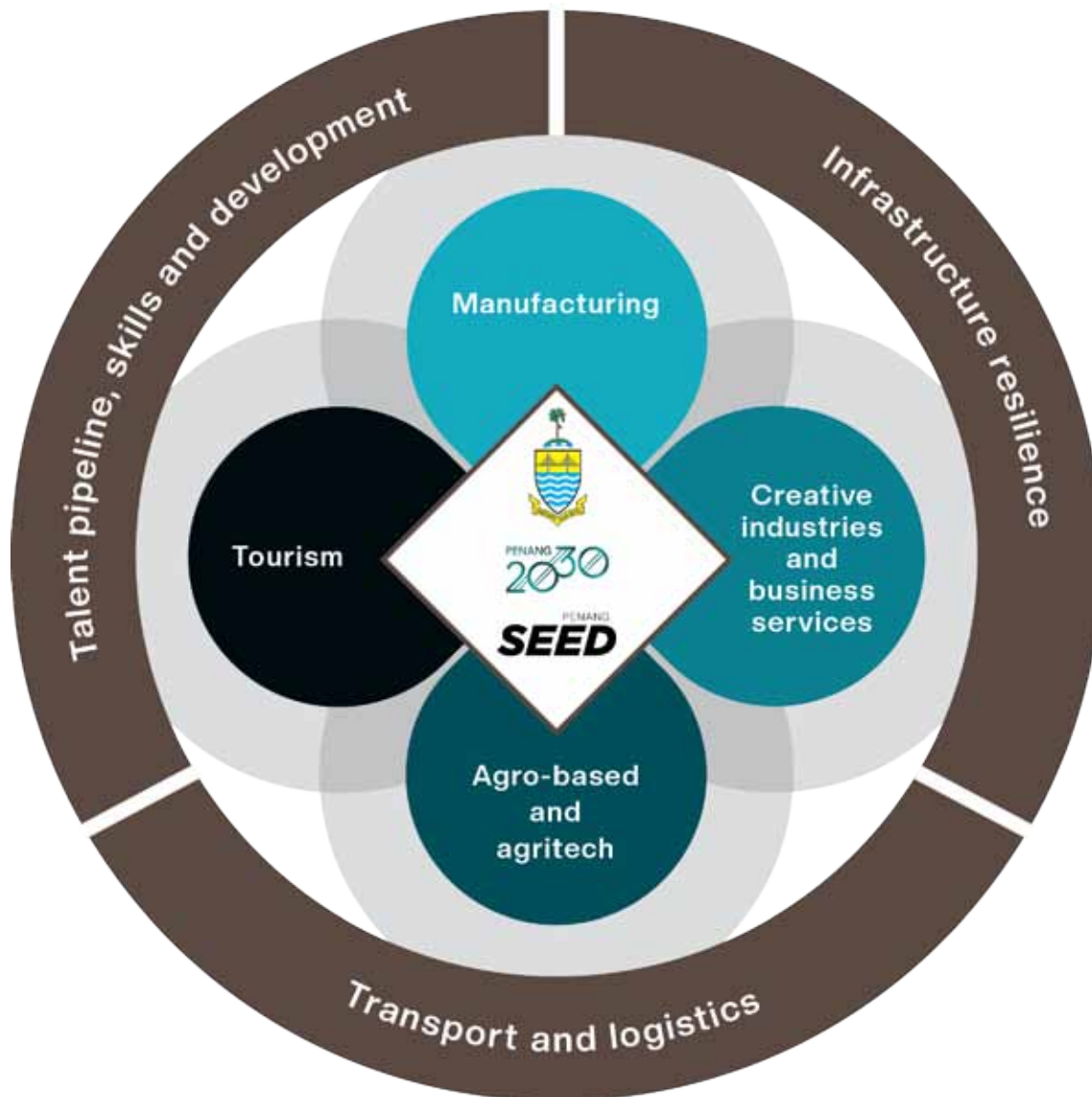
Structure of Penang SEED:
Policy Enablers and Key Economic Sectors

Charting Penang's economic trajectory

Penang's socio-economic landscape, mega-trends and potential impacts

Socio-economic landscape

Gross Domestic Product (GDP)

Penang contributes **7.1%** to Malaysia's overall GDP

GDP per capita stands at **RM59,685** 2021
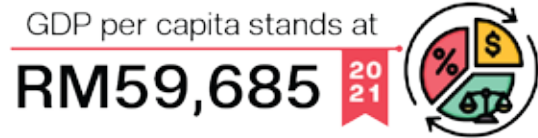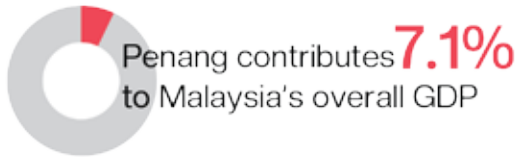
Penang's **GDP** registered the highest growth rate in Malaysia (6.8%, 2021), underpinned by the strong growth in the **manufacturing** sector, particularly in **E&E**.
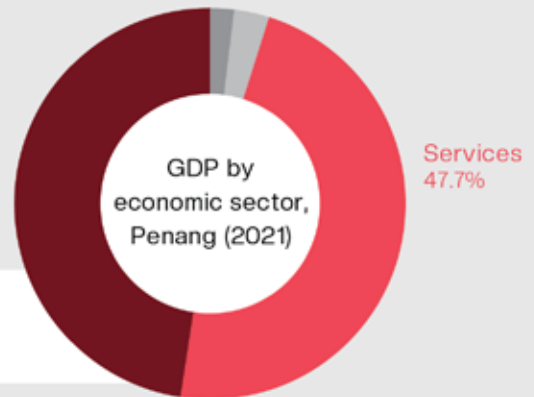
Over 95% of Penang's economic output is in manufacturing and services

Manufacturing 47.6%

Services 47.7%

GDP by economic sector, Penang (2021)

Penang's **GDP per capita** is the fourth largest in Malaysia (2021), with an 8.1% increase from the pre-pandemic level in 2019. (RM55,202)

RM47,439 Malaysia

59,685

Kuala Lumpur   Labuan   Sarawak   Penang

18.7% higher than national GDP per capita
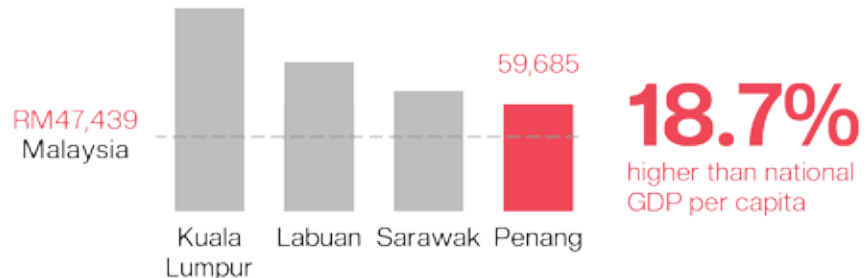
Share of Penang's GDP by sector (2015 constant prices, %)

The **services** sector rebounded from the pandemic shock and is expected to gradually outpace the **manufacturing** sector by 2025.

services

manufacturing

49.8%

45.7%

2025
12th Malaysia
Plan targets

2014　2016　2018　2020　2022　2024　2026

5.4%

3.5%

Actual
(2016-20)

Target
(2021-25)
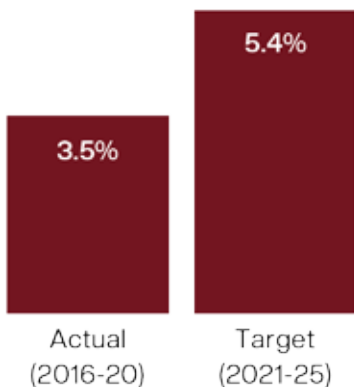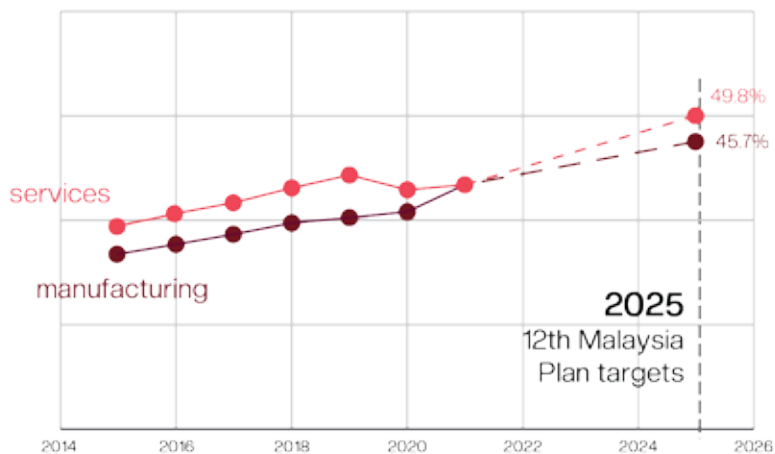
The **12th Malaysia Plan** expects economic growth in Penang to accelerate

*average annual growth rate

23

External Demand

Penang's exports make up **nearly 30%** of Malaysia's exports, with **Penang International Airport** alone making the largest export channel in Malaysia.

29.1% (2022)

RM 387 billion

Bayan Lepas | Pelabuhan Klang | Tanjung Kupang | Bintulu | Pasir Gudang
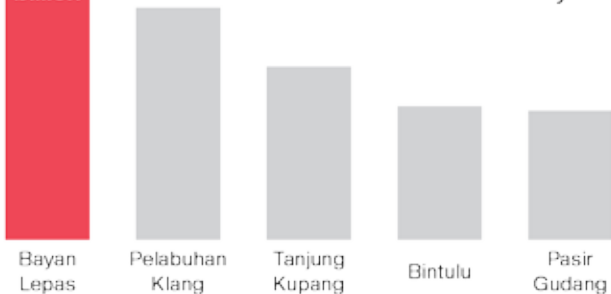
Penang's **exports** have enjoyed robust growth on the back of reshoring driven by US-China trade tensions

RM 452bil (2022)

RM 291 bil (2019)
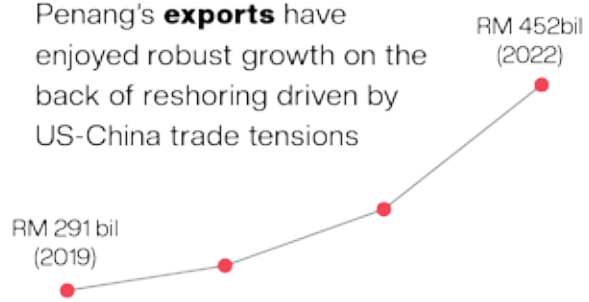
Manufacturing

Penang has been contributing a growing share of Malaysia's manufacturing output at **13.9%** (2021)

12.9% (2018)

Penang's **manufacturing** sector bounced back from Covid-19 recording **12.4%** growth in output (2021) in response to a global chip shortage driven by
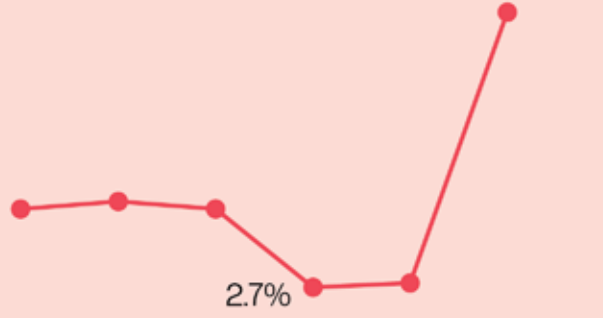
2.7%

- increased costs
- the 5G transition
- demand for consumer electronics

Electrical and electronics
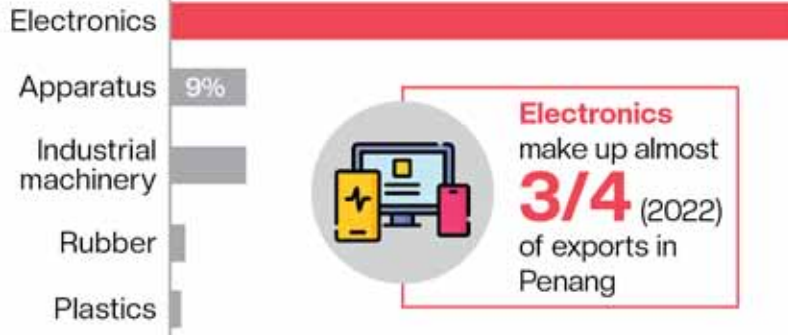
Electronics make up almost **3/4** (2022) of exports in Penang

Electronics

Apparatus 9%

Industrial machinery

Rubber

Plastics

RM218,817
value added per employee (2021)

Johor | Melaka | Selangor | Penang | Kedah
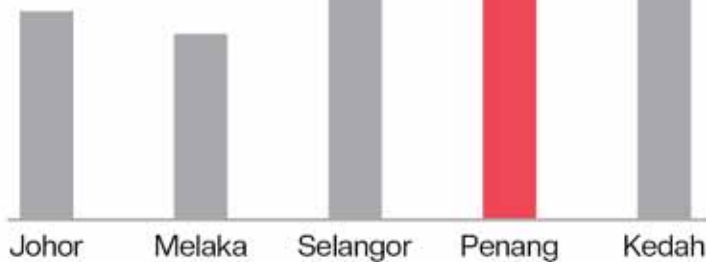
69.3% (2021)
of Penang's manufacturing GDP

75.7% (2018-2022)
of approved manufacturing investment

157,827 (2021)
employees

25

Services

The services sector contributes more than **45%** of Penang's GDP growing by 2.1% in 2021, while the wholesale trade and retail, food & beverage and accommodation subsector contributed **30.3%** (2021) of GDP from services.

The tourism sector has been recovering rapidly following the reopening of domestic and international borders over the last two years.

Total air passengers (excluding transit) handled by selected airports (millions), quarterly basis

Mar 2020
Movement
Control
Order (MCO)

Oct 2021
Lifting of
international
travel ban

KLIA2

KLIA

Penang International Airport

Langkawi

KLIA

KLIA2

Volume of
passengers surged
across all airports

PEN

LGK
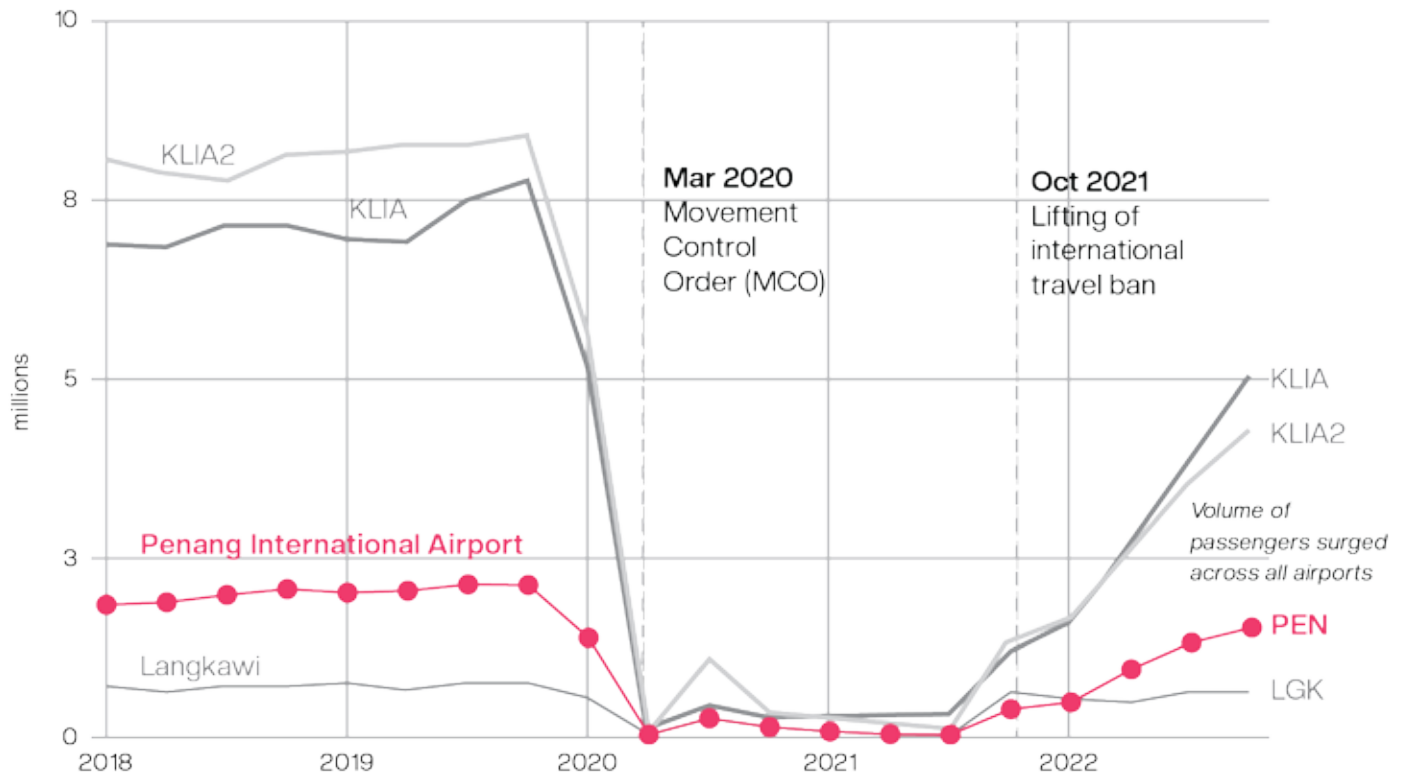
Source: Ministry of Transport, Malaysia

Income

Wages in Penang managed to recover to pre-2020 levels
Mean and median wage (RM), Penang, 2010-2021
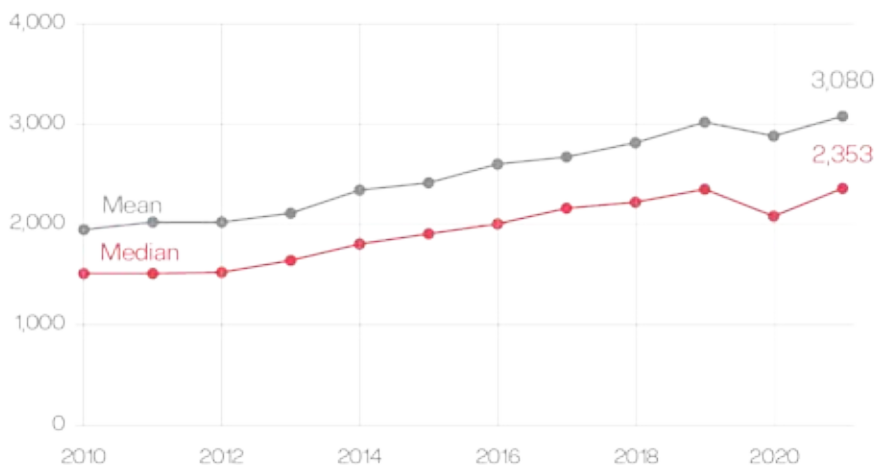
Share of household income across income groups, Penang

The bottom 40% (B40) of households receive **under 20%** of Penang's total household income share, while the top 20% (T20) receive **over 40%** of total household income share

RM6,169
Median household income, Penang (2019)

By income group

RM3,631
B40

RM7,264
M40

RM14,002
T20

Inflation

Percentage change in Consumer Price Index, Penang, January 2019 - January 2023 (YoY), %

Inflation has been driven by higher consumer expenditure coupled with higher commodity prices, new minimum wage policy and special EPF withdrawals.

May 2020
First round of EPF withdrawal (i-Lestari) payments commence

Feb 2022
War in Ukraine

May 2022
Minimum wage raised to RM1,500
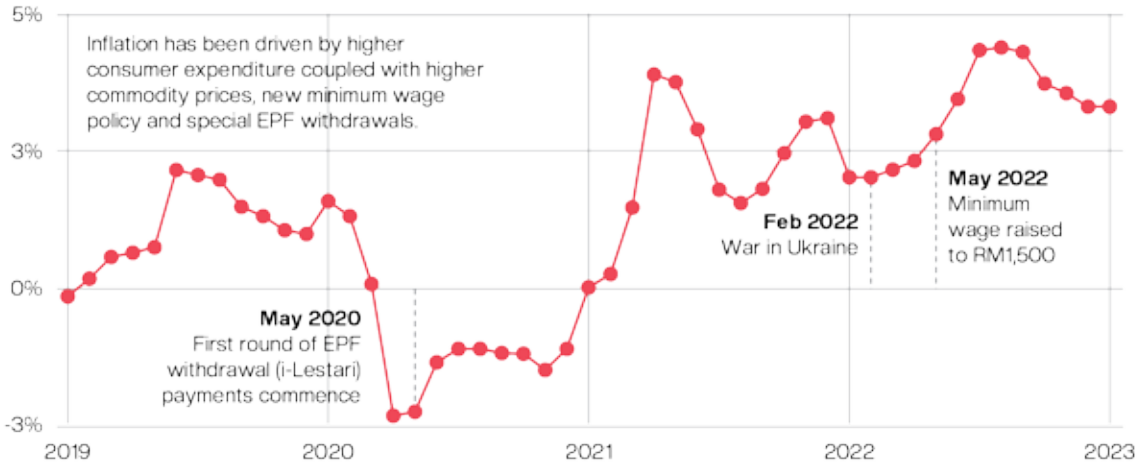
Life satisfaction and wellbeing

Penangites are generally happy with the quality of life in Penang
A high percentage of them feel satisfied with their liveability, social and economic wellbeing.

Legend: ■ Happy ■ Narrowly happy ■ Unhappy

Category	Happy
Liveability and social wellbeing	79.3%
Economic wellbeing	79.1%
Freedom and governance	78.2%
Environment sustainability	76.1%

Labour Force

Doubling in share of elderly population projected by 2028

Share of population by age group, Penang, 2021 and 2028

73%

Shrinking share of **working-age population** reduces fiscal space for aged care welfare

68%

Share of **elderly population** (65+) to double by 2028

7%

14%

2021   2028*
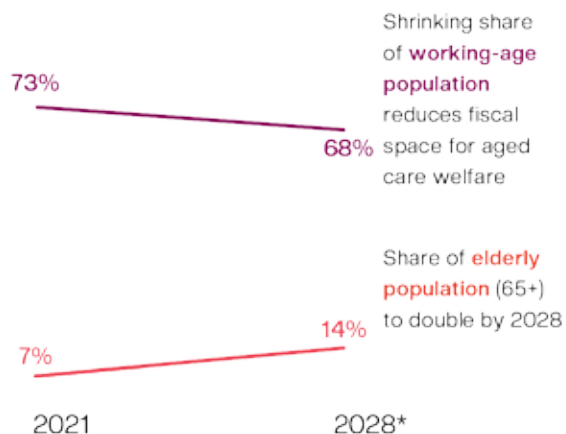
Penang's labour force grew by >20k between 2020 and 2021 while population remained constant.

Labour force, Penang ('000)

889.5

863.4

852.3

849.4

841.1

2017   2018   2019   2020   2021
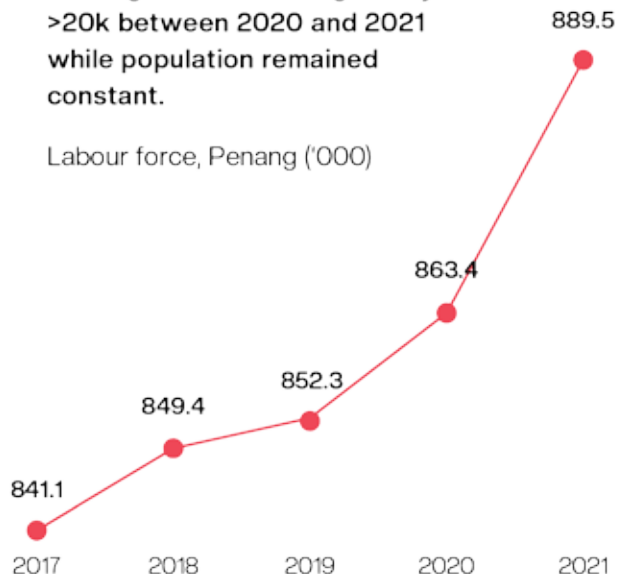
Penang's employment has a greater share of tertiary-educated persons when compared to Malaysia.

Share of employed persons

	Tertiary	Secondary	
Penang	34%	Secondary	
Malaysia	32%		
Johor	28%		
Selangor	38%		
Kuala Lumpur	54%		
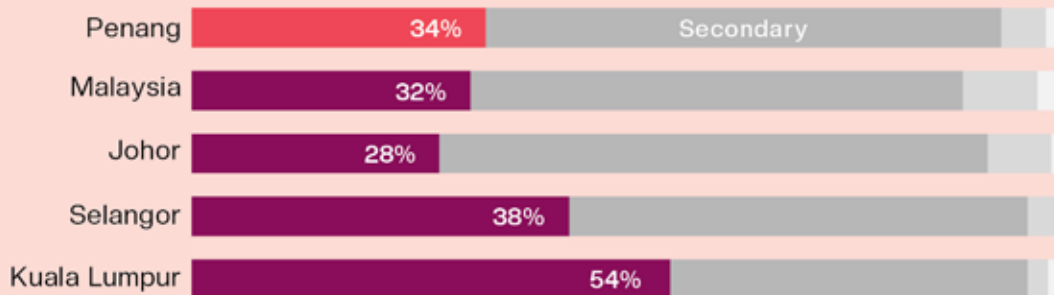
Penang's unemployment rate improved significantly, easing at a faster pace than Malaysia.

Unemployment rate, %

5.1
4.7
4.3
4.0
3.3
1.9
2.1
3.6
2.3

The rate has gradually declined to pre-pandemic levels, and the economy has maintained full employment.

2019   2020   2021   2022
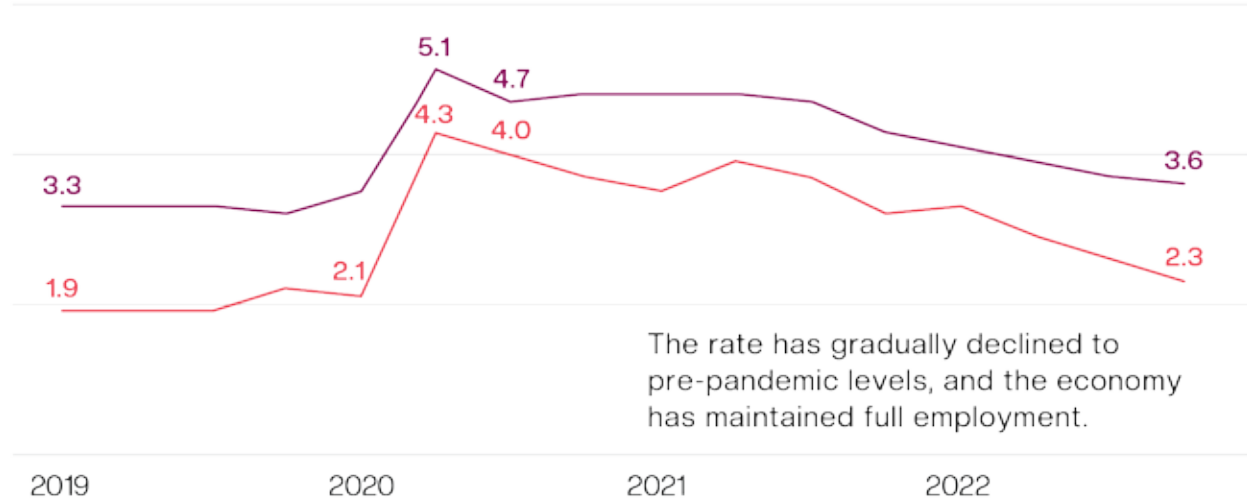
Labour force participation in Penang, male vs female, 1982-2021

While the gender gap in labour force participation has shrunk over time, a persistent 25-point gap remains

Male   82.7%
Female   56.6%

80%
60%
40%

1980   1990   2000   2010   2020
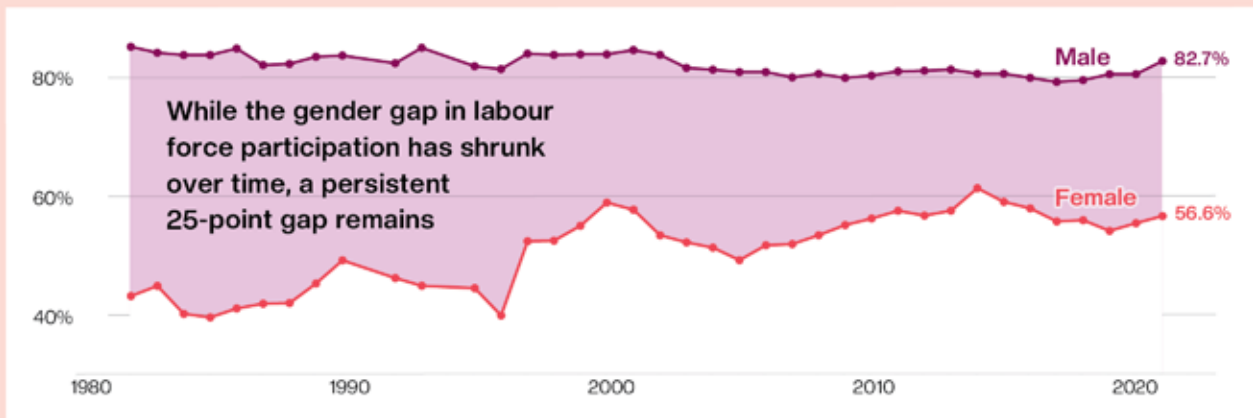
Megatrends and potential impacts

As Penang's economy is highly reliant on global economic and political tailwinds, it is essential to understand the impact of the changing geopolitical landscape on the state's economic development. Designing an economic plan that anticipates uncertainties can help the state prepare well for an unpredictable future. This is especially needed in the short-to-medium term. The potential impact of current economic, technological and social trends in the international and domestic environment on Penang's economic development is presented in the following diagram.

Megatrends	Potential impacts	
	Best-case	Conservative
Economic • Geopolitical uncertainties • US-China trade tensions • Covid-19 pandemic • Russia-Ukraine war • Demand for E&E products • Cost cuts/layoffs in the US/global tech companies	• More inflows of foreign and domestic investments • Improved business opportunities for local companies due to supply chain relocation • Rising consumer demand for tourism activities post-pandemic • Heightened capacity building for the semiconductor supply chain • Better diversification of local supplier network • Penang strengthens its role as a neutral and business-friendly destination despite US-China tensions • Repositioning of production facilities and suppliers closer to customers	• Disruption of manufacturing supply chains, e.g. shortages of minerals used in advanced technologies • Increase in production costs • Supply bottlenecks in meeting demand for electronics products • A resurgence of Covid-19 cases • Rise in retrenchment in the high-tech manufacturing • Overhiring of personnel • Deglobalisation leads to fall in offshoring • Persistent inflationary pressures • Outsized labour costs • Slow structural transformation

Megatrends	Potential impacts	
	Best-case	**Conservative**
Technological • Chips war • The rise in EV demand • Deglobalisation • Innovation gaps • Digitalisation and IR4.0 • Talent gaps	• Investment expansion including the EV and semiconductor sectors • Thriving creative, innovation and entrepreneurial environment • Stronger supporting SME ecosystem for manufacturing services • University and industry linkages that enhance innovation systems • Upskilling of low-skilled labour and reskilling of workers • Deployment of EV ecosystem through government incentive and facilitation • Increase in total factor productivity growth • Increase in investments in R&D for IR4.0; surge in smart factories • A holistic education and learning ecosystem that produces a highly skilled and adaptable workforce • Automation and robotics replace low-skilled labour • Rising demand for high-skilled and knowledge-intensive workers • Increase in future-proof graduates • Capitalise on emerging green industries for growth e.g. agri-tech, photovoltaics, carbon capture	• Rise in protectionism • Slow progress in technology innovation • Electricity grid capacity struggles to cope with rise in demand from electrification of cars and industry in general • Low innovation and patenting activities • Undersupply of workforce and inadequate skillsets • Stronger domination of low-skill activities • Moderated competitive advantage in technology advancements • Unexpected seismic changes in manufacturing supply chain ecosystem

Megatrends	Potential impacts	
	Best-case	Conservative
Social and Environment • ESG practices • Generational gaps • Stagnant population growth • Gender pay gaps • Sustainable Development Goals (SDGs)	• Public-private partnerships, social enterprises and innovations take the lead to address society needs • Higher digital literacy among senior citizens and youths • Social mobility improving across all segments of society - diverse, inclusive and fair workplaces and job markets • Implementation of Competency, Accountability and Transparency (CAT) in government policies and corporate practices • Companies with better ESG metrics deliver higher returns on equity, lower risk and a lower cost of capital • Changes in workplace policies that support women and families • Penang improves its status as a preferred destination for skilled migration • Green innovations reduce energy, waste, resource use and water consumption as well as carbon footprint, and improve business efficiency • Societal risks relating to emerging technologies such as artificial intelligence are adequately managed while displaced workers are successfully reskilled and redeployed	• Challenges to food security e.g. surge in fertilizer costs • Social welfare of workers may drop, e.g. through low wages, employment disputes, retirement savings • Aging population exerts fiscal pressures on social safety nets • Need for social safety nets for vulnerable families and individuals experiencing urban poverty • Vulnerability of women in unemployment may increase due to employment and societal pressures • Efforts at reducing material consumption, recycling, using eco-friendly materials and reducing water waste and pollution • Challenges from changes in climate e.g. water scarcity, heat and flooding • Rise in air pollution, traffic congestion and urban heat island effect due to increasing number of motor vehicles • Artificial intelligence and other emerging technologies permanently displace workers, bringing unmitigated societal impacts, e.g. bias and discrimination, privacy invasion, disinformation, etc. • Technological changes create insurmountable generational gaps

Snapshot of socio-economic targets

Socio-economic targets are projected using the available time series data published by federal government departments. Adjustments are made by benchmarking the projections with national data and local economy capacity. Three hypothetical scenarios are examined to project the key economic indicators for the next five years. These scenarios are classified based on conservative, reference and best-case situations as explained in the previous section. The definition of the scenarios is presented below.

Conservative scenario

In this scenario, Penang is unfavourably impacted by global economic development. With limited significant policy changes domestically, Penang relies on its past successes and policies to drive economic development. Without immediate intervention from the state and federal governments, the population, labour force, exports, technological progress and industrial structure constrain the state's capability for expansion and diversification.

Reference scenario

This is the benchmark 'business-as-usual' scenario providing a comparable frame of reference to other situations, where the policy interventions and institutional reforms remain in place, and using the existing resources.
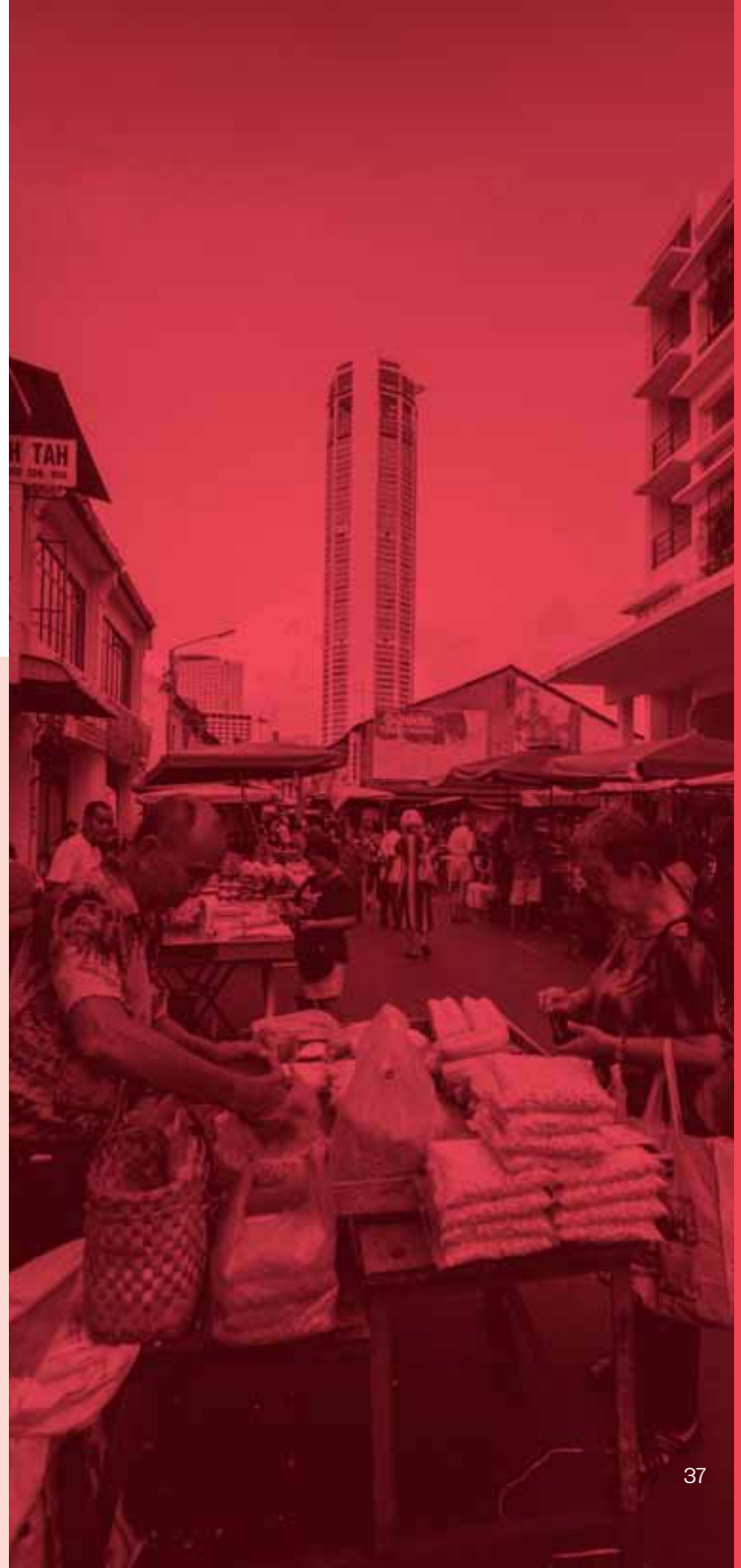
Best-case scenario

This is the optimistic outlook where Penang continues to command interest and attract high-value investments to the state, positioning it as a fierce regional competitor in talent and technological development. Policy interventions are available and accessible to all, each layer of society is projected to benefit socially and economically. Tripartite linkages between government, civil society and industry will strengthen to continue building progressive and dynamic economic resilience in the next five years.

According to the Twelfth Malaysia Plan 2021-2025, Penang's GDP is targeted to reach RM120 billion by 2025, with an average annual growth rate of 5.4%. Penang Institute estimates that under normal circumstances, GDP will grow at an annual rate of 4.4% from 2023-2028. Since Penang's economy is interconnected with global events, under the conservative scenario, the worst-case GDP projection is a growth of 3.5% annually, while under the optimistic outlook, GDP is predicted to expand by 5.8% annually.

Projected key indicators for Penang based on three scenarios, 2023-2028

Key indicators	Conservative	Reference	Best-case
GDP growth (Compounded Annual Growth Rate-CAGR)	3.5%	4.4%	5.8%
Annual approved manufacturing investment	RM3 billion	RM6 billion	more than RM10 billion
Engineers, technicians and IT professionals needed by 2026	*	9,841 persons	*
Annual employment growth (CAGR)	0.6%	0.8%	1.4%
Annual median salaries and wages growth (CAGR)	*	4.6%	*

* The data is insufficient to make a projection

Developing policy enablers

Trends, issues and strategies

Investing in our people

Talent pipeline, skills and development

Rapid technological change and advancements in automation technology call for a whole-of-society approach to talent development and acquisition that is both adaptive to and anticipatory of skill requirements.

The Penang State Government has played an integral role in bridging the skill requirements of the industrial sector and the offerings of the education sector. This role is important for closing skills gaps and remedying skill deficiencies in the labour market. The State has also begun to facilitate the involvement of the private sector in Penang's schools, alongside supporting alternative pathways to the workforce, particularly the vocational education model. Besides building local talent, supporting labour mobility can improve talent matching with skill profiles and job preferences across Malaysia.

For policymakers to make informed decisions, a systematic approach is needed to monitor labour and skills shortages and bring together local and federal authorities.

MAJOR CHALLENGES

Labour market intelligence

- Assessing talent requirements
- Identifying skills gaps
- Anticipating new skill requirements: digital and green skills

Limited talent pool

- Attracting and retaining talent
- Employee compensation and work-life practices
- Reskilling and upskilling

STEM participation

- Lack of STEM interest
- Equity and access to programmes
- Limited exposure to the breadth of STEM occupations for students, teachers, parents and the community

Graduate work readiness and adaptability

- Enhancing foundational skills
- Improving soft skills
- Adapting to evolving skill requirements
- Lowering underemployment among postgraduates

Supporting infrastructure

- Housing and accommodation
- Upgrading transport facilities
- Child and elderly care

Lack of vocational skills

- Improving public perceptions of TVET
- Strengthening industry partnerships and involvement
- Expanding vocational pathways and pipelines

Strategies and action plans

Enhance skills matching

Measures	Short-term/ medium-term	Agencies
E1.1 Work closely with federal agencies to monitor at higher frequency and granularity the shortage of skills, skills demand and skills gaps occurring at the state level	Short-term	• CAT Centre • Penang Skills Development Corporation (PSDC) • Penang Institute • Penang Green Council (PGC) • TalentCorp • Institute of Labour Market Information and Analysis (ILMIA) • Department of Statistics Malaysia (DOSM) • Industry associations
E1.2 Transform Penang into a preferred destination for skilled talents	Medium-term	• Penang Development Corporation (PDC) • InvestPenang • EXCOs for Housing and Transport • DOSM

Possible Actions

- Map the current and future talent and TVET demand of the industry to identify critical skills and share the related information through industry dialogue
- Develop state-level labour market intelligence together with federal government agencies to identify skills needs and skills gaps
- Strengthen linkages between state agencies, the Department of Statistics Malaysia (DOSM) and industry stakeholders to derive high-frequency skill shortage indicators at the state level
- Enhance TalentCorp's Critical Occupation List through capacity building for industry associations and firms
- Work closely with federal agencies to incorporate green skills into skill monitoring mechanisms along with in-depth coverage of digital skills
- Explore using the Graduate Tracer Study for skills monitoring

- Expand DOSM's migration data to enhance the state's economic planning
- Enhance communication of job market information to potential skilled migrants, e.g. StudyPENANG, Penang Vocational Courses Portal
- Frequent updates from the federal government agencies on the available incentives for talent attraction and retention
- Develop housing support incentives and consider alternative housing models such as hostels for students/interns and new employees to consider working in Penang
- Harmonise local planning with work-play-live lifestyle to attract and retain knowledge and technical workers
- Intensify talent attraction and retention efforts by expanding effective programmes targeting high-demand skills pathways

Develop new skills

Measures	Short-term/ medium-term	Agencies
E1.3 Increase training and development programmes by expanding public-private partnerships to enhance support in the upskilling and reskilling of workers	Short-term	• TVET institutions • State EXCO for Industry Development • Industry players
E1.4 Proactively ensure that training supply is responsive to skill demand	Medium-term	• Penang STEM • PSDC • Digital Penang (DP)

Possible Actions

- Establish inter-agency and inter-institution training partnerships to capitalise on shared resources
- Pool public and private resources to fund centres of excellence for strategically important industries
- Establish a Talent Fund for vocational training to ensure skills are developed evenly across the industries especially within SMEs
- Provide incentives for employers to engage in TVET by encouraging professionals to become TVET instructors
- Co-ordinate cooperation schemes between large companies and SMEs to close skills gap and share best practices

- Keep the length of vocational training short, coupled with recurrent provision of training in new skills to those in employment
- Arrange for employers to take on trainees and/or apprentices for more specialised skills
- Defer specialised programmes until closer to the time of the trainee's entrance into the labour market
- Rent training equipment or use equipment available in the marketplace to avoid heavy sunk costs in particular technologies
- Integrate green and digital skills and occupations into skill anticipation and development mechanisms

Develop new skills

Measures	Short-term/ medium-term	Agencies
E1.5 Enhance state-based school programmes to support high-demand skill pathways by providing training and development to schoolteachers to enrich the national education system	Short-term	• Penang STEM • Penang Science Cluster • Penang Tech Dome • Penang State Education Department • Penang Math Platform

Possible Actions

- Intensify visits for classrooms into work spaces to concretely demonstrate how general and job-specific skills are applied at work
- Co-develop teacher training programmes with the private sector, and offer opportunities for teachers to enter work spaces to understand how skills are deployed in practice
- Track and assess the content, location and effectiveness of school programmes and identify groups that are missing out
- Address barriers to involvement in school programmes such as information barriers and make sure vulnerable groups are not left behind
- Ensure that programmes involve development of core competencies as well as soft skills to nurture a highly employable workforce
- Explore opportunities for collaboration with federal programmes, e.g. Yayasan AMIR and the Ministry of Education's (MOE) Trust Schools programme to coordinate private involvement in schools

Develop new skills

Measures	Short-term/ medium-term	Agencies
E1.6 Promote TVET and STEM education as an option for further education, and create a monitoring mechanism for placements in order to ensure job security	Short-term	• Penang STEM • PSDC • Penang Science Cluster • Penang State Education Department • TVET institutions

Possible Actions

- Launch TVET awareness campaigns to improve the public reputation of TVET
- Offer career counselling at the high school level to inspire and motivate students from a young age to pursue TVET and STEM careers through Parent-Teacher Associations (PTA)
- Broaden education opportunities for TVET graduates, including access to higher education
- Improve and promote the value of skill certificates to companies
- Intensify STEM programmes to nurture students' interest in science and technological development especially for girls and engage gender equality experts to enhance existing programmes to manage gender-specific challenges
- Consider opportunities for integrating state-level school STEM programmes with the arts (STEAM) such as visual arts, product development and creative multimedia
- Exposing arts stream students to relevant STEM fields such as data analytics, cybersecurity and computer sciences to increase STEM intake
- Publicise and highlight Penang's homegrown success stories in STEM including engineers, young innovators, SMEs and R&D prowess to change the mindsets of parents and young children on the manufacturing jobs in Penang
- Publicise the success stories across the states in Malaysia and neighbouring countries

Support mid-career transition

Measures	Short-term/ medium-term	Agencies
E1.7 Increase the participation of women in the workforce by improving the quantity, quality and accessibility of child care and elderly care services and increasing support for return-to-work	Medium-term	• Penang Women's Development Corporation (PWDC) • TalentCorp • HRD Corp

Possible Actions

- Investigate the feasibility of building more public-private partnerships (PPP) to provide affordable childcare and early childhood education
- Make comprehensive information on location and availability of childcare centres and early childhood education centres readily accessible to parents
- Facilitate active-ageing programmes while expanding state day-care and home nursing services
- Strengthen labour supply of care work with competitive wages
- Provide opportunities and financial incentives for life-long learning

In support of SDGs

SUSTAINABLE DEVELOPMENT G⬤ALS

| 4 QUALITY EDUCATION | 5 GENDER EQUALITY | 8 DECENT WORK AND ECONOMIC GROWTH | 9 INDUSTRY, INNOVATION AND INFRASTRUCTURE | 10 REDUCED INEQUALITIES | 17 PARTNERSHIPS FOR THE GOALS |

Support for businesses

Infrastructure resilience

A resilient infrastructure is essential to spur economic opportunity in a highly-urbanised and fast-changing business environment. A whole-of-society infrastructure has the potential to generate multiplier effects not only on the quality of life but also to elevate the standard of living of the people in Penang. Maintenance, utility and spatial infrastructure development are vital to address short-to-medium-term infrastructure challenges. These promote equal opportunities and balanced and sustainable growth.

As with all other states, taking on these challenges will require Penang policymakers to develop tight collaboration with federal ministries and departments. Legislative, administrative and financial support by the central government will be needed, cognizant of Penang's role in spearheading the country's economic development.

MAJOR CHALLENGES

Internet accessibility and connection stability

- Stability and reliability of internet connection
- Internet access and telecommunications lagging behind neighbouring countries
- Suboptimal round-the-clock accessibility for online learning and work
- Increasing demand needing to be met

Water resources and quality of life

- Adequate response to climate variability needed
- Water supply becoming unsustainable
- Increasing demand for water needing to be met

Electricity supply

- Instability of electricity supply to industry
- Insufficient capacity of electricity supply to meet increased demand
- High carbon intensity of electricity supply

Resilient spatial development for inclusive and liveable communities

- Community and environmental protection
- Public infrastructure services and facilities
- Waste management
- Disaster, flood, haze and urban heat resilience management

Public housing and public spaces

- Inadequate upkeep of property
- Inefficient use of public spaces for wellness
- Insufficient support for the safety and health of residents

Balanced regional development

- Balanced use of land on the mainland
- Insufficient broadband penetration rate and corresponding stability on the mainland
- Need for residential land use within 400m of public facilities

Strategies and action plans

Enhancing quality of life

Measures	Short-term/ medium-term	Agencies
E2.1 Upgrade internet access and ensure stable internet connection to the public and to businesses across all areas in Penang with a special focus on Seberang Perai and rural areas	Medium-term	• PDC Telecommunication Services • State EXCO for Infrastructure
E2.2 Improve water security and minimise water disruption for private households and industries	Short-term	• Perbadanan Bekalan Air (PBA)

- Strengthen network coverage and connectivity speed in densely populated and suburb areas
- Expand fiberisation plan by replacing copper cables with fibre optic cables to all new and existing houses and buildings in Penang
- Capitalise on 5G-enabled business models for enhanced supply chain systems, Industry/Manufacturing 4.0 applications and digital marketplaces, particularly among SMEs
- Increase tech-based business solutions such as autonomous vehicles and enhanced cybersecurity

- Construct a seawater desalination facility in the southern area of Penang Island
- Preserve 160,000 hectares of rainforests in Ulu Muda as water catchment areas for water supply security
- Explore the use of seawater in industry and greywater recycling
- Enhance the Penang State Rainwater Harvesting System Incentive and make rainwater harvesting mandatory for all new developments
- Implement Floating Solar Panels project to reduce water loss from evaporation and supplement PBA revenue
- Implement initiatives under the Raw Water Contingency Plan 2030 to tap into additional raw water resources raw water resource for Penang such as Sungai Perai using advanced water treatment technologies
- Activate pump in Seberang Perai Selatan based on needs, upgrade the Bukit Panchor water treatment plant and enhance portable water treatment plants
- Explore the use of smart water management systems to monitor and optimise the water distribution network

Enhancing quality of life

Measures	Short-term/ medium-term	Agencies
E2.3 Improve the management of safety and environmental hazards, and increase liveability	Medium-term	• Local authorities (Majlis Bandaraya Pulau Pinang (MBPP) and Majlis Bandaraya Seberang Perai (MBSP))

Possible Actions

- Increase awareness programmes for building information modelling (BIM) and Industrialised Building System (IBS) technology in construction projects especially towards SMEs
- Support smart and green neighbourhood initiatives that promote safe city and community wellness
- Enhance environmental monitoring of construction projects
- Support and spearhead renovation of existing building stock
- Reinforce erosion and siltation control plans
- Emphasise on flood and landslide mitigation plans in developed areas and in new development planning
- Improve the construction waste management mechanism
- Enhance Green Building Incentives and raise standards for building construction in line with Green Building Index criteria

Rejuvenate utility and spatial efficiency

Measures	Short-term/ medium-term	Agencies
E2.4 Champion inclusive spatial development of affordable housing to be constructed in areas nearer to work, school and hospital	Medium-term	• State EXCOs for Housing and Infrastructure • PDC • Local authorities (MBPP & MBSP) • PLANMalaysia
E2.5 Modernise and improve the maintenance of public housing including expanding and enhancing green spaces and community parks	Medium-term	• State EXCOs for Housing and Infrastructure • PDC • Local authorities (MBPP & MBSP) • PLANMalaysia

Possible Actions

- Promote optimum and inclusive land use and spaces by reviewing zoning strategy transparently and prioritising integrated land-use planning
- Work with stakeholders to reform land management strategies to ensure balanced and inclusive spatial development, diversify state revenue, and improve transparency
- Streamline processes for renewal of leasehold and work with federal government to reform the leasehold system e.g. make applications for enfranchisement easier
- Embrace the "15-minute city" or 400m concept as a model for creating walkable, mixed-use and compact neighbourhoods with access to public amenities
- Incorporate universal design guidelines into public housing development
- Explore innovative land acquisition strategies and partnerships to build affordable housing
- Explore different home ownership models e.g. build-to-rent, shared ownership and shared equity ownership
- Enhance public infrastructure services and facilities

- Implement smart and green neighbourhood initiatives through safe city monitoring system, community gardening and walkability
- Ensure electrical, sewage and pipes are in good condition
- Develop a systematic funding mechanism to finance maintenance in public housing
- Intensify nature in gardens and parks and restore nature into the urban landscape that is age-friendly
- Retrofit existing public housing to improve thermal comfort and comply with Universal Design Guidelines
- Proactively monitor the wellbeing of residents in public housing facilities

Rejuvenate utility and spatial efficiency

Measures	Short-term/ medium-term	Agencies
E2.6 Encourage on-site solar power generation across the whole of Penang, including industries, households and government offices, to ease the load on the electricity grid	Medium-term	• TNB • State Exco for Infrastructure • Northern Corridor Implementation Authority (NCIA) • Sustainable Energy Development Authority (SEDA)

Possible Actions

- Install solar panels on all state government offices by 2028
- Double solar power generation capacity in Penang by 2028
- Implement a solar panel mandate on new buildings
- Establish and expand vocational programmes for solar power installation
- Explore the use of electric vehicles as energy storage devices for solar power
- Explore the use of alternative surfaces e.g. water bodies, car parking lots, temporary vacant land, sheltered walkways for solar power generation
- Explore agrivoltaic farming to supplement agricultural incomes
- Work with the federal government to expand the SuriaKU (Sunlight at Koridor Utara) programme for generating solar power with low-income households

In support of SDGs

SUSTAINABLE DEVELOPMENT GOALS

| 3 GOOD HEALTH AND WELL-BEING | 6 CLEAN WATER AND SANITATION | 7 AFFORDABLE AND CLEAN ENERGY | 11 SUSTAINABLE CITIES AND COMMUNITIES | 12 RESPONSIBLE CONSUMPTION AND PRODUCTION | 13 CLIMATE ACTION | 15 LIFE ON LAND | 17 PARTNERSHIPS FOR THE GOALS |

Scaling up the services sector

Transport and logistics

Improving the local transportation system is essential for enhancing mobility and accessibility, which are vital to economic development. An efficient transportation and road system will lower costs and increase efficiency across economic sectors. Better public transportation systems will improve road and traffic congestion and enhance accessibility for the general public and Penang's many tourists. It is also necessary for elevating the liveability of Penang, meeting Sustainable Development Goals (SDGs), and transforming Penang into a zero-carbon state, in line with the Penang Green Agenda. On a larger scale, expanding the capacity of Penang's airport and seaport is crucial to support Penang's outsized contribution to national trade in goods.

MAJOR CHALLENGES

Traffic congestion and road condition

- Limitations in road infrastructure
- Peak hour delays
- Insufficiency of parking spaces
- High volumes of traffic

Public transportation

- Lack of public transportation options
- Efficiency and scheduling issues
- Accessibility to services
- Accessibility to services schedules
- Last-mile connectivity
- Payment systems

Skilled logistics workforce

- Shortage of skilled workers and underemployment
- Lack of study options for logistics courses
- Need for upskilling and reskilling for digitalisation (and green transition)
- Need for strategic partnerships for work placements in logistics companies

Logistic infrastructures

- Transportation networks
- Low adoption of digital technologies
- Low utilisation of Digital Free Trade Zones
- Flight routes and flight connectivity
- Airport and seaport services

Strategies and action plans

Improve public transportation, road and traffic conditions

Measures	Short-term/ medium-term	Agencies
E3.1 Transform Penang's public transportation system towards the mode of transportation of choice	Medium-term	• State EXCO for Infrastructure and Transport • Rapid Penang • Ministry of Transport (MOT) • Local authorities (MBPP & MBSP)

Possible Actions

- Identify the routes with high demand and high density of users, especially industrial parks
- Increase the frequency of services of high density routes and consider establishing decentralised public transport hubs for high-traffic areas
- Ensure constant communication with drivers on the density and efficiency of their routes and services
- Develop measures for closing the last-mile connectivity gap, such as shared mobility options
- Establish a mixed-mode transit system
- Develop more efficient ways of communicating service schedules to the general public
- Review existing payment systems and develop a more efficient and accessible system
- Monitor the performance of public transportation routes
- Continually assess the comprehensiveness of coverage of routes across key tourist destinations, residences and workplaces
- Ensure accessibility and safety of transit services, particularly for vulnerable groups
- Pilot dedicated bus lanes

Improve public transportation, road and traffic conditions

Measures	Short-term/ medium-term	Agencies
E3.2 Collect information about road users' preferences and behaviours as well as traffic data in highly congested areas	Short-term	• State EXCO for Infrastructure and Transport • Rapid Penang • (MOT) • Ministry of Works (MOW) • Public Works Department • Local authorities (MBPP & MBSP)

Possible Actions

- Conduct research and surveys on road usage and behaviour to identify travel patterns and areas needing improvement
- Work with the Ministry of Transport and Ministry of Works on collecting and supplying traffic data to the public to alleviate road congestion
- Utilise digital technology such as GPS tracking and mobile road applications to collect traffic data
- Install traffic sensors in areas with heavy traffic congestion and high volumes of traffic to collect data on traffic flow, volume and speed.

Enhance the delivery of logistic services

Measures	Short-term/ medium-term	Agencies
E3.3 Increase airport and seaport capacity, flight connectivity and shipping lines	Medium-term	• State EXCO for Infrastructure and Transport • MOT • Malaysia Airports Holdings Berhad • Penang Port Sdn. Bhd

Possible Actions

- Expand and upgrade airport infrastructure, which includes enhancing the terminal facilities, increasing the number of gates, and improving runway capacity
- Expand and upgrade port infrastructure, which includes improving existing port facilities, increasing the number of berths, and improving cargo handling equipment
- Optimise storage and logistics spaces at the airport and seaport, and increase Penang's capacity for transhipment
- Form and foster partnerships and collaboration with the private sector to attract investment for infrastructure development and induced demand for airport and seaport cargo use within the IMT-GT context and Malaysia's national development
- Invest in training, development and upskilling courses and programmes for logistics workers to expand their professional capacity
- Increase direct flights among SEA cities and China

Enhance the delivery of logistic services

Measures	Short-term/ medium-term	Agencies
E3.4 Increase efficiency of airport and seaport service at the port and customs	Medium-term	• State EXCO for Infrastructure and Transport • Ministry of Transport • Immigration Department of Malaysia • Malaysia Airports Holdings Berhad (MAHB) • Penang Port Sdn. Bhd • Royal Malaysian Customs Department (RMCD)

Possible Actions

- Increase and improve the usage of technological solutions, such as
  - Airports: facial recognition software, automated gates, and the usage of mobile boarding passes to speed up processes and reduce queues
  - Seaports: automated gates/berths, mobile apps for cargo tracking, advanced container/cargo technology and advanced cargo screening systems to speed up and create more seamless cargo handling processes
- Streamline customs and logistics processes for better efficiency
- Establish training and development programmes to improve the capacity of airport/seaport personnel and security personnel
- Enhance the capacity and productivity of staff in immigration and security processes

In support of SDGs

SUSTAINABLE DEVELOPMENT G⬤ALS

8 DECENT WORK AND ECONOMIC GROWTH

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

10 REDUCED INEQUALITIES

11 SUSTAINABLE CITIES AND COMMUNITIES

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

Steering the key economic sectors

Towards high-value manufacturing

MANUFACTURING

Industry overview

The manufacturing sector continues to be the core economic engine for Penang, accounting for 47.3% of Penang's GDP in 2021. The electrical & electronics (E&E) industry represents the largest contributor to manufacturing investment for the last decade (2013-2022), contributing 71.4% of total investments, followed by machinery & equipment (M&E) (11.2%) and scientific & measuring equipment (6.2%). Collectively, these sectors contribute 88.8% to the state's total approved manufacturing investment, demonstrating the significance of semiconductor-related and precision engineering-based industries in Penang. They also serve sectors specialising in semiconductors, medical technology, avionics, and the production of their components and equipment. The E&E sector alone has created
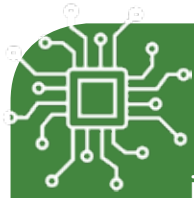
88.8%
approved capital investment was from **semiconductor** and **precision engineering** industries (2013-2022)

Electrical & electronics	71.4%
Machinery & equipment	
Scientific & measuring equipment	

about 56% of new jobs from a total of 145,000 jobs created from the approved investment over the last 10 years.

With 50 years of manufacturing excellence, Penang has a strong regional competitive advantage in the talent, technology and skills needed for the global manufacturing supply chain. Linkages between multinationals and local suppliers create a 'plug-and-play' dynamic that is vital to Penang's manufacturing ecosystem. The industry is expected to move up the value chain, as recently approved investments in Penang are geared towards higher value-added segments. Investors have continued to reinvest in Penang's manufacturing sector, which reflects their confidence in Penang as a world-class destination for the manufacturing sector.

145,000
jobs created by manufacturing investments approved between 2013-2022

56%
jobs created in the E&E sector

Expansion/diversification manufacturing investments as a share of approved manufacturing investments in Penang, 2013-2022

	Expansion/diversification	New
Total	34.5%	
Foreign	30.4%	
Domestic	57.9%	

Source: Calculated based on data from Malaysian Investment Development Authority (MIDA)

Selected recently approved investments, Penang

TF-AMD is investing RM2 billion in a new manufacturing facility.

EG Industries Bhd is investing RM180mil in its first fully-automated Lights-Out Smart Factory 4.0, creating 1,000 jobs.

Scandinavian Industrialised Building Systems (SIBS) is investing RM200mil in its second manufacturing facility at the Penang Science Park North, Simpang Ampat to boost the production of modular construction materials.

AEM plans to construct a new 365,000 sq ft. manufacturing plant for assembly and quality assurance, including a warehouse and research and development lab to develop advanced testing and handling equipment.

TTM Technologies Inc plans to invest RM550mil in a new plant manufacturing advanced printed circuit boards (PCBs) such as high layer count and high-density interconnect (HDI), creating 1,200 jobs.

Source: Compilation based on public announcements

Penang is expected to maintain and upgrade its position as a regional hub for E&E, automation, medical technology and outsourced semiconductor assembly & test (OSAT), while strengthening key promoted areas such as avionics, food and agritech. Moving forward, IR 4.0 technologies, integrated circuit (IC) design and engineering services are essential for Penang to move up the electronics value chain.

As an export-oriented economy, developments in Penang's manufacturing sector are sensitive to geopolitical developments.
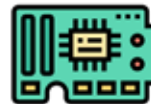
Other important subsectors

Medical Technology

Avionics

Production of components and equipment

Over the next five years, several key trends are expected to
dominate the state's manufacturing landscape:

Continuing demand for technology in various sectors creates demand for critical components such as semiconductors and associated equipment

Malaysia's recent free trade agreements including the recent Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP), the Regional Comprehensive Economic Partnership (RCEP) and potential developments such as the Indo-Pacific Economic Framework for Prosperity (IPEF)

Fluctuations in geopolitics

- The US-China trade tension is expected to benefit its manufacturing sector due to Malaysia's favourable geopolitical position. For instance, major American and Dutch chip tool makers are eyeing Southeast Asia as a location to expand and diversify their geographical footprint (including Malaysia).

- However, with the imposition of US sanctions as well as global economic uncertainties (dampened demand for semiconductors and inflationary pressure), there may be trade diversions or slowdowns, though likely with short-term effects, against the backdrop of trade tensions.

Review of existing plans

Penang plays a key role as one of Malaysia's main manufacturing powerhouses. The Twelfth Malaysian Plan (12MP) for the period of 2021-2025 aims to further develop further the manufacturing sector to be more innovative, sustainable, and high value-added.

In line with Penang's vision, the 12MP aims to:

- enhance the competitiveness of local industries;
- promote high-value-added industries such as aerospace and medical devices;
- strengthen the manufacturing supply chain and local SMEs; and
- promote sustainability.

Among the most recent manufacturing industry plans is the Industry4WRD: National Policy on Industry 4.0 (Industry4WRD), a national policy launched in 2018 that sets the vision for the manufacturing sector for the next 10 years. It

aims to transform Malaysia's manufacturing sector by adopting Industry 4.0 technologies and principles. This initiative is focused on driving innovation and productivity and strengthening the competitiveness of the manufacturing sector.

The National Industry Policy 2021-2030 is a comprehensive plan that outlines the country's strategic direction for its industrial development. Penang is seen as a key hub in this policy, gearing it to promote high-value-added and knowledge-intensive industries, increase the adoption of digital technologies, and enhance the competitiveness of local industries. Most recently, the New Investment Policy was issued in 2022, guided by the National Investment Aspirations which specify that investments should be pursued to increase economic complexity, create high-value job opportunities, extend domestic linkages, develop new and existing clusters and improve inclusivity. The Ministry of Investment, Trade and Industry (MITI) is reviewing the New Industrial Master Plan 2030, in which Penang should have greater relevance given its importance in key promoted sectors for the country.

MAJOR CHALLENGES

Talent and workforce dynamics

Penang's strong record of full employment, sustained despite the pandemic, does not preclude mismatches in skill profiles. Low unemployment can exist alongside a shortage of suitable talent, while in other parts of the labour market, workers may even be overqualified to perform their job functions. Addressing skills gaps can lead to better labour market outcomes for Penang's workforce while supporting the growth of the manufacturing sector.

A Penang Institute study (Students' Choice of STEM Study in Secondary and Tertiary Education in Penang, 2022) found that engineering and computer science graduates rated skills learned in university as only somewhat relevant to their current jobs, which reflects a gap in their training in meeting industry demands. On the other hand, 22.5% of fresh graduates are employed in a job that does not match their education level. Specifically, pure and applied sciences have underemployment rates of about 50%, on top of their already low employment rates. This is due to the relatively low supply of suitable jobs and the correspondingly high number of graduates in these fields.

Localisation and spillover

The rapid growth in foreign direct investments has outpaced domestic investments, providing much room for the growth of domestic firms and industries, specifically in local value-added activities and knowledge spillovers from foreign as well as domestic investments.

Innovation, knowledge-based activities and technological advancements

The manufacturing industry in Penang needs to continuously innovate to accelerate the progress toward higher-value manufacturing. In ancillary industries such as food processing, plastics and chemicals, increasing the use of technology and innovative solutions are needed, given challenges in the availability of skilled workers and competition from firms in other countries.

Compliance and voluntary initiatives in ESG and responsible business conduct

The manufacturing sector is transforming to comply with ESG requirements and engage in responsible business conduct, especially for those that are integrated into the global value chains. At the federal level, investment principles and disclosure standards incorporating ESG, coupled with the development of carbon markets are expected to facilitate ESG compliance; for the state, pursuing public-private ESG initiatives and incentivising responsible business practices will elevate the state's standing as a preferred location for doing business. This should move in line with Malaysia's efforts to address challenges such as labour practice improvements and climate change.

Strategies and action plans

Strengthen innovation and promote technological and knowledge transfer

Measures	Short-term/ medium-term	Agencies
S1.1 Strengthen the business ecosystem through strategic industry clustering and boost innovation and localisation through technology and knowledge transfers	Medium-term	• InvestPenang • MIDA • MITI • PDC • Malaysia Productivity Corporation (MPC) • Penang SME Centre • NCIA • Business/industry associations
S1.2 Create an ecosystem that enhances innovations and intellectual property cultivation in industries, universities and research institutions	Medium-term	• State EXCO for Economy • State EXCO for International Trade & Industry • InvestPenang • MIDA • MPC • MITI • PDC • NCIA • The Catalyst For Malaysia's Technology Ecosystem (CREST) • Industry associations • Academia

Possible Actions

- Replicate and enhance the Penang Automation Cluster (PAC) model with the approach of large companies as locomotive companies to drive the capabilities and scale of smaller companies
- Establish a new cluster for engineering services and facilitate the development of new companies especially SMEs to place Penang as a hub for engineering services
- Improve ease of doing business by streamlining bureaucratic processes across all levels of government

- Designating Penang as a hub for test/sandbox of deep tech and microelectronics
- Add IR 4.0 innovations and higher-value activities including engineering services and R&D to key promoted areas
- Strengthen and formalise fiscal and non-fiscal value propositions for investment promotion in key promoted areas
- Support SMEs with information on intellectual property protection and rights
- Promoting Penang as a centre for Industry 4.0 innovations, and the integration of hardware and software technologies
- Enhance the collaboration and linkages between research institutes and firms in the E&E industry to intensify the creation of components and products and the integration of R&D into the supply chain
- Promoting linkages of research institutes and maker labs as well as the integration of industries

Facilitate an ideal demand and supply of talent for the manufacturing industry

Measures	Short-term/ medium-term	Agencies
S1.3 Continue working closely with industries and state agencies to address human capital needs through activities in schools and colleges	Short-term	• CAT Centre • InvestPenang • PDC • PSDC • MIDA • Tertiary education institutions • TVET institutions • TalentCorp • Industry associations
S1.4 Conduct a regular skills requirement survey in the primary manufacturing industries to monitor current demand for human capital	Short-term	• EXCO for Human Capital • CAT Centre • Penang Institute

Possible Actions

- Strengthen existing Penang STEM initiatives
- Engage industry partners to organise job fairs, internships and structured programmes that allow for students to gain hands-on experience for their prospective careers
- Facilitate collaboration between universities, colleges and TVET institutions and industry players to align academic curricula with industry needs in ensuring that students are equipping themselves with the necessary skills and knowledge
- Map out the roadmap for the state's human capital demand and supply for key promoted sectors
- Promote Penang as a key destination for talent to live, work, study and play, and as a preferred location for labour migration
- Refer to Policy Enabler: Talent pipeline, skills and development

- Conduct joint public-private skills monitoring surveys
- Identify the current industrial gaps and needs and construct means to address arising concerns
- Formulate training, development and upskilling programmes through public-private initiatives to address current human capital demands
- Refer to Policy Enabler: Talent pipeline, skills and development

Enhance and forge partnerships between Penang's industrial parks

Measures	Short-term/ medium-term	Agencies
S1.5 Create more industry clusters and specialisations between the different public and private industrial parks in Penang	Medium-term	• PDC • InvestPenang • State EXCO for Economy • Private developers • MITI • MIDA
S1.6 Transform industrial estates into eco-industrial parks in compliance with ESG principles, benchmarking global best practices and international standards	Medium-term	• PDC • InvestPenang • State EXCO for Economy • Private developers • MITI • MIDA

Possible Actions
• Upgrade the infrastructure facilities in the existing industrial parks to meet needs and expectations • Create platforms for more public-private partnerships in and between existing industrial parks • Establish joint initiatives to explore and address common challenges as well as opportunities in the industry, e.g. the development of shared infrastructure and facilities or the establishment of industry-specific hubs
• Develop a state-level carbon-neutral roadmap • Accelerate the adoption of responsible business conduct following international standards, with the federal and state agencies taking on the main facilitating role • Offering financial incentives such as assessment discounts and government grants/rebates to encourage businesses to adopt sustainable business practices • Establish education and training programs and work on tools and resources to help businesses understand the benefits of sustainable business practices as well as the principles of ESG

Strengthening sustainable tourism

TOURISM

Industry overview

Penang is one of the internationally most recognised tourism destinations for Malaysia. Its tourism industry is an important part of the state's services sector and an important contributor to the state's economy. Notably, Penang is internationally acknowledged as one of the premier destinations for street food and heritage tourism. Additionally, its medical tourism industry is one of the most competitive in the region, and generates a high volume of revenue. With Penang's forest reserves, natural hills and parks as well as mangrove forests, ecotourism is a key subsector, and an integral part of sustainable tourism. The evolution of the industry has encouraged economic activities that have contributed to the growth of small

businesses and the wider local economy, and the increase of employment opportunities.

The tourism sector's rejuvenation after the Covid-19 pandemic has remained steadily positive. Passenger movements have increased exponentially in 2022, although the number has yet to return to pre-pandemic levels. Even so, the 6.8 times increase in 2022's passenger movements can be considered a highly positive sign.

Total number of passenger movements (excluding transit), Penang International Airport, 2019 - 2022
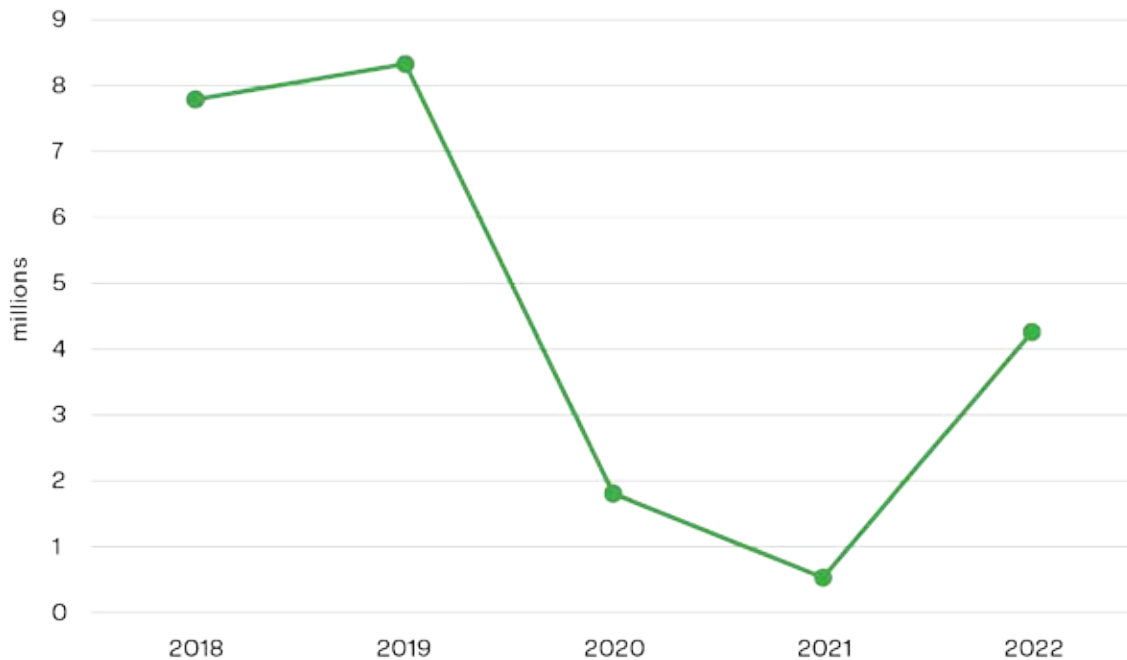
Source: Ministry of Transport, Malaysia.

8.3x

hotel guests
year-on-year,
Q1-Q3 2022

3.7x

hotel average
occupancy rate
year-on-year,
Q1-Q3 2022

2.9x

growth in medical
tourism revenue,
Jan-Aug 2022
(vs Jan-Aug 2021)

*The reported revenue is from nine member hospitals as provided by PMED

The prospects of the state's tourism industry look undoubtedly promising, with full recovery expected by the end of 2023. By leveraging and continuously innovating on its unique strengths, Penang is in a position to establish itself as a top sustainable and responsible tourism hub. Going forward, sustainable tourism practices and initiatives should be at the forefront of tourism development in the state.

Review of existing plans

The National Tourism Policy 2020-2030 aims to transform Malaysia's tourism industry in line with the Sustainable Development Goals. The enhancement of public-private partnerships is at the forefront of the Policy, as well as embracing digitalisation for increasing innovation and driving competitiveness.

The six transformation strategies are:

| strengthen governance capacity | create special tourism investment zones | embrace smart tourism | enhance demand sophistication | practise sustainable and responsible tourism | upskill human capital |

The Plan also emphasises the importance of increasing and adding value to existing tourism products to enhance experiential tourism.

The National Ecotourism Plan 2016-2025 focuses on developing potential ecotourism destinations. It highlights the need for more investments in ecotourism, and for synergy to be cultivated and enhanced between ecotourism and conservation. Ecotourism marketing,

tourism concessions at ecotourism sites and the development of ecotourism clusters through stakeholder partnerships are the other three proposed strategies.

The Twelfth Malaysia Plan calls for the strengthening and re-energising of Malaysia's tourism industry, with a key focus on restoring tourism confidence. Other strategic thrusts include enhancing the quality of tourism products and services in order to cater to the changing demands of tourists, enhancing the sustainability of tourism products, strengthening the Malaysia brand, instituting government reforms and intensifying domestic tourism.

The Penang Tourism Master Plan 2021-2030 targeted the development of Penang as a premier, sustainable, diversified and smart tourism destination. The Plan had four thrusts: diversification of tourism products,

positioning Penang as a premier destination, ensuring sustainable and responsible tourism and enhancing Penang as a smart tourism destination. There are also additional sub-thrusts focusing on tourism product innovation and refinement, strengthening branding and developing high-yield tourism strategies, boosting creative economy, ecotourism and nature sites, and heritage tourism, and adopting new technology to improve and enhance the tourism experience.

Penang2030 places importance on diversifying and upgrading the state's tourism products and offerings, which is in line with the national plans. It aims for Penang to be recognised as the top destination for health, business, culture and ecotourism, with a focus on developing high-value tourism products and services. The upskilling of hospitality workers is also an important initiative in ensuring services of an international standard can be provided.

MAJOR CHALLENGES

Competition

Tourist destinations in the region such as Bali, Phuket and Bangkok pose stiff competition to Penang, as they offer similar attractions and activities such as the beach and cultural/heritage activities. Penang, therefore, faces the challenge of highlighting its uniqueness and differentiating itself from these other destinations.

Thailand and Singapore are also competitors to Penang's medical tourism industry as they offer comparable services in terms of quality and pricing. Additionally, Indonesia is determined to recoup revenue from outbound health travel, with Bali in development to become an international health hub.

Low-value tourism activities and tourism products

Penang's affordability makes it a strong contender as a tourist destination but at the same time, this has led to an over-reliance on low-cost and low-value tourism. This causes the focus to shift from quality to quantity, which may result in a compromise on the quality of services, which in turn deters the visitation of high-spending tourists. Furthermore, mass-produced, generic tourism products and souvenirs add little value to the state's tourism market.

Labour supply and labour issues

The industry faces continual labour shortages especially in the hotel sector. The high turnover rate among hospitality workers is is also a significant challenge, as it will lead to a loss of institutional knowledge and skills, and a lack of consistency in service quality. Additionally, wages in the tourism industry may be comparatively lower due to the seasonality of work, and this results in a challenge to attract and retain skilled workers.

The tourism industry also requires a skilled workforce to provide high-quality services to tourists. However, there is a shortage of workers with the required skills and qualifications to provide high-quality services to tourists.

Transportation

Penang's public transportation network is admittedly not as extensive or well-developed as other major tourist destinations, often facing issues of connectivity and availability, which poses a challenge for tourists. The congestion of traffic on the roads often leads to longer travel times and this may also be a cause of frustration for tourists.

Infrastructure

The maintenance of some tourist attractions can be lacking in certain cases, and needs upgrading and/or restoration. The accessibility of some tourist attractions also needs to be improved to cater to tourists with disabilities or limited mobility. Furthermore, limited, insufficient or poorly maintained public facilities such as public restrooms, parks and waste management systems may to overall tourism experiences.

Sustainability

Tourism can cause potential negative impacts on environmental degradation through overcrowding, resource depletion, pollution, as well as deforestation and habitat destruction due to infrastructure development. In addition, the lack of engagement with the local communities may cause local cultures and traditions to be negatively impacted through activities such as commercialisation and cultural appropriation.

Strategies and action plans

Diversifying tourism offerings, services and products

Measures	Short-term/ medium-term	Agencies
S2.1 Explore the potential of developing and strengthening niche tourism sub-sectors	Short-term	• State EXCO for Tourism and Creative Economy • Penang Global Tourism (PGT) • Penang Centre of Medical Tourism (PMED) • Penang Convention and Exhibition Bureau (PCEB) • Industry associations • Industry players

Possible Actions

- Develop new tourism sub-sectors by engaging players in identifying potential sub-sectors
- Adapt the Penang Michelin Guide in developing a strategic plan to promote and enhance gastronomy tourism
- Continue to strengthen cultural and heritage tourism by promoting museums, galleries as well as cultural festivals and events
- Maintain the competitiveness of the medical tourism industry by enhancing the quality of medical services provided and improving accessibility and digitalisation
- Promote and develop wellness tourism as a subsector to medical tourism through partnerships with spa and wellness centres
- Enhance the MICE tourism industry by investing in infrastructure development, offering financial incentives and strengthening local and international business partnerships
- Explore and develop agro-tourism by highlighting the state's farms and plantations, as well as different agricultural activities and agro-products by supporting their engagement and expansion in tourism activities
- Explore and develop the potential of adventure tourism by highlighting high-impact activities such as jungle trekking, canopy walks, sky-diving and water sports
- Continue to promote Penang as a top domestic tourism destination by creating special offers and packages for domestic tourists, e.g. Integrated Digital Tourist Pass
- Promote and strengthen emerging tourism sub-sectors such as wedding tourism, sports tourism and education tourism
- Continually support the adoption of digital technologies to improve and enhance each tourism sub-sector, particularly among SMEs
- Continually assess tourist information touch-points to ensure the relevance of information, in particular the inclusion of information on new tourism niches

Diversifying tourism offerings, services and products

Measures	Short-term/ medium-term	Agencies
S2.2 Re-energise existing tourism attractions such as Batu Ferringhi, both commercially and aesthetically	Medium-term	• State EXCO for Tourism and Creative Economy • PGT • Local authorities (MBPP & MBSP)

Possible Actions

- Assess existing tourism sites to identify the attractions needing maintenance and rejuvenation
- Monitor visitor volume across tourism sites to prioritise the rejuvenation of the more popular tourism sites
- Develop maintenance plans to ensure the continuous upkeep and sustainability of all tourism sites
- Engage and collaborate with the local community in developing maintenance and rejuvenation plans, for example, in Batu Ferringhi
- Upgrade existing infrastructures at all tourist destinations, such as public transportation, parking and other public facilities, and improve accessibility for elderly and disabled persons
- Develop new activities, experiences and initiatives at existing tourism sites
- Collaborate with local trades and small businesses to produce high-value and specialised tourism products and souvenirs

Advancing the capacity and professionalism of hospitality workers

Measures	Short-term/ medium-term	Agencies
S2.3 Develop and improve the capacity and work attitudes of service and hospitality workers	Medium-term	• State EXCO for Tourism and Creative Economy • Tertiary education institutions • TVET institutions • CAT Centre • Hospitality players • Industry associations • Industry players

Possible Actions

- Address the issue of labour shortages by offering more competitive wages and employee benefits
- Identify the gaps and industry needs in recruiting high-skilled hospitality workers
- Work with the relevant tertiary institutes and technical-vocational education institutions as well as tourism academies on developing curricula and courses that are relevant to current industry needs
- Develop training and development programmes for hospitality workers, tourist guides, interpreters and tour operators
- Identify and adopt international best practices in the food and hospitality sector
- Collaborate with the private sector and tourism players in establishing skills development infrastructure for service and hospitality workers, with a key focus on addressing industry needs and improving professionalism and front desk services
- Develop workplace training programmes and placements for service and hospitality students to offer workplace experiences
- Develop retention strategies such as opportunities for professional development, training and attractive wage packages and benefits
- Increase the adoption rate of digital technologies to enhance hospitality services

Foster partnerships between tourism players and stakeholders

Measures	Short-term/ medium-term	Agencies
S2.4 Develop a baseline tourism study	Short-term	• State EXCO for Tourism and Creative Economy • PGT • Industry associations • Industry players • DOSM • Local authorities (MBPP & MBSP)

Possible Actions

- Automate the collection of tourism-related data on an annual basis, such as the number of visitors, demographics and profile of visitors, tourism revenue, spending patterns, preferred activities etc.
- Perform a market analysis on market trends and Penang's regional competitors to ensure Penang remains competitive, particularly in high-value segments such as medical tourism and MICE
- Work with DOSM to assess and update the economic impact of the tourism industry such as contribution towards the state's GDP, creation of employment opportunities and generation of revenue by each tourism subsector
- Work with local councils to stocktake Penang's tourism assets such as the state's natural, cultural and historical attractions, parks and forest reserves, museums, activity centres etc.
- Identify opportunities for improvement and upgrades as well as potential growth trends for future development

Foster partnerships between tourism players and stakeholders

Measures	Short-term/ medium-term	Agencies
S2.5 Increase public-private initiatives and develop networks between tourism players and stakeholders	Short-term	• State EXCO for Tourism and Creative Economy • PGT • Travel agencies • Airline companies and associations • Industry associations • Industry players

Possible Actions

- Identify potential tourism stakeholders and players for collaboration (hotels, tour operators, food and beverage businesses etc)
- Maintain and expand partnerships between domestic tourism stakeholders by fostering communication and collaborative measures
- Expand the collaborative networks with international players for global exposure
- Develop and increase strategic partnerships with airlines to bring direct flight routes to Penang
- Develop incentives for partnerships, such as subsidies and other financial incentives
- Create a platform for knowledge sharing and capacity building between partners on topics such as digitalisation and business development
- Create a collaborative ecosystem for sustainable tourism funding mechanisms
- Create a more business-friendly environment for collaborations by streamlining regulations and processes for business to participate in partnerships

Developing sustainable tourism practices and initiatives

Measures	Short-term/ medium-term	Agencies
S2.6 Develop and promote experiential-based sustainable tourism initiatives	Short-term	• State EXCO for Tourism and Creative Economy • PGT • Industry associations • Industry players
S2.7 Establish the Middle Bank Marine Sanctuary (MBMS) in the Straits of Penang	Medium-term	• Department of Environment (DOE) • Department of Fisheries (DOF) • PLAN Malaysia • MBSP • State Economic Planning Unit (BPEN) • Malaysian Fisheries Development Authority (LKIM) • Penang Institute

Possible Actions

- Highlight and promote Penang's natural forests, hills and parks as destinations for ecotourism
- Curate specialised heritage walks and trails that highlight the state's history, culture and traditions
- Strengthen and develop Seberang Perai's capacity in ecotourism by identifying and utilising its natural assets of mangrove forests, mudflats and rivers
- Work together with homestay operators and the local community to create more high-value experiences for visitors
- Support local communities and businesses, particularly women and youth-led businesses to develop sustainable tourism offerings, such as homestays, farm to table experiences, handicrafts and traditional products businesses etc.
- Develop and curate personalised and high-value experiential tour packages in accordance with different tourism subsectors

- Advance sustainable tourism initiatives by successively conserving surrounding marine ecosystems and allowing tourists to experience marine life via boat tours
- Support heritage tourism initiatives by protecting and highlighting marine traditions and the lives of coastal fisher folks and their relations with the sea
- Enhance adventure tourism initiatives e.g. sports fishing activities

Nurturing creative industries and business services

CREATIVE INDUSTRIES AND BUSINESS SERVICES

Industry overview

Creative economy

Penang's creative ecosystem, although small, has always been vibrant and holds the potential to diversify the state's economic structure with high-value activities. Over the past ten years, Penang's creative industries have prospered from spillovers from its dynamic tourism sector, in no small part due to George Town's World Heritage Site status. Nurturing a vibrant creative sector demands a specialised set of strategies beyond those for the tourism sector. Creative businesses play a key role in

producing content for tourism-related businesses, and a competitive startup ecosystem would provide a valuable testbed for new ideas in established industries such as manufacturing, finance and agriculture.

The **creative industry** in Penang consists of

- Film and lifestyle innovation
- Fashion
- The performing arts
- Architectural design
- Handicrafts
- Copywriting
- Cultural exhibitions facilities
- Visual arts
- Festivals
- Publishing
- Animation and digital media
- Archives and resources

The executive council portfolio for Creative Economy was created in September 2020, which is intended to focus on developing Penang's creative economy. It aims to ensure that the unique art, culture and heritage of Penang will not lose its inherent characteristics and economic value. At the same time, developing the creativity and technological focus of the youth is regarded as vital.

SME

In 2015, Penang's small and medium enterprises (SMEs) make up

99%
of all business establishments

OR

7.4%
of all SMEs nationally

89.1%
of SMEs are in the services sector

1 in 6
are women-owned

Of the
404,013
persons employed by SMEs in Penang,

37.3%
are employed by micro enterprises

41.1%
are employed by small enterprises

Digital startups

Curating an ecosystem conducive to the growth of tech and digital startups is one of Penang's focus areas for development. Since the establishment of Digital Penang in 2020, Penang's startup scene, especially in George Town, has matured considerably, as reflected in local and international rankings. The startup ecosystem in George Town is ranked second-best in Malaysia, and in 2023, its global ranking climbed twelve spots in the Global Startup Ecosystem Index. Startups in education, marketing and sales, and e-commerce and retail represent about 55% of the startups on StartupBlink's Startup Ecosystem Map in George Town.

The success of Penang's homegrown startups, including Forward School, Piktochart and Exabytes, continues to inspire local entrepreneurs. Digital Penang plays a leading role in fostering the startup ecosystem by providing facilitation and support to potential tech startups. Currently, about 60 startups are listed on Digital Penang's directory, cutting across agritech, AI, consulting, digital marketing and gaming, with several venture capital firms establishing their local chapters in Penang.

**Penang's
Global
Business
Services**
employ

17,000
staff across
70
firms

Global business services

Global Business Services (GBS) is a centralised approach to delivering services to businesses. The sector consists of shared services (also known as 'captives'), outsourcing firms and centres of excellence (COEs) and can be delivered from onshore or offshore locations. The services provided include finance, IT, HR, procurement and other functions. While the sector is emerging, employing 17,000 staff across 70 firms in Penang, for GBS has the potential to capitalise on digital transformation towards specialised and non-routine services. In addition, Penang is strategically well-placed due to the availability of a multicultural and multilingual labour force, as well as an advantageous time zone when it comes to supporting global operations.

Review of existing plans

Creative economy

Malaysia has promoted the creative industries by implementing policies and programmes that encourage infrastructure and market-based reforms, such as streamlining intellectual property, fostering human capital development, and breaking into global markets. However, unclear definitions, poor governance, limited funding, incentives, intellectual property (IP) issues, and a lack of talent and capacity building, challenge the growth of the creative industry.

The Twelfth Malaysia Plan has outlined several paths to accelerate the growth of the creative industry, including developing a holistic ecosystem, upskilling talent to match industry needs as well as strengthening product development and promotion. To develop Penang's creative economy, Penang2030 includes plans to establish an arts and culture masterplan, invest in a network of museums and galleries and establish a culture and design cluster.

Small and medium enterprises

Malaysia's goal to become an outstanding entrepreneurial country in 2030 requires improving the entrepreneurial ecosystem in terms of market, policies, funding, support, culture, skills and talent, technology and innovation.

Under the National Entrepreneurship Policy 2030, six strategic thrusts have been identified to empower local entrepreneurs:

Fostering entrepreneurship culture across all segments of Malaysian society

Optimising the regulatory environment and access to funding

Stimulating holistic and integrated entrepreneurship development

Accelerating economic growth through innovation-driven enterprise

Strengthening entrepreneurial capabilities and performance of MSMEs

Internationalising high-growth enterprises

Following the direction of the National Entrepreneurship Policy, the Twelfth Malaysia Plan sets out to (1) create innovative and sustainable entrepreneurs, (2) promote inclusive participation and (3) develop a conducive and holistic ecosystem for entrepreneurship; through measures such as enhancing entrepreneurship development, capitalising private entities to develop entrepreneurs, enhancing governance and regulation, and improving access to financing. Federal policies on entrepreneurship also include plans for specific, niche entrepreneurial areas, for example, the Social Entrepreneurship Action Framework 2030, which sets out to develop a thriving ecosystem of impact-driven entrepreneurship. At the regional level, Northern Corridor Economic Region (NCER) programmes focus on encouraging and creating opportunities for entrepreneurship through entrepreneurial development, financing, and digitalisation.

The Penang State Government has been working to encourage SMEs to contribute to economic growth. The Penang Structure Plan 2030 enhances the competitiveness of SMEs and microenterprises through youth entrepreneurship, digitalisation, raising productivity and building business ecosystems. Under Penang2030, the state encourages co-working spaces, e-commerce and digital businesses, and envisions Penang as a startup and social enterprise-friendly state. Among its initiatives are to enhance startup and entrepreneurial programmes for youth, women and vulnerable communities.

PDC has managed the state's Skim Pinjaman Harapan since 2009, which is a low-cost source of funding for hawkers and other small traders. In addition, the state has been driving a series of initiatives under the banner of Keusahawanan Satu Budaya 2022-2030.

Digital startups
Federal government policies, in particular capital market access policies, attracting and retaining tech talents and market access opportunities, are important for the development of Malaysia's startup ecosystem. The Malaysian Startup Ecosystem Roadmap (SUPER) 2021-2030 aims to create 5,000 startups and place Malaysia within the Top 20 startup ecosystems by 2030. This will be done through a two-pronged approach of growing startups while developing strategic sectors. Cradle Fund Sdn Bhd is tasked with providing early-stage funding, while Malaysian Research Accelerator for Technology & Innovation (MRANTI, formerly MAGIC) and Malaysia Digital Economy Corporation (MDEC) are responsible for supporting startups in later stages of growth.

Meanwhile, the Digital Transformation Master Plan (DTMP) extends Penang2030's vision of enabling and orchestrating Penang's digital strategy through accelerating efforts to capture opportunities in the digital economy and to continually promote a digitally engaged society. This is executed via Digital Penang, which was established by the Penang state government. Digital Penang brings together partners including federal agencies and private

corporations to create a thriving startup ecosystem. The state agency also established the Founders' Grit Seed Programme in 2022, which provides critical business support to early-stage startups by catalysing growth and providing access to funding. Digital Penang works closely with its federal counterparts, in particular Cradle/MyStartup, MDEC and MRANTI. In addition, the state has designated Creative Digital District @ George Town (CD^2 @ George Town) as the hub for Penang's digital ecosystem.

Global Business Services

Malaysia's GBS industry is supported by the National Fourth Industrial Revolution (4IR) Policy and Malaysia Digital Economy Blueprint (MDEB), which focus on developing talent and skills, building supporting infrastructure and facilitating business adoption of relevant technologies. These measures accelerate the adoption of key skillsets required to create high-value jobs at outsourcing firms, including robotic process automation, natural language capabilities and machine learning. Furthermore, the National Digital Network (JENDELA) initiative will ensure reliable, stable connectivity to support GBS needs.

At the state level, Penang2030 has identified business outsourcing in Penang as a key initiative for the services sector.

MAJOR CHALLENGES

Financial resources

SMEs and creative enterprises face difficulty in accessing and securing financing. There is a lack of investment in the creative sector in comparison to other economic sectors. Moreover, SMEs in general lack economies of scale and scope, leading to high overhead costs. Digital startups in particular have a defined route of funding from inception to IPOs. However, this process may be challenging to navigate and may not be compatible with certain market niches. It is important to build a local ecosystem of funding organisations across various market niches, including angel investors and venture capitalists, to achieve critical mass for Penang's startup ecosystem. The appeal of generous capital availability from funding institutions based outside Penang may lure startups away from Penang as a destination to start their business.

Talent and skills

Smaller firms lack funding and the resources needed to offer competitive salaries and to retain, upskill or reskill their workers. Limitations of education and training programmes have led to challenges in the cultivation of talent to address industry needs and to move up the value chain.

Relatively poor access to talent and the lack of suitable talent for SMEs impede innovation and digital adoption. On top of that, the movement of local talents to neighbouring states/countries with a more robust creative industry ecosystem amounts to a serious brain drain.

Infrastructure

The creative sectors lack creative working spaces, such as studios, workshops, exhibition spaces and performance halls. In particular, the performance arts incur high costs in renting/buying studio spaces, rehearsal and performance venues.

SMEs may be hindered by limited access to technological infrastructures, including digital technology and facilities, efficient online connectivity and other digital resources. Similarly, GBS operations require large MSC-compliant office spaces.

Insufficient access to information and knowledge

Entrepreneurs in small businesses may lack the entrepreneurial energy, capacity, skills and knowledge to grow their businesses. Creative entrepreneurs and SMEs in particular may be hindered by deficiencies in their digital skills and in the adoption of new technologies, which lead to resistance to change and fear of risks. Smaller firms will also find it difficult to compete against larger firms in terms of R&D expenditure and innovation. Specifically in the creative industry, smaller firms may be affected by a lack of protection for creative works due to unfamiliarity with intellectual property, patents, trademarks and copyright issues. Small businesses in Penang would benefit from networks and opportunities to foster collaboration and knowledge sharing.

Fragmentation of the creative ecosystem

In general, there is a lack of consensus on the definition of the creative sector, leading to uncoordinated discussions and uneven development. In Penang, the creative ecosystem is geographically scattered. Besides, there is a lack of coordination and collaboration among different creative sectors, industry players and relevant stakeholders.

Strategies and action plans
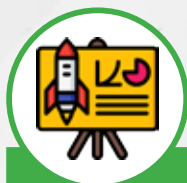
Expand access to funding for small trades and businesses, including startups

Measures	Short-term/ medium-term	Agencies
S3.1 Expand the Skim Pinjaman Harapan microfinance scheme for SMEs while ensuring the sustainability of the fund	Medium-term	• Penang Development Corporation • SMART Penang Centre
S3.2 Enhance access to funding for innovative creative and digital startups	Medium-term	• State EXCO for Tourism and Creative Economy • Digital Penang • SMART Penang Centre

Possible Actions

SMEs
- Review the adequacy of the financing terms of Skim Pinjaman Harapan to meet SME needs
- Work with other public SME financing agencies such as Credit Guarantee Corporation and SME Bank to identify potential areas of collaboration and gaps in SME financing in Penang
- Explore opportunities for entrepreneur support programmes for recipients, e.g. capacity building programmes and mentorship

Creative industries
- Create a fund for various potential creative enterprises

Digital startups
- Continue to work closely with potential partners: angel investors, venture capitalists, federal agencies, and government-linked entities

Support the growth of creative and other small businesses

Measures	Short-term/medium-term	Agencies
S3.3 Diversify creative products to improve competitiveness, focusing on traditional products and arts, tradespersons, and local designers	Short-term	• State EXCO for Tourism and Creative Economy • State EXCO for Trade, Industry and Entrepreneur Development • State EXCO for Tourism and Creative Economy • Industry associations • Industry players
S3.4 Support existing small business ecosystems; ensure the sustainability of George Town as a core business ecosystem	Short-term	• State EXCO for Trade, Industry and Entrepreneur Development • George Town World Heritage Incorporated

Possible Actions

Creative industries
- Promote high-quality products that highlight local produce, heritage and tradition, and contemporary local designer goods, e.g. exhibitions, showcases and competitions
- Encourage local culture, heritage and traditions as a source of innovation and creativity for the re-interpretation and creation of cultural products among small enterprises
- Encourage craft-makers to use raw materials from Sabah & Sarawak

SMEs
- Engage priority groups, particularly women, Bumiputera and low-income groups, to set up enterprises to support economic empowerment

Creative industries
- Recognise the small business ecosystem's key role in tourism and heritage preservation, including niche retail outlets, trades, etc.
- Identify street retail zones and systematically plan for street retail infrastructure in prominent business areas in the GTWH area and beyond, e.g. covered walkways, no-car/short-term parking zones

SMEs
- Empower and elevate Penang's trades and craftsmen, especially in repair businesses, and pilot apprenticeship programmes to ensure continuity
- Monitor and address financial hurdles from small businesses' compliance with George Town World Heritage City requirements

Support the growth of creative and other small businesses

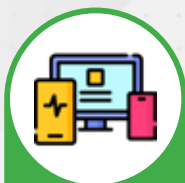| Measures	Short-term/ medium-term	Agencies
S3.5 Support access to the market for SMEs by advocating for SMEs and reducing information barriers to market access	Short-term	• State EXCO for Trade, Industry and Entrepreneur Development • SME Corp • PDC • InvestPenang • Penang Youth Development Corporation (PYDC)

Possible Actions

SMEs
- Work closely with small business associations to understand barriers to small business development and address their challenges
- Integrate and formalise the roles of the State Entrepreneurship EXCO, SMART Centre and Penang SME Centre under a state Small Business Commission to champion issues relating to small businesses
- Extend assistance to social enterprises, including working towards compliance with standards such as the National Social Enterprise Accreditation and B Corp Certification
- Champion the interests of small businesses with online platforms e.g. online shopping, digital payments and delivery services

SMEs and digital startups
- Provide aspiring entrepreneurs with the essential technical skills (e.g. digital knowledge, ESG, intellectual property and regulations), and help them align with market opportunities (e.g. access to local supply networks and exports markets)

Creative industries, SMEs and digital startups
- Regularly monitor programmes to ensure that barriers to priority groups, particularly Bumiputera, women and youth, are addressed

Supporting infrastructure for a thriving creative ecosystem

Measures	Short-term/ medium-term	Agencies
S3.6 Strengthen and upgrade the capabilities of physical and digital infrastructure to support small businesses	Short-term	• State EXCO for Tourism and Creative Economy • Penang Art District • Digital Penang • Local authorities (MBPP & MBSP) • InvestPenang

Possible Actions

Creative industries
- Increase access to resources, equipment and spaces (e.g. organising regular exhibitions, expositions, festivals) and revitalise existing spaces e.g. Dewan Sri Pinang

Digital startups
- Build partnerships with owners of vacant buildings and spaces to creatively adapt and reuse these for events and performances

SMEs
- Provide flexible leasing options for different types of usage (e.g. pop-up markets, presentations etc)
- Support digital transformation via Penang SME Go Digital, particularly among microenterprises; continuously monitor and address gaps in digital adoption

GBS
- Expand the availability availability of physical workspaces for GBS

Creative industries and SMEs
- Ensure access to affordable and reliable digital connectivity for creative and small enterprises

Creative industries and startups
- Support the role of co-working spaces in the startup ecosystem and creative economy

Supporting infrastructure for a thriving creative ecosystem

Measures	Short-term/ medium-term	Agencies
S3.7 Promote a vibrant and creative ecosystem for the growth of small businesses	Short-term	• State EXCO for Tourism and Creative Economy • State EXCO for Trade, Industry and Entrepreneur Development • Penang State Museum and Art Gallery • Penang Art District • Digital Penang

Creative industries
- Improve access to museums and art galleries as key exhibition venues for creative activity
- Invest in promoting the Penang "brand" through historical and artistic values, including new approaches (e.g. emerging digital platforms)

SMEs
- Identify new avenues for partnerships and event venues to provide exposure for SMEs, e.g. Hin Bus Depot

Creative industries and SMEs
- Develop a network to provide guidance and support to startups and other small businesses

Creative industries and startups
- Enhance George Town's Creative Digital District (CD^2) by building partnerships between businesses and education towards developing its talent pool
- Develop a strategy for talent, businesses and education in CD^2

Innovation, talent, and skills

Measures	Short-term/ medium-term	Agencies
S3.8 Increase opportunities for upskilling across the services sector	Short-term	• State EXCO for Human Resources and Science, Technology & Innovation • PSDC • PYDC

Creative industries
- Involve talented young people, especially those from low-income backgrounds, so that they contribute to the development of the creative economy through different training pathways
- Provide training/courses for creative workers and artists

GBS
- Work with training providers to provide training options for emerging and current skillsets for GBS, including engineering support services
- Explore the potential of the vocational model to address skill gaps in GBS, e.g. finance and accounting, secretarial services

SMEs and startups
- Develop and strengthen the efficacy of startup and entrepreneurship development programmes
- Assist SMEs with capacity building programmes e.g. to comply with international standards and regulatory requirements, remedy gaps in ESG, and upskill for Industry 4.0

Boosting agricultural resilience, growth and productivity

AGRO-BASED AND AGRITECH

Industry overview

Although the agriculture sector contributes only 2% to Penang's GDP, it is still a key component of the state's economy, providing raw materials to resource-based industries such as the food manufacturing sector as well as employment for thousands of people. The sector also contributes to food and nutrition security. The aquaculture sub-sector is the main contributor to Penang's agricultural income. In 2021, the state's aquaculture production gained the second-highest wholesale value

(RM562.5 million) in the country after Perak. In the crop sub-sector, Penang recorded a high self-sufficiency level (SSL) for vegetables (81.4%) in 2021 and was able to meet 60% of its domestic demand for rice. The SSL for fruits remains at less than 50%. In the livestock segment, poultry farming has the largest production in Penang, followed by pork. In 2021, the production of pork (227.3%) and poultry meat (113.3%) recorded a higher SSL compared to eggs (42.6%), fresh milk (25.2%), cow meat (20.9%) and lamb (5%).

RM562.5 mil
Wholesale value of aquaculture, Penang (2021)

16% of Malaysia's aquaculture production (by wholesale value)

Perak | Penang | Johor
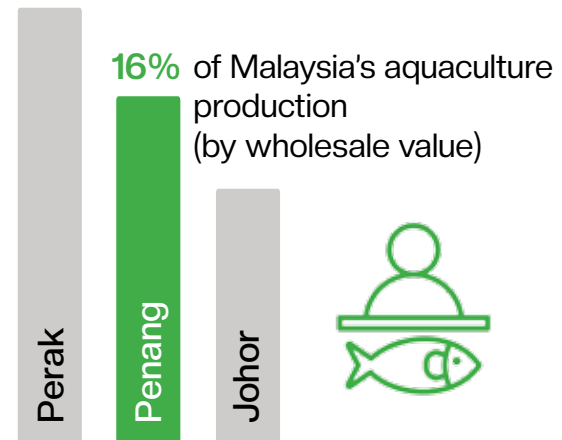
Self-sufficiency level (SSL) 2021

81%
vegetables

60%
rice

50%
fruits

227%
pork

113%
poultry meat

43%
eggs

25%
fresh milk

21%
beef

5%
lamb

With Penang's limited land area, sustainable agriculture solutions, application of technology and smart farming are crucial for the development of its agriculture sector. Although smart farming in Penang is still in an early stage of development, the state possesses great potential for adopting technologies, especially in the high-yield sectors of aquaculture and rice. Additionally, the E&E ecosystem in Penang provides good foundations for the state to continue developing the agrotech industry.

Review of existing plans

To ensure the country's food supply and security, the Ministry of Agriculture and Food Industry (MAFI) has introduced various policy plans and programmes. The National Food Security Policy Action Plan 2021-2025 takes into account challenges facing the food supply chain, ranging from agricultural inputs to climate change. This action plan has five strategic thrusts, namely, expansion of technology application, enhancing study and

research; strengthening food security data, expansion of strategic collaborations among ministries, state governments and private sector players, and strengthening governance at departmental and agency levels. Under this action plan, initiatives that will be implemented include an expanded aquaculture centre, the Large-Scale Smart Paddy Field (SMART SBB) programme, a site-specific nutrient management system, studies on alternative livestock and staple foods, and the adoption of modern cultivation techniques.

The food security issue is also addressed in the National Agrofood Policy 2021-2030 (NAP 2.0). This policy builds on five pillars, namely (1) modernisation and smart agriculture; (2) strengthening market and product access; (3) development of human capital; (4) raising food system sustainability; and (5) creating conducive business ecosystems and governance.

Additionally, the National Food Security Framework (KSMN) highlights the four dimensions of food availability, accessibility, utilisation and stability. This is supported by various strategies, policies and programmes based on social, economic, environmental and technological

The Twelfth Malaysia Plan, in turn, focuses on enhancing productivity, augmenting the support system, and strengthening the food value chain. In order to raise the total agriculture value-added in the country's GDP, the agrifood sector will be mainly driven by modernisation, mechanisation and technology adoption.

Modernising and diversifying the agriculture sector to increase yield and produce higher-value products is one of the main strategic initiatives of Penang2030. The state intends to function as a high-tech Green Valley, aquaculture industrial zone, and halal hub. It also aims to bridge the gap between basic skills and technology and to enable investment for R&D and talent development in the agriculture sector. The Feeding Penang initiative will also be introduced to create more localised and urban farming.

MAJOR CHALLENGES

Labour supply

The supply and quality of labour significantly affect agricultural productivity and the sector's long-term sustainability. The difficulty of employing local as well as foreign workers, especially since the COVID-19 pandemic is compounded by the negative perception of farming involving relatively low wages, hard work and limited career prospects. Labour-saving technologies could bring new opportunities, but even then, upskilling and reskilling of labour will be required.

Smallholders' market access

Farmers, particularly smallholders, often lack access to profitable and value-added markets. Smallholders' market access is mainly constrained by factors such as their location (logistics), lack of market information, and lack of business skills, especially in rural areas. Better access to markets allows farmers to sell their products at higher prices, and motivates them to increase the quantity, quality and diversity of their produce.

Pest and disease

Pests (in crops sub-sector) and diseases (in crops, livestock and fisheries sub-sectors) are common issues that adversely affect food production. Climate change is one of the main factors affecting pest and disease spread, which are driven by higher temperatures, higher humidity and rising CO_2 levels (FAO, 2021). There is a great need for better pest and disease management.

Technology adoption

One of the main difficulties facing a traditional industry like agriculture is convincing farmers to embrace new technologies and apply new farming methods. Statistically, most farmers in Malaysia—and this is exemplified in Penang—are relatively elderly, and may not be willing to adopt digital technology. Also, the process of implementing digital technology is expensive and better suited for large-scale producers. Without subsidies or aid, smallholders are likely to get left further behind. Broadband infrastructure is another important issue—many rural areas enjoy only limited mobile signal and landline internet connection. These are prerequisites for digitalisation. Therefore, it is important to ensure that the fundamental digital infrastructure in terms of network coverage and transmission rates in rural areas is in place. The availability and quality of data are often poor. There is an increasing need for information generated on-farm in its local-specific context; this is needed as an input in smart farming systems.

Climate change

The agriculture sector is extremely vulnerable to changes in the frequency and severity of extreme weather (e.g., droughts and floods). Climate change can reduce yields, and threaten food security. A good example is the November 2017 flash floods in Penang which significantly damaged paddy fields and aquaculture cages and badly affected the overall food production of the state. Substantial investments in adaptation and mitigation actions are therefore needed to manage risks from climate change and to achieve higher production and food quality.
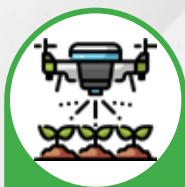
Strategies and action plans

Adoption of digital technologies and new farming methods

Measures	Short-term/ medium-term	Agencies
S4.1 Develop and provide training programmes to develop the skills and knowledge of farmers in using agricultural technology	Short-term	• State EXCO for Agrotechnology, Food Security & Rural Development • Department of Agriculture (DOA) • Department of Fisheries (DOF) • Department of Veterinary Services (DVS) • Farmers' Organisation Authority (LPP)

Possible Actions

- Identifying agricultural labour market needs in order to match skills demand and supply
- Introducing appropriate technologies that have the potential to contribute to sustainable farming systems
- Developing required digital skills and making sure that there is an openness about potential new business opportunities and models that may be unfolding with the digital transformation

Adoption of digital technologies and new farming methods

Measures	Short-term/ medium-term	Agencies
S4.2 Curate and publish data and information generated on-farm in its local-specific context and which are needed as input in smart farming systems	Short-term	• DOA • DOF • DVS
S4.3 Subsidise agricultural technology for smallholders for the purpose of facilitating adoption	Short-term	• State EXCO for Agrotechnology, Food Security & Rural Development • DOA • DOF • DVS
S4.4 Facilitate an ecosystem for agropreneurs to share best practices, insights and resources	Short-term	• State EXCO for Agrotechnology, Food Security & Rural Development • DOA, • DOF • DVS

Possible Actions

- Generating site-specific data and information, sharing them with farmers and making them publicly available
- Creating web-based data platforms together with big data analytics

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- Simplifying the application process and making it easier for smallholders to apply

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- Provide young agropreneurs with platforms to showcase their products.
- Promoting collaboration and knowledge sharing digitally throughout the e-agriculture community
- Models, methodologies, good practices and interoperability standards can be shared, along with open access possibilities

Adoption of digital technologies and new farming methods

Measures	Short-term/ medium-term	Agencies
S4.5 Facilitate and encourage joint efforts and partnerships between the public sector, industry actors and the farming community to adopt agricultural technology	Short-term	• State EXCO for Agrotechnology, Food Security & Rural Development • DOA • DOF • DVS • LPP • Malaysian Fisheries Development Authority (LKIM) • Farmers associations • Industry associations • Tertiary education institutions

Possible Actions

- Establishing specific guidelines and framework for public-private partnerships
- Getting public institutions to help farmers navigate and invest in digital technologies
- Digital industry players should be recommended to create a competitive and innovation-friendly landscape that allows equitable information flow and encourages fair competition
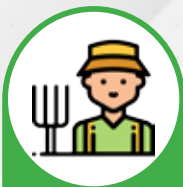
Enhancing farmers' position in the value chain

Measures	Short-term/ medium-term	Agencies
S4.6 Facilitate sustainable business development in rural areas	Short-term	• State EXCO for Agrotechnology, Food Security & Rural Development • DOA • DOF • DVS • LPP • LKIM
S4.7 Increase localisation of food supply chains	Short-term	• State EXCO for Agrotechnology, Food Security & Rural Development • DOA • DOF • DVS • LPP • LKIM

Possible Actions
• Increasing access of farmers in rural areas, especially women and youth, to markets and affordable financial and business advisory services such as market literacy, loan guarantees and venture capital
• Facilitating access to larger markets for smallholders by promoting local produce in supermarkets and hypermarkets

Boosting agricultural productivity through pests and diseases management

Measures	Short-term/ medium-term	Agencies
S4.8 Digital pest and disease control solutions	Medium-term	• DOA • DOF • DVS
S4.9 Plant protection and management training	Short-term	• DOA • LPP • Farmers associations

Possible Actions
• Applying technologies such as drones, AI-driven sensing technology and early warning systems for pest control and monitoring the appearance of dangerous weeds, pests or diseases
• Providing training programmes on sustainable methods of pest and disease management such as organic pest management, good pest control practices, monitoring and evaluation

Promoting urban farming for food security

Measures	Short-term/ medium-term	Agencies
S4.10 Promoting vertical farming (VF) through smart greenhouses and indoor farming	Short-term	• State EXCO for Agrotechnology, Food Security & Rural Development • Local authorities (MBPP & MBSP) • DOA • LPP
S4.11 Maximising the use of available space for urban farming and incorporating these in local plans	Medium-term	• State EXCO for Agrotechnology, Food Security & Rural Development • Local authorities (MBPP & MBSP) • Penang State Lands and Mines Department • Technology providers

Possible Actions

- Establishing a One Stop Centre to assist entrepreneurs in terms of sharing information and guidelines, providing equipment and training, and issuing licences and permits

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- Identifying vacant lands and buildings potentially suitable for urban and vertical farming
- Setting up community gardens at schools to promote urban farming education, healthy lifestyle behaviours, physical activity, and to develop social and leadership skills in children and their families

Glossary of Terms

12MP	Twelfth Malaysia Plan
4IR	National Fourth Industrial Revolution
BIM	building information modelling
BIS	Industrialised Building System
BPEN	State Economic Planning Unit
CAT	Competency, Accountability and Transparency
CAT Centre	Career Assistance and Talent Centre
CD2	George Town's Creative Digital District
COE	centres of excellence
CREST	The Catalyst For Malaysia's Technology Ecosystem
CPTPP	Comprehensive and Progressive Agreement for Trans-Pacific Partnership
DOA	Department of Agriculture
DOE	Department of Environment
DOF	Department of Fisheries
DOSM	Department of Statistics Malaysia
DTMP	Digital Transformation Master Plan
DP	Digital Penang
DVS	Department of Veterinary Services
E&E	electrical & electronics
ESG	Environmental, social, and corporate governance
EV	electric vehicle
EXCO	Executive Council
GBS	Global Business Services
GDP	Gross Domestic Product
GTWH	George Town World Heritage
HDI	high-density interconnect
HRD	Human Resource Development
ILMIA	Institute of Labour Market Information and Analysis
IC	integrated circuit
Industry4WRD	National Policy on Industry 4.0
IP	intellectual property
IPEF	Indo-Pacific Economic Framework for Prosperity
IPO	Initial Public Offer
IR4.0	Industrial Revolution 4.0
JENDELA	National Digital Network
KSMN	National Food Security Framework
LKIM	Malaysian Fisheries Development Authority
LPP	Farmers' Organisation Authority
M&E	machinery & equipment
MAFI	Ministry of Agriculture and Food Industry
MAHB	Malaysia Airports Holdings Berhad
MBPP	Majlis Bandaraya Pulau Pinang
MBSP	Majlis Bandaraya Seberang Perai
MDEB	Malaysia Digital Economy Blueprint
MDEC	Malaysia Digital Economy Corporation
MRANTI	Malaysian Research Accelerator for Technology & Innovation
MICE	Meetings, Incentives, Conferences and Exhibitions
MIDA	Malaysian Investment Development Authority
MITI	Ministry of Investment, Trade and Industry
MOE	Ministry of Education
MOT	Ministry of Transport
MOW	Ministry of Works
MPC	Malaysia Productivity Corporation
MSC	Multimedia Super Corridor
MSME	Micro, Small and Medium Enterprises
NCIA	Northern Corridor Implementation Authority
OSAT	outsourced semiconductor assembly & test
PAC	Penang Automation Cluster
PBA	Perbadanan Bekalan Air
PCB	printed circuit boards
PCEB	Penang Convention and Exhibition Bureau
PDC	Penang Development Corporation
PGC	Penang Green Council
PGT	Penang Global Tourism
PMED	Penang Centre of Medical Tourism
PRISM	Penang Regional Industrial Support Measures
PSDC	Penang Skills Development Centre
PSERCC	Penang Socio-Economic Recovery Consultative Council
PTA	Parent-Teacher Associations
PWDC	Penang Women's Development Corporation
PYDC	Penang Youth Development Corporation
R&D	research & development
RECP	Regional Comprehensive Economic Partnership
RMCD	Royal Malaysian Customs Department
SEDA	Sustainable Energy Development Authority
SDG	Sustainable Development Goals
SIBS	Scandinavian Industrialised Building Systems
SMART-SBB	Large-Scale Smart Paddy Field
SME	Small and Medium Enterprises
SSL	self-sufficiency level
STEM	science, technology, engineering and mathematics
STEAM	science, technology, engineering, mathematics and arts
SUPER	Malaysian Startup Ecosystem Roadmap
TNB	Tenaga Nasional Berhad
TVET	Technical and Vocational Education Training
US	United States