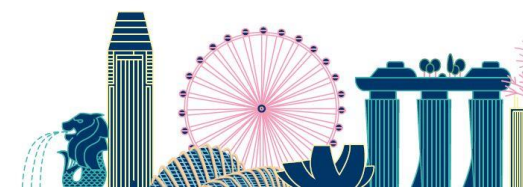


Overview of Singapore & Regional's Industry & Economy

Tjin Swee Chuan
LUX Photonics Consortium
Singapore



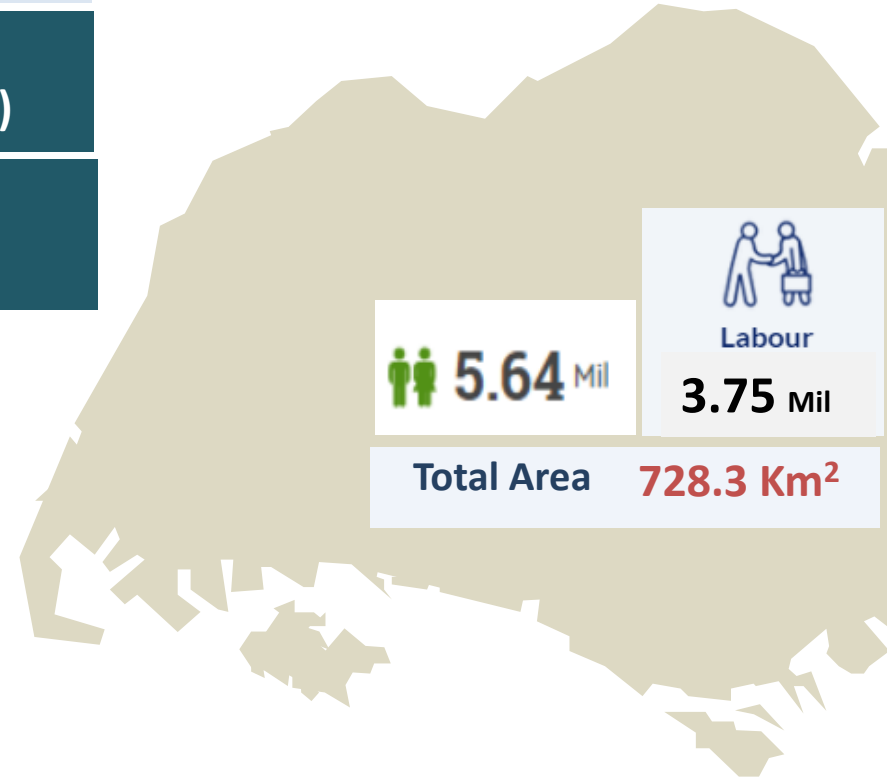
Introduction to Singapore



Singapore's Economy

2022 GDP: SGD \$643 B (~ USD \$470 B)
GDP Per Capita: SGD 114 k (~ USD \$85 k)

2022 GDP Growth: 3.6%
2023 GDP Growth forecast: 0.5 - 2.5%



Business-friendly environment

- Pro-business environment



World-class Talents

- Highly educated workforce



Critical Connector to the Rest of the World

- Connected to the global trade network
- Openness to talent



Great Place to Live

- A safe and vibrant city to work, live and play



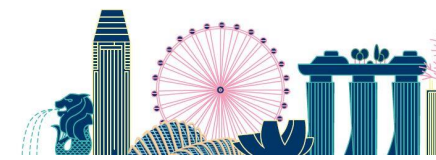
Trusted Partner

- Government as a trusted partner

Manufacturing is a Key Pillar of Economic Growth (> 20% contribution)

*Website: <https://www.singstat.gov.sg/modules/infographics/economy/>;
Source: Singapore - Ministry of Trade and Industry, MTI's Economic Survey of Singapore 2022.

Singapore's vibrant ecosystem



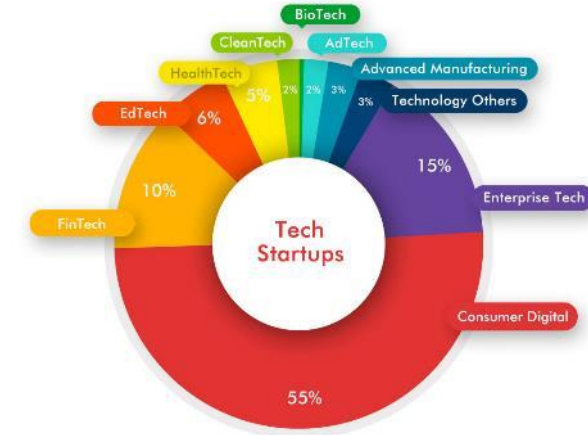
MNCs



Supporting Services



Startups



One of the highest concentration of global MNCs

- Base of over 7,000 MNCs, from G3, China, India, SEA and others countries
- Singapore enterprises with strong global / regional market share
- Regional mandate for SEA / APAC for market growth, budget allocations & spends, and partnerships
- Increasingly developing new products, services and go-to-market models

Established professional services with differentiated offerings

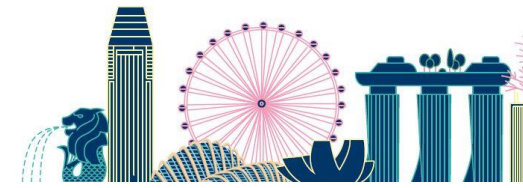
Hub for global service providers, often with Centres of Excellence to drive differentiated offerings for the region, e.g.:

- Asian consumer insights
- Future of Work
- Digital innovation & analytics
- UX
- Robotic Process Automation (RPA)
- I4.0

Ranked #1 Asian (ex-China) ecosystem for startups

- Over 2,400 tech startups
- Established funding & accelerator scene, with >40% deal flow in Southeast Asia
- Global Innovation Alliance (GIA) network to connect startups with key cities globally, e.g. San Francisco, Beijing, Jakarta, Bangkok, etc.
- Strong government support and policies to promote startup innovation

Excellent Connectivity to APAC and Beyond



OUR NETWORK



World's Best Airport.

World Airport Awards 2013 – 2020

~70 airlines ~100 cities

3 mil tons air cargo handling capacity

1.54 mil tons handled in 2020, 12th busiest international air cargo hub



Best Seaport in Asia.

Asian Freight, Logistics & Supply Chain Awards (32 times)

>200 shipping lines >120 countries

50 mil TEUs handling capacity

36.6 mil TEUs handled in 2020, 2nd busiest port in the world

ALTERNATIVE TRANSPORTATION

SOLUTIONS



Sea-Air-Land Intermodal Solutions

- 1 Optimal speed-to-cost solution
- 2 Viable alternative solutions providing options for shippers to cope with dynamic freight capacity situations

e.g. chilled meat from NZ was transported by air to Singapore, then shipped to the EU, ensuring freshness while remaining cost-effective

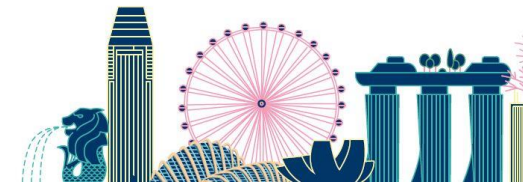


Facilitate Express Connections From Batam

- 1 New solution for same-day uplift of express cargoes from Batam
- 2 Suitable for high-value, time-sensitive cargoes to be delivered from Batam to region via Singapore

e.g. electronic components delivered by air express players from Batam via Singapore's airports

Regional Comprehensive Economic Partnership



Signed on 15 November 2020, the Regional Comprehensive Economic Partnership (RCEP) is the world's largest free trade agreement comprising of 15 economies, making up 30% of global GDP and about one-third of the world's population.



Australia



Brunei



Cambodia



China



Indonesia



Japan



South Korea



Lao PDR



Malaysia



Myanmar



New Zealand



Philippines



Singapore



Thailand



Vietnam

Key Benefits for Businesses in Singapore

Tariff elimination of around 92% of goods traded among RCEP parties on average.

Commitments among RCEP parties to **prohibit performance requirements on investors**

Enhanced Non-Tariff Measures (NTM) Provisions to **bring down trade transaction costs for businesses**

More conducive digital trade environment while enhancing information protection

Streamlined rules for greater flexibility to tap on **preferential market access benefits**

Businesses can **obtain greater IP protection** when venturing into RCEP markets

Simplified customs procedures for a **more efficient clearance of traded goods**

Businesses are **protected from anti-competitive activities** with competition law regimes

At least 65% of services sectors will be fully open with **increased foreign shareholding limits**

Greater transparency through publication of laws, regulations and procedures

Indonesia



GDP in 2021: USD 1,186 Bil*

GDP Growth in 2022: 5.31%**

Indonesia



GDP (US\$)
1,186.1 billion (2021)



GDP Per Capita (US\$)
4,357 (2021)



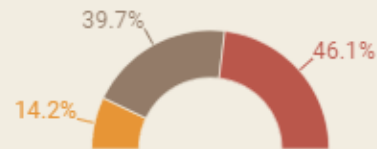
Capital: Jakarta

External Trade (% of GDP)

33.2% (2020)



Economic Structure (GDP composition, 2020)



● Agriculture, hunting, forestry, fishing ● Industry ● Services

Currency

(period average)

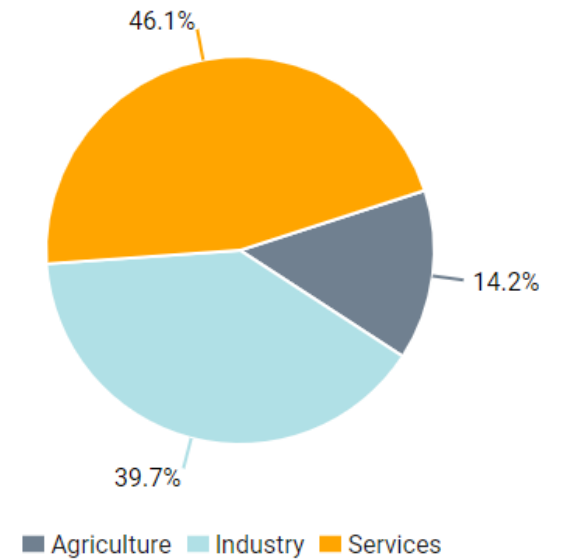
Indonesian Rupiah



14,308.14 per USD (2021)

Industry: 39.7%

GDP by Sector (2020)



■ Agriculture ■ Industry ■ Services

*estimate by HKTDC Research; on website: <https://research.hktdc.com/>

Source: Department of Economic and Social Affairs of United Nations, Encyclopædia Britannica, IMF, Pew Research Center, State Information Center of China, United Nations Conference on Trade and Development, World Bank, World Trade Organization

**<https://asia.nikkei.com/Economy/Indonesia-s-GDP-grew-5.31-in-2022-hitting-9-year-high>

Thailand



GDP in 2021: USD 513.2 Bil*

GDP Growth in 2022: 2.6%**

Thailand



GDP (US\$)
513.2 billion (2021)*



GDP Per Capita (US\$)
7,336 (2021)*

Capital: Bangkok

External Trade
(% of GDP)

98.0% (2020)



Economic Structure
(GDP composition, 2020)



● Agriculture, hunting, forestry, fishing ● Industry ● Services

Currency
(period average)

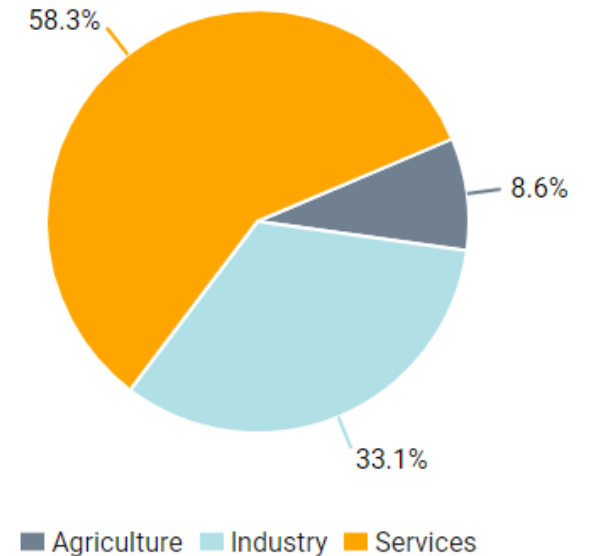
Thai Baht



31.98 per USD (2021)

Industry: 33.1%

GDP by Sector (2020)



*estimate by HKTDC Research; on website: <https://research.hktdc.com/>

Source: Department of Economic and Social Affairs of United Nations, Encyclopædia Britannica, IMF, Pew Research Center, State Information Center of China, United Nations Conference on Trade and Development, World Bank, World Trade Organization

**<https://asia.nikkei.com/Economy/Thai-GDP-grew-2.6-in-2022-as-slow-exports-outweighed-tourism-gain>

Vietnam



GDP in 2021: USD 366.2 Bil*

GDP Growth in 2022: 8.02%**

Viet Nam



GDP (US\$)
366.2 billion (2021)*



GDP Per Capita (US\$)
3,725 (2021)*



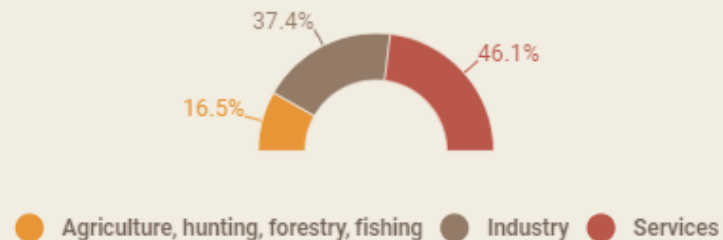
Capital: Hanoi

External Trade (% of GDP)

208.3% (2020)



Economic Structure (GDP composition, 2020)



Currency (period average)

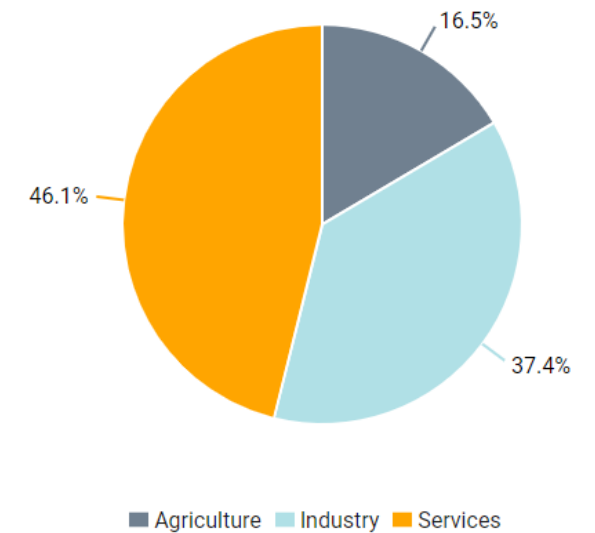
Vietnamese Dong



23,159.78 per USD (2021)

Industry: 37.4%

GDP by Sector (2020)



*estimate by HKTDC Research; on website: <https://research.hktdc.com/>

Source: Department of Economic and Social Affairs of United Nations, Encyclopædia Britannica, IMF, Pew Research Center, State Information Center of China, United Nations Conference on Trade and Development, World Bank, World Trade Organization

**<https://asia.nikkei.com/Economy/Vietnam-GDP-grows-8.02-in-2022-fastest-expansion-in-25-years>

Malaysia



GDP in 2021: USD 372.8 Bil*

GDP Growth in 2022: 8.7%**

Malaysia



GDP (US\$)
372.8 billion (2021)



GDP Per Capita (US\$)
11,399 (2021)*

Capital: Kuala Lumpur

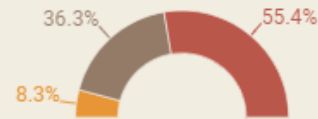


External Trade
(% of GDP)

116.4% (2020)



Economic Structure
(GDP composition, 2020)



● Agriculture, hunting, forestry, fishing ● Industry ● Services

Currency
(period average)

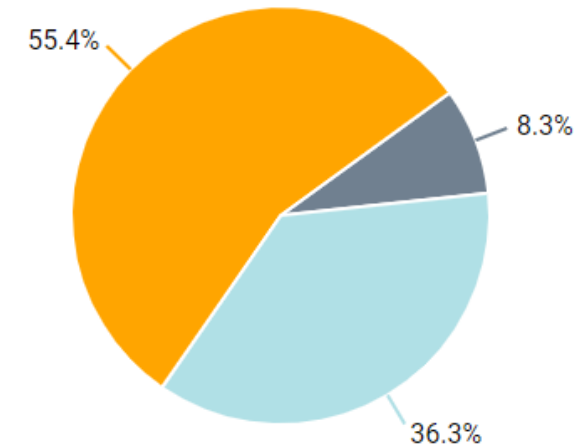
Malaysian Ringgit



4.14 per USD (2021)

Industry: 36.3%

GDP by Sector (2020)



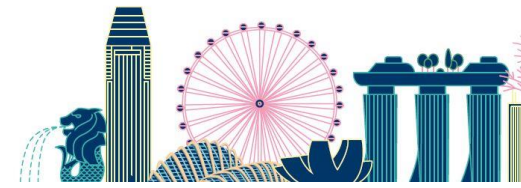
■ Agriculture ■ Industry ■ Services

*estimate by HKTDC Research; on website: <https://research.hktdc.com/>

Source: Department of Economic and Social Affairs of United Nations, Encyclopædia Britannica, IMF, Pew Research Center, State Information Center of China, United Nations Conference on Trade and Development, World Bank, World Trade Organization

** <https://asia.nikkei.com/Economy/Malaysia-GDP-grew-7-in-4th-quarter-beating-forecasts>

Singapore's Industry Landscape – Enabled by Photonics



Sectors with Growth Opportunities

- Demand for Photonics is driven by industries that Singapore occupies leading positions in and/or are critical to us

Life Science Tools



- Surgery and Diagnosis e.g. glaucoma surgery, flow cytometry, microscopy.
- 8 of the top 10 life science tool companies have operations in Singapore.

Semiconductor Equipment



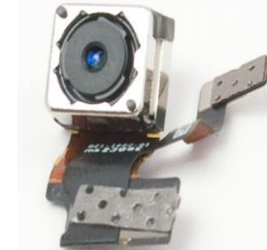
- Front end and Back end processes, such as lithography.
- Singapore's semiconductor equipment sector contributes to ~20% of the global market

Industrial Machinery



- Material processing e.g. cutting, annealing.
- Advanced manufacturing, 3D printing and Machine Vision

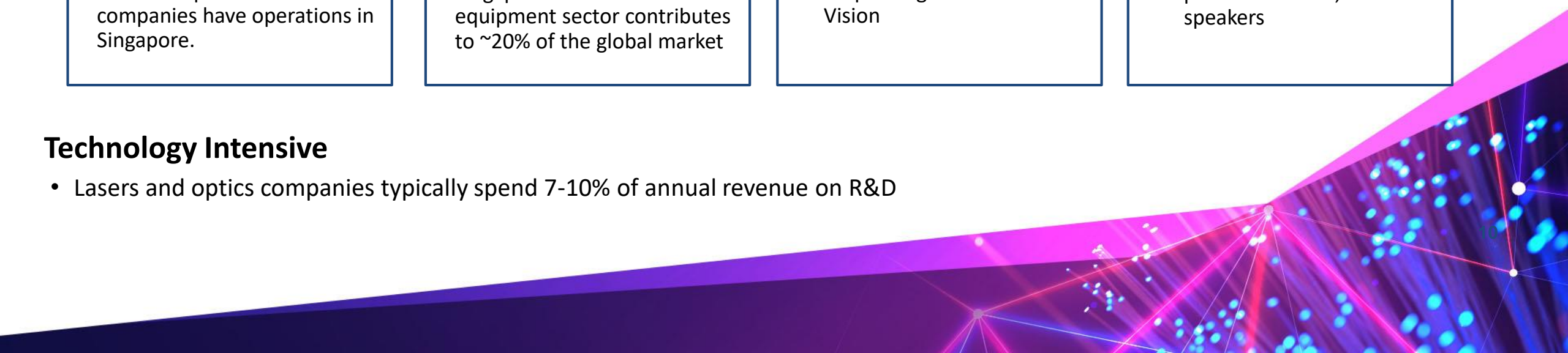
Consumer Electronics



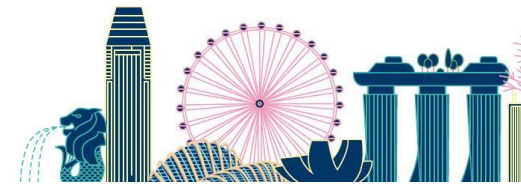
- key components in many consumer electronic devices e.g. mobile phones cameras, micro speakers

Technology Intensive

- Lasers and optics companies typically spend 7-10% of annual revenue on R&D



Complemented by semiconductor equipment industry



Front End Equipment

Back End Equipment



Largest manufacturing site
(40% of AMAT's output)

Applied Packaging
Development Centre

APAC customer service hub



Largest manufacturing site
(30% of KLA's output)

Lead R&D site for 2
product groups

APAC customer service
hub



Global manufacturing hub
(80% of tool production)

Process development &
New Product Introduction



Global HQ & Global manufacturing hub
(90% of tool production)

Central engineering & process development for
SMT equipment & wirebonders

APAC customer service hub



Manufacture gas/liquid delivery systems;
Integrate & refurbish process modules

Ex-US R&D Hub

APAC customer service hub



Global manufacturing hub
(50% of tool production)

R&D hub for gas & chemical delivery
subsystems

APAC customer service hub



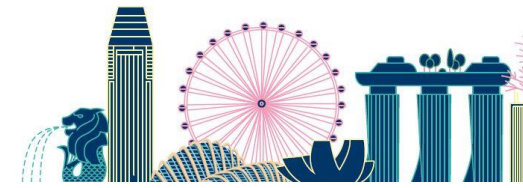
Global HQ & global manufacturing hub
(60% of final tool assembly)

Central engineering & process development for
products manufactured in Singapore

APAC customer service hub

- Singapore's semiconductor equipment sector contributes to ~20% of the global market*

LIFE SCIENCE TOOLS- enabling by Photonics



- 8 out of the top 10 analytical instrument firms have a sizeable presence, employing >3,000 professionals

Waters

THE SCIENCE OF WHAT'S POSSIBLE.™

- APAC HQ
- R&D team

Waters opens food and water research centre in Singapore

Published: Sep 14, 2018

Source: Waters Corporation

ThermoFisher SCIENTIFIC



TMO's first cloud-enabled benchtop instrument

- APAC HQ operations
- Product Development team across multiple BU
- Manufacturing site for sequencers, thermal cyclers and cytometry



Agilent Tech to invest S\$85m over 5 years in manufacturing, research in Singapore

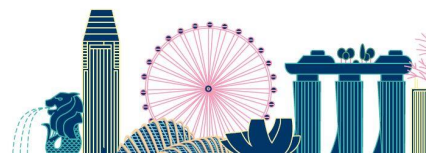
July 2017



Agilent Technologies

- APAC HQ and supply chain control tower
- Global Solution Development Centre
- Manufacturing site, which in 2017 the company committed to further expanding to include new product lines
- Agilent University – first in Asia training facility for customer engagement and applications development
- Jan 2022: Signed RCA with A*STAR's Singapore Institute of Food and Biotechnology Innovation to develop enhanced methods of biochemical analysis for food.

National Priorities for Lasers & Optics R&D in Singapore



As part of the “Research, Innovation & Enterprise (RIE) 2025” budget planning process, the R&D Sectoral Strategy for Precision Engineering and specific to Photonics was developed, 4 priority areas were identified:

1 Integrated Photonics & Flat Optics

- Flat optics design • System integration
- Wide spectrum operability • Dynamic wavelength tunability
- Scalable manufacturability, etc.

2 Imaging Systems, Metrology & Sensors

- Micro-optics • hybrid sensors
- AI-assisted automated inspection
- High-flux soft X-ray, EUV, etc.

3 Lasers & Fibre Optics

- Ultra-fast high-power fibre laser • Ceramic laser gain media
- Mid-IR laser • eye-safe laser • GaN green laser • VCSEL pixel arrays
- Tunable quantum cascade laser (QCL) • Transparent scintillators

4 Displays & Lighting

- Micro-LED (pixel, color-conversion)
- Novel photonics devices- light field AR/VR

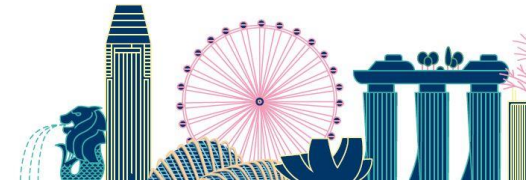
Near-term
(1-3 years)

Medium-term
(3-5 years)

Long-term
(5-10 years)

Timeline to impact →

Welcome to visit LUX Photonics Consortium - Singapore



27 November – 1 December 2023. Malaysia/Singapore

EPIC Members Delegation to Malaysia/Singapore 

Hosted by: LUX Photonics Consortium - Singapore



LUX's local partners:



LUX's members:



Co-hosted by LUX's member in Malaysia:

