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EUCLUSTERS MATCHMAKING EVENTS

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EU-Singapore #ECCPMatchmaking

EUROPEAN CLUSTER COLLABORATION PLATFORM

European Commission

SINGAPORE BUSINESS FEDERATION
Apex Business Chamber

Enterprise Singapore

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Asia Clean Energy Summit

Contents

I. Extract from the Input paper on cluster and important value chains with Singapore

Source: ECCP

1. Key insights from the Input paper on clusters & important value chains in Singapore and latest trends

This section provides key insights building on the Input Paper developed in 2022 on the occasion of the EU-Singapore Matchmaking event under the European Cluster Collaboration Platform (ECCP) and shows later trends.

Economy and Sectors in Singapore

- The high levels of GDP in Singapore are constituted by a strongly diversified economy. The services sector dominates the economy in Singapore, with trade, business services, transportation, communications as well as financial services make up a large proportion of growth. The considerably low level of activity in the agricultural sector has made Singapore vulnerable to shocks, driving the island state to funnel extensive investment in high-tech farming that would cover more domestic nutritional needs.
- The port of Singapore as one of the most important regional commercial hubs in the world, ranking second to Hong Kong in total volume of container transshipment traffic.

Trade with the EU27: prospects for EU27 linkages

- Singapore has become the EU's fifth largest trading partner, defined by diverse exports and imports of goods in manufacturing, machinery, chemicals and many more.
- The trade basis between the EU and Singapore has been made easier thanks to the EUSFTA. This has specifically facilitated investment, whilst alleviating customs duties and bureaucracy for EU Exports to Singapore.

Singapore Cluster and Industry Programmes: reimagining value chains

- Singapore's unique location and creative way of utilizing it to its own advantage has yielded great economic growth and attracted increased investment from both foreign and domestic actors. Particularly the Singapore government aims to enable growth on a sustainable basis, and consistently initiates programmes and projects to set objectives, instruments, and evaluation processes e.g.,

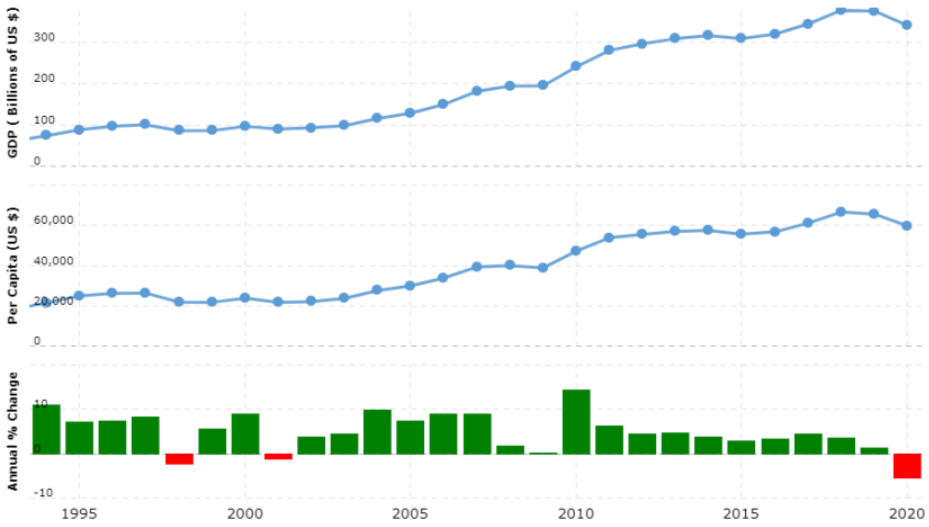
    - Industry Transformation Programme (ITP)
    - Research Innovation Enterprises 2025 Plan (RIE2025)
- EU-Singapore relations could provide further prospects of intensifying existing linkages, particularly for cluster-based projects.

1.1. Singapore's economic profile and position in innovation and science

Over half a century ago, Singapore faced significant challenges such as widespread unemployment, inadequate infrastructure, and an uncertain outlook. In the 60s, after gaining independence and in the aftermath of the rapid industrialization, Singapore rapidly developed from low to a high-income economy, with manufacturing becoming the main driver of growth and with a GDP increase among the world's highest with an average of about 7%. The city-state's economy is also supported by one of the **highest standards of human capital development** worldwide, as reflected by the 2020 World Bank Human Capital Index[1]. Singapore's uniqueness is characterized by its open and financially effective economic structure, innovation-driven commerce and governmental policies. Its economy is **largely oriented around trade**, with diverse industrial sectors contributing to high levels of growth.

[1] The World Bank (2020) Human Capital Index (HCI, Scale 0-1) – Singapore. Available here: Human Capital Index (HCI) (scale 0-1) - Singapore | Data (worldbank.org)

Figure 1: Singapore GDP 1995 - 2020



Source: World Bank (2022)

In the first quarter of 2024, the Singapore economy grew by 2.7% on a year-on-year basis, extending the 2.2% expansion in the previous quarter. According to the Ministry of Trade and Industry, the general GDP growth forecast for Singapore in 2024 is maintained at 1.0 to 3.0%. The sectors that mostly contributed to the GDP growth during this quarter were the finance & insurance (service sector), transportation & storage (industrial sector) and wholesale trade sectors (service sector)[2].

The economy of Singapore is strongly diversified, with the **services sector** contributing to the **70.9% its GDP** and employing 84.1% of the active working population[3]. The industrial sector is the second economic sector driving growth in Singapore. Therefore, both the manufacturing and services sectors remain the twin pillars of Singapore's high value-added economy.

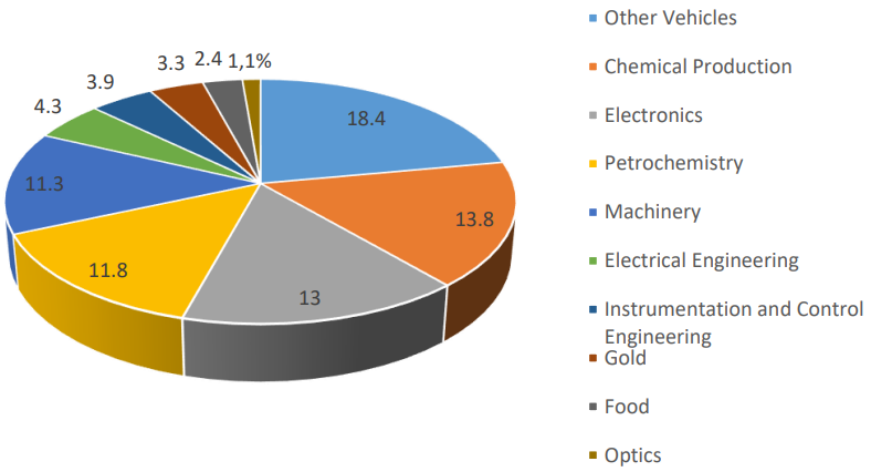
- **Services sector**: Singapore grew by 2.3% in 2023, with notable expansions in accommodation (+12.1%) and information & communications (+5.7%) due to increased international visitor arrivals and demand for data services.

[2] Ministry of the Trade and Industry – Republic of Singapore, *Economic Survey of Singapore First Quarter 2024* (2024). Available here: Economic Survey of Singapore First Quarter 2024 (mti.gov.sg)
[3] The World Bank (2022) Services, value added (% of GDP) – Singapore. Available here: Services, value added (% of GDP) - Singapore | Data (worldbank.org)

- **Industrial sector**: it accounts for 22.4% of GDP[4] with manufacturing as the most relevant sub-sector. It also encompasses biomedical sciences, logistics, transport engineering and especially electronics and petrochemicals. More specifically, the manufacturing sector experienced a contraction of 1.8% on a year-on-year basis in the first quarter of 2024 as it experienced a downturn due to reduced production in the biomedical manufacturing, electronics, and general manufacturing clusters, which outweighed the growth seen in the precision engineering, chemicals, and transport engineering clusters.
- **Agricultural sector**: although it is considerably low, Singapore has managed to boost its food security through increased domestic production. According to the MIT Technology Review[5] investment in **high-tech farming** has been driving this change in policy, with the objective of the government to produce **30% of its national nutritional needs by 2030**[6]. The significant government investments and partnerships with global innovators are allowing Singapore to position itself as a leader in the **food-tech industry**. Its strategic geographical location, Southeast Asia, enable Singapore to helm the development of the regional industry, specifically in relevant areas of this sector such as plant-based protein, dairy products and lab-based protein products. In addition to this, the city-state can serve as a strategic launchpad for global food-tech companies looking to enter Asian markets. Its diverse talent pool and innovative environment attract business aiming to develop sustainable food production methods.[7] Furthermore, the potential for the sector is also based on the agrarian countries like Myanmar or Cambodia and R&D, innovation, and a conducive manufacturing ecosystem in Singapore.
- **Chemical industry**: this is also a notable sector in Singapore, ranking 8th among the largest exporters of chemicals in 2029, as reported in the 2022 ECCP Input Paper and having China as the biggest export market.

[4] World bank (2023) Industry (including construction), value added (% of GDP) – Singapore. Available here: Industry (including construction), value added (% of GDP) - Singapore | Data (worldbank.org)
[5] Website available here: MIT Technology Review
[6] MIT Technology Review (2020), *Inside Singapore's huge bet on vertical farming*. Available here: Inside Singapore's huge bet on vertical farming | MIT Technology Review
[7] Business Insider, *How Singapore is helping 'future-food' companies scale up* (2023). Available here: Singapore Is Investing Heavily in the Food-Tech Sector - Business Insider

Figure 2: Export goods in Singapore – Share of total exports in %



Source: ECCP (2022), own calculation based on UN Comtrade Database

Figure 3: Innovation inputs in Singapore

Source: Global Innovation Index 2024

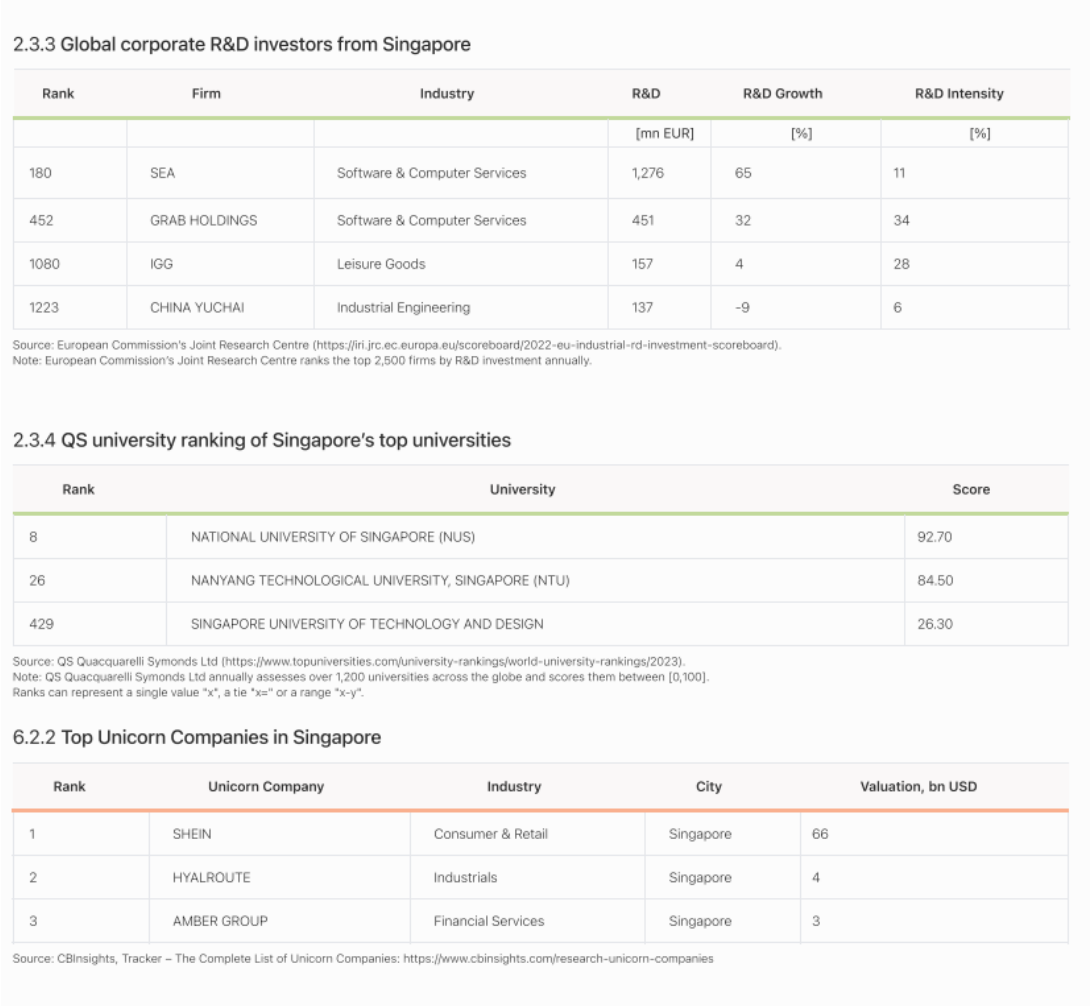
The figure above illustrates various aspects of the country's performance in the Global Innovation Index (GII) 2024. In particular, these indicators related to innovation inputs show the following trends:

Singapore's strong performance in innovation inputs is underpinned by its strategic investments in education, research, and development, which are critical to fostering a vibrant innovation ecosystem. The country allocates a notable portion of its GDP to education, although this has seen a slight decline recently; nonetheless, it remains a priority that supports the development of a highly skilled workforce. With 35.94% of graduates in science and engineering fields, Singapore cultivates a talent pool that is essential for driving technological advancements and innovation. Furthermore, the nation boasts an impressive number of researchers per million population, ranking fifth globally, which reflects its

commitment to scientific inquiry and innovation. The gross expenditure on R&D also highlights Singapore's dedication to enhancing its innovation capabilities, with a rank of 17 in this area. Additionally, the high QS university rankings indicate that Singapore's educational institutions are recognized for their quality, contributing to the overall innovation landscape. These inputs collectively create a robust foundation for innovation, positioning Singapore as a leader in the Global Innovation Index and emphasizing the importance of continuous investment in human capital and research infrastructure to sustain long-term growth and competitive advantage in the global market.

To complete this overview, the figure below illustrates Singapore's top performers in innovation, with a focus on global corporate R&D investors from Singapore, QS University ranking among top universities in the country and top unicorn companies.

Figure 4: Singapore's innovation top performers



2.3.3 Global corporate R&D investors from Singapore

Rank	Firm	Industry	R&D	R&D Growth	R&D Intensity
			[mn EUR]	[%]	[%]
180	SEA	Software & Computer Services	1,276	65	11
452	GRAB HOLDINGS	Software & Computer Services	451	32	34
1080	IGG	Leisure Goods	157	4	28
1223	CHINA YUCHAI	Industrial Engineering	137	-9	6

Source: European Commission's Joint Research Centre (https://iri.jrc.ec.europa.eu/scoreboard/2022-eu-industrial-rd-investment-scoreboard).
Note: European Commission's Joint Research Centre ranks the top 2,500 firms by R&D investment annually.

2.3.4 QS university ranking of Singapore's top universities

Rank	University	Score
8	NATIONAL UNIVERSITY OF SINGAPORE (NUS)	92.70
26	NANYANG TECHNOLOGICAL UNIVERSITY, SINGAPORE (NTU)	84.50
429	SINGAPORE UNIVERSITY OF TECHNOLOGY AND DESIGN	26.30

Source: QS Quacquarelli Symonds Ltd (https://www.topuniversities.com/university-rankings/world-university-rankings/2023).
Note: QS Quacquarelli Symonds Ltd annually assesses over 1,200 universities across the globe and scores them between [0,100].
Ranks can represent a single value "x", a tie "x=" or a range "x-y".

6.2.2 Top Unicorn Companies in Singapore

Rank	Unicorn Company	Industry	City	Valuation, bn USD
1	SHEIN	Consumer & Retail	Singapore	66
2	HYALROUTE	Industrials	Singapore	4
3	AMBER GROUP	Financial Services	Singapore	3

Source: CBInsights, Tracker – The Complete List of Unicorn Companies: https://www.cbinsights.com/research-unicorn-companies

Source: Global Innovation Index 2024

In conclusion, Singapore's economy has shown remarkable resilience and adaptability to major challenges e.g., Covid-19, continuing its growth trajectory even in darkest times. The diverse sectors, particularly finance and insurance, transportation and storage, and wholesale trade, have played a crucial role in driving economic expansion. The services sector remains dominant, significantly contributing to overall economic activity and employment, while the industrial sector continues to be a vital component, despite facing some recent challenges in manufacturing. Overall, Singapore exemplifies a forward-thinking economy that is well-prepared for sustainable growth and development in the future and that the EU could benefit from, both in terms of trade and a shared vision for the next years.

II. EU trade with Singapore: prospects for EU27 linkages, partnerships and agreements

Being this document part of the ECCP project, it is important to gain an account of the specific European Union (EU) – Singapore trade relationship and which opportunities these present to companies. As mentioned in the previous chapter, part of Singapore's economy builds on trade, valued €550 billion annually, relying on a wide international network of trading partners.

2.1 Trade structure of EU-Singapore

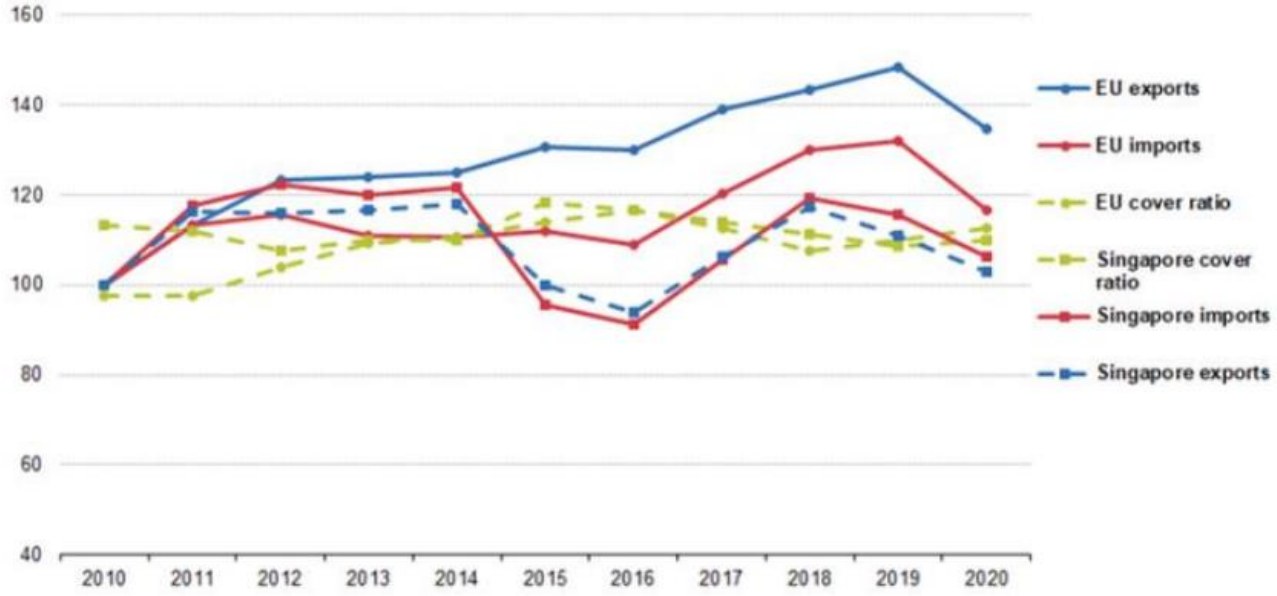
The openness of the Singapore's market formed a wide-ranging industrial ecosystems and enabled businesses to thrive in an innovation-driven environment. Its unique vantage point for trade in the Asian region, has attracted foreign company's investments and collaborative efforts from countries around the world. Parallelly, the European Union's shared single market, common trade policy and its openness towards third countries has prioritized the integration of global markets for sourcing and exporting goods.

The Treaty of Lisbon of 2007 is the key instrument that helped the European Union to lay the foundations for the relationship with Singapore, with the **EU-Singapore Free Trade Agreement** that entered into force in November 2019.[8] This Agreement has enabled increased market access for EU-Singapore businesses, facilitated trade to expediate green technology trade and investment, as well as removing custom duties and bureaucracy for EU exports to Singapore.

Drawing on Eurostat data, Figure 3 showcases how exports between 2010 and 2019 reached its highpoint in 2019 (149%), with the cover ratio at its highest in 2016 (116%). Here one can also see how **trade between the EU and Singapore has overall been on an upward trajectory**.

[8] European Commission, EU-Singapore Free Trade Agreement, Investment Protection Agreement and Digital Trade Agreement. Available here: EU-Singapore (europa.eu)

Figure 4: Trade in goods of the EU and Singapore, 2010-2020



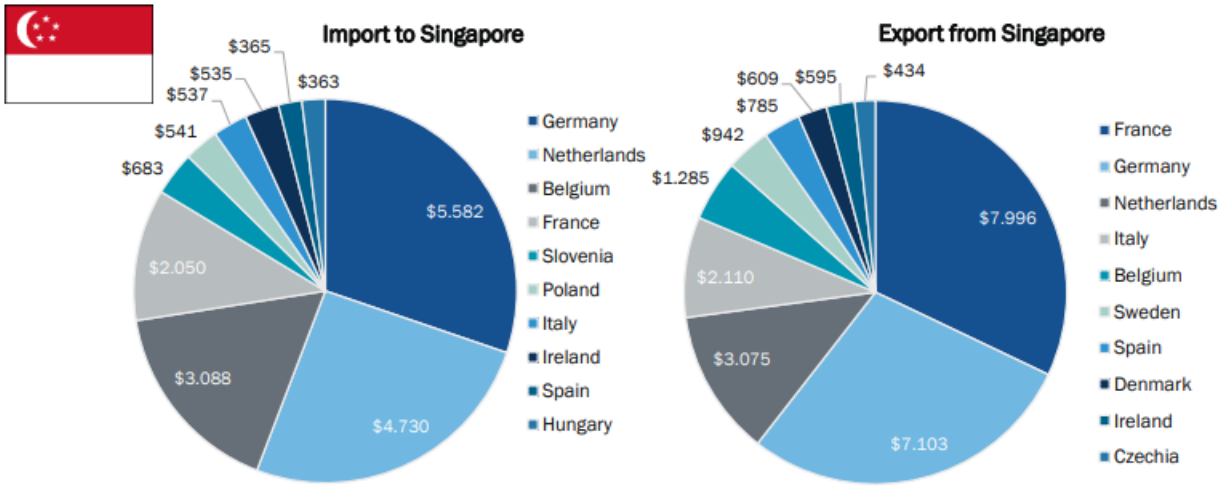
Source: Eurostat and UNCTAD (2022)[9]

In 2020, a sharp decrease in trade can be seen, potentially consequently from the COVID-19 pandemic which saw a significant disruption in global financial systems.

For a complete framework of the trade flows between EU and Singapore, one can look at the **10 most important trading partners** on an individual basis (Figure 4). It can be observed how, in 2020, Germany stands out as a key country, ranking the highest in import and second highest in export. More specifically, Germany imports up to $5.6 billion worth of goods from Singapore, which stands out as more than a quarter of total from Singapore to the EU.

[9] Trade balance holds information on the absolute value of tradition positions. Yet the cove ratio showcases a
relative measure based on the ratio (communicated in %) between the value of exports and imports, respectively.
If Exports are higher than imports, then the cover ratio is above 100. (CFI, 2022)

Figure 5: overview of the 10 most important EU27 trading partners for Singapore, by imports and exports, values in Million USD



Source: ECCP (2022), own calculations based on UN Comtrade Database

As per imports, the Netherlands, Belgium and France together account for more than 50% of total imports from Singapore, specifically with the Netherlands that imported $4.7 billion worth of goods, Belgium up to $3.1 billion and France accounting for imports of $2.05 billion. For what concerns the exports, France accounted for the majority of exports from the EU27 to Singapore in 2020.

In general, according to the analysis conducted by ECCP based on data from the UN Comtrade Database, the **imports of the EU27 from Singapore amounted to $19.9 billion in 2020** and the **EU27 exports to Singapore to around $26.7 billion** resulting in a trade balance on $8.6 billion.

2.2 EU-Singapore key partnerships, agreements for trade and beyond

The European Union and Singapore have cultivated a dynamic partnership that extends beyond traditional trade relations, encapsulating investment protection, digital cooperation, and sustainable development. This chapter explores the multifaceted nature of the EU-Singapore relationship, highlighting key agreements and strategies that underpin their collaboration. From the EU-Singapore Investment Protection Agreement to the Digital Partnership and Trade Agreement, these initiatives demonstrate a commitment to fostering economic growth, digital innovation, and environmental sustainability. Moreover, through the EU's Indo-Pacific Strategy and the Global Gateway initiative, the partnership continues to evolve, addressing shared challenges and advancing mutual prosperity.

2.2.1 EU-Singapore Investment Protection Agreement

Signed in October 2018, the EUSIPA, EU-Singapore Investment Protection Agreement, foresees modern provisions to **ensure a high level of investment protection**, **while preserving the EU's and Singapore's right to regulate and pursue legitimate public policy objectives** e.g., protection of public health, safety, environment. Upon ratification of all Member States, the agreement will enter into force in accordance with their internal legal procedures and replace the existing bilateral investment treaties between Singapore and single EU countries.[10]

2.2.2 The EU Strategy for Cooperation in the Indo-Pacific

The EU's commitment to deepen and strengthen the relations with the wider region is further underpinned by the 2021 **EU Strategy for Cooperation in the Indo-Pacific**, that recognizes the growing importance of the region with South-Eastern Asia at the core and reinforces collaboration with EU's partners in the region, with the aim of contributing to the stability, security, prosperity and sustainable development in the Indo-Pacific.

[10] EUR-Lex, EU-Singapore Investment Protection Agreement. Available here: Investment Protection Agreement between the EU and Singapore | EUR-Lex (europa.eu)

The message at the basis of the Strategy embeds **that the EU will further deepen its engagement with partners in the Indo-Pacific to respond to emerging dynamics that are affecting the stability of the region**. In this regard, the approach the EU designed would build on a rules-based international order, a level playing field, as well as an open and fair environment for trade and investment, tackling climate change and supporting connectivity with the EU. Endorsed by EU Member States in 2021, the Strategy sets out seven priority areas for deepening the EU – Indo-Pacific cooperation: **sustainable and inclusive prosperity, green transition, ocean governance, digital governance and partnerships, connectivity, security and defense and human security**. The progress achieved since 2021 up to early 2024 is testament to the EU's commitment to building partnerships that support peace, stability, prosperity for people in both Europe and the Indo-Pacific. Partners on both sides have advanced concrete cooperation across all seven priority areas. For what specifically concerns Singapore, Digital Partnerships were established with the city-state to foster cooperation for a safe and secure digital space.[11]

2.2.3 The EU-Singapore Digital Partnership (EUSDP)

The **European Union-Singapore Digital Partnership (EUSDP)** and the **EU-Singapore Digital Trade Agreement** are the two landmarks for the cooperation between the two parties in the field of digital innovation. While the first provides a comprehensive framework for collaboration in digitalization, the latter focuses on establishing specific rules and standards to facilitate trade between EU and Singapore.

The EUSDP, concluded in December 2022 and signed in February 2023, is an overarching framework for digital cooperation between EU and Singapore, with the objective of facilitating and organizing joint work in areas of mutual interest, going beyond dialogue and exchange of information, while strengthening collaboration on a wide range of areas including **trade facilitation, trusted data flows and data innovation, digital trust, standards, digital skills for workers,** and the **digital transformation of businesses and public services**. The Digital Partnership is also the means that will allow the creation of opportunities for joint efforts in the areas of **5G/6G**, **artificial intelligence** and **digital identities**. The Partnership foresees the development of a joint workplan and deliverables, building on existing cooperation mechanisms such as the above-mentioned EU-

[11] European Union External Action, EU-Indo Pacific Strategy Factsheet (2024). Available here: EU Indo-pacific FS-01-24-V3_0.pdf (europa.eu)

Singapore Free Trade Agreement (EUSFTA) Committees and dedicated expert workshops. The aim is to leverage existing cooperation activities, not to replace or duplicate them, and should not result in additional bureaucratic burdens or heavy coordination costs. Furthermore, the Digital Partnership would provide for mechanisms to review progress on a yearly basis and identify areas for future collaboration and possible deliverables.[12] At the inaugural EU-Singapore Digital Partnership Council, the EU and Singapore agreed on the following key priorities for 2023:

- Exchanges on AI governance and standards which includes data, algorithms and computing power combined with data sets
- Exchanges on best practices, such as the eIDAS (electronic identification and trust services)/eID wallet) and by exploring use cases paving the way for the mutual recognition of digital identities
- Defining projects such as e-invoicing and exchange best practices to facilitate digital trade
- Defining projects and exchange best practices in SMEs digital transformation
- Sharing best practices in the field of digital skills.[13]

2.2.4 The EU-Singapore Digital Trade Agreement

The EU-Singapore long-standing relations anchored by the 2019 EUSFTA further deepened thanks to the Digital Trade Agreement (DTA), underscoring the EU and Singapore's key role in setting **high-standard** and **legally binding digital trade rules**. The negotiations concluded in July 2024, with the DTA specifically targeting not only the facilitation of digital trade, but also the cross-border data flow, seeking to set global standards, ensure certainty for businesses, enhance consumer trust, and remove unjustified barriers to digital commerce. The EUSDTA builds on several existing trade arrangements between the EU and Singapore, including a bilateral free trade agreement, the investment protection agreement, which is pending ratification, and a negotiated set of digital trade principles. A Study on the potential impacts of a future EU-Singapore Digital Trade Agreement, drafted during the Agreement negotiations by the EU-Indonesia and Vietnam and EU-Malaysia and Singapore Partnership Facility, provides a careful overview of the consequences of

[12] Ministry of Trade and Industry Singapore (MTI), European Union-Singapore Digital Partnership. Available here: https://www.mti.gov.sg/Trade/Digital-Economy-Agreements/EUSDP

[13] Delegation of the European Union to Singapore, EU Singapore Trade & Investment 2023 edition (2023). Available here: EEAS-EU-SINGAPORE-TRADE-BOOKLET_2023_230920_WEB.pdf (europa.eu)

likely outcomes for government, business and civil society. Some of the results emerged in the study can be listed in the following points:

- **Enhanced trade facilitation**: as the EUSDTA is expected to streamline cross-border trade processes, reducing barriers and costs associated with digital transactions, paperless trading and the use of electronic documentation will enhance efficiency in the trade logistics.
- **Data governance and free flow of data**: the Agreement promotes the concept of *Data Free Flow with Trust*, allowing for unrestricted cross-border data flow ensuring high levels of data protection. This would translate in facilitated innovation and growth in digital services, as businesses can operate more freely across borders.
- **Consumer and business trust**: the objective to establish robust consumer protection online foresees for businesses more freedom in cross-border operations.
- **Support for SMEs**: the Agreement emphasizes inclusive digital benefits, particularly for micro, small and medium sized enterprises, ensuring that smaller businesses can access the advantages of digital trade and compete effectively in the market. However, there might be the risk that businesses struggle to navigate the complexities of compliance with new digital trade rules, potentially limiting their ability to benefit from the agreement.[14]

The study not only highlights the positive effects of the Agreement, but also that despite the ambitious objectives set in the agreement and the positive impact it may foster, the overlap of various digital agreements could lead to regulatory inconsistencies or redundancies, making compliance more challenging for businesses operating in multiple jurisdictions.

[14] EU Delegation of the European Union to Singapore, Study on the potential impacts of a future EU-Singapore Digital Trae Agreement (2024). Available here: Study on the potential impacts of a future EU-Singapore Digital Trade Agreement | EEAS (europa.eu)

2.2.5 The Global Gateway and the EU-Singapore dialogue

The Global Gateway[15] is a European Union strategy launched in 2021 to boost smart, clean and secure links in digital, energy and transport sectors and to strengthen health, education and research systems across the world. It is the EU's contribution to narrowing the global investment gap worldwide following a set of values, principles and high standards, to enhance good governance, transparency, and sustainability. Global gateway aims to mobilize up to €300 billion in investments, bringing together the EU, its Member States and their financial and development institutions in the digital sector, healthcare, transport, climate and energy and education and research. The focus is on smart investments in quality infrastructure, respecting the highest social and environmental standards, in line with the EU's interests and values: rule of law, human rights and international norms and standards. The Global Gateway's priorities in Southeast Asia are the **green transition** and **sustainable connectivity**, with the EU aiming to mobilize €10 billion in investments specifically for these purposes. The European Fund for Sustainable Development Plus (EFSD+) is the main financial tool to mobilize investments under the Global Gateway, and ensures worldwide coverage for blending, guarantees and other financial operations. It also raises financial resources for sustainable development from the private sector for inclusive economic development. As a highly developed city-state, Singapore has substantial experience in financing infrastructure projects through public-private partnerships, positioning it as **a central hub for infrastructure funding**. The nation has cultivated **a strong infrastructure ecosystem that integrates developers, master planners, financiers, and various professional services**. Numerous Singaporean firms, both private and government-linked, possess globally recognized expertise in project structuring, management, financing, and investment, along with a deep understanding of regional markets.

This expertise enables them to collaborate effectively with partners like the EU to address Asia's infrastructure demands and unlock the region's potential. Additionally, the government has established Infrastructure Asia (InfraAsia) to facilitate social and economic growth in the region through infrastructure development. In January 2024, the inaugural EU-Singapore Global Gateway brought together a variety of stakeholders together to discuss ways to facilitate green and sustainable investments in Southeast Asia.

[15] Discover more about the Global Gateway here: Global Gateway - European Commission (europa.eu)

III. Singapore and the cluster landscape's overview

In December 2020, the EU and Singapore signed an administrative arrangement on cluster cooperation. This agreement builds on the benefits of the EUSFTA and facilitates cooperation and activities between industry clusters in Singapore and the European Union, particularly in view of the need to drive a resilient and sustainable joint recovery from the Covid-19 pandemic.

3.1 Singapore cluster & Industry Programmes: reimagining value chains

Source: ECCP

The established agreements and partnerships mentioned in the previous chapter are evidence of the growing trade relations between the EU and Singapore, opening the opportunity for novel projects build on previous successes. The two counterparts provide an array of goods and services to one another, with Singapore offering an exceptional access point for EU27 businesses to new markets. With the attempt to enhance the effective trade relations between the EU and Singapore, one could propose cluster-based projects, given their potential to enable and facilitate effect on innovation, economic performance, and growth. When it comes to clusters, the **Industry Transformation Map** is the primary Singaporean industrial policy, initiated in 2016, that drives the development of clusters on the city-state. In 2020, EU and Singapore formally signed a **Cluster Collaboration Agreement** with a signing ceremony as the highlight of an online event celebrating the first anniversary of the EU-Singapore Free Trade Agreement (EUSFA). The Cluster Collaboration Agreement seeks to build upon the benefits of EUSFA and to increase the **cooperation between industry clusters in Singapore and the EU**.[16]

As acknowledged by the ECCP Input Paper (2022), the case of Singapore showcases the example of how industrial policies, as well as national cluster policies, correspond to development programmes.

[16] ECCP news. Available here: EU and Singapore sign cluster cooperation agreement | European Cluster Collaboration Platform

In 1991, the government of Singapore began to invest in R&D in a significant and structured manner thanks to the first 5-year National Technology Plan. Today, the **Industry Transformation Programme Industrial Policy (ITP)**, with its set of objectives, instruments, and evaluation processes, is complemented by aspects and goals directed through the **Research and Innovation Enterprise 2025 Plan (RIE2025)**[17].

On the one hand, the ITP was launched to develop roadmaps for **23 industries** which aim to **lay out the blueprint and key strategies needed to drive the specific industry forward**. Each roadmap has thereby individual key objectives and has a growth and competitiveness plan developed specifically for them. The roadmaps are called Industry Transformation Maps (ITMs) and are strategically guided by four pillars:

1. **Productivity**: strategies to support companies especially SMEs to move to higher value-added activities and raise operational efficiency.
2. **Jobs & Skills**: investing in upskilling and deep skills to Support staff in the shift to greater value creation.
3. **Innovation**: strategies to leverage R&D to develop new products and services
4. **Trade and internationalization**: supporting companies in expanding to overseas markets.

On the other hand, the RIE2025 efforts are organized under 4 strategic domains:

1. **Manufacturing, trade and connectivity**
2. **Human health and potential**
3. **Urban solutions and sustainability**
4. **Smart nation and digital economy.**

The efforts under RIE2025 are further supported by 3 cross-cutting horizontals:

1. **Academic research**
2. **Manpower**
3. **Innovation and enterprise**

To build on their progress and create greater value, RIE 2025 emphasizes 3 strategic focus areas: **expanding of RIE mission to tackle a broader spectrum of national needs**, **enriching the scientific base** and **scaling up platforms to drive technology translation and strengthen the innovation capabilities of enterprises**. In addition to this, RIE20205 directs its attention to the internationalization of projects, by **promoting and facilitating open innovation**

[17] European Observatory for Clusters and Industrial Change. Cluster programmes in Europe and beyond May 2019. Available at: www.clustercollaboration.eu/sites/default/files/news_attachment/cluster_programmes_in_europe_and_beyond_ 0.pdf

partnerships across international ecosystems. This is prioritized to enable enterprises to expand into new markets, while aligning themselves with sustainable manufacturing practices.

When looking at the *policy focus* underpinning the respective objectives of both plans, the ITP programme, for instance, directs its attention to the Industry Transformation Maps (ITMs) and addresses complex challenges that require cross-cutting solutions from multiple stakeholders. In this regard, strategies are developed to enhance and sustain innovation and productivity of industries. Parallelly, RIE2025 focuses on promoting science & technology across sector to meet future challenges and respond to global economy disruptions.

As per *funding* and *governance*, as well as the implementation of side-programmes, the FEC, which operates under the Ministry of Trade and Industry is considered the main responsible authority under the ITP. Accordingly, the National Research Foundation (NRF) provides funding for strategic initiatives to build up R&D capabilities, with the Research, Innovation and Enterprise Council overseeing the 5-year long-term strategies.

If comparing the *beneficiaries* of both plans, the ITP seeks to tackle existing issues within each sector, by reinforcing partnerships between larger enterprises and SMEs, public research institutions, education and training providers, trade associations, ministerial authorities, unions, individuals and the government. Corresponding to the ITP, the RIE2025 promotes strong partnerships across businesses, universities, research institutes and the government, specifically targeting cluster organizations contrarily to the ITP.

In order to achieve the objectives set, a series of *instruments* are necessary to facilitate the implementation process. The ITP foresees a roadmap depending on a government agency and overseen by the FEC. Nevertheless, each map (ITM) works within the "Skills Framework" that provides key information on employment trends in each specific sector and a list of training programmes for upskilling.[18] Once again, the ITP is complemented by the RIE2025, with a budget directed to a diversified portfolio of foundational and applied R&D projects, including support from the government for start-ups. Furthermore, RIE2025 prioritizes both hard and

[18] Singapore's Professional Services Industry to lead globally in high-value, specialist services Available at: www.mti.gov.sg/-/media/MTI/ITM/Modern-Services/Professional-Services/Professional-Services-ITM-- -Press-Release.pdf

soft skills development, while the facilitation across local and international ecosystems is considered the key pillar of its strategy.

Finally, for what concerns the overall *budget*, the ITP's amounts to €2.8 billion (4.5 SGD), financed by the Ministry of Trade and Industry. While the budget of RIE2025 amounts to €15.5 billion (25 SGD), drawing 1% of Singapore's GDP from 2021 to 2025.[19]

3.2 The state of play of cluster policy in Singapore

Source: ECCP

The cluster policy approach in Singapore is mainly based on **support to cooperation projects** and a **broad-based framework policy to support cooperation effectiveness**. According to the European Observatory for Clusters and Industrial change (EOCIC) report, **Singapore was one of the first Asian countries to introduce the cluster approach to promote industrial development** and base their economy on innovation and differentiation in the 1990s. The then government sought to give priority to areas with the highest growth potential. Therefore, they launched the first **Strategic Economic Plan** which set out to establish competitive and industry-leading clusters within the areas of **chemicals**, **biomedical science**, and **engineering**. By linking education and entrepreneurship policies to industrial development, Singapore has for years outlined policies which assigned specific areas to host knowledge clusters and identified special areas of R&D to establish knowledge hubs.

In 1986, a review from the national Economic Review Committee suggested to set up five-year plans that would move Singapore up in the economic value chain, away from low-cost competition in traditional manufacturing and services to develop new high-technology clusters and activities. With the launch of Singapore's first five-year National Technology Plan in 1991, the government began to invest in R&D in a significant and structured way. Since then, the budget increased for every plan significantly. The current RIE2025 is the country's seventh five-year plan.

[19] Prime Minister's Office Singapore – National Research Foundation. Research Innovation and Enterprise 2025 Plan. Available at: https://www.nrf.gov.sg/docs/default-source/default-document-library/rie_booklet_fa2021_pages.pdf

The different strategies outlined in the plans, have had **a consistent focus on supporting ties and concrete partnerships between technology, research, and innovation across the private and public sectors**. The current phase of Singapore's broader economic transformation involves **strengthening linkages between complementary industries** and this is done so by grouping them into economic clusters under the Industry Transformation Programme. The current national cluster policy is also an expression of this approach. Within the previous RIE plan, RIE2020, the approach was to further strengthen cooperation between academia, businesses and the government. Under RIE2020, the Innovation & Enterprise (I&E) Cluster Fund was established and focused on key priorities, including:

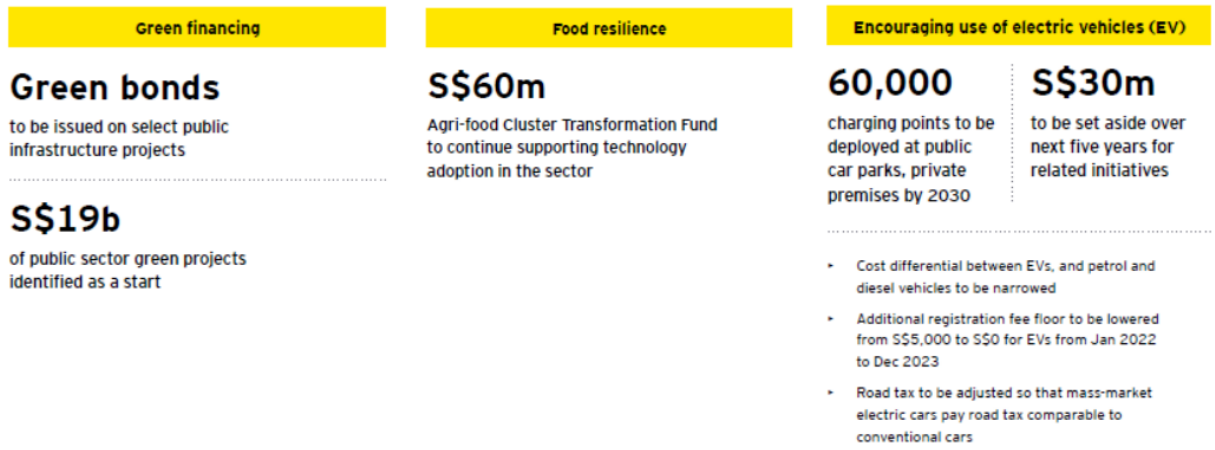
- Targeted support to help firms scale-up
- Fostering stronger collaboration and cohesion
- Encouraging greater industry participation
- Supporting domain-specific strategies.

IV. A glance to the focus areas of the EU-Singapore Matchmaking Event 2024

4.1 Clean energy & green tech

Singapore is rapidly positioning itself as a leader in global green technology e-mobility, driven by its ambitious 2030 Green Plan[20], released in 2021 and which seeks to integrate sustainable transportation solutions into the urban landscape and that relies on the joint forces of the Ministry of Education, the Ministry of National Development, the Ministry of Sustainability and the Environment, the Ministry of Trade and Industry and the Ministry of Transport.

Figure 6: Key pillars and goals of the Singapore Green Plan 2030



Source: ECCP Input Paper 2022; Singapore Economic Development Board, Reimagining manufacturing and supply chains. Investing in Southeast Asia (2022). Available here: Reimagining Manufacturing and Supply Chains: Investing in Southeast Asia | Market Reports & Industry Trends | Singapore EDB

[20] Singapore Green Plan. Website available here: Singapore Green Plan 2030

As acknowledged in the ECCP Input Paper 2022 on Singapore, with the Green Plan 2030, the Singaporean government has laid out an important roadmap for green and sustainable investment in the country. Amongst others, the government is **issuing green bonds on selected public infrastructure projects with approximately S$19b of public sector projects**. These projects include *Tuas Nexus*, the first integrated **water and solid waste treatment facility** in Singapore, which shall be operational from 2025. Moreover, to **improve food resilience**, the so-called *agrifood cluster transformation fund* with S$60m is to support the technology adoption in the food industry. Finally, the Green Plan also includes measures in encouraging the use of electric vehicles by supporting infrastructure development.[21]

Despite its reputation as a global leader in green technology, sustainability and climate change are hot issues for Singapore, as a city-state vulnerable to climate change and as the country ranked 20th worldwide in terms of CO2 emissions per capita.[22]

> Beyond what is shown in the picture above, the Singapore Green Plan 2030 also includes a pillar on **energy reset** that foresees **the transition to cleaner energy sources across sectors such as building and transport**. More specifically, there is a broad focus on the decarbonisation of Singapore's energy grid.

Today, most of Singapore's energy comes from fossil fuels, specifically natural gas and liquified natural gas. In 2023, 94.3% of Singapore's energy was generated by natural gas – far from the goal of decreasing natural gas reliance to over 50% by 2035. In parallel, only 4.4% of energy was produced by renewable sources e.g., solar power.[23] Transitioning away from natural gas results a clear challenge to Singapore mainly since there is an important amount of energy infrastructure tailored

[21] ECCP Input Paper 2022, Clusters and Important Value Chains with Singapore. Note on recent developments and market opportunities for the EU (2022). Available here: ECCP_InputPaper_SG_final_1609.pdf (clustercollaboration.eu)
[22] International Energy Agency. 2024. "Singapore - Countries & Regions - IEA." International Energy Agency. Available here: https://www.iea.org/countries/singapore/emissions
[23] Singapore Economic Development Board. 2024. "What could Singapore's energy mix look like in 2035?" Singapore Economic Development Board. https://www.edb.gov.sg/en/business-insights/insights/what-could-singapores-ener gy-mix-look-like-in-2035.html

towards the transportation and use of natural gas, making switching to renewable sources more complicated and costly.[24]

> **The solar and hydrogen energy are the two renewable resources that have emerged as scalable green energy solutions for Singapore**. Specifically on solar energy, it is a promising option for green energy, as the island is located close to the equator and enjoys sunlight all year. In the specific case of Singapore, less land is needed to harness solar energy, compared to other forms of green energy: for example, solar photovoltaic panels (PV) use up to 25 times less than hydropower per megawatt-hour of electricity generated.

There are two main poles in the Singapore's solar energy strategy:

- **facilitating the deployment of PV systems**: the objective is to attain a higher rate of PV panel installation, facing the competing demands for land usage and by deploying PV panels in reservoirs, on rooftops and at temporarily vacant plots of land. Among the most prominent projects:
    - ***SolarNova Programme***, pioneered by the Singapore's Housing and Development Board (HDB) and the Economic Development Board (EDB), that foresees the installation of solar PV panels on the roofs of HDB blocks.[25]This programme has allowed the HDB to commit to a total solar capacity of 380-megawatt peak as of 2022, which is enough to power 95.000 4-room HDB flats. The energy generates under SolarNova is used to power common services such as lifts, water pumps and lights, and excess energy will be channelled to the power grid. The efforts of the Government can be complemented by privately owned buildings e.g., landed properties, to install their own PV systems. If excess energy is produced, the Energy Market Authority (EMA) can allow the sale of excess solar-generated electricity to the grid, allowing the increase of the total amount of electricity obtained via solar energy.

[24] MAJU – The Youth Policy Research Initiative – Oo I. and Chen E., Lighting the Future: Singapore's Green Energy Transition (2024). Available here: Lighting the Future: Singapore's Green Energy Transition (maju.sg)

[25] Housing & Development Board, HDB to Bring Solar Energy to Over 8,000 Blocks through SolarNova Programme (2022). Available here: https://www.hdb.gov.sg/about-us/news-and-publications/press-releases/HDB-tobring-solar-energy

- ***Overcoming solar energy intermittency***: being solar energy sporadic, Singapore has taken means to increase the resilience of its solar grid. The first involves the *Solar Forecasting Model* that makes use of real-time irradiance data measured through sensors installed on rooftops and electrical substations across Singapore. The data collected is used alongside forecasting techniques e.g., machine learning algorithms and, subsequently, the output is combined with weather prediction system of the Meteorological Service of Singapore (MSS) in order to produce 24-hour solar irradiance forecasts.[26]

In addition to these two actions, Singapore has launched a 285MWh Energy Storage System on Jurong Island – the largest system in Southeast Asia and commissioned in only 6 months – allowing Singapore to store energy to supply electricity in a future period.[27]

As per the hydrogen energy, according to a 2022 Report on Singapore's National Hydrogen Strategy from the Ministry of Trade and Industry, the energy produced from hydrogen could be a low-carbon energy source, contributing up to 50% of Singapore's green energy mix by 2050.[28] In this regard, the Energy Market Authority has engaged several companies to build and manage two hydrogen plants that will meet the energy needs of thousands of households by 2030 and that will use hydrogen for 30% of their fuel needs. The National Strategy's efforts revolve around 5 key thrusts:

- Experiment with the use of advanced hydrogen technologies at the cusp of commercial readiness through pathfinder projects
- Invest in research and development to unlock technological bottlenecks
- Pursue international collaborations to enable supply chains for low-carbon hydrogen economy
- Undertake long-term land and infrastructure planning.

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[26] Energy Market Authority, Enhancing Singapore's Solar Adoption and Grid Reliability with Solar Forecasting Tools (2022) Available here: https://www.ema.gov.sg/news-events/news/media-releases/2022/enhancing-singap ores-solar-adoption-and-grid-reliability-with-solar-forecasting-tools

[27] Singapore Green Plan 2030, Energy Reset - Green Economy - Resilient Future, (2021). Available here: https://www.greenplan.gov.sg/key-focus-areas/energy-reset/

[28] Ministry of Trade and Industry, Singapore's National Hydrogen Strategy. Available here: Singapore's National Hydrogen Strategy (mti.gov.sg)

The investments in R&D ran by Singapore have primarily involved the private sector, such as the French renewable energy company *ENGIE* Group, which has set up a research site on Semakau island to test the various methods of renewable energy, including the generation of power from hydrogen fuel.[29] In addition to this, Singapore's universities are also conducting research on hydrogen energy technology: for instance, the NUS Green Energy Programme gathers experts across faculties in order to research on emerging energy production methods, more specifically hydrogen fuel production via electrolysis, capturing and converting CO2 into green fuels, and testing the feasibility of scaling these solutions.[30]

Southeast Asia became a significant cusp of growth for renewable energies. According to EDB and McKinsey,[31] annual renewable capacity addition for solar and wind power must increase 7 to 12 times for the region to achieve its net-zero goals. The International Energy Agency has also projected clean energy investment in SEA will need to quadruple to US$160 billion dollars by 2030.[32]

[29] ENGIE, ENGIE inaugurates a platform designed to test renewable technologies in Singapore, thus accelerating its strategy towards a carbon-neutral economy (2020). Available here: ENGIE inaugurates a platform designed to test renewable technologies in Singapore, thus accelerating its strategy towards a carbon-neutral economy | ENGIE

[30] National University of Singapore, Green Energy Programme Faculty of Engineering, Faculty of Science. n.d. "NUS Flagship Green Energy Programme." Available here: https://greenenergy.nus.edu.sg/

[31] EDB, How renewable energies project developers can power Southeast Asia's green energy transition (2023). Available here: How renewable energy project developers can power Southeast Asia's green energy transition | Singapore EDB

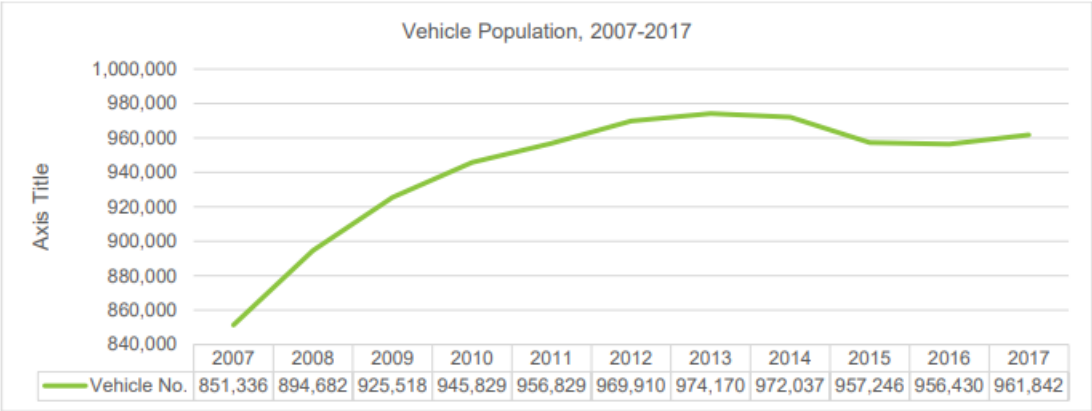
[32] International Energy Agency, World Energy Outlook (2023). Available here: World Energy Outlook 2023 – Analysis - IEA

4.2 E-mobility

Singapore's public transit system is a world class, with a diverse selection of modes, affordable fares, fast commute times, and stations within easy walking distance for its residents. In relation to the section above, it is crucial to underline the role of Singapore not only as a leader in green technology as a whole, but also more specifically as a leader in global green technology e-mobility, as enshrined in the 2030 Green Plan. In particular, the city-state's 2030 Green Plan seeks to enlist the private sector in expanding sustainable transportation infrastructure and exporting the resulting know-how and experience around the world.

As a small and densely populated country, Singapore depends highly on efficient and effective transportation solutions to overcome land and manpower constraints as well as mitigate pollution from its increasing fleet of vehicles. With roads occupying 12% of Singapore's relatively small land area, the focus on intelligent transport solutions is accelerating.

Figure 7: Vehicle Population, 2007-2017



	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Vehicle No.	851,336	894,682	925,518	945,829	956,829	969,910	974,170	972,037	957,246	956,430	961,842

Figure: Land Transport Authority

As the graph above shows, in 2017, there was a total of 961,842 motor vehicles on Singapore's roads. Among the 612,256 passenger cars, 20,751 were petrol-electric, 206 petrol-electric (plug-in), 1,006 petrol-CNG, 314 electric, and 22 diesel-electric vehicles. In the same year, among the 23,140 taxis, there were 4,159 petrol-electric and only 1 petrol-CNG registered vehicle. In addition, Singapore had only 1 petrol-electric, 3 petrol-CNG, 31 electric and 7 diesel-electric vehicles among the 142,857 Goods & Other Vehicles category. Finally, out of 18,814 buses on Singapore's roads, the country had only 1 petrol-CNG, 12 CNG, 2 electric and 3 diesel electric buses,

while the country's 141,304-wide motorcycle population recorded only 2 electric vehicles.[33]

Singapore is particularly keen on transforming its public transport system and introducing new, innovative solutions that help reduce the country's vehicle fleet and encourage citizens to use greener means of transport.

For instance, the Singaporean government is spearheading significant projects, including the completion of a sixth metro line that incorporates autonomous technology, digitization efforts at Changi Airport, and an extensive expansion of cycling paths and electric vehicle (EV) charging stations. By **aiming to install 60,000 charging points by 2030**[34], Singapore is not only enhancing its own mobility infrastructure but also ensuring that it remains at the forefront of innovation in urban mobility. According to the Economic Development Board (EDB), these upgrades promise to keep Singapore at the forefront of mobility innovation, as a city that already ranks **4th globally in the Oliver Wyman Forum's Urban Mobility Readiness Index**[35], and **3rd in the public transit sub-index**, thanks to its strong public transit network.

> *What are the challenges and opportunities for the transportation system of Singapore?*

The lack of electric vehicles (EV) charging station density and the subsequent EV market share in sales play a role. The measures taken to improve the EV infrastructure included:

- Deploying more than 600 public charging stations in 2022, and 2.000 by the end of 2023[36]
- Offering discounted car ownership permits for EV purchases as part of a plan to phase out sales of combustion engine vehicles by 2030[37].

[33] EU Business Avenues in Southeast Asia, Green Energy Technologies. Singapore Market Study (2018)
[34] Singapore Green Plan targets: Available here: Our Targets (greenplan.gov.sg)
[35] Oliver Wyman Forum's Urban Mobility Readiness: How Singapore Performs Across Urban Mobility Targets (oliverwymanforum.com)
[36] Ministry of Transport: MOT | Electric Vehicles
[37] National Environmental Agency, Sustained Government Support To Encourage Vehicle Electrification (2023). News release available here: NEA | Sustained Government Support To Encourage Vehicle Electrification

- Launching the National Electric Vehicle Centre to promote public-private partnerships to accelerate the deployment of a nationwide EV charging infrastructure, regulations and standards.

Recalling on the last point, building such reliable and efficient transit system requires collaboration and synergy with the private sectors: leaders in aviation, energy, logistics and public transit emphasized that building infrastructure to support greener transportation must require joint efforts.

4.3 Sustainability in digital technologies

The adoption and efficient exploitation of emerging technologies such as IoT, AI, blockchain in manufacturing, warehousing and logistics makes Singapore a global leader in digital and tech, becoming in the past decade a destination of choice for tech enterprises. Multinational companies and start-ups find Singapore attractive because of government initiatives and access to regional business opportunities. Singapore's ascent as a global tech powerhouse is anchored on the pillars of innovation, business networks, and robust tech infrastructure. By actively fostering collaboration with local and international entities, the government strengthens the nation's position as first destination for tech companies seeking growth opportunities: in fact, 80 of the world's top 100 technology companies have presence there.[38]

> *What does Singapore have to offer to top tech firms to power their work?*

Technology: top tech innovation hub outside of the Silicon Valley, 2nd in digital competitiveness in Asia, beating South Korea, Japan and China, 1st in global smart city index, beating London and New York.

Business: 2nd for ease of doing business in Asia, the only Southeast Asian nation in the top 10 for Asia, and 18th globally, 1st for the most innovative economy in the whole Asia, 1st for Intellectual Property protection in Asia and 2nd globally.

[38] EDB, How Singapore has become a leading force in tech innovation (2023). Available here: How Singapore has become a leading force in tech innovation | Singapore EDB

Talent: 1st in developing, attracting and enabling talent in Asia and 3rd globally, 2nd most attractive destination in Asia for global talent, more than 5/10 workers in high-skilled employment, and 74.3% of resident population literate in two or more languages.

Digital: 2nd globally in digital connectivity, 3rd most desirable location for data centers globally, with more than 60% of Asia-Pacific's data center supply, top global submarine cable hub, with 29 submarine internet cables linking to multiple key locations worldwide, established progressive Digital Trade Agreements (DEAs) with key trade partners to ensure digital connectivity and data protection regime interoperability.[39]

Hence, Singapore's appeal spans multiple levels as it offers a business-friendly environment, competitive government support, and a highly skilled workforce. It has demonstrated its ability to adapt to macroeconomic trends and leverage technological advances effectively.

In fact, in 2014, Singapore government launched the **Smart Nation Agenda**, led by the Ministry of Digital Development and Information (MDDI), with the objective to build a thriving digital future for all. In 2024, the refreshed Smart Nation vision was unveiled to leverage technology to enhance citizens' lives and promote economic growth through a comprehensive digital transformation strategy. Since 2014 the initiative has seen significant progress, with the digital economy contributing **17.7%** to the GDP in 2023, up from **13.8%** in 2018. The agenda includes objectives such as achieving **99%** online completion of government services, training over **340,000 seniors** in digital skills, and ensuring that **95%** of small and medium enterprises adopt digital technologies.

In particular, the refreshed vision of the Smart Nation agenda emphasizes three core goals:

- **Growth** - fostering economic empowerment
- **Community** - promoting social cohesion and
- **Trust** - enhancing cybersecurity and data protection.

This strategic approach aims to create a thriving digital future for all Singaporeans while addressing the challenges and opportunities presented by rapid technological advancements.

[39] EDB, Singapore's Tech Ecosystem (2022). Available at: Singapore's Tech Ecosystem | Singapore EDB

4.4 Energy transition financing

Singapore has emerged as a financial and legal powerhouse, offering easy access to investor capital. Singapore's energy transition financing ecosystem is rapidly evolving, driven by a combination of governmental initiatives, partnerships with international organizations, and the active participation of financial institutions. The aim is to transition from fossil fuels to renewable energy sources while ensuring economic growth and sustainability.

Investments play a crucial role in this ecosystem. The Monetary Authority of Singapore (MAS), in collaboration with the Asian Development Bank (ADB) and the Global Energy Alliance for People and Planet (GEAPP), has initiated an energy transition acceleration finance partnership. This partnership aims to mobilize up to $2 billion in concessional and commercial capital to support energy transition projects across Asia, focusing on the early phase-out of coal and the promotion of renewable energy sources.[40] The partnership seeks to de-risk investments through blended finance, enabling private capital to flow into projects that may otherwise struggle to attract funding due to perceived risks.[41]

Financial institutions in Singapore are pivotal in supporting clean energy projects through various mechanisms:

- **Blended finance**: this approach combines concessional capital from public and philanthropic sectors with private investment, reducing the overall cost of capital for clean energy projects. Institutions like HSBC and Temasek have been instrumental in establishing blended finance initiatives that facilitate funding for sustainable infrastructure projects.[42]
- **Green loans and investments**: financial institutions are increasingly providing green loans to support renewable energy initiatives. For instance, HSBC Singapore has financed renewable projects such as hydropower plants and solar portfolios across Southeast Asia, demonstrating the capacity of Singaporean banks to catalyze clean energy investments.[43]
- **Taxonomies and frameworks**: the MAS has developed a transition-focused taxonomy that sets clear criteria for financing activities related to the energy

[40] Asian Development Bank, ADB, GEAPP, and MAS to Establish Energy Transition Acceleration Finance Partnership in Asia (2023). Available at: ADB, GEAPP, and MAS to Establish Energy Transition Acceleration Finance Partnership in Asia | Asian Development Bank
[41] Menon R., Developing the ecosystem for energy transition (2023). Available here: Ravi Menon: Developing the ecosystem for energy transition (bis.org)
[42] Ibid.
[43] HSBC, Singapore's outsized impact on ASEAN's energy transition (2024). Available here: Singapore's outsized impact on ASEAN's energy transition (hsbc.com.sg)

transition. This framework helps investors assess the sustainability of their investments and encourages adherence to best practices in green financing.[44]

Furthermore, Singapore's strategic position as a regional financial hub significantly enhances its influence over green investments in Asia:

- **Infrastructure financing**: the country has established itself as a leading center for infrastructure financing, attracting major investors like GIC who have substantially increased their portfolios in sustainable projects. This concentration of capita enables Singapore to fund large-scale clean energy initiatives effectively.
- **Global Leadership initiatives**: Singapore has launched initiatives such as the **Transition Credits Coalition (TRACTION)** aimed at using carbon credits to finance the early closure of coal facilities. These initiatives not only enhance local capabilities but also position Singapore as a leader in regional climate finance discussions.
- **Collaborative partnerships**: through partnerships like the **Financing Asia's Transition Partnership (FAST-P)**, Singapore aims to mobilize substantial resources—up to $5 billion—to support green projects across Asia. This collaborative approach brings together multilateral development banks, sovereign partners, and philanthropic organizations, reinforcing Singapore's role as a critical player in regional energy transitions.[45]

[44] Menon R., Developing the ecosystem for energy transition (2023). Available here: Ravi Menon: Developing the ecosystem for energy transition (bis.org)

[45] Monetary Authority of Singapore, ADB, GEAPP, and MAS to Establish Energy Transition Acceleration Finance Partnership in Asia (2023). Available at: ADB, GEAPP and MAS to Establish Energy Transition Acceleration Finance Partnership in Asia

Bibliography

Asian Development Bank (ADB). (2022). *Energy Transition Acceleration Finance Partnership*. Retrieved from https://www.adb.org/news/adb-launches-energy-transition-acceleration-finance-partnership

Business Insider. (2023). *How Singapore is helping 'future-food' companies scale up*. Retrieved from https://www.businessinsider.com/singapore-food-tech-sector

Delegation of the European Union to Singapore. (2023). *EU Singapore Trade & Investment 2023 edition*. Retrieved from https://www.eeas.europa.eu/singapore/eu-singapore-trade-booklet_2023_230920

ECCP. (2022). *Input Paper on Clusters and Important Value Chains in Singapore*. European Cluster Collaboration Platform. Retrieved from https://www.clustercollaboration.eu/eu-singapore-cluster-cooperation

European Commission. (2023). *EU-Singapore Free Trade Agreement, Investment Protection Agreement, and Digital Trade Agreement*. Retrieved from https://www.europa.eu/eu-singapore

European Fund for Sustainable Development Plus (EFSD+). (2021). *Mobilizing Investments for Sustainable Development*. Retrieved from https://www.ec.europa.eu/international-partnerships/efsd-plus

European Union External Action. (2024). *EU-Indo Pacific Strategy Factsheet*. Retrieved from https://europa.eu/eu-indo-pacific-fs

Global Energy Alliance for People and Planet (GEAPP). (2022). *Partnership for Energy Transition Financing*. Retrieved from https://www.gea.org/energy-transition-financing

Housing & Development Board (HDB). (2022). *HDB to Bring Solar Energy to Over 8,000 Blocks through SolarNova Programme*. Retrieved from https://www.hdb.gov.sg/about-us/news-and-publications/press-releases/HDB-tobring-solar-energy

International Energy Agency. (2024). *Singapore - Countries & Regions - IEA*. Retrieved from https://www.iea.org/countries/singapore

Ministry of Trade and Industry Singapore (MTI). (2024). *Economic Survey of Singapore First Quarter 2024*. Retrieved from https://www.mti.gov.sg/economic-survey-2024

Ministry of Trade and Industry Singapore (MTI). (2022). *Singapore's National Hydrogen Strategy*. Retrieved from https://www.mti.gov.sg/Singapore-national-hydrogen-strategy

MIT Technology Review. (2020). *Inside Singapore's Huge Bet on Vertical Farming*. Retrieved from https://www.technologyreview.com/2023/01/12/singapore-high-tech-farming

National University of Singapore. (n.d.). *NUS Flagship Green Energy Programme*. Retrieved from https://greenenergy.nus.edu.sg

Prime Minister's Office Singapore – National Research Foundation. (2021). *Research Innovation and Enterprise 2025 Plan*. Retrieved from https://www.nrf.gov.sg/docs/default-source/default-document-library/rie_booklet_fa2021_pages.pdf

Singapore Economic Development Board (EDB). (2024). *What Could Singapore's Energy Mix Look Like in 2035?* Retrieved from https://www.edb.gov.sg/en/business-insights/insights/what-could-singapores-energy-mix-look-like-in-2035

Singapore Green Plan 2030. (2021). *Energy Reset - Green Economy - Resilient Future*. Retrieved from https://www.greenplan.gov.sg/key-focus-areas/energy-reset

World Bank. (2020). *Human Capital Index 2020: Singapore's Development Overview*. Retrieved from https://www.worldbank.org/en/publication/human-capital

World Bank. (2022). *Services, Value Added (% of GDP) – Singapore*. Retrieved from https://data.worldbank.org/indicator/NV.SRV.TOTL.ZS?locations=SG

World Bank. (2023). *Industry (including construction), Value Added (% of GDP) – Singapore*. Retrieved from https://data.worldbank.org/indicator/NV.IND.TOTL.ZS?locations=SG