

International Maritime Centre 2030

STRATEGIC REVIEW

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Chairman, IMC 2030
Advisory Committee



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IMC 2030
Advisory Committee



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FOREWORD

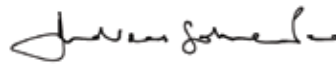
Singapore has grown successfully as a maritime centre over the past few decades. This has been founded on many factors, including strategic geographic port location, rule of law, skills, good infrastructure, and a government that is attuned to business needs. The outcome has been a large number of shipping companies setting up in Singapore and stimulating demand for an entire ecosystem of maritime-related businesses. Singapore is now perceived as a leading maritime centre globally.

All countries and industries face new uncertainties over the coming decades, brought about by changes in important fields like energy, and by advances in technology that will change the way jobs are performed and assets are managed.

It is therefore timely to review the strategy for the maritime sector, to consider what skills will be needed for the future and how to participate in digital opportunities, while taking care not to discard elements that have contributed to past success and will continue to be important in future.

This report is the result of work by the IMC 2030 Advisory Committee, supplemented by industry roundtable discussions and feedback. We thank the Advisory Committee members for providing their time and insights over a period of many months, with many travelling long distances to join the meetings.

We hope these recommendations will enable Singapore to continue its leading role in the global maritime sector in time to come; as always, combining far-sighted strategic planning with effective execution.



Andreas Sohmen-Pao

Chairman, IMC 2030 Advisory Committee



IMC 2030

ADVISORY COMMITTEE

▸ **Mr Geir
Sjurseth**

*Branch Manager and
Managing Director,
Global Head of Offshore
Finance, DVB Bank SE
Singapore Branch*



▸ **Mr Andreas
Sohmen-Pao**

Chairman

*Chairman,
BW Group Limited*



▸ **Mr Rashpal
Bhatti**

*Vice President,
Freight Marketing,
BHP Billiton*



▸ **Prof Torger Reve**

*Wilh Wilhelmsen
Professor of Strategy
and Industrial
Competitiveness,
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of Management*



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Eriksen**

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▶ **Mr Chua Chye Poh**

*Chief Executive Officer,
ShipsFocus Group*



▶ **Mr Kent Chaplin**

*Chief Executive Officer,
Lloyd's Asia Pacific*



▶ **Mr Esben Poulsen**

*President,
Singapore Shipping
Association*



▶ **Mr Eddie Chau**

*Founder and
Chairman,
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▶ **Mr Tan Chin Hwee**

*Chief Executive Officer
for Asia-Pacific,
Trafigura Pte Ltd*



▶ **Mr Teo Siong Seng**

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Pacific International
Lines (Pte) Ltd*



▶ **Ms Cindy Kong**

*Managing Director,
Shipping/Specialised
Asset Based
Financing,
United Overseas Bank
Limited*



▶ **Mr Ong Kim Pong**

*Regional Chief
Executive Officer,
PSA International
Pte Ltd*



▶ **Mr Andrew Tan**

*Chief Executive,
Maritime and Port
Authority of Singapore*



▶ **Mr Mikael Makinen**

*President – Marine,
Rolls Royce*



▶ **Ms Tan Beng Tee**

*Assistant Chief
Executive
(Development),
Maritime and Port
Authority of Singapore*



INTRODUCTION



Maritime Singapore is an important economic pillar anchored on our global hub port and vibrant international maritime centre (IMC). Singapore’s port has historically been a key driver of Singapore’s connectivity and competitiveness, and remains so. Hence, the Singapore Government continues to make significant investments in port infrastructure as part of the Next Generation Tuas Port to ensure that Singapore retains its leading position as a global hub port. The strong port has laid the physical foundation for Singapore’s maritime success. This, coupled with a competitive IMC, will help set Singapore apart from other maritime centres.

Following the Economic Review Committee’s recommendation to adopt a “London-Plus”¹ development framework in 2003, Singapore has grown beyond a physical port to also become a vibrant IMC. Singapore is now home to one of the highest concentrations of international shipping groups and global maritime service providers (**Figure 1**), totalling more than 5,000 establishments.

¹ The “London-Plus” vision was to develop Singapore into a premier IMC by building up a vibrant maritime services cluster with skilled and experienced professionals (“London”), while maintaining and leveraging our existing strengths such as hub port, ship registry, and other value propositions (“Plus”), to differentiate ourselves from other IMCs.

Figure 1 *Growth in International Shipping Groups and Maritime Service Providers in Singapore since 2000*

Sectors	2000	Today
International Shipping Groups	20+	140+
Banks offering Ship Financing	15	20+
International Group of Protection & Indemnity (IG P&I) Clubs ²	2	8
Lloyd's Asia Service Companies ³	2	20
Law Firms with Maritime Practice	15	30+
Leading Shipbroking Firms	10	20+

Today, Maritime Singapore contributes about 7% of Singapore's Gross Domestic Product and generates more than 170,000 jobs. The port and IMC have strong economic linkages to the wider Singapore economy and generate significant value for other related sectors. Singapore is widely recognised as a leading IMC in international benchmarking studies such as "The Leading Maritime Capitals of the World" study conducted by Menon Economics and the "Xinhua-Baltic Exchange International Shipping Centre Development Index".

As Singapore's IMC matures, it is timely to review the "London-Plus" framework and chart out a new growth strategy to stay relevant amidst changing global trends. In August 2016, the Maritime and Port Authority of Singapore (MPA) established the IMC 2030 Advisory Committee (the Committee), comprising industry leaders from diverse fields to undertake a strategic review, dovetailing with Singapore's wider economic restructuring efforts driven by the Committee on the Future Economy (CFE). This strategic review was to take stock of Singapore's achievements as an IMC to date, identify key trends which may impact future IMC competitiveness, and map out a developmental strategy to take Singapore's IMC to 2030 and beyond.

² The International Group of Protection & Indemnity (IG P&I) refers to a group of 13 Group Clubs, which are independent, non-profit making mutual insurance associations. The Group Clubs provide third-party liability cover relating to the use and operations of ships on a mutual basis for their shipowner members. Collectively, they insure approximately 90% of the world's ocean-going tonnage.

³ As pioneers of marine insurance, Lloyd's of London leads the global insurance market in writing specialist risks, including marine and offshore energy. Lloyd's of London (Asia) Pte Ltd is a platform set up in Singapore consisting of 21 service companies, of which 20 write marine and/or offshore energy business.

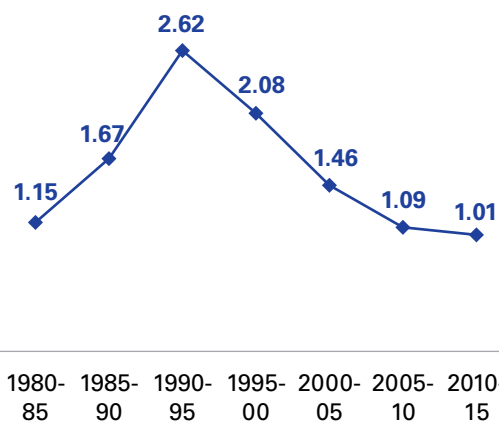
KEY DRIVING FORCES

In formulating the strategic recommendations to develop Singapore’s IMC, the Committee has considered the changing global environment and emerging trends that pose headwinds and tailwinds for Maritime Singapore.

Since the global financial crisis of 2008, the world economy has been facing uneven growth prospects. In particular, trade growth remains subdued while long-term growth fundamentals continue to be weak. These economic headwinds are gradually translating into long-term structural shifts in the global maritime industry. Weak and uneven global demand and volatile commodity prices have exacerbated, in varying degrees, tonnage overcapacity in most shipping segments.

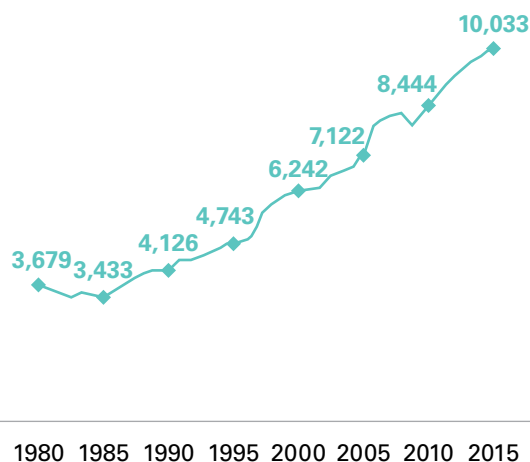
Figure 2 Normalisation of the Growth of World Trade

Figure 2.1 Trade-to-GDP Multiplier
(5-year CAGR of Exports and Real GDP growth data were used to mitigate intra-year volatility)



The Trade-to-GDP growth multiplier has slipped from an average of 2.62 in 1990-1995 to 1.01 in 2010-2015⁴ (Figure 2.1). This is attributable to the gradual shift towards non-tradable services in many economies and the maturation of global supply chains.

Figure 2.2 World Seaborne Trade
(million metric tonnes loaded)



Despite the moderating Trade-to-GDP multiplier, world seaborne trade⁵ is expected to grow (Figure 2.2) as emerging market economies continue to rely on trade for economic development. Furthermore, the growth of e-commerce and e-payments, as well as the digitalisation of logistics, would enable more small and medium enterprises to engage in international trade, boosting trade growth in the longer term.

4 International Monetary Fund (2017), World Economic Outlook April 2017, Washington DC.

5 United Nations Conference on Trade and Development (2016) Review of Maritime Transport 2016, Geneva.



Despite the slowdown in trade growth, we see opportunities with the rise of the global middle class, especially in emerging markets, and Asia as a key growth driver for maritime business in the next 15 years and beyond. From Norway's Maritim21 to China's Maritime Silk Road and Indonesia's Global Maritime Fulcrum, we observe growing interest among nations to develop new national maritime strategies to boost trade and connectivity.

Technology is transforming maritime business models and value chains. Ships are becoming smarter and increasingly connected. Ports around the world are becoming more automated in the face of growing labour constraints. Maritime companies are leveraging developments in both hardware (e.g. advanced sensor systems, sea-to-shore connectivity, robotics) and software (e.g. data analytics, artificial intelligence) to better optimise their operations. With technology blurring traditional industry boundaries, new players and maritime start-ups (e.g. Xeneta) have emerged to provide technology-driven solutions that deliver new value and challenge traditional business models.

Meanwhile, competition has intensified among both established and emerging IMCs. To remain competitive, a key differentiator for Singapore will be the ability to create and sustain value propositions that will help to grow and anchor the maritime cluster based here. Singapore needs to explore ways to strengthen the network effects within the maritime cluster and explore new cross-sector growth opportunities in related sectors such as logistics, commodity trading, and technology. For instance, the rise of e-commerce logistics has created new opportunities such as carrier-to-marketplace partnerships (e.g. Maersk, CMA CGM, Evergreen and Zim with Alibaba's OneTouch platform) and ocean freight platforms (e.g. Flexport and Haven) that enable carriers and shipping lines to improve their asset utilisation and optimise supply chains.

Within its borders, Singapore needs to contend with domestic shifts and challenges. Managing business costs and long-term productivity growth are issues that need to be addressed. With a maturing population, forward-looking manpower policies and continuous human capital development will be needed to build up a globally-oriented and multi-skilled workforce that is agile, resilient, and competent in order to take on higher-value job roles in the future economy.

As Maritime Singapore embarks on its next phase of growth, we are confident that Singapore will continue to stay adaptive and nimble in transforming itself to remain a globally-important maritime hub. We believe the strategies proposed in this report will complement Singapore's key strengths and place it in a strong position to seize emerging opportunities in the years ahead.

TAILWINDS



Rising incomes in Asia



Complementary growth of adjacent sectors such as commodity trading, finance, and technology



Consolidation of shipping companies (in mega alliances and pools) that are more inclined towards IMCs with scale and connectivity



Healthy collaboration between public and private sectors



Liveable city that attracts global maritime talent



Pro-business environment (political stability, adherence to rule of law, access to talent)



Comprehensive maritime ecosystem with port, shipping, maritime services, and offshore & marine engineering

HEADWINDS

Slowing growth in global seaborne trade amidst shifting trade patterns



Rising nationalism and protectionist policies



Accelerating pace of technological change leading to disruption of existing business models



Changing skills requirements along with commercial and technological developments



Innovation and commercialisation requiring new forms of collaboration



Intensifying competition among regional ports and IMCs



Tightening environmental, fiscal, and financial regulations translating into higher compliance costs for businesses



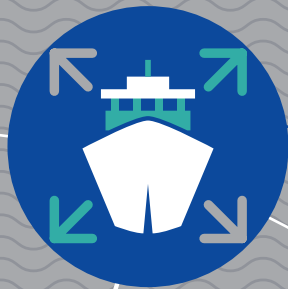
VISION FOR MARITIME SINGAPORE

The Committee recommends that Maritime Singapore adopts the vision to be the **Global Maritime Hub for Connectivity, Innovation, and Talent**. As a Global Maritime Hub, Maritime Singapore will be a centre of excellence for shipping, port, offshore, and maritime-related businesses. It will have strong inter-linkages to adjacent sectors such as commodity trading and logistics. Anchored on a strong port and international maritime cluster, Singapore will leverage cutting-edge systems and infrastructure to serve as a key node in a globally-connected network of maritime activity. It will be driven by strong innovative players and a talented workforce equipped with future-ready skills and a global mindset.

In short, Maritime Singapore will be **“the place to be”** for global maritime businesses to access multiple opportunities within an innovative and interconnected maritime cluster.



MARITIME SINGAPORE –
GLOBAL MARITIME HUB FOR
CONNECTIVITY,
INNOVATION
& TALENT



PROPOSED STRATEGIES

1 Expand and deepen the maritime cluster

Continue to grow the number of shipping players



Capture more market share in shipbroking sectors



Advance Singapore's standing as an Asian insurance and maritime legal and arbitration hub



Expand the sources of financing and attract new players



Strengthen Singapore's port and develop opportunities related to the port ecosystem

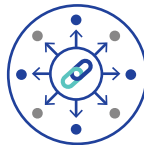


2 Strengthen inter-linkages and network effects

Promote physical clusters of maritime-related activities within Singapore



Enhance inter-linkages between Singapore's maritime cluster and adjacent industries (e.g. logistics and commodity trading)



Strengthen inter-linkages with other international maritime clusters



3 Develop a vibrant maritime innovation ecosystem and promote digitalisation

Build a strong maritime cluster centred on strong alignment of innovation and R&D efforts between public and private sectors



Promote digitalisation of the maritime industry leveraging Big Data, Internet-of-Things, and Intelligent Systems



4 Develop a multi-skilled maritime workforce with a global mindset

Strengthen quality of maritime education and training



Further enhance standards of professionalism of the maritime industry



Raise profile of the maritime industry to attract talent



5 Establish Singapore as a global maritime standard bearer

Position Singapore as a leader in existing and new areas of excellence such as port management, risk management, and safety, security and sustainability



Promote a regulatory environment that supports new innovation and standards



STRATEGY 1

EXPAND AND DEEPEN THE MARITIME CLUSTER

Singapore has built up a diverse IMC anchored by shipowners and operators at its core. This is supported by a comprehensive ecosystem of technical and commercial maritime service providers offering a wide spectrum of services such as broking, insurance, finance, legal and arbitration, surveying as well as ship repair and conversion. Complementing the maritime ecosystem is an established pool of international trading, commodity, and logistics players, which enhances the vibrancy of Singapore as a marketplace and strategic location for global maritime businesses to expand their Asian footprint.

Setting our sights beyond the “London-Plus” development strategy, it is essential for players within Singapore’s maritime industry to invest in new growth areas that leverage and complement our existing strengths. To this end, there is a need to further develop the IMC by strengthening the core of shipowners and operators, deepening our services sectors, and investing in the development of Singapore’s future port.

RECOMMENDATION 1.1

CONTINUE TO GROW THE NUMBER OF SHIPPING PLAYERS

Strengthening the shipping core will continue to drive demand for maritime services, which in turn will enhance the ecosystem as a whole. Growing and entrenching the core of shipowners and operators in Singapore remains a key priority. In this respect, Singapore should continue to reach out to shipping companies and shipping-related service providers (e.g. ship managers and ship agencies) from various locations to establish their presence in Singapore, while encouraging existing companies based here to expand their scale of operations and breadth of key functions in Singapore.

Singapore should facilitate shipping players, maritime service providers as well as the offshore & marine engineering companies to develop new commercial and technical capabilities including areas such as Big Data, research and development, risk management, and green technologies. Greater support for Singapore-based entrepreneurial ventures in traditional shipping domains as well as new and emerging business segments (e.g. renewable energy, sea bed mining) could be provided to foster the development of traditional and non-traditional maritime players in Singapore.

To better service the international shipping community in Singapore, efforts should be undertaken to cultivate and encourage maritime-related international organisations to establish and grow their regional presence in Singapore (e.g. Baltic and International Maritime Council, International Tanker Owners’ Association). Maritime programmes such as the Maritime Sector Incentive and Maritime Cluster Fund (MCF) should be regularly reviewed and updated to ensure that they remain relevant and competitive to support Singapore’s growth as a maritime business hub.

CONTINUAL GROWTH OF OUR SHIPOWNERS AND OPERATORS CORE

FEATURE
STORY

As pillars of maritime growth for Singapore, the global hub port and IMC continue to provide a strong and unique proposition for a growing core of global shipowners and operators to undertake shipping operations from Singapore. MPA remains committed to supporting players in Singapore – two examples being the A.P. Moller-Maersk (Maersk) and CMA CGM Groups.

Headquartered in Copenhagen, Denmark, the Maersk Group is an international transport and logistics business with a strong focus on container shipping and ports. With an early presence in Singapore dating back to 1975, the Maersk Group has grown substantially in Singapore in tandem with the country's development as an IMC.

Outside of Denmark – where Maersk's global headquarters is housed – Singapore is the only other country where key segments of the Maersk Group's business are represented. These include container, tanker, gas, marine services, freight forwarding, and supply chain management operations. The strong presence of the Maersk Group in Singapore attests to Singapore's attractiveness as a base for global shipping companies to grow their business in Asia.



Photo Credit: Maersk Group



Photo Credit: CMA CGM Group

Following its acquisition of Neptune Orient Lines, the CMA CGM Group established its regional headquarters in Singapore in July 2016. In January 2017, CMA CGM set up its third global Navigation and Port Operations Centre in Singapore, a state-of-the-art facility providing critical navigational support for its combined fleet of over 500 container vessels. In April 2017, it opened in Singapore its Asia CMA CGM Academy in partnership with IE Business School (Spain), Singapore Management University (Singapore), and Sciences Po Institute (France). The Academy aims to promote CMA CGM's regional talents.

The CMA CGM Group has entered into a joint venture with PSA Singapore Terminals to operate four mega container berths in Singapore's Pasir Panjang Terminal Phases 3 and 4. Since commencing operations in mid-2016, the CMA CGM-PSA Lion Terminal partnership has allowed CMA CGM and its affiliates to leverage PSA Singapore Terminals' industry-leading port technologies and infrastructure.

Apart from the Maersk and CMA CGM Groups, Singapore has also partnered other shipping lines such as China Cosco Shipping Group and the Ocean Network Express to expand their presence in Southeast Asia and beyond. As these shipowners and operators remain key demand drivers of our maritime ecosystem, MPA will need to continue strengthening the shipping core by ensuring that Singapore's business environment remains conducive and its policies responsive and relevant.

1 | Pictured here are crew members of MARY MAERSK, which is a Maersk "Triple E" Class container ship with a capacity of 18,340 twenty-foot equivalent units (TEUs).

2 | With a length of 400m – about four football fields end to end – and width of 54m, CMA CGM BOUGANVILLE is the CMA CGM Group's flagship vessel with a capacity of 18,000 TEUs.

RECOMMENDATION 1.2 CAPTURE MORE MARKET SHARE IN SHIPBROKING SECTORS

With leading shipbroking companies from Norway, Germany, the UK, the US, and other IMCs having significant operations here, Singapore has grown to be a key shipbroking hub in Asia. To strengthen Singapore's position as a leading shipbroking hub, Singapore should grow the local broking talent pool to support a broader range of shipbroking activities, while encouraging international shipping groups and commodity traders to undertake key decisions on chartering, sale & purchase, and commissioning of newbuildings in Singapore.

RECOMMENDATION 1.3 ADVANCE SINGAPORE'S STANDING AS AN ASIAN INSURANCE AND MARITIME LEGAL AND ARBITRATION HUB

Singapore's marine insurance sector continues to grow in scale and diversity. To elevate Singapore's standing as an Asian insurance hub, efforts should be undertaken to strengthen expertise in traditional classes of marine insurance such as Cargo, Hull, Marine Liability, Marine War, and Ports & Terminals. For example, the Singapore War Risk Mutual was launched in 2015 in response to the industry's growing demand for Singapore to have its own war risk mutual. Singapore should continue to support the development of new insurance products which focus on emerging risks such as cyber security risks. In addition, marine mutuals should be encouraged to offer a full range of services, so as to better serve the needs of international shipping companies based in Singapore. These developments would require deep expertise in underwriting, claims handling, and loss prevention.

The marine insurance sector generates spin-offs to other adjacent sectors. For example, it contributes towards our efforts in strengthening Singapore's maritime legal and arbitration sector. As part of the latter, the Singapore Chamber of Maritime Arbitration (SCMA), Maritime Law Association of Singapore and other partners could jointly intensify marketing and promotional efforts, as well as support efforts to build quality maritime legal and arbitration expertise.



Chairman of the SCMA, Mr Goh Joon Seng, delivering his welcome address at the SCMA Conference 2017.

SINGAPORE'S GROWTH AS A HUB FOR MARITIME SERVICES AND INSURANCE



Photo Credit: Lloyd's Asia

Photo of Lloyd's Asia, situated at CapitaGreen

As the founders of the marine insurance market 329 years ago, Lloyd's of London has a long maritime heritage. Lloyd's Asia was established in Singapore in 1999 with two service companies to support the marine and energy sectors in the region. Today, the Lloyd's Asia platform has 21 service companies, of which 20 write a comprehensive range of marine and/or offshore energy risks. Lloyd's Asia's presence and underwriting expertise has helped Singapore grow as a hub for maritime services and insurance.

In addition to its substantial business presence, Lloyd's Asia also collaborates with marine and shipping associations and government agencies in Singapore to enhance the understanding of risk management and marine insurance. This has helped to promote the development of the Singapore marine insurance sector.

An emerging risk for the maritime industry would be cyber security risk. As the market leader for specialist insurance cover, Lloyd's Asia has committed to becoming a founding partner of the Cyber Risk Management Programme (CyRiM). The CyRiM, led by the Monetary Authority of Singapore (MAS), aims to develop an efficient cyber security risk insurance market by consolidating cyber data loss and building useful analytics. The project aims to identify major risk drivers of cyber-related loss events and map these to existing insurance lines of business to identify gaps and opportunities. With such information, the maritime sector would be better equipped to handle cyber breaches and emergencies.

GROWING THE SPECTRUM OF MARITIME SERVICES IN SINGAPORE

A comprehensive maritime services cluster supports the growth of shipping lines across container, dry bulk, tanker, and offshore services segments. It is important that Singapore continues to strengthen existing services and grow emerging products and services increasingly demanded by the international maritime community.



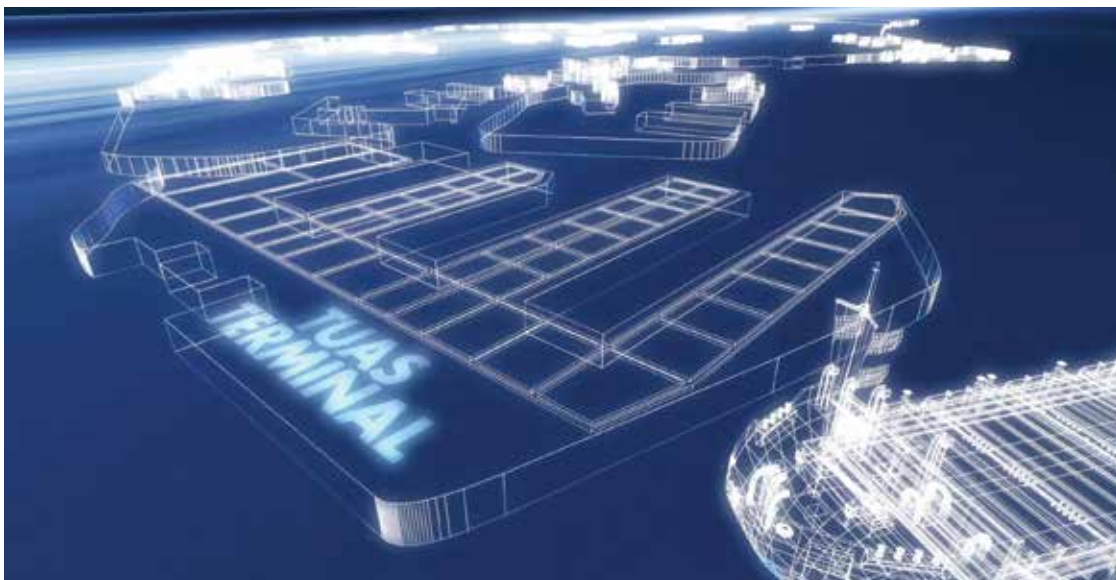
RECOMMENDATION 1.4 EXPAND THE SOURCES OF FINANCING AND ATTRACT NEW PLAYERS

Bank loans are expected to continue to play a central role in ship financing even with tightening global financial regulations and the emergence of non-traditional ship financing sources. To develop Singapore's ship financing landscape, we should continue to strengthen Singapore's traditional ship financing markets while supporting the growth of new specialist players and financing institutions such as private equity funds and leasing companies. On the capital markets front, MPA and MAS, along with stakeholders such as the Singapore Shipping Association (SSA) and Singapore Exchange (SGX), should continue to implement the recommendations of the Maritime Listings Taskforce⁶ to grow Singapore's maritime equity and debt capital markets.

RECOMMENDATION 1.5 STRENGTHEN SINGAPORE'S PORT AND DEVELOP OPPORTUNITIES RELATED TO THE PORT ECOSYSTEM

To propel the growth of the IMC, Singapore should continue to invest in the development of future port infrastructure based on the Next Generation Port (NGP) 2030 roadmap. This would help to attract and entrench more container shipping activities. Beyond capturing physical "flows", the NGP could catalyse the growth of new maritime technology players.

Furthermore, Singapore should leverage its position as a transshipment hub to encourage the development of improved systems for supply chain management. Concepts such as forward hubbing via Advance Transshipment Management, Advance Cargo Management for less-than-container loads, and intermodal logistics (i.e. sea-air or air-sea distribution models) could be explored with a view to serve as a "control tower" for seamless and efficient coordination of physical and non-physical flows across borders.



Under the NGP 2030 roadmap, the Tuas Terminal Development will be developed in four phases over a span of some 30 years, with Phase 1 scheduled to be completed by the early 2020s. Upon completion, the terminal will have a total capacity of up to 65 million TEUs.

⁶ The Maritime Listings Taskforce is an inter-agency taskforce formed to review Singapore's capital market for the shipping and offshore sectors and to recommend measures to enhance its attractiveness. The taskforce is led by MPA and supported by MAS, SSA, and SGX.

STRATEGY 2

STRENGTHEN INTER-LINKAGES AND NETWORK EFFECTS

Beyond expanding and deepening the maritime cluster, strengthening Singapore as a confluence for businesses, people, and ideas is important to achieve differentiation from other global maritime centres. We see such network effects occurring in three dimensions – within the IMC cluster, between the maritime industry and adjacent sectors, and between Singapore’s IMC and other international maritime clusters.

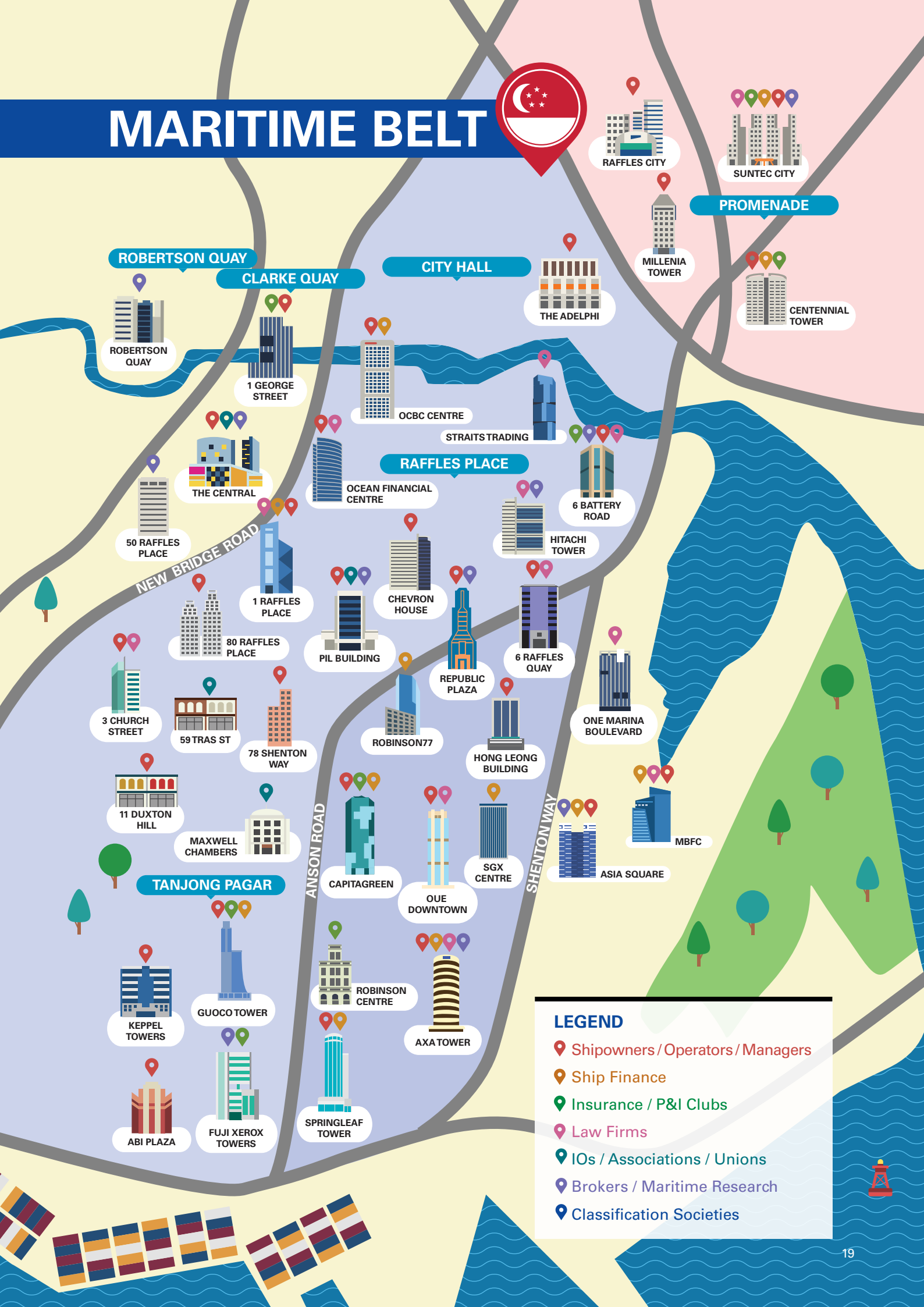
RECOMMENDATION 2.1

PROMOTE PHYSICAL CLUSTERS OF MARITIME-RELATED ACTIVITIES WITHIN SINGAPORE

Singapore’s IMC is today a tightly-integrated ecosystem with dynamic business linkages and synergies. These linkages have deepened into partnerships, for example, between shipping companies and port terminal operators (e.g. joint venture operations of terminals by COSCO-PSA Terminal and CMA CGM-PSA Lion Terminal). To strengthen inter-linkages within Singapore’s IMC cluster, Singapore should explore the feasibility of increased physical co-location of maritime companies. This could include exploring the formation of other clusters of maritime activities away from the Central Business District area or creating new physical maritime clusters such as that for maritime start-ups.



MARITIME BELT



ROBERTSON QUAY

CLARKE QUAY

CITY HALL

PROMENADE

ROBERTSON QUAY

1 GEORGE STREET

OCBC CENTRE

THE ADELPHI

MILLENNIA TOWER

CENTENNIAL TOWER

THE CENTRAL

STRAITS TRADING

RAFFLES PLACE

OCEAN FINANCIAL CENTRE

6 BATTERY ROAD

50 RAFFLES PLACE

HITACHI TOWER

NEW BRIDGE ROAD

1 RAFFLES PLACE

CHEVRON HOUSE

3 CHURCH STREET

59 TRAS ST

78 SHENTON WAY

PIL BUILDING

REPUBLIC PLAZA

6 RAFFLES QUAY

ONE MARINA BOULEVARD

11 DUXTON HILL

MAXWELL CHAMBERS

ROBINSON77

HONG LEONG BUILDING

TANJONG PAGAR

ANSON ROAD

CAPITAGREEN

QUE DOWNTOWN

SGX CENTRE

SHENTON WAY

ASIA SQUARE

KEPPEL TOWERS

GUOCO TOWER

ROBINSON CENTRE

AXA TOWER

ABI PLAZA

FUJI XEROX TOWERS

SPRINGLEAF TOWER

LEGEND

- 📍 Shipowners / Operators / Managers
- 📍 Ship Finance
- 📍 Insurance / P&I Clubs
- 📍 Law Firms
- 📍 IOs / Associations / Unions
- 📍 Brokers / Maritime Research
- 📍 Classification Societies

RECOMMENDATION 2.2 ENHANCE INTER-LINKAGES BETWEEN SINGAPORE'S MARITIME CLUSTER AND ADJACENT INDUSTRIES (E.G. LOGISTICS AND COMMODITY TRADING)

As traditional boundaries across trade-related industries continue to blur and overlap, it becomes increasingly important for Singapore's IMC to look at creating value from complementary industries. It is imperative for Singapore's maritime industry to strengthen its linkages with adjacent sectors such as logistics, commodity trading, and e-commerce through increased cross-sector promotion and development efforts such as organising joint events, industry forums, public-private dialogues, and trade missions.

Furthermore, Singapore should support and encourage collaboration among maritime and related communities to co-innovate in areas of common interests, for example in developing digital solutions to streamline cross-border cargo, financial, and information flows through the National Trade Platform⁷ (NTP).

The Singapore Government should ensure that the regulatory environment is conducive for cross-sector collaboration by being open to pilot trials and regulatory sandboxes to test-bed innovative solutions with high potential.

7 Announced in Budget 2016, the NTP is a trade and logistics IT ecosystem connecting businesses, community systems and platforms, and government systems. The NTP will be an open innovation platform, which businesses and service providers can tap on to develop new applications in support of evolving business needs.



RECOMMENDATION 2.3 STRENGTHEN INTER-LINKAGES WITH OTHER INTERNATIONAL MARITIME CLUSTERS

Beyond enhancing inter-linkages within the maritime cluster and across adjacent industries, Singapore should strengthen linkages and partnerships with other complementary maritime clusters. Possible focus areas could include business linkages between maritime economies, collaboration opportunities surrounding research and education, as well as joint development and implementation of new international standards. To this end, Singapore can deepen inter-cluster networks by establishing more cross-promotion platforms at other international flagship maritime events such as Nor-Shipping (Oslo), Posidonia (Athens), Danish Maritime Days (Copenhagen), and London International Shipping Week (London).

In addition, Singapore can encourage closer tie-ups between local education and research institutions with those in other leading maritime clusters, to collaborate on areas of common interest such as digitalisation, Big Data, and autonomous systems.

To complement its existing strength in physical trade connectivity, Singapore should strive to enhance digital connectivity (e.g. improving flow of information pertaining to international cargo movements through initiatives such as the ASEAN Single Window⁸) and institutional connectivity (e.g. customs green lane in major trade routes) with other key maritime centres and trade partners.

8 The ASEAN Single Window (ASW) is a regional initiative that connects and integrates the national single windows of individual ASEAN member states. The ASW's objective is to expedite cargo clearance and promote ASEAN economic integration by enabling the electronic exchange of cross-border documents among ASEAN member states. Upon its completion, the NTP will replace TradeNet as Singapore's national single window.



STRATEGY 3

DEVELOP A VIBRANT MARITIME INNOVATION ECOSYSTEM AND PROMOTE DIGITALISATION



The advent of technology is expected to magnify disruptive forces and rapidly shift competitive dynamics for the maritime industry. To enable the maritime industry to ride on the next wave of innovation-driven growth and move up the value chain, a concerted effort is needed to transform Singapore's maritime industry to encompass knowledge-based growth drivers, using business models that employ advanced technologies such as autonomous systems, robotics, data analytics, and artificial intelligence.

RECOMMENDATION 3.1

BUILD A STRONG MARITIME CLUSTER CENTRED ON STRONG ALIGNMENT OF INNOVATION AND R&D EFFORTS BETWEEN PUBLIC AND PRIVATE SECTORS

To develop a maritime ecosystem that is innovative and future-ready, Singapore must build on its existing R&D base and develop a vibrant maritime innovation cluster that is characterised by a diverse and tight-knit community of maritime enterprises (including start-ups and scale-ups), maritime technology solution providers, researchers, incubators, and venture capitalists, supported by an enabling environment. In particular, efforts centred on building up local capabilities in niche areas (e.g. vessel conversions, autonomous systems) should be encouraged and readily supported.

As a start and to better enable the development of innovative solutions for the industry, the Singapore Government can encourage greater sharing of data between the maritime industry and the research/technology community. It is also important that Singapore better aligns research efforts of both the public and private sectors with the needs of the industry.

At the industry level, the Singapore Government can help accelerate the development of maritime technological capabilities by leveraging strategic projects and joint research programmes with the industry (e.g. NGP 2030). Furthermore, Singapore could position itself as a global maritime "living lab" to pilot front-end concepts and serve as a launch pad for exportable products and solutions.

The Singapore Government should work together with various stakeholders to support the growth of maritime technology start-ups and scale-ups to strengthen the maritime innovation ecosystem. "PSA unboXed", PSA International's corporate venture arm, is a good example of a private sector driven initiative that pushes industry boundaries and can augment the public sector's innovation efforts.

SINGAPORE AS A GLOBAL MARITIME “LIVING LAB”

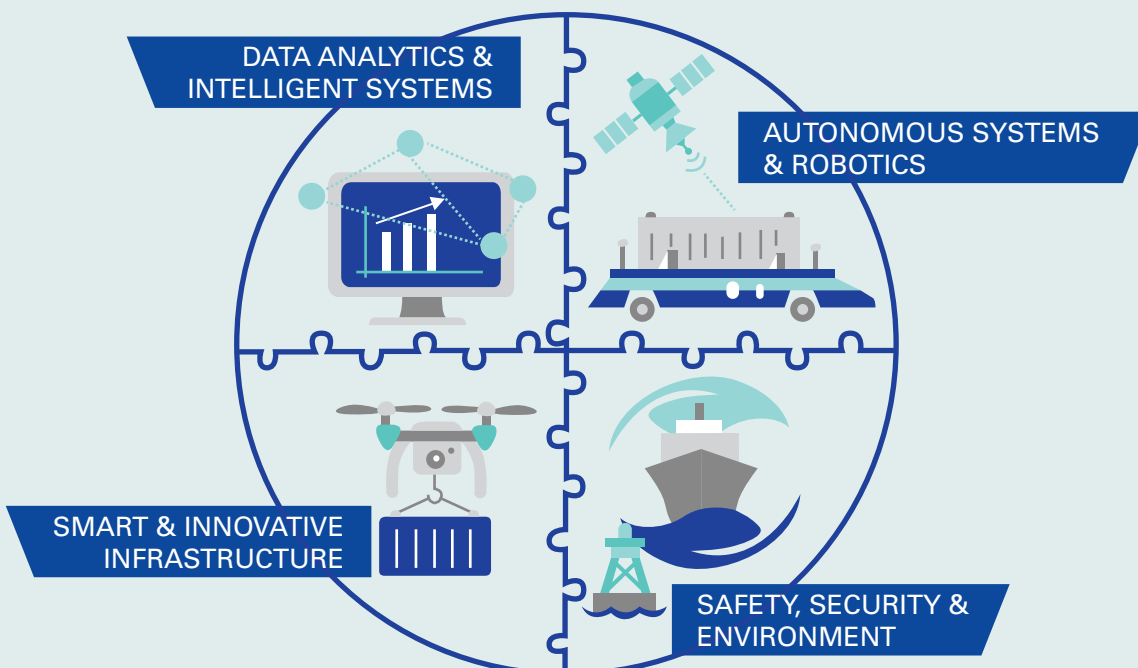
FEATURE
STORY

In June 2016, PSA, with the support of MPA and the Singapore Economic Development Board (EDB), committed close to S\$100 million to establish the “PSA Living Lab”, a living laboratory for the port and logistics industry. Comprising two operational berths at Pasir Panjang Terminal, the PSA Living Lab enables technology solution providers to collaborate with PSA to develop and test-bed ideas in a live port environment, which is amongst the world’s busiest container hubs. An example of a technology test-bedded at the PSA Living Lab is the Automated Guided Vehicle (AGV) system, which would be deployed for terminal operations at existing terminals, and eventually at Singapore’s future Tuas mega port.

Operating 24/7, PSA’s fleet of AGVs transports containers between the quay side and the container yard, completely without human drivers.



Similarly, in March 2017, MPA announced the plan for a “MPA Living Lab” to provide a platform, with sufficient scale and real operating conditions, that technology providers and industry players can plug into for the co-development and piloting of innovative solutions. The MPA Living Lab will focus on developing technological capabilities in the following four areas:



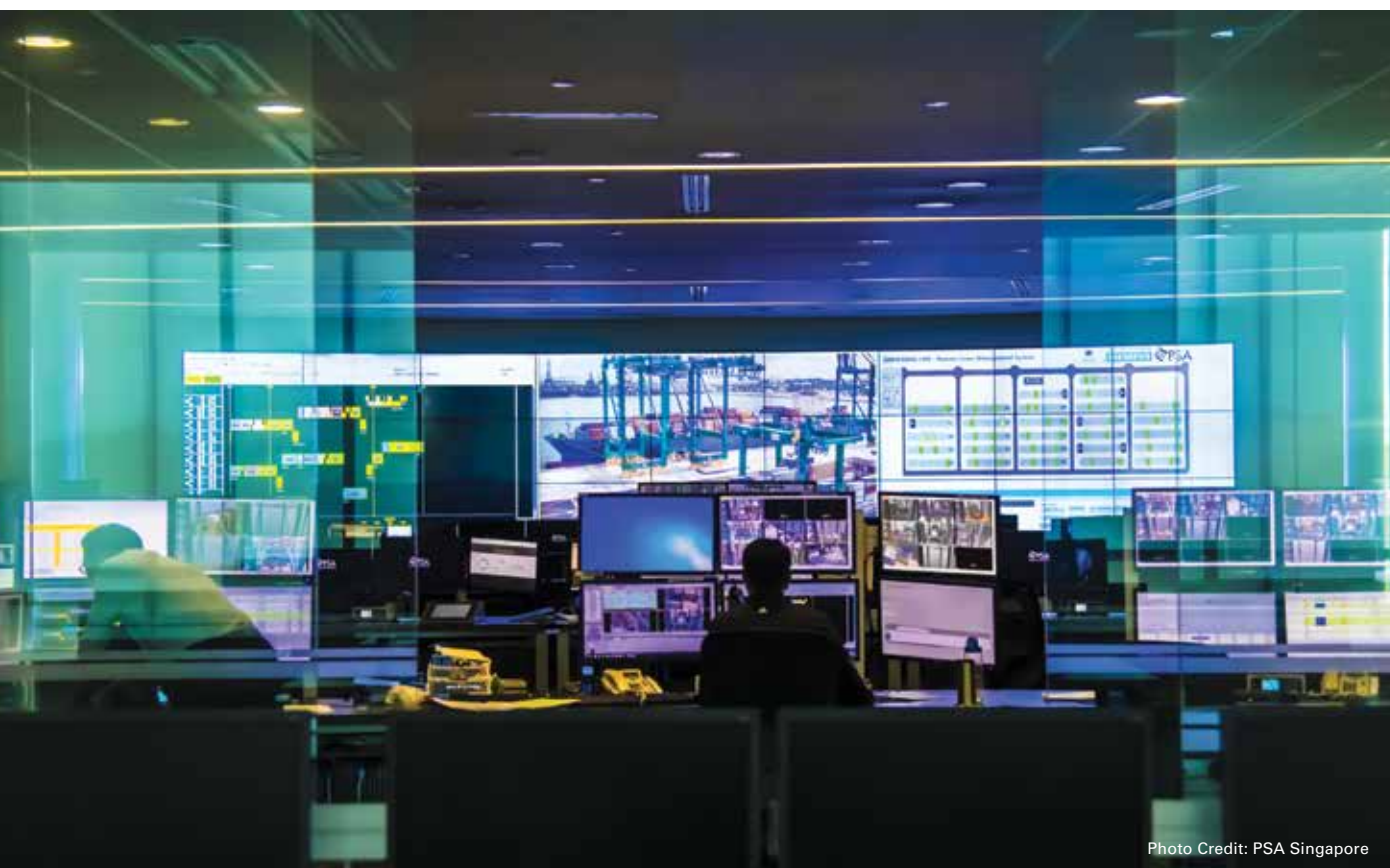


Photo Credit: PSA Singapore

RECOMMENDATION 3.2 PROMOTE DIGITALISATION OF THE MARITIME INDUSTRY LEVERAGING BIG DATA, INTERNET-OF-THINGS, AND INTELLIGENT SYSTEMS

The rate of digitalisation varies among subsectors and among companies in the maritime industry. The ship management sector, for example, has demonstrated how digital solutions such as data analytics, smart sensors, and the Internet-of-Things can be harnessed to enhance operational efficiency in areas such as predictive vessel maintenance, bunker fuel optimisation, and global fleet monitoring. However, despite the opportunities presented by digitalisation, digital investments by maritime companies have, thus far, remained relatively low⁹.

The Singapore Government should therefore work with the industry to drive greater digitalisation of the maritime industry to enable productivity-driven growth in the longer term. For instance, the Singapore Government could encourage higher participation in national-level initiatives such as the NTP and the Maritime Single Window (MSW)¹⁰ to enhance digital connectivity of the maritime community with the wider trade and logistics ecosystem. Singapore should identify specific segments of the value chain to encourage the development of industry-wide digital solutions such as e-documentation to reduce paper-intensive transactions. In this regard, the Singapore Government, along with partners such as SSA, can play a greater role to increase the awareness of the benefits of digitalisation. Industry grant schemes (e.g. MCF-Productivity) that can support industry players in their efforts to digitalise and improve business productivity can be better promoted.

⁹ Waypoint Digital 2017 Survey (Futureautics Maritime and Ericsson).

¹⁰ The national MSW is an inter-government agency effort led by MPA to develop an interconnected digital platform that facilitates single window port clearance declarations and the booking of port services as well as enables cross-border data exchange within the maritime community.

ACCELERATING PACE OF MARITIME DIGITAL TRANSFORMATION

Although the digital transformation of the maritime industry is still nascent, the pace of change is likely to accelerate in the years ahead with the emergence of a new breed of maritime-focused technology companies. Alpha Ori is one such example.

Headquartered in Singapore, Alpha Ori is a maritime technology company providing the global maritime industry with a suite of digital products that leverages the Internet-of-Things, artificial intelligence, and machine learning technologies to help maritime customers unlock business value, increase operational efficiency, and capture new growth opportunities.

In April 2017, the first ships in the world to be certified with Cyber (AL-SAFE) notation by Lloyd's Register were delivered to Global United with autonomous systems powered by Alpha Ori's SMARTShipTechnology. Looking ahead, Alpha Ori will be establishing a fleet network operating centre as a centralised location to visualise data drawn from cloud-enabled, connected ships – a stepping stone towards the ultimate goal of remote management and operation of ships.

Screenshots of Alpha Ori's SMARTShip systems, an Internet-of-Things platform that enables remote data collection, monitoring, control, and diagnostics of vessel performance.



STRATEGY 4

DEVELOP A MULTI-SKILLED MARITIME WORKFORCE WITH A GLOBAL MINDSET



A skilled workforce is essential to support maritime companies in delivering high quality services, and is a critical factor for sustaining Singapore's competitiveness. Maritime Singapore should ride on the momentum of the national SkillsFuture¹¹ initiative, as we fine-tune our existing education programmes and develop well-structured training courses to help individuals acquire new economy job skills and stay industry-relevant.

RECOMMENDATION 4.1

STRENGTHEN QUALITY OF MARITIME EDUCATION AND TRAINING

Today, our key Institutes of Higher Learning (IHLs) offer more than 20 maritime education programmes¹² across various qualification levels and disciplines. In addition, MPA works closely with commercial training service providers (TSPs) to support a wide range of continuous education and training courses, which maritime professionals can pursue for skills deepening and career development.

This partnership among MPA, industry stakeholders, and the IHLs/TSPs could be further strengthened to ensure that maritime curricula stays flexible and up-to-date. For example, regular reviews to incorporate industry-relevant content and industry exposure components (e.g. student exchange programmes, overseas internships, work-study arrangements) could be undertaken to better equip our future workforce with relevant skills and a global mindset.

To ensure quality delivery of maritime programmes, there must be quality teaching faculty and programme administrators in key IHLs. The appointment of leading chairs and lecturers who are closely in touch with the industry is important, as these individuals will help attract and inspire students, as well as ensure that tertiary and executive education programmes are of the highest quality.

¹¹ Launched in October 2014, SkillsFuture is a national movement to provide Singaporeans with the opportunities to develop their fullest potential throughout life, regardless of their starting points. SkillsFuture aims to promote a culture of lifelong learning and continuous skills deepening. More information could be found on www.skillsfuture.sg.

¹² Examples include Nanyang Technological University's Bachelor of Science in Maritime Studies, Singapore Management University's Maritime Economics Track and Singapore Polytechnic's Diplomas in Maritime Business, Nautical Studies and Marine Engineering.



Photo Credit: Singapore Maritime Academy, Singapore Polytechnic

RECOMMENDATION 4.2 FURTHER ENHANCE STANDARDS OF PROFESSIONALISM OF THE MARITIME INDUSTRY

Beyond enhancing our education and training landscape, professionalising the industry can help boost aspirations and career mobility of our maritime workforce. This may be achieved through the development and promotion of certification and accreditation for selected maritime professions. The Professional Qualifying Exams (PQE) administered by the Institute of Chartered Shipbrokers (ICS) is a good example of an industry-recognised professional certification. PQE-qualified maritime professionals are eligible for induction to ICS chartered membership status, which is well-respected within industry circles as a distinguished level of professional achievement.

To this end, MPA could provide co-funding assistance and play a facilitative role in fostering closer partnerships between employers and relevant industry professional bodies (e.g. ICS and Institute of Marine Engineering, Science and Technology) to develop such certification/ accreditation frameworks.

RECOMMENDATION 4.3 RAISE PROFILE OF THE MARITIME INDUSTRY TO ATTRACT TALENT

Emphasis on the diverse and exciting career opportunities within the maritime sector should be an integral part of Singapore's profiling efforts to enhance perceptions of the maritime industry and elevate the attractiveness of maritime careers. As part of career outreach and marketing efforts, MPA and its outreach partners (e.g. SMF, SSA, and the Association of Singapore Marine Industries, through the MaritimeONE initiative) should feature the ongoing industry transformations, global-connectedness, competitive remuneration, and structured career progression pathways, as key value propositions of the maritime industry.

In addition, Singapore should build up a closely-knit community of maritime leaders as part of developing the future generation of industry leadership. The leadership community could help to raise the overall prominence of the maritime industry and encourage knowledge-sharing, foster closer networks, and empower industry initiatives.

RECENT MARITIME MANPOWER DEVELOPMENT INITIATIVES

SINGAPORE MARITIME CLUSTER MANPOWER DEMAND AND SUPPLY STUDY 2016/2017

MPA commissioned the Singapore Maritime Cluster Manpower Demand and Supply Study in 2016 as part of its efforts to better understand the drivers of maritime manpower growth and develop policies to address future manpower challenges. Drawing on industry surveys and interviews with more than 150 industry stakeholders, the study identified a list of core skills that would be important for the maritime industry in the future. They include:

- ▶ **Digital literacy & data analytics**, as the maritime industry will become more digitalised in the years ahead;
- ▶ **Environmental engineering and green technologies**, as environmental sustainability efforts continue to gain momentum in the maritime space; and
- ▶ **Soft skills** (e.g. negotiation, communication, and resource management), as Singapore aims to move towards higher-value business services that cannot be easily automated.



While it is important that IHLs continue to develop these skills among students, employers have to accept that a large part of these skill sets can only be developed on the job. In 2017, MPA enhanced the MCF-Manpower Development programme to support maritime workers in acquiring these competencies through skills-upgrading and training courses.



Maritime Singapore offers a variety of rewarding and enriching career pathways – both seafaring and shore-based.

L: Ms Tan Hui Xian, 4th Engineer, Pacific International Lines (Pte) Ltd

R (Top): Mr Zhang Fan, Marine Surveyor (Class), DNV GL

R (Bottom): Ms Eunice Lim, Assistant Operations Manager, "K" Line Pte Ltd

Photo Credits: SkillsFuture Singapore

SKILLS FRAMEWORK FOR SEA TRANSPORT

Jointly developed by SkillsFuture Singapore (SSG), Workforce Singapore (WSG), and MPA with employers, industry associations, education, and training providers and unions, the Skills Framework for the Sea Transport sector was launched in April 2017 to provide information on:

1. Sector and employment opportunities
2. Career pathways
3. Occupations and job roles
4. Existing and emerging skills
5. Training programmes for skills upgrading and mastery

As maritime jobs evolve, skills requirements for both seafaring and shore-based maritime workers will change. New job roles such as data analytics specialists will be created, while existing job roles would need to be redesigned through integration of technology to remain relevant. Going forward, the Skills Framework will be expanded to cover more subsector-specific job roles and updated periodically to reflect the latest changes in the maritime sector.

Adapted from the Skills Framework for Sea Transport, the below infographic highlights some of the desired attributes and skills in demand by Singapore's maritime industry.

DESIRED ATTRIBUTES



Decisive – Takes appropriate action after studying potential outcomes in unique scenarios



Meticulous – Pays attention to fine details and accuracy



Analytical – Enjoys analysing things from all angles and thinking of ways to solve problems

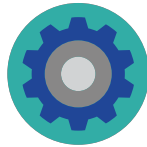


Resilient – Highly adaptive to handle transformative changes



Team player – Understands that each person is part of a larger team working together to bring about success

SKILLS IN DEMAND



Automation Skills – Acquire systems engineering skills to play a part in new port technologies and automation efforts



Data Analytics and Cyber Security Skills – Generate business insights and upkeep cyber security of the fleet and automated systems



Green Shipping Skills – Keep abreast of new developments in green shipping



Transdisciplinary Skills – Make connections across disciplines to solve complex problems



Leadership and Management Skills – Acquire leadership and management skills to grow Singapore as an International Maritime Centre

STRATEGY 5

ESTABLISH SINGAPORE AS A GLOBAL MARITIME STANDARD BEARER

Singapore should leverage its reputation for strong governance, credible institutions, and ability to facilitate international collaboration across stakeholders and interest groups and to build itself as a thought leader and a standard bearer in key maritime domains. Such a flag-bearing role could include defining gaps, developing new capabilities, and facilitating platforms to shape new global standards.

RECOMMENDATION 5.1

POSITION SINGAPORE AS A LEADER IN EXISTING AND NEW AREAS OF EXCELLENCE SUCH AS PORT MANAGEMENT, RISK MANAGEMENT, AND SAFETY, SECURITY AND SUSTAINABILITY

It is recommended for Singapore to study the potential for standards development in the following areas:

- ▶ **Excellence in Port Management**
Continue to help shape global port management best practices and aim to set new benchmarks of excellence regionally and internationally.
- ▶ **Risk Management Hub**
Leverage the Baltic Exchange platform, as well as the strong pool of leading shipbrokers and banks in Singapore, to build up Singapore's freight derivatives market and strengthen the role Singapore plays in risk management. MPA and SGX, together with relevant stakeholders such as MAS, the Baltic Exchange, and SSA, could form a working group to develop these opportunities further.
- ▶ **Safety, Security and Environmental Sustainability**
Build on Singapore's extensive experience and capabilities in maritime safety, security and environmental sustainability, to champion thought leadership and shape new global standards in these areas.

RECOMMENDATION 5.2

PROMOTE A REGULATORY ENVIRONMENT THAT SUPPORTS NEW INNOVATION AND STANDARDS

In pursuing new frontiers in global standards and excellence, the Singapore Government can play an enabling role to establish a supporting ecosystem that facilitates forward-thinking ideas and collaborative efforts. Flexibility should be exercised in the formulation, review, and updating of regulations to maintain Singapore's pro-business environment. This would facilitate the growth of new and existing maritime players while supporting the adoption of new industry benchmarks. In addition, joint efforts between MPA and like-minded partners such as SPRING Singapore/Enterprise Singapore should be encouraged to support innovative pursuits in emerging areas of interest, such as that relating to data management and security as well as applications of new technologies.

ENHANCING OPERATIONAL EFFICIENCY IN THE NEXT GENERATION PORT

NEXT-GENERATION VESSEL TRAFFIC MANAGEMENT SYSTEM (VTMS)

MPA is developing the next-generation VTMS to further enhance navigational safety, protect the marine environment, and enable just-in-time arrivals in the port. This will help to transform Singapore's port services into digital operations and enable the seamless exchange of information across Singapore's maritime ecosystem.

The next-generation VTMS will leverage initiatives such as International Maritime Organization (IMO) e-Navigation where information exchange between ship and shore will be in electronic form and automated. Smart algorithms will predict traffic hotspots and anticipate potential collisions. An array of sensors and decision-support tools will provide ship masters with comprehensive real-time traffic situation and assist the master in planning an optimal route to avoid congestion. With the advent of

smart shipping, the next-generation VTMS will also be capable of handling unmanned vessels, where both sides communicate autonomously through digital systems.

MARITIME SINGLE WINDOW (MSW)

The MSW is an inter-government agency effort led by MPA to develop an interconnected digital platform that facilitates single window port clearance declarations and the booking of port services as well as enables cross-border data exchange within the maritime community.

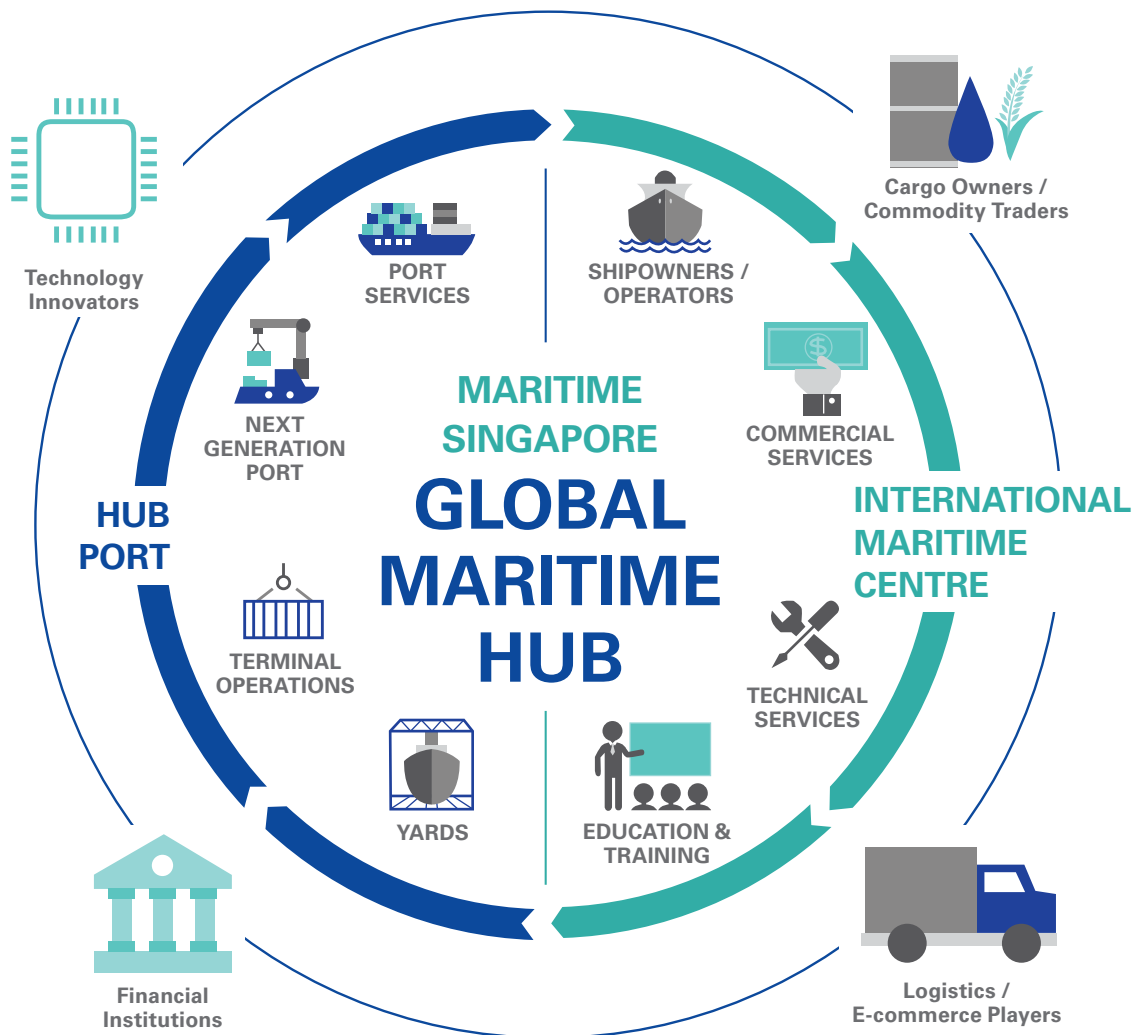
The MSW will simplify and automate port, immigration, and port health clearance procedures to improve transparency and efficiency. The portal will serve as a community platform to experiment new port digitalisation services in the future and forms part of the NGP systems to support the implementation of Just-in-Time arrival and IMO e-Navigation.

Visual impressions of the next-generation VTMS, which would allow Singapore to handle higher vessel traffic volumes within the Straits of Malacca and Singapore with increased safety, security, and efficiency.



CONCLUSION

The strategies outlined in this report represent a first step towards Maritime Singapore's next phase of development. More importantly, the effective implementation of these plans to translate ideas into actions will be critical. Building on its global hub port and leading IMC, Singapore is in a strong position to forge a new path ahead. We are confident that Maritime Singapore will continue to scale new heights and stay ahead as a world-leading maritime hub.



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MARITIME FINANCE ROUNDTABLE

Mr Clive Kerner

*Chief Executive Officer,
Clifford Capital Pte Ltd*

Mr Christos Tsakonas

*Regional Head of Asia
Corporate Banking
Department, Shipping,
Offshore & Logistics,
DNB Asia ASA*

Mr Lee Keng Mun

*Head of Shipping Asia,
HSH Nordbank*

Mr Cao Yun Chuan

*Deputy General Manager,
ICBC Bank*

Mr Kwek Chih Keong

*Senior Vice President,
Head of Shipping, Offshore &
Oil Services - Asia,
Nordea Bank*

Ms Angeline Teo

*Business Head,
Transportation,
Overseas-Chinese Banking
Corporation Limited*

COMMODITY TRADING ROUNDTABLE

Mr Andrew Barker

*Asia Pacific Lead,
Cargill Ocean Transportation*

Mr Michael Nagler

*General Manager, Global
Chartering,
Noble Resources*

Mr Peter Mannion

*General Manager, Fleet
Operations,
Rio Tinto Marine*

Mr Nick Potter

*General Manager,
Asia Pacific & Middle East,
Shell Shipping & Maritime*

Mr Anders Mogensen

*Director,
ST Shipping and Transport
Pte Ltd*

LOGISTICS ROUNDTABLE

Mr Kay Kong Swan

*Chief Executive Officer,
Integrated Logistics,
CWT Limited*

Mr Desmond Gay

*Chief Executive Officer,
Keppel Logistics*

Mr Sam Ang

*Chief Executive Officer,
Quantum Solutions,
SingPost*

Mr Robert (RMC) Yap

*Deputy Chairman &
Executive Director, Y3
Technologies,
YCH Group*

Mr Ng Kim Hung

*Managing Director,
Yusen Logistics Singapore*

PRIVATE SECTOR AND INDUSTRY ORGANISATIONS

Singapore Exchange Limited

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GOVERNMENT AGENCIES

Maritime and Port Authority of Singapore *(Secretariat)*

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Singapore Economic Development Board

SkillsFuture Singapore

SPRING Singapore


Workforce Singapore

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CONTACT US

 460 Alexandra Road, PSA Building #19-00
Singapore 119963

 <http://www.mpa.gov.sg>

 imc@mpa.gov.sg