MPA
SINGAPORE

Sustainability Report 2023

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ABOUT THIS REPORT

The Maritime and Port Authority of Singapore (MPA) started sustainability reporting in 2014. This edition of MPA's Sustainability Report uses the updated Global Reporting Initiative (GRI) 2021 standards and offers an updated picture of our position on environmental sustainability, and how we manage material sustainability issues in carrying out our mission to develop Singapore as a global hub port and international maritime centre.

Our report sets out MPA's policies and practices to monitor the risks and opportunities arising from material topics that are significant for us and our stakeholders. It details MPA's efforts to enhance environmental sustainability in the maritime industry by: (1) forging consensus and collaboration and setting standards at the international level; (2) enhancing innovation and transformation, and growing opportunities as we embark on efforts to reduce emissions domestically; and (3) enabling positive change and managing resources effectively as a public sector organisation.

MPA's efforts are in support of the United Nations Framework Convention on Climate Change (UNFCCC), the 2023 International Maritime Organization (IMO) Strategy on Reduction of Greenhouse Gas (GHG) Emissions from Ships, and Singapore's Nationally Determined Contribution (NDC). There are also disclosures, such as environmental targets and measurements.

ABOUT THIS REPORT

Reporting Standards

This report is guided by the GreenGov.SG requirements and prepared with reference to the GRI 2021 standards. It incorporates relevant disclosures aligned to key global standards, frameworks, and guiding principles from the IMO in alignment with the United Nations Sustainable Development Goals (UN SDGs). The report also considers certain metrics and issues relevant to the maritime industry as discussed in the World Port Sustainability Programme (WPSP).

Reporting Scope and Period

This report covers MPA's sustainability approach, organisational activities, achievements and performance in key environmental, social and governance topics in FY2023 (1 January 2023 to 31 December 2023) across MPA's key premises and assets.

For MPA's organisational performance, we recommend that this report be read together with **MPA's Annual Report 2023.**

MPA calculates and scopes its emissions in accordance with the Operational Control approach defined in the GHG Protocol Corporate Accounting and Reporting Standard, which is the world's most widely used GHG accounting standard. As this report is guided by the metrics and asset considerations provided by GreenGov.SG, there are some differences in measurements from the previous reporting period[1]. There may also be differences from the previous reporting period's sustainability disclosures as we have incorporated other reporting standards, including the updated GRI Standards.

External assurance has not been sought for this report. However, we have conducted an internal review focused on relevance and reliability of the information.

Questions or feedback on the report can be emailed to **Sustainability@mpa.gov.sg.**

GreenGov.SG

GreenGov.SG is a sustainability movement in the public sector that supports Singapore's national sustainability agenda as set out in the Singapore Green Plan 2030. Statutory Boards are required to make their annual environmental sustainability disclosures starting from FY2023.

Global Reporting Initiative (GRI) Universal Standards 2021

GRI is the independent international organisation that helps entities understand and report on their impact on the economy, environment and people. The GRI Standards are the world's most widely-used standards for sustainability reporting.

International Maritime Organization (IMO) and United Nations Sustainable Development Goals (UN SDGs)

IMO is the UN specialised agency responsible for regulating international shipping, including issues of safety and security, and the prevention of marine and atmospheric pollution by ships. The IMO's work supports the UN SDGs.

Singapore is one of the 176 member States of the IMO.

World Ports Sustainability Program (WPSP)

The WPSP is managed by the International Association of Ports and Harbors (IAPH). It promotes best practices of ports worldwide which apply the 17 UN SDGs and integrate them into their organisational practices across six areas: Digitalisation, Infrastructure, Health Safety and Security, Environmental Care, Community Building, and Climate and Energy. MPA's disclosures of its internal measures and collaborations to navigate geopolitical risks and counter terrorism threats are informed by issues highlighted by the WPSP.

1 The disclosure in this report is more comprehensive as we have included all key premises and assets in the measurement of CHG emissions, electricity and water consumption and waste.

BOARD AND SENIOR MANAGEMENT STATEMENT 2023

The decarbonisation of the global maritime industry, which accounts for about 3 per cent of global GHG emissions, has been gaining momentum. In 2023, the IMO revised its Strategy on Reduction of GHG Emissions from Ships, with a commitment to achieve net-zero emissions by or around, i.e. close to 2050. Maritime leaders have also been developing zero-emission technologies and advocating regulatory frameworks.

Extreme weather pattern changes and the rise in sea levels are both accelerating. As a low-lying coastal state, Singapore's well-being will be adversely affected if global GHG emissions continue unabated. To preserve the environment for future generations and protect lives and livelihoods today, we must take urgent action against climate change.

Singapore also faces unique challenges as we have few options for renewables to meet all our energy demand. The drive for sustainability will create new opportunities which Singapore is well poised to capture. The Government has pledged that Singapore will achieve net-zero emissions by 2050, with the public sector taking the lead to attain the target earlier.

As the custodian of our global hub port and international maritime centre, MPA plays a key role in maritime decarbonisation at three levels. First, at the international-level, MPA will continue to work with IMO members States to shape global measures to achieve net-zero emissions by or around 2050. Our MPA officer, Mr Tan Hanqiang, is currently serving as the Vice-Chair of the Marine Environment Protection Committee at IMO. MPA is also working with governments and port authorities to unify efforts across stakeholders in the value chain. One such effort is the establishment of Green and Digital Shipping Corridors (GDSCs) with like-minded international partners. The GDSCs aim to support the transition to low-carbon and zero-carbon fuels by facilitating the supply and adoption of these fuels, the building of necessary infrastructure and regulations for bunkering, and the use of digital solutions to support sustainability.

Second, for Maritime Singapore, MPA is doing more work with our industry and academia partners to trial and pilot low-carbon and zero-carbon fuels. We are developing fuel and bunkering standards, and building the supply chain and infrastructure for bunkering such fuels. MPA is also leading the work to electrify the local harbour craft sector. This includes research which can contribute to the development of a new generation of greener harbour craft, and the setting up of charging points for electric harbour craft. MPA is driving efforts with industry and our unions to equip the Maritime Singapore workforce with skills for the green transition.

Finally, as an organisation, MPA is committed to the public sector's target to achieve net-zero emissions by 2045 under the GreenGov.SG initiative. MPA is optimising the deployment of our operational assets and exploring the use of biofuels and renewables to reduce emissions from our operations. MPA will also develop the use of renewables. MPA's new buildings will be designed to minimise lifecycle emissions, by consuming less energy and generating renewable energy.

To ramp up the efforts at all three levels, MPA set up a new Maritime Decarbonisation Division to drive the various workstreams in conjunction with the rest of the organisation.

Building a strong sustainability culture within the organisation continues to be a priority for MPA. We are working on deepening eco mindsets and habits in our staff with training, communications and events. We are also encouraging a spirit of giving back to the community. MPA has formed a workgroup to monitor our environmental, social and corporate indicators. We will also work with our partners to co-create solutions.

CHIEF EXECUTIVE'S MESSAGE

In 2023, there were unprecedented climate events as global temperatures reached record highs. The Third National Climate Change Study by the Centre for Climate Research in Singapore projected more extreme weather patterns and rising sea levels in our region. Such developments have a real impact on our lives and livelihoods, as well as the wider economy and the maritime trade.

Singapore had recognised this urgency and announced enhanced climate targets in 2022, a key one being to achieve net-zero emissions by 2050 through the Long-Term Low-Emissions Development Strategy (LEDS). We also launched the Singapore Green Plan 2030, which is an action plan to ensure that all sectors in the nation will have a greener future. The public sector has taken the lead and set a target to achieve net-zero emissions by around 2045. By showing the way, the public sector hopes to encourage companies across all industries to build their environmental capabilities.

This report details the sustainability efforts of the Maritime and Port Authority of Singapore (MPA) and tracks the progress in our journey to attain the Government's 2030 targets for emissions, energy, water, and waste. As the sector lead in maritime and port, we are committed to playing our part in this national effort, and to work on forging global consensus and coordination at international fora such as the International Maritime Organization (IMO). We are also reviewing measures to reduce business costs, and to support maritime companies in enhancing their sustainability capabilities and raising their competitiveness.

MPA's Environmental Performance

MPA has aligned our targets with Singapore's Whole-Of-Government GreenGov.SG targets. We are reviewing the deployment and utilisation rate of our fleet of vessels to ensure that we remain operationally efficient. We have also been working on efficiency by design and adopting energy efficiency measures, which are integral to reducing emissions. The measures include designing and constructing net-zero and Super Low Energy buildings in the coming years, adopting energy-saving measures in our buildings, and increasing the proportion of renewable energy in our mix. We are working to reduce water and waste consumption at our public facilities. This includes exploring water-efficient technologies, stepping up public education campaigns to encourage responsible water conservation practices, and putting more recycling bins at our public facilities.

Maritime Singapore and International Decarbonisation

As the sectoral lead, MPA is working with our tripartite partners – the industry and unions – to transform and decarbonise the domestic maritime sector. Our port operators have set targets to reach net-zero by 2050, in line with the national target. We are also promoting the early adoption of electric harbour craft (eHC). From 2030, all new harbour craft have to be fully electric, be capable of using B100 biofuel or be compatible with net-zero fuels. Plans are underway to support this effort through financing and insurance options. This will allow the stock of vessels to be progressively enhanced, and help to attract more professionals to the maritime sector. MPA is also working with relevant stakeholders to actively study the decarbonisation pathways for tugs, bunker tankers and pleasure craft.

"We are committed to achieving our sustainability targets and advancing decarbonisation in international shipping as well as to upskilling our maritime workforce, and we will continue to work closely with our domestic partners and the international shipping community on these efforts."

- Mr. Teo Eng Dih

CHIEF EXECUTIVE'S MESSAGE (CONT.)

MPA is preparing Singapore, the world's largest bunkering hub, for a multi-fuel bunkering future. Biofuels and liquefied natural gas made up 1.2 percent of bunker fuels sold in 2023. For biofuel, MPA is working with industry experts and researchers to develop the world's first provisional standards for marine biofuel blends up to B50, and conducting trials for blends up to B100. We facilitated the world's first ship-to-containership methanol bunkering operations in July 2023 and are developing the Technical Reference for methanol bunkering. We are also making preparations for ammonia bunkering.

The decarbonisation of international shipping must be a global effort. MPA is Singapore's national representative in the IMO, and MPA officers serve in leadership positions in IMO workgroups. We will continue to work with IMO member States to shape global measures for international shipping to achieve net-zero emissions by or around 2050.

Besides contributing to multilateral efforts at IMO and beyond, MPA also develops bilateral partnerships with governments and port authorities. We have established Green and Digital Shipping Corridors (GDSCs) with Australia, Japan, the Port of Los Angeles/Long Beach, the Port of Rotterdam, and Tianjin. These partnerships help us expand our network to develop and trial new technologies and fuels, and pilot green and digital solutions before scaling them up for wider adoption to decarbonise the maritime industry.

Looking Ahead

Climate change and geopolitical challenges will have an impact on global supply chains. MPA monitors key risks in our operating environment, such as reconfigurations in supply chains, restrictions on maritime routes, terrorism and cyber-attacks on key maritime infrastructure, and public health emergencies.

We will maintain a proactive approach in risk management, including engaging with key partners and relevant international, regional, and domestic organisations. To ensure that our port and maritime operations remain resilient, we will conduct regular multi-agency exercises, both physical and table-top, to test and strengthen our response capabilities. We will also continue to prioritise the development of a capable maritime workforce with sustainability expertise.

While the effects of global supply chain disruptions and climate change present uncertainties, they also present opportunities for Singapore to play a catalytic role in the energy, carbon and economic transition of Maritime Singapore and international shipping. We are committed to achieving our sustainability targets and advancing decarbonisation in international shipping as well as to upskilling our maritime workforce, and we will continue to work closely with our domestic partners and the international shipping community on these efforts.

MPA will keep up our efforts to reinforce Singapore's status as a leading global hub and international maritime centre, as we continue our journey of transformation to a more sustainable Maritime Singapore.

Mr. Teo Eng Dih
Chief Executive
Maritime and Port Authority
of Singapore

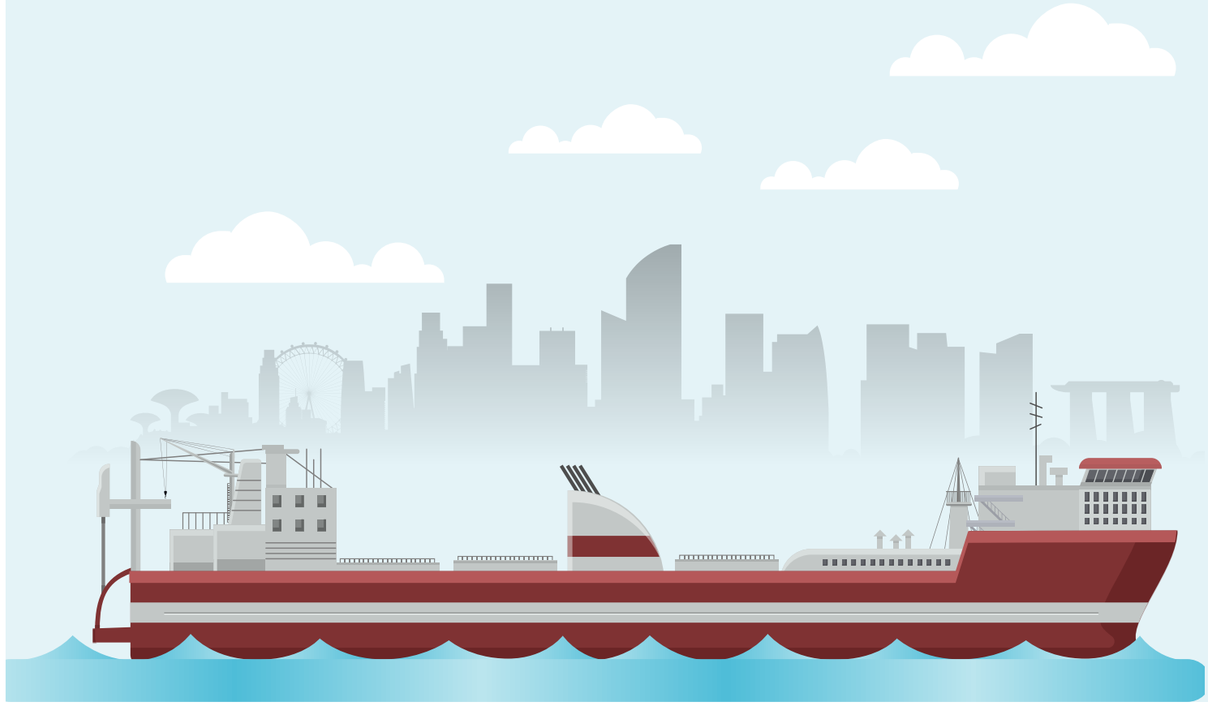
ABOUT MPA AND MARITIME SINGAPORE

MPA was set up on 2 February 1996 to develop Singapore as a premier global hub port and international maritime centre, and to safeguard and advance its strategic maritime interests. Besides being Singapore's port authority, maritime and port regulator and planner, MPA is also Singapore's international maritime centre champion, national maritime representative, and a champion of digitalisation and decarbonisation efforts at regional and international fora such as the International Maritime Organization.

To fulfil its responsibilities for the development and growth of the maritime domain and Port of Singapore, MPA partners industry, the research community and other agencies. The collaborations include work on enhancing safety, security and environmental protection in our waters, facilitating maritime and port operations and growth, expanding the cluster of maritime ancillary services, developing maritime digitalisation and decarbonisation policies and plans, and developing manpower.

In 2023, Singapore's annual vessel arrival tonnage exceeded 3 billion Gross Tonnage. Singapore remains the world's busiest transshipment hub with a total container throughput of 39.01 million 20-foot equivalent units (TEUs).

For more information, please visit
www.mpa.gov.sg



SUSTAINABILITY HIGHLIGHTS

Green and Digital Initiatives

Introduced electronic bunker delivery notes (e-BDNs), saving the bunkering industry up to

40,000

man-days a year

Launched 5 Green and Digital Shipping Corridors

Started preparations for world's first sea trial of ammonia-fuelled vessel

Conducted world's first ship-to-containership methanol bunkering operation

Launched three Expression of Interest (EOI) calls for design development, charging infrastructure, and financing and insurance for electric harbour craft

GreenGov.SG

11,731

tonnes CO_2 equivalent of gross emissions emitted

Energy Utilisation Index =

110

kWh/m²

Water Efficiency Index =

64

L/person/day

Waste Disposal Index =

0.526

kg/person/day

Social

Average

110

training hours per employee

23

people appointed to Environment, Health and Safety (EHS) committee

6

people appointed as Wellness Ambassadors

Governance

0

incidents of fraud or corruption

100%

of employees have completed basic cybersecurity training

Women in leadership –

25%

female representation in Board and senior management team

MEMBERS OF THE AUTHORITY
(AS AT 31 DECEMBER 2023)

Mr. Niam Chiang Meng
Chairman
Maritime and Port Authority
of Singapore

Mr. Teo Eng Dih
Chief Executive
Maritime and Port Authority
of Singapore

Mr. Abu Bakar Bin Mohd Nor
Group Chairman,
M Kapital Holdings Pte Ltd

Mr. Chan Cheow Hoe
Government Chief Digital
Technology Officer,
Smart Nation & Digital
Government Office

Dr. Vincent Lien
Managing Director,
Lien Properties Pte Ltd

Ms. Mary Liew
General Secretary,
Singapore Maritime Officers' Union

Mr. Jermaine Loy
Principal Private
Secretary to Prime Minister,
Prime Minister's Office

Mr. Chris Ong Leng Yeow
Chief Executive Officer,
Seatrium Ltd,
Seatrium Offshore & Marine Ltd

Mr. Esben Poulsson
Executive Chairman,
Enesel Pte Ltd

Mr. Sng Seow Wah
Corporate Advisor,
Temasek International

A/Prof. Simon Tay
Associate Professor, Faculty of Law,
National University of Singapore;
Chairman, Singapore Institute of
International Affairs

Mr. Teo Choo Wee
Director,
PIL Holdings Pte Ltd

RADM Sean Wat
Chief of Navy,
Republic of Singapore Navy

Ms. Caroline Yang
President,
Singapore Shipping Association

Mr. Yee Ping Yi
Deputy Secretary,
Strategy, Sustainability &
Technology, Ministry of Transport

Ms. Patricia Yim
Member of the Authority

SENIOR MANAGEMENT
(AS AT 31 DECEMBER 2023)

Mr. Teo Eng Dih
Chief Executive

Mr. Tan Hoe Soon
Assistant Chief Executive
(Corporate & Strategy)
Chief Risk Officer

Ms. Cindy Sim
Senior Director, Finance,
Procurement & Admin

Ms. Chua Chen Yun
Director,
Internal Audit

Mr. Koh Chin Yong
Chief Information Officer /
Director Information Technology

Mr. Vince Tan
Director, Operations
Transformation & Planning

Mr. David Foo
Assistant Chief Executive
(Operations Technology)

Ms. Tan Beng Tee
Senior Advisor

Ms. Tan Woei Tyng
Senior Director,
International Maritime Centre

Ms. Caroline Goh
Director, Business
Capability Development

Mr. Jason Leong
General Counsel

Mr. Thai Low Ying-Huang
Chief Hydrographer

Mr. Kenneth Lim
Assistant Chief Executive
(Industry & Transformation)
Quality Service Manager

Ms. Angela Png
Senior Legal Advisor &
Corporate Secretary

Er. Tham Wai Wah
Senior Director, Engineering & Project
Management Chief Engineer /
Chief Sustainability Officer

Mr. George Goh
Director,
Communications & Community

Mr. Ng Yi Han
Director, Innovation, Technology
& Talent Development /
Chief Transformation Officer

Mr. Benjamin Wong
Director,
Strategy & Policy

Capt. M Segar
Assistant Chief Executive
(Operations)

Capt. Daknashamoorthy Ganasen
Senior Director,
Operations & Marine Services

Mr. Cheah Aun Aun
Director, Shipping /
Director, Marine

Mr. Dennis Khoo
Director,
Maritime Systems & Technology

Mr. Tan Suan Jow
Dean of MPA Academy

Ms. Yeo Suat Lay
Director,
Human Resource

RISKS AND OPPORTUNITIES

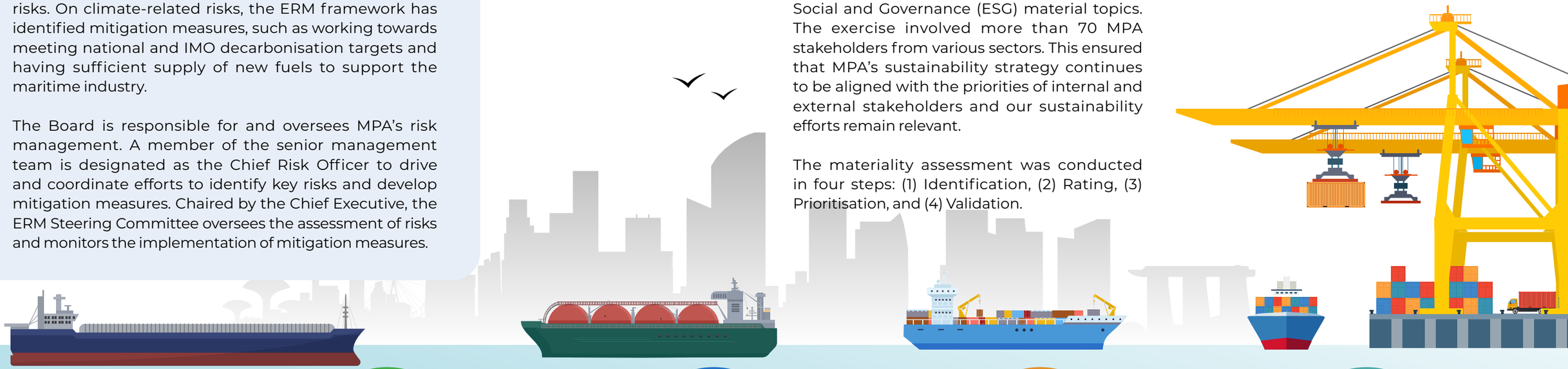
MPA uses our Enterprise Risk Management (ERM) framework to identify, monitor and assess risks that may derail us from our mission. The ERM also sets out mitigation measures to reduce the likelihood and/or impact of the risks. On climate-related risks, the ERM framework has identified mitigation measures, such as working towards meeting national and IMO decarbonisation targets and having sufficient supply of new fuels to support the maritime industry.

The Board is responsible for and oversees MPA's risk management. A member of the senior management team is designated as the Chief Risk Officer to drive and coordinate efforts to identify key risks and develop mitigation measures. Chaired by the Chief Executive, the ERM Steering Committee oversees the assessment of risks and monitors the implementation of mitigation measures.

STAKEHOLDER ENGAGEMENT AND MATERIAL TOPICS

Between June and September 2023, MPA worked with an external consultant to conduct materiality assessment of the Environment, Social and Governance (ESG) material topics. The exercise involved more than 70 MPA stakeholders from various sectors. This ensured that MPA's sustainability strategy continues to be aligned with the priorities of internal and external stakeholders and our sustainability efforts remain relevant.

The materiality assessment was conducted in four steps: (1) Identification, (2) Rating, (3) Prioritisation, and (4) Validation.



01 IDENTIFY

Desktop research on ESG topics relevant to the maritime industry was conducted. The research referred to global and local reporting standards and industry association ESG agendas. From this research, a preliminary list of potential ESG issues was identified.

02 RATE

This involved a comprehensive stakeholder engagement exercise, with surveys, and one-on-one interviews. Key groups of external MPA stakeholders were involved. The goal was to gather and analyse stakeholders' insights on the potential ESG topics identified in Step 1. Stakeholders were invited to rank the ESG topics according to their importance to MPA and the maritime industry.

03 PRIORITISE

Based on the consolidated stakeholder engagement findings, the list of potential ESG topics was ranked and prioritised by MPA's internal stakeholders. This took into account both financial materiality and impact materiality. The most material ESG topics for MPA were then shortlisted.

04 VALIDATE

The prioritised list was further validated through a peer benchmarking exercise involving port authorities, port operators, shipping companies, statutory bodies, and companies with sustainability reporting best practices. The Sustainability Report Work Group vigorously reviewed and validated the list. A final list of 15 material topics deemed relevant and essential for MPA's FY2023 disclosure reporting was approved by the Board.

MATERIAL TOPICS

Environment

Material topic	Why topic is material	Aligning to UN SDGs
Energy management and climate mitigation	With the public sector leading the national effort to achieve Singapore's net-zero emissions goal by 2045, MPA has a vital role to play. This includes demonstrating our commitment to responsible energy management, energy efficiency, the use of renewable energy sources, and net-zero emissions.	7 AFFORDABLE AND CLEAN ENERGY; 13 CLIMATE ACTION
Climate resilience and adaptation	Climate change poses significant risks to Singapore as we are a coastal state. MPA works closely with PUB, the national coastal protection agency, to protect Singapore's coastlines and make our ports resilient for the future.	11 SUSTAINABLE CITIES AND COMMUNITIES; 13 CLIMATE ACTION
Water and effluent management	As Singapore is a water-stressed nation as well as an island, MPA has to ensure proper water management, such as regulating the discharge of effluents from vessels. Singapore is also a signatory of the International Convention for the Prevention of Pollution from Ships (MARPOL) set by the IMO.	6 CLEAN WATER AND SANITATION; 14 LIFE BELOW WATER
Biodiversity	MPA's activities and ports are located near natural habitats. We have a responsibility to protect biodiversity.	14 LIFE BELOW WATER; 15 LIFE ON LAND
Waste	We promote resource efficiency and a circular economy within MPA's facilities as well as Singapore's port waters, to minimise waste generation and meet our national zero-waste goals. This is especially important given Singapore's limited land space.	12 RESPONSIBLE CONSUMPTION AND PRODUCTION
Supplier environmental assessment	MPA incorporates supplier environmental assessments aligned with Singapore's GreenGov.SG initiative.	16 PEACE, JUSTICE AND STRONG INSTITUTIONS

Social

Material topic	Why topic is material	Aligning to UN SDGs
Public policy	As a regulator and port authority, MPA monitors and influences public policy to foster growth within the maritime domain and safeguard Singapore's maritime interests. This includes providing marine and coastal geospatial data so that the Government can analyse rising sea levels and ensure that coastal protection measures are adequate.	8 DECENT WORK AND ECONOMIC GROWTH; 16 PEACE, JUSTICE AND STRONG INSTITUTIONS
Port safety and security	A core function of MPA as a port operator and regulator is to ensure safety and security in Singapore's port waters.	16 PEACE, JUSTICE AND STRONG INSTITUTIONS
Employment practices	Fair employment practices are essential to safeguard employees' interests, motivate them, and attract passionate maritime professionals.	8 DECENT WORK AND ECONOMIC GROWTH
Occupational health and safety	MPA gives top priority to the safety and physical and mental well-being of our employees and the workers of our contractors. It is important that all of them can perform their duties safely.	3 GOOD HEALTH AND WELL-BEING
Training and education	MPA will equip our employees and stakeholders with the necessary knowledge and skills to meet the challenges of a rapidly evolving maritime industry driven by digitalisation and decarbonisation.	4 QUALITY EDUCATION; 8 DECENT WORK AND ECONOMIC GROWTH; 17 PARTNERSHIPS FOR THE GOALS

Governance

Material topic	Why topic is material	Aligning to UN SDGs
Indirect economic impacts	MPA's sustainability efforts and contributions to the Singapore economy will be more comprehensively portrayed by including indirect impacts in our reporting.	11 SUSTAINABLE CITIES AND COMMUNITIES
Anti-corruption	It is paramount that MPA, a public agency, upholds a culture of integrity and non-corruption.	16 PEACE, JUSTICE AND STRONG INSTITUTIONS
Economic performance	MPA must make financially responsible decisions to ensure that we have sufficient funds for our operations and development.	8 DECENT WORK AND ECONOMIC GROWTH
Secure and reliable information technology infrastructure	In MPA's work to promote digitalisation crucial for the development of the maritime industry, it is important to address data security vulnerabilities and responsibly manage big data and algorithms. As the sector lead in the world's busiest transshipment hub, MPA monitors activities data across maritime and port critical information infrastructure (CII) and take early actions to prevent major disruptions to port operations and delivery of services.	9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

STAKEHOLDER ENGAGEMENT

To achieve shared sustainability goals and objectives, we engage a wide range of stakeholders so that we can forge effective partnerships and develop innovative solutions for the maritime industry.

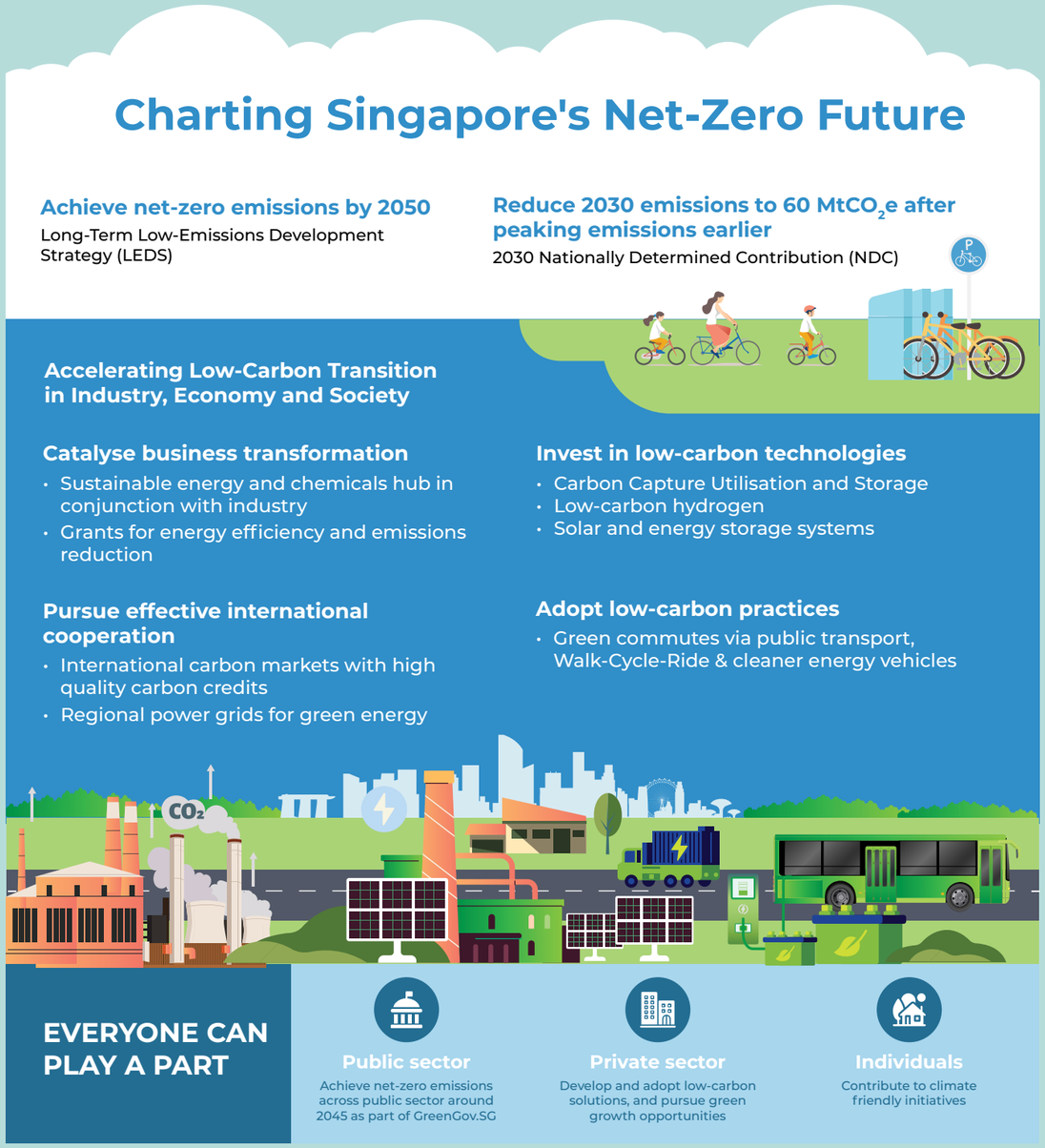
Key Stakeholder Groups	Key Engagement Methods	Key Areas of Interest
Board Members	Board meetings	• Public sector targets • Economic growth
Employees	• Town hall meetings • Staff intranet • Electronic Direct Mail (EDMs) • Engagement and employee wellness activities	• Corporate direction and growth plans • Remuneration and benefits • Talent attraction and capacity building • Occupational safety, health and well-being • Labour and human rights • Diversity, equity and inclusion • Work-life balance
Maritime Ecosystem & Value Chain (Port terminal operators, harbour craft, ship owners and management companies, ship operators, maritime law & arbitration, ship finance)	• Media releases • Circulars and notices • Annual reports and sustainability reports • Conferences and exhibitions • Meetings	• Environmental sustainability • Climate risks • Maritime safety for future fuels adoption • Economic impacts • Supply chain • Maritime competitiveness and transition • Talent attraction and capacity building • Governance and oversight • Human rights
Non-profit/supporting organisations (MaritimeSG Youth Ambassadors and environmental groups)	• Media releases • Annual reports and Sustainability reports • Dialogue sessions • Events	• Inter-agency collaboration for tackling biodiversity and sustainability issues • Safety at sea for all users, including marine pollution • Sustainable supply chain • Greenwashing
Public sector agencies and ministries	Inter-agency and workgroup meetings	• Environmental sustainability • Public policy • Climate change mitigation • Leadership diversity • Anti-corruption • Local hiring

PROLOGUE

Anchoring Sustainability: Singapore's Role in Global Maritime Decarbonisation

As a global maritime hub critically dependent on the health of the oceans, Singapore fully supports maritime decarbonisation efforts. Singapore has pursued sustainable development since independence. We participated actively in the discussions leading to the adoption of the UN Framework Convention on Climate Change in 1992, and in subsequent negotiations. The United Nations Climate Change Conference (COP 28/CMP 18/CMA 5) in December 2023 had highlighted the urgent need to transition from fossil fuels if the world is to keep global temperature increase to well below 2°C above pre-industrial levels and limit it to 1.5°C above pre-industrial levels, so that the risks and impact of climate change can be significantly reduced.

It is vital to protect our environment not just for future generations but also for Singapore's economic well-being, given that maritime trade is highly important for our economy. The Government has submitted an update to our 2030 Nationally Determined Contribution (NDC) with a new target of reducing emissions to around 60 million tonnes of carbon dioxide equivalent ($MtCO_2e$). We also have a Long-Term Low-Emissions Development Strategy (LEDS) to achieve net-zero emissions by 2050.



Adapted from National Climate Change Secretariat

Singapore has embarked on a nationwide sustainability movement to achieve net-zero targets. The Green Plan 2030 sets out our plans for a comprehensive suite of mitigation and adaptation measures to meet our emission reduction commitments across all sectors and to strengthen our resilience to address future negative impacts from climate change. We are also taking a circular economy approach, ensuring that scarce resources are valued, retained, and reused.

SG GREEN PLAN

As a maritime nation, Singapore can contribute significantly to global climate change efforts. International shipping accounts for three per cent of global Greenhouse Gas (GHG) emissions. More than 80 per cent of global trade is transported by sea. Furthermore, shipping transports fuels that are important for helping economies decarbonise. MPA will continue to work closely with the International Maritime Organization (IMO) and its member States to contribute to the decarbonisation agenda of international shipping. In July 2023, the 80th session of the Marine Environment Protection Committee (MEPC) adopted by consensus a revised IMO GHG Strategy for international shipping to achieve net-zero emissions by or around, i.e. close to 2050. It also made a commitment to ensure an uptake of alternative zero and near-zero GHG fuels by 2030, as well as indicative checkpoints.

Developing a Sustainable Global Hub Port and International Maritime Centre

Our Global Hub Port

Singapore plays a crucial role in advancing the international shipping agenda as it is the world's leading transshipment hub port and a major maritime centre. Connected to over 600 ports, the Port of Singapore achieved a record of 3.09 billion gross tonnage (GT) in vessel arrival tonnage and 39.01 million twenty-foot equivalent units (TEUs) of container throughput in 2023.

The port is integral to Singapore's climate change strategy. It supports our NDCs and broader environmental commitments with decarbonisation through the adoption of renewable energy, automation, and digitalisation. This also makes port operations more resilient and sustainable. The terminals of the Port of Singapore – Tanjong Pagar, Keppel, Brani, Pasir Panjang, Sembawang, Jurong, Jurong Island and Tuas – accommodate vessels ranging from container ships, bulk carriers and ro-ro ships to cargo freighters, coasters and lighters. The aim is for the terminals to be net-zero by 2050 and this includes our domestic harbour craft sector. As the port planner and port authority, MPA has designed the new Tuas Port to adapt to rising sea levels. We are also studying long-term adaptation measures to ensure that Tuas Port remains resilient.

We are continuing to develop GeoSpace-Sea – a marine spatial data infrastructure that enables researchers, port planners and other government agencies to take a data-driven approach to understand and anticipate ocean changes.

Our International Maritime Centre (IMC)

In 2023, significant maritime companies had business spending of S$4.8 billion. This reflects the sector's vibrant growth and Singapore's attractiveness to maritime businesses. An increasing number of maritime companies have set up sustainability desks in Singapore as part of their strategy for decarbonisation and growth.

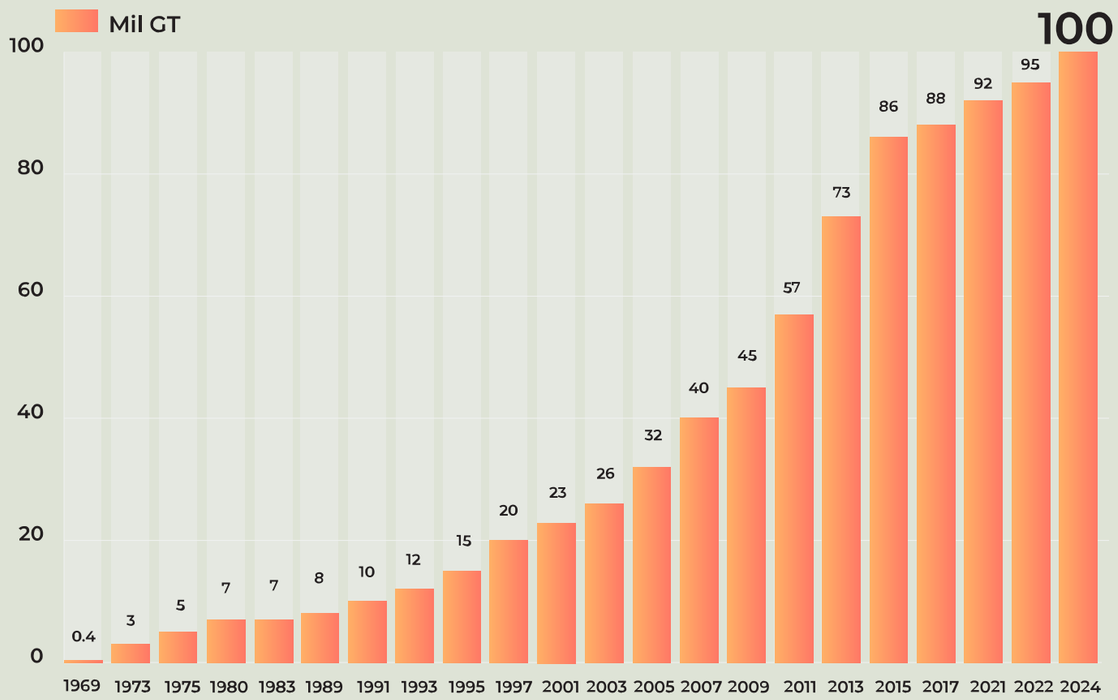
To support the maritime industry in exploring new opportunities in the green economy, MPA has allocated S$15 million until 2030 under the Maritime Cluster Fund–Sustainability. This fund aims to encourage the early adoption of sustainable technologies.

MPA is also committed to promoting sustainability with the Singapore Registry of Ships (SRS). The SRS has grown significantly, surpassing 100 million GT in early 2024. It is now one of the world's largest ship registries, with about 4,000 vessels, and one of the youngest and highest-quality fleets.

MPA's Green Ship Programme (GSP) launched in 2011 recognises ships for reducing their environmental impact. The GSP is part of the Maritime Singapore Green Initiative (MSGI) which recognises and encourages the adoption of clean and green practices on Singapore-registered ships. It provides incentives and fee reductions for ship owners who adopt solutions that enable ships to exceed IMO environmental standards. This includes using low-carbon fuels and implementing energy-efficient technologies.

Singapore-flagged ships that qualify for the GSP receive the SRS Green Notation. Recognised by RightShip, a leading ship vetting company, this notation is awarded to ships that either reduce their carbon intensity to a level exceeding the IMO Energy Efficiency Design Index (EEDI) Phase 3 requirements by at least 10 per cent or use low-carbon or zero-carbon fuels. In 2023, 22 new SRS vessels received Green Ship certificates under the GSP. MPA expects more such vessels in the coming years.

Total tonnage of ships under the Singapore Registry of Ships (million gross tonnage (GT))



CHAPTER 01:

MARITIME SINGAPORE PLAYING A LEADING ROLE IN DECARBONISATION

As custodian of Singapore's global hub port and international maritime centre, MPA works with our partners in the Maritime Singapore ecosystem and international partners to drive the decarbonisation of the global maritime industry, so that we can ensure a sustainable future for the industry. Our ports and harbour craft fall within our domestic targets in the UN Framework Convention on Climate Change, while the emission reduction efforts for international shipping are regulated through the International Maritime Organization (IMO). Cooperation and collaborations with our partners, both local and international, are essential. At home, we work closely with our tripartite partners, the maritime workforce and shipping companies, to upskill our workforce and support our companies in their sustainability and decarbonisation journey.

Electric harbour craft charging point at Marina South Pier.

Domestic Initiatives

MPA aligns our efforts with Singapore's sustainable development agenda and climate action plans. We are reducing greenhouse gas (GHG) emissions and promoting sustainability in the local maritime sector through initiatives such as adopting electric harbour craft (eHC) and implementing digital bunkering solutions.

Building a Sustainable Harbour Craft Ecosystem

Harbour craft play a vital role in our port ecosystem. About 1,600 of these vessels provide essential marine services in the port. They deliver ship supplies, operate launches, and do bunkering and towage. In line with the national target, MPA has set a target of net-zero emissions in the harbour and pleasure craft sectors by 2050. From 2030, all new harbour craft must be fully electric, capable of using B100 biofuel, or compatible with net-zero fuels. MPA is studying the transition timeline for new tugs and bunker tankers, which have a higher energy profile where full electrification is not yet feasible. We are co-funding pilot tests to trial new decarbonisation pathways before 2030. The pilot tests are now being conducted with towage service providers and international technology providers. MPA will also work with stakeholders on the decarbonisation pathways for pleasure craft.

Various Expression of Interest (EOI) and Call for Proposal (CFP) exercises were launched in 2023, each focused on a specific area to accelerate the adoption of eHC. Such engagements ensure that the needs, concerns and suggestions of the industry are considered, while also fostering their support and compliance with future regulations. To prepare the industry for mandatory requirements in the future, MPA has also been encouraging stakeholders to consult with it on designs for electric, B100 and hydrogen-compatible harbour craft. There will be such consultations with all harbour craft operators from 2027.

MPA conducting a briefing for the Expression of Interest to encourage the design and adoption of electric harbour craft in Singapore.

EOI 1: Design and Promote Adoption of eHC

The strategy for harbour craft is to look globally for the most feasible designs for electrification. We will engage our research institutes to enhance the selected designs with the aim of reducing the life cycle costs. The enhanced reference designs will then be type-approved for the selected companies to seek market aggregation of orders so that the unit construction costs can be further reduced, and the eHC programme can be supported by enhanced financing and insurance.

In February 2024, MPA selected 11 out of 55 global proposals from an EOI it had launched seven months earlier for the design of electric passenger launches and cargo lighter vessels. MPA was looking for design proposals for eHC that are efficient and have integrated battery management and energy storage systems, and essential safety features. Six of the selected proposals had more mature technology and were more ready for the market, while the remaining five showed promising concepts that needed further development. MPA has provided funding to support the selected companies and research institutes in their work to improve and scale up their designs. Once the prototype is developed, participants can start to market their enhanced eHC reference designs and aggregate production demand from the industry. With ready reference designs and production at scale, companies that switch to eHC will benefit from cost savings.

CFP: eHC Charging Points

In August 2023, MPA and the existing licensees and operators of suitable sites invited proposals to set up, maintain and operate eHC charging points at their locations. The strategic locations include Jurong Port, Marina South Pier, Pasir Panjang Ferry Terminal, PSA Marine-West Coast Base and Sebarok Terminal. Pyxis Energy Pte Ltd, Pyxis Maritime Pte Ltd and SP Mobility Pte Ltd partnership, Seatrium O&G (International) Pte Ltd and Yinson Electric Pte Ltd were selected for their vessel charging concepts to be piloted in Singapore. The first pilot trial by the Pyxis and SP Mobility partnership was launched at Marina South Pier during Singapore Maritime Week 2024. MPA is working with Seatrium and Yinson to further develop their eHC charging point concepts. The pilot trials at various sites will help us assess different charging technologies and infrastructure needs.

The results will contribute to the development of a National Charging Infrastructure Standard (NCIS). MPA is working on this with Enterprise Singapore and other stakeholders, and the industry is being consulted to align on the technical specifications. A standardised technical reference will ensure safety and interoperability in the eHC charging system. MPA is also working on a charging masterplan to support eHC operations in Singapore, in collaboration with agencies such as A*STAR and the Singapore Maritime Institute (SMI), which will be rolled out in 2025. This involves evaluating potential charging sites and understanding the needs and power requirements for eHC operations within the port. Insights gathered from harbour craft users and pilot charging stations will contribute to the development of the masterplan, which will be implemented in tandem with eHC adoption. The masterplan will support MPA's plans to progressively roll out charging infrastructure for eHC operations in Singapore from 2025.

First pilot trial for electric harbour craft charging point launched at Marina South Pier.

EOI 2: Financing and Insurance for eHC

In October 2023, MPA launched an EOI which invited financial institutions, insurers, and intermediaries to submit proposals for financing and insurance solutions. The aim was to support the adoption of eHC. Twelve of the 20 submissions received were financing proposals and eight were insurance proposals. MPA will work with industry stakeholders to review the feasibility of implementing the financing proposals. MPA will also consult the industry on supportive mechanisms to help right-price the insurance premiums, such as a data repository platform, training programmes, and quality assurance frameworks.

For further details on these initiatives, please refer to our Annual Report, page 35-36.

Advances in MPA's eHC Strategy

The *Penguin Refresh* is the first of three Shell electric ferries in Singapore.

In April 2023, MPA signed a five-year MoU with Shell Eastern Trading Pte Ltd to advance eHC, charging infrastructure and low-carbon fuels in Singapore's maritime sector. The MoU was signed during the unveiling of the first of Shell's three electric ferries. Developed by Penguin International, the 200-passenger electric ferries can carry several thousand Shell personnel, contractors, and visitors daily between Pasir Panjang Ferry Terminal and Shell Energy and Chemicals Park on Pulau Bukom.

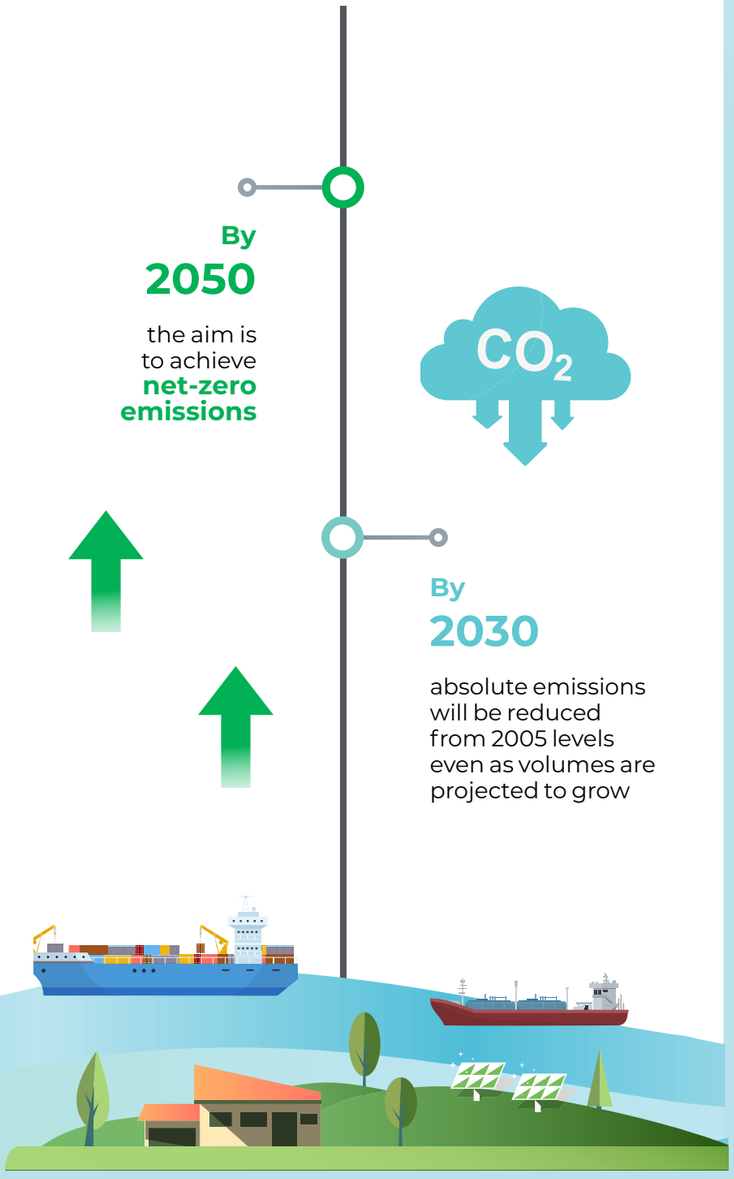
The *Yinson Hydromover* is Singapore's first fully electric cargo vessel.

In November 2023, Yinson GreenTech (YGT) and the Goal Zero Consortium led by SeaTech Solutions launched the *Hydromover*, Singapore's first fully electric cargo vessel. MPA and the Singapore Maritime Institute (SMI) had chosen the *Hydromover* as one of three winning proposals to develop and commercialise an all-electric cargo vessel with interoperable swappable battery infrastructure solutions. It can potentially reduce operational cost by up to 50 per cent compared to conventional vessels because of improved energy efficiency and lower maintenance cost. The *Hydromover* is a living laboratory for YGT and Goal Zero's R&D partners, the Singapore Institute of Technology (SIT) and Technology Centre for Offshore and Marine, Singapore (TCOMS).

Low-Carbon Future for Port Terminals

Another focus area of our decarbonisation efforts is to reduce emissions from port terminals and adopt low-carbon solutions. Our port terminal operators, PSA Corporation Limited (PSAC) and Jurong Port Private Limited (JPPL), have set their own targets and developed strategies to reach net-zero emissions. The cruise terminals are also working on reducing their energy consumption.

Targets for Our Port Terminals



Our Terminals' Strategies

	PSA Corporation Limited (PSAC)	Jurong Port Private Limited (JPPL)
Targets	• Reduce absolute Scope 1 & 2 carbon emissions by 50 per cent by 2030, and by 75 per cent by 2040, from 2019 baseline year. • Achieve net-zero carbon emissions by 2050.	• Reduce carbon emissions by 62 per cent by 2030, from 2005 baseline year. • Achieve net-zero carbon emissions by 2040.
Mitigation Measures	• Integrate carbon emissions and financial considerations into the annual budget for lower-carbon equipment and technologies like electric prime movers and battery energy storage systems. • Hybridise or fully electrify equipment fleet and deploy low-carbon fuels where possible. • Generate renewable energy from solar.	• Electrify operations for handling of aggregates, such as the use of electric balance cranes and conveyor systems to transfer aggregates. • Convert port lightings to energy-efficient LED lights, to reduce up to 2 GWh in electricity consumption annually. • Embark on Lighterage Ecosystem Optimisation study with the aim of developing new operating models to enable supply chain optimisation and electrification (e.g. truck & boat space utilisation, digital booking, e-harbour crafts and e-forklifts/e-cranes). • Maximise solar energy generation capabilities and install more solar photovoltaic (PV) systems within the port. • Explore low-carbon fuels as an alternative energy source to mitigate emissions.
Adaptation Measures	• Guided by PSA Civil Infrastructure Sustainability Roadmap, including sustainability for existing buildings, climate risk assessment, and site wide climate adaptation. • Design new equipment and buildings to withstand extreme weather; regularly review plans to minimise operational disruptions.	
Circularity Measures	• Continue to integrate the 3Rs – Reduce, Reuse, Recycle – into PSA's culture to promote waste circularity. • Include application of circularity principles as criteria in waste management contracts and as part of wider PSA Sustainable Procurement Framework. • Launch the Green Finance Framework to enhance access to green loan and bond markets and finance new or existing green assets or projects with environmental benefits.	• Optimise business operations by improving processes and implementing energy-efficient technologies. • Implement circular economy programmes (e.g., water recycling at Ready-Mixed Concrete Ecosystem's sludge treatment plant).

Advancing Sustainability at the Singapore Cruise Centre

Singapore Cruise Centre Private Limited (SCCPL), the owner and operator of sea passenger ports in Singapore, is actively pushing its sustainability agenda. It is integrating a range of green initiatives across its operations. These include expanding the use of solar PV systems at Harbourfront Passenger Terminal and Pasir Panjang Ferry Terminal and enhancing energy efficiency through hybrid cooling systems at Tanah Merah Ferry Terminal. SCCPL is also replacing conventional equipment with electric options such as automated guided vehicles and electric forklifts and implementing e-manifest systems to cut paper use. In partnership with MPA, SCCPL is promoting an awareness of sustainability among its regional operators and encouraging a shift to alternative fuels and power technologies. To encourage the development of an environmentally responsible business community, SCCPL is advancing green procurement and promoting green leases among its commercial tenants.

Enhancing Port Connectivity and Efficiency

MPA is spearheading initiatives that make use of digitalisation and automation to improve operational efficiency and reduce environmental impact. These initiatives enhance competitiveness and align with our commitment to decarbonisation. They will help us to achieve our goal of zero emissions from international shipping by or around mid-century.

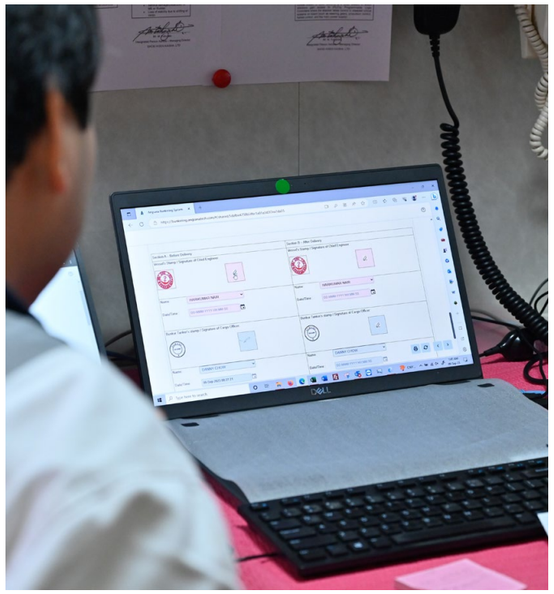
Maritime 5G Networks

MPA is deploying maritime 5G networks to enhance connectivity across all our anchorages and ports. The first phase of the network was completed in September 2023 with the full coverage of the southern port waters. Three maritime 5G base stations are now working to support the testing and development of innovative digital applications such as remotely assisted pilotage advisory and digital bunkering. This promises to make maritime operations more efficient.

MPA will continue to work closely with the Infocomm Media Development Authority (IMDA) so that we can operationalise the remaining base stations by mid-2025 and bring full 5G coverage to all our major anchorages, fairways, terminals, and boarding grounds.

Transforming Bunkering Operations

Singapore was the first in the world to use mass flow meters for bunker fuels in 2017. It was also the first in the world to use electronic bunker delivery notes (e-BDNs) for the entire port ecosystem. MPA launched the e-BDNs system on 1 November 2023, after conducting over 100 trials involving more than 20 companies. The digitalisation of bunkering processes and documentation, such as bunker requisition forms and checklists, has made bunkering operations more efficient and transparent. The system can also potentially save the bunkering industry up to 40,000 man-days a year. MPA is actively promoting digital bunkering to drive business transformation and enhance operational standards, with a view to making digital bunkering the default in the coming months.



With digital bunkering, Cargo Officers and Chief Engineers can complete the pre- and post-bunkering processes without filling any physical documents, enhancing the efficiency and transparency of bunkering operations in Singapore.

Streamlining Maritime Operations

Since its inception in 2020, digitalPORT@SG™ has streamlined port clearance processes and saved the maritime industry about 100,000 man-hours annually. Phase 2 of digitalPORT@SG™ was launched in October 2023, featuring a Just-In-Time Planning and Coordination Platform. Users get real-time information and can better coordinate, plan and allocate resources and services to the vessels. This not only makes port operations more efficient but also cuts turnaround and idling time for the vessels, thus reducing GHG emissions.

Maritime Drones

Maritime drones tap the 5G capabilities to exchange real-time video with shore-based entities. This capability can replace various traditional maritime operations, including defect inspection onboard vessels and will improve operational efficiency, safety and reduce carbon emissions.

Advancing Clean and Green Shipping Practices with MSGI

The Maritime Singapore Green Initiative (MSGI) underscores Singapore's commitment, as a responsible flag and port state, to promote clean and green shipping and reduce the environmental impact of shipping and related activities. It was launched in 2011, with MPA pledging to invest up to S$100 million over five years.

The MSGI has evolved and expanded to address the pressing need for maritime decarbonisation. The latest extension of the MSGI, to December 2024, prioritises initiatives that promote the reduction of carbon emissions. The MSGI has four programmes – the Green Ship Programme, Green Port Programme, Green Energy and Technology Programme, and Green Awareness Programme. There are incentives for companies to adopt clean and green shipping practices beyond the minimum requirements set by IMO conventions. Extension of the MSGI beyond 2024 is currently under review.

Fostering Innovation for Sustainable Solutions with PIER71™

PIER71™, the maritime innovation ecosystem co-founded by MPA and NUS Enterprise, plays an important role in driving innovation and sustainability in the maritime industry. Through its annual innovation competition, the Smart Port Challenge (SPC), PIER71™ provides a platform for technology start-ups to address opportunities and challenges in maritime decarbonisation and digitalisation. Over the years, MPA and the PIER71™ programme have supported over 100 start-ups. These have deployed 27 tech solutions to the maritime industry and raised over S$65 million in venture capital.

SPC 2023 attracted 150 proposals from 30 countries and 18 finalists were shortlisted for the start-up acceleration programme. Maritime decarbonisation was the theme of 40 per cent of the proposals. The solutions presented ranged from clean fuel operations to green maritime supply chain initiatives, reflecting the industry's awareness of the urgency to develop more sustainable practices.

Launch of PIER71™'s Smart Port Challenge 2023.

The top three start-up solutions presented at SPC 2023 were:

1

Measure.AI

Measure.AI makes novel and highly sensitive real-time gas sensors which are low cost and reusable. They patented a method of making unique gas sensors, for ammonia and other gases, which address safety concerns for bunkering of alternative fuels.

2

CRecTech

CRecTech developed a catalyst coating for biogas reforming that is sustainable and substantially enhances the production of methanol.

3

Rux Energy

Rux Energy, an Australian advanced materials start-up, proposed their Metal Oxide Framework which aims to double the volumetric efficiency and halve the cost of dispatchable hydrogen storage for bulk distribution, refueling, heavy mobility and aviation.

International Collaborations

Decarbonisation of international shipping requires unified efforts across borders. Maritime Singapore can help strengthen such collaborations. Our unique strengths as a global hub port and international maritime centre complement multilateral efforts like those spearheaded by the IMO. Also, we pursue plurilateral collaborations, bilateral initiatives, and partnerships with industry stakeholders across the entire maritime value chain to accelerate decarbonisation efforts.

Global Partnership for Green and Digital Shipping Corridors

In 2023, MPA launched several Green and Digital Shipping Corridors (GDSCs) with international partners. These are to pilot new technologies which would accelerate the uptake of zero and near-zero emission fuels and support the scaling up of green and digital maritime solutions so that they would be more widely adopted. Our partners are the Port of Rotterdam, Port of Los Angeles (POLA), Port of Long Beach (POLB), China's Tianjin Municipal Transportation Commission, the Ministry of Land, Infrastructure, Transport and Tourism of Japan (MLIT), and Australia's Department of Infrastructure, Transport, Regional Development, Communications, and the Arts (DITRDCA).

The GDSC initiative is a significant step forward in global efforts to decarbonise the maritime industry by integrating sustainable solutions across various shipping activities and port operations. The key areas in this initiative are aimed at reducing GHG emissions, driving innovation and technological advancement, enhancing operational efficiency, developing regulatory and financial support mechanisms, promoting capacity building and knowledge sharing, and advancing infrastructure development.

GDSC with Port of Rotterdam

The GDSC between Singapore and the Port of Rotterdam aims to reduce GHG emissions from this international shipping corridor by 20 per cent and then to 30 per cent in 2030 from the baseline of 2022 levels. To reach the targets, we will expedite the transition to zero and near-zero emission fuels by adopting similar bunkering standards and safety frameworks and using alternative fuels such as synthetic and bio-variants of methanol, ammonia, LNG, and hydrogen. The collaboration also aims to reduce GHG emission through operational measures, with both ports accelerating the adoption of global standards and solutions to facilitate efficient port calls and the flow of goods and encouraging paperless handling.

GDSC with Port of Los Angeles (POLA) and Port of Long Beach (POLB)

In collaboration with POLA and POLB and supported by C40 Cities, MPA signed an MoU to establish a GDSC for ships calling at Singapore and the San Pedro Bay port complex. The aim of the Partnership Strategy for a GDSC across the Pacific Ocean is to coordinate decarbonisation efforts and scale up the adoption of low-emission and zero-emission fuels. A partnership structure and governance mechanism has been developed, and a study commissioned to analyse trade flows and identify opportunities for collaboration in advancing the GDSC between the ports of Singapore and Los Angeles and Long Beach.

GDSC between Tianjin and Singapore

MPA and the Tianjin Municipal Transportation Commission signed an MoU to establish the Singapore-Tianjin GDSC. This is the first corridor between Singapore and China. It supports the decarbonisation and digitalisation of the maritime industry in the Bohai Region and serves as a testbed for innovative solutions and talent development. The collaboration aims to streamline port clearance, promote the use of low-emission fuels and new fuel technologies, foster innovation, support maritime start-ups, and facilitate professional development.

Mr. Teo Eng Dih, MPA Chief Executive (right), with Mr. Wang Zhinan, Director General, Tianjin Municipal Transportation Commission (left) signed the MoU to establish Singapore – Tianjin Green and Digital Shipping Corridor on 6 December 2023.

GDSC between Japan and Singapore

Singapore's Ministry of Transport (MOT) and Japan's Ministry of Land, Infrastructure, Transport and Tourism (MLIT) signed a memorandum of cooperation (MoC) to establish the Singapore-Japan GDSC. This corridor is focused on developing standards and best practices to support decarbonisation, digitalisation, and growth of the maritime industry. In this initiative, MPA will work with six Japanese ports serving the Kanto, Kansai and Chubu regions on pilot projects and trials for alternative marine fuels such as ammonia, develop bunkering infrastructure and standards, encourage adoption of decarbonisation and digitalisation technology, and exchange maritime cybersecurity best practices.

GDSC between Australia and Singapore

MPA and Australia's Department of Infrastructure, Transport, Regional Development, Communications, and the Arts (DITRDCA) are working on establishing a Singapore-Australia GDSC by 2025. This will facilitate digital information exchange for efficient port operations and develop zero or near-zero GHG emission fuel supply chains. It will be supported by joint research projects under the Australia-Singapore Initiative on Low-Emissions Technologies (ASLET) partnership which focuses on low emissions technologies for maritime operations.

For further details on these initiatives, please refer to our Annual Report, pages 32-33.

Mr. Teo Eng Dih, MPA Chief Executive (sixth from left), with Ms. Yuki Tanaka, Director-General for International Affairs (seventh from right), with the signed MoC to establish Singapore – Japan Green and Digital Shipping Corridor.

Strengthening International Cooperation for Maritime Decarbonisation

In 2023, MPA, the IMO and Norway's Ministry of Climate and Environment signed an MoU to help developing countries reduce emissions from ships and ports. This effort is part of the NextGEN Connect initiative[2] and the IMO-Norway GreenVoyage2050 Project. It is dedicated to supporting the Initial IMO Strategy on the Reduction of GHG Emissions from Ships.

MPA hosted forums and workshops throughout 2023 which showcased Singapore's leadership in maritime sustainability. These brought together global maritime leaders at events such as the MPA-C40 Green Ports Forum and the Voyage to Net-Zero Forum. They discussed strategies for developing green ports and reducing emissions along international shipping routes and highlighted the need for new maritime fuel supply chains and green shipping corridors.

MPA's collaborations with industry partners have also resulted in valuable resources such as the *Routes-based Action Plans: A Toolkit* report. Published by Lloyd's Register Maritime Decarbonisation Hub (LR MDH), the report was the product of a workshop organised by MPA, IMO and Norway in October 2023. It identified a key role for regional hubs to help connect large demand clusters and remote locations with regional low-carbon fuel sources, as this would enable a more inclusive and effective transition to a low-carbon maritime future.

MPA is also working with various classification societies and the International Association of Classification Societies (IACS) to develop common standards, focusing on areas such as smart and autonomous ships, cybersecurity, and the integration of zero-carbon and low-carbon fuels on vessels.

2 NextGEN Connect, a collaboration between the IMO and MPA established in April 2022, brings together industry, academia, and global research centres to offer inclusive solutions for maritime decarbonisation for trial along shipping routes.

MPA Chief Executive Mr. Teo Eng Dih (left) with H.E. Eivind S. Homme, Ambassador, Royal Norwegian Embassy (centre), and Associate Professor Chai Kah Hin, NUS Centre for Maritime Studies (right), at the IMO-Singapore NextGEN Connect workshop to discuss shipping routes and maritime hubs' actions to cut shipping's GHG emissions.

Port Authorities Roundtable (PAR)

MPA also exchanges best practices with other port authorities. We set up the Port Authorities Roundtable (PAR) in 2015 as a forum for port authorities around the world to share best practices and foster collaboration in such issues as maritime decarbonisation. MPA serves as the secretariat for PAR.

The 8th edition of PAR was held in Shanghai in 2023 with the theme "Seizing New Opportunities Amidst Global Port Transformation". It was attended by 17 port authorities from the Americas, Asia, Europe, the Middle East, and Oceania, and they discussed global port and shipping trends, decarbonisation, and digitalisation.

Heads of delegations attending the 8th Port Authorities Roundtable 2023 held in Shanghai in September 2023.

MPA-Shanghai Municipal Transportation Commission MoU

On the sidelines of the PAR in Shanghai, Singapore and Shanghai signed an MoU to strengthen bilateral port and maritime ties. It is a significant collaboration as Singapore and Shanghai are two of the world's largest ports. Shanghai is also one of China's key transshipment centres and plays a crucial role in the development of the Yangtze River delta. Under the MoU, the two sides will learn from each other through the exchange of information on port and shipping developments, and maritime policies and regulations, as well as through training and research. The MoU also provides for co-development of digitalisation and decarbonisation solutions for shipping and port development.

Mr Teo Eng Dih, MPA Chief Executive (right), with Mr Yu Fulin, Director General of Shanghai Municipal Transportation Commission, (left), at the signing of the MoU between MPA and the Shanghai Municipal Transportation Commission.

Expanding Maritime Education and Training – Building Capacity in Other Countries

Since 1998, MPA and IMO has collaborated on the Singapore-IMO Third Country Training Programme, focusing on capacity building and technical cooperation for the international maritime community. In 2023, we pledged US$5 million for the period 2024-2028, with US$2 million allocated for the first two years. The funds pledged are for enhancing technical cooperation, and training through fellowships, scholarships, workshops, and courses for IMO members.

With increasing focus on decarbonisation in the maritime sector and in line with the revised IMO GHG Reduction Strategy, MPA has also dedicated sessions within our suite of flagship programmes, such as the Advanced Maritime Leaders' Programme (AMLP) and the Maritime Public Leaders' Programme (MPLP), to share our maritime decarbonisation experience and initiatives.

In November 2023, MPA, together with IMO, completed the pilot of Project SWiFT (Single Window for Facilitation of Trade), a Maritime Single Window (MSW) platform developed for the Port of Lobito in Angola. After a successful week-long user acceptance testing session, MPA organised a handing-over ceremony involving officials from the IMO, MPA and the Port of Lobito. This MSW platform allows all information required by various agencies from visiting ships to be submitted electronically through a single online portal for efficient clearances to be conducted.

Anchoring MPA's Global Position

Singapore secured its 16th consecutive term on the IMO Council in December 2023. As Singapore's national maritime representative, MPA actively participates in and contributes to the work of the IMO to advance the interests of the international maritime community. This includes working closely with fellow member States to address issues such as emissions from international shipping. MPA also works closely with a network of partners in the IMO to formulate strategies and measures on decarbonisation and digitalisation, and to take actions which will bring progress in these key areas. Our active participation in the global work on maritime decarbonisation includes taking on leadership positions in various committees and working groups.

Building consensus to address climate change at MEPC 80

The 80th session of the Marine Environment Protection Committee (MEPC 80) was a significant event, with the adoption by consensus of the 2023 IMO Strategy on Reduction of GHG Emissions from Ships. This set out enhanced targets for international shipping and reflected a collective will to address climate change. It sent a strong and clear signal to the global maritime community on the way ahead. This will help strengthen investment confidence in newbuilds and infrastructure development along the fuel supply chain.

Singapore's representative, Mr. Tan Hanqiang from MPA, helped to drive the work on the impact assessment of the basket of candidate mid-term measures. He led the team tasked to ensure that the implementation of the Strategy and development of the candidate mid-term measures would be effective and inclusive. Mr. Tan was re-elected as Vice-Chair of the MEPC for a second term in July 2023.

Mr. Tan Hanqiang was re-elected Vice Chair of IMO's Marine Environment Protection Committee for a second term in July 2023.

Finalisation of IMO Strategic Plan 2024-2029

The IMO Assembly adopted the Strategic Plan for the organisation on 11 December 2023. This is to be implemented from 2024 to 2029.

The Strategic Plan was a significant milestone in global maritime governance. Strategic Direction 3 on Climate Change Response acknowledged the maritime sector's substantial contribution to GHG emissions and underscored the member States' commitment to mitigating the environmental impact by adopting cleaner technologies and energy sources.

Singapore led the discussions on the development of the Strategic Plan. MPA officer Mr. Darrick Leow, Counsellor (Maritime) at the Singapore High Commission to the United Kingdom, chaired the IMO Council Working Group on the Strategic Plan (WG SP).

Top:
Dr. Amy Khor, Senior Minister of State, Ministry of Transport and Ministry of Sustainability and the Environment (centre), and officers from MPA, Ministry of Transport and Ministry of Foreign Affairs at the 33rd Session of the IMO Assembly.

Bottom:
Mr Darrick Leow (left) and Mr. Tan Hanqiang (right) holding leadership position at the IMO.

CHAPTER 02:

IGNITING MULTI-PATHWAYS FOR MARITIME DECARBONISATION

MPA is committed to working with our maritime community to improve vessel design and efficiency, and promote the use of energy-efficient measures and applications, such as wind-assisted propulsion, navigational tools for route-planning, and just-in-time operations. Shipowners have taken action, knowing that such enhancements will reduce energy and operational costs and pay back over the life cycle of the vessel. These enhancements should be adopted while new marine fuels becomes more widely available as it will take time for the fuels to be more economical and supplied in sufficient quantities.

Gearing Up for a Multi-Fuel Future

The demand for more energy-efficient designs and technologies as well as alternative fuels will grow, as more ships which can operate on zero or near-zero emission fuels are delivered progressively over the next few years. To avoid stranded assets, owners are also considering building new vessels with the flexibility to meet regional and international regulatory standards as they evolve, through the vessels' life cycle.

To help the global maritime community meet the indicative checkpoints and targets of the 2023 IMO Strategy on the Reduction of Greenhouse Gas Emissions from Ships, it is vital to also upskill the maritime workforce and seize new opportunities as we make the energy transition.

In 2023, Singapore recorded its highest bunker sales, surpassing the previous high in 2017. Alternative fuels made up 1.2 per cent of the 51.8 million tonnes of bunker fuel sold.

Singapore is committed to the energy transition. We had supported trials for biofuels and liquefied natural gas, which are more mature options that have seen considerable growth in recent years. For biofuels, we are conducting trials of higher blends beyond B50 (i.e., blends of more than 50 per cent), and developing standards for higher blends up to B100. For liquefied natural gas, there has been interest in conducting more ship-to-ship bunkering, adopting measures to reduce slips, and conducting biomethane trials.

	Bunker sales in 2023 (in '000 tonnes)
Conventional Fuel	51,189
Bio-blended Fuel	523.8
LNG	110.9
Methanol	0.3
Total	51,824

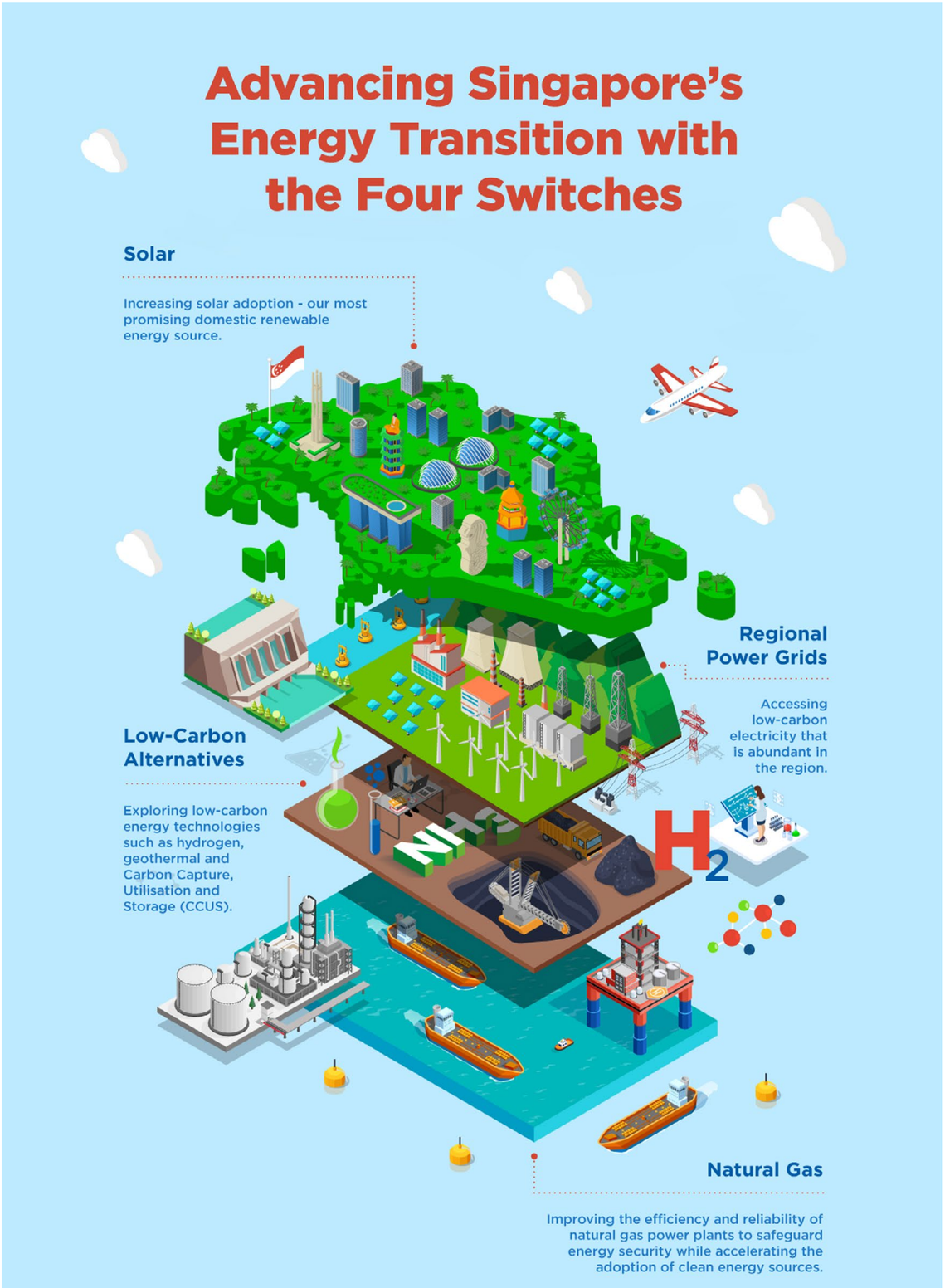
Marine Biofuels: Developing World-First Standards

In Singapore, sales of biofuel blends as a marine fuel increased from 140,000 tonnes in 2022 to 520,000 tonnes in 2023. To support the multi-fuel transition, MPA collaborated with industry experts and researchers to develop the world's first provisional standards for marine biofuels permitting blends of up to B50, to ensure their quality before international standards are formalised. Trials are now being conducted for blends up to B100. The standard for marine biofuels will also be progressively updated to B100 by 2025.

Increasing Decarbonisation Options

Singapore continues to work on harnessing more renewables, such as floating solar installations and building-integrated solar photovoltaics. However, the potential is limited given intermittency and the insufficient space here. Large-scale renewables such as hydropower and offshore wind are not available to us. Singapore is therefore keeping alternative energy options open for the future. The Energy Market Authority (EMA) is studying the potential for deep geothermal energy, and agencies continue to monitor the progress of advanced nuclear technologies. Singapore is also studying the feasibility of aggregating carbon emissions generated within Singapore for use locally or storage in other countries.

For ocean-going vessels, efficient design and adopting energy-efficiency measures continue to be of high priority. Singapore aims for electricity imports to meet a third of our energy needs by 2035, and commercial operations could begin from 2028. Vessels to lay, service and maintain the subsea cables will support the development of an inter-connected grid within Southeast Asia as more renewable projects come online over the next decade.



Credit: Energy Market Authority

Besides the cables transporting electrons from renewable projects within Southeast Asia, vessels serve a similar function transporting energy in the form of molecules. Even as international shipping accounts for about three per cent of global emissions and will require new fuels to progressively decarbonise, vessels also play a key role in the export of molecules from low-emission sources around the world.

Hydrogen in the form of liquid hydrogen and its carriers such as ammonia and methanol are being trialled, and the relevant standards, safety protocols, emergency response and training required are being developed in the process. These fuels will also require new vessel engines to be developed and commercialised. Numerous workstreams are ongoing at the international and regional levels to increase supply, and to ensure that these options meet environmental standards.

Hydrogen: First Bulk Liquefied Hydrogen Carrier

Singapore welcomes *Suiso Frontier*

In 2023, the Port of Singapore welcomed the world's first bulk liquefied hydrogen carrier, *Suiso Frontier*. This visit required meticulous safety preparations. There were consultations with government bodies, risk assessments, plume modelling, and comprehensive emergency response and evacuation plans. Throughout the time that *Suiso Frontier* was in port, MPA's Emergency Operations Centre was fully operational for the highest level of safety preparedness. The *Suiso Frontier's* visit furthered our understanding on the feasibility and preparations for the safe transportation of liquefied hydrogen by sea across long distances.

The world's first bulk liquefied hydrogen carrier, *Suiso Frontier*, arriving at the Port of Singapore in August 2023.

MPA is exploring the use of low-carbon hydrogen and hydrogen-derived fuels as these are alternatives to fossil fuels in the maritime sector. A key thrust of Singapore's National Hydrogen Strategy is to experiment with advanced hydrogen technologies which are almost ready for commercial use. One example is a trial by Vinssen, a South Korean company specialising in electric and hydrogen hybrid propulsion systems. It has installed a hydrogen fuel cell system on the RoRo vessel *Penguin Tenacity* to evaluate hydrogen as a marine fuel. This year-long trial, which starts in 2024, will make use of operational data to derive real-time insights which can assess system stability and performance.

Methanol: Pioneering Bunkering Operations

MPA is working with our stakeholders to use methanol as an alternative marine fuel. In 2023, Singapore marked a milestone with the world's first ship-to-containership methanol bunkering operation when the Maersk container vessel *Laura Maersk* was refuelled with about 300 metric tonnes of bio-methanol. This pilot operation involved extensive collaboration between MPA and more than 28 agencies, partners and research institutes. Safety was of the highest priority, and the preparations included workshops, hazard analyses and emergency response drills, including a customised methanol fire-fighting and training programme. This programme has since been used to train over 200 personnel from shipping companies with dual-fuelled vessels using methanol. Advanced technologies, such as methanol-detecting drones, were integrated to enhance the safety measures. Insights derived from this pilot will inform the development of a technical reference for methanol bunkering operations in Singapore. This is expected to be completed by the end of 2024.

MPA is working on developing our port to be a leading bunkering hub for alternative fuels. We issued an EOI to gather proposals for supplying and operationalising the bunkering of methanol. The response has been positive, reflecting the industry's confidence. Proposals from the EOI will shape the development of Singapore's methanol bunkering licensing framework. MPA plans to call for applications for licences to supply methanol blends as marine fuel in Singapore. At the same time, we are working with industry partners to study various aspects of commercial-scale methanol bunkering. These include expanding methanol supply, meeting infrastructure needs such as terminals and tankers, and enhancing crew training and bunkering standards.

Singapore's first methanol bunkering operation involving a Maersk container vessel, *Laura Maersk*, was successfully completed at the Raffles Reserved Anchorage, with the support of MPA, government agencies and research institutes.

The Potential of Ammonia: Risk Management, Emergency Response & Fuel Trial

In December 2022, MPA and EMA launched a joint initiative to develop low-carbon or zero-carbon ammonia solutions for power generation and bunkering. The Government will select a principal developer by 2025 and work with it for an end-to-end ammonia solution. There are plans to test and deploy a direct ammonia combustion power plant, and to assess the viability of ammonia bunkering for both international shipping and domestic harbour craft.

To prepare for ammonia bunkering, MPA and relevant government agencies are developing emergency responses, mitigation measures and procedures for safe handling. In 2023, MPA conducted an industry workshop, together with the Embassy of France and Innovation Norway, to understand the risks of using ammonia as a marine fuel and to establish protocols for managing accidents during bunkering and when used in ship operations.

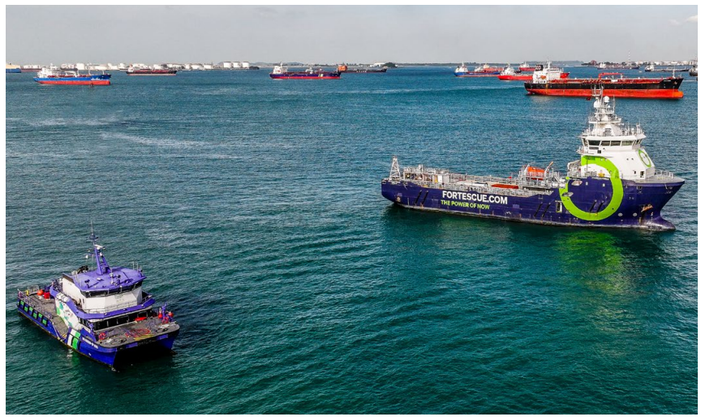
Representatives from MPA, the French Embassy in Singapore, and Innovation Norway at a workshop on the emergency response strategies for ammonia bunkering incidents.

Preparing for The World's First Sea Trial of Ammonia-Fuelled Vessel

MPA played a key role in commissioning the world's first ammonia dual-fuelled vessel for sea trials. Fortescue's Singapore-flagged offshore supply vessel *Fortescue Green Pioneer* underwent an engine retrofit at Seatrium's Benoi Yard in Singapore to enable it to run on ammonia. Its ammonia storage systems, associated piping and seaworthiness were rigorously tested. The preparations included a two-day safety workshop jointly organised by MPA, Fortescue and Vopak which involved over 30 participants from various agencies. The workshop participants discussed the potential risks during the commissioning process, including fuel transfer and sea trial and the various prevention, control and mitigation methods.

A dynamic ammonia plume model was developed by A*STAR's Institute of High Performance Computing, the Technology Centre for Offshore and Marine Singapore (TCOMS), and Tropical Marine Science Institute (TMSI). This was used in MPA's risk and environmental impact assessment to forecast the dispersion path of the ammonia plume in case of accidental release. The model also guided operations during the fuel transfer and sea trial.

The *Fortescue Green Pioneer* set sail from Singapore to Dubai for the UN Climate Change Conference to showcase ammonia shipping technology. World leaders, captains of industry, and members and officials of international organisations were hosted on the vessel. In March 2024, we completed the successful trial of the world's first use of ammonia, combined with diesel, as a marine fuel when the *Fortescue Green Pioneer* returned to the Port of Singapore.



Fortescue, with support from MPA, government agencies, research institutes, and industry partners, successfully conducted the world's first use of ammonia, in combination with diesel in the combustion process, as a marine fuel. Here is the Singapore-flagged ammonia-powered vessel, *Fortescue Green Pioneer* (right), in the Port of Singapore in March 2024.

CHAPTER 03:

CHARTING OUR COMMITMENT TO THE ENVIRONMENT

Under the Singapore Green Plan 2030, one objective of the Long-Term Low-Emissions Development Strategy (LEDS) is for Singapore to achieve net-zero emissions by 2050. The public sector will take the lead in this and aim for net-zero by 2045. In line with these national objectives, MPA will track and report its carbon emissions, energy consumption, water consumption, and waste generation, as required under the GreenGov.SG initiative.

Overview of MPA's GreenGov.SG Targets and 2023 Performance

Greenhouse Gas (GHG) Emissions

GreenGov.SG Targets

Peak emissions by around

2025

and net-zero emissions by around 2045

(Emissions in tonnes CO_2e)

MPA's Targets

Peak Gross emissions around

2027

Indicator	Baseline	2023 Performance
Gross emission	NA	11,731 t CO_2e
Renewables	NA	111 t CO_2e
Net emission	NA	11,620 t CO_2e

Status

The addition of three new MPA buildings – the MPA Building at Tuas Terminal Gateway, the new Maritime House, and The WAVES – progressively over the next few years will add about 5,794 t CO_2e to the gross electricity consumption. MPA's emissions is expected to peak around 2027, at about 17, 000 t CO_2e.

Energy Utilisation Index (EUI)

GreenGov.SG Targets

10%

reduction in EUI by 2030, from average of 2018-2020 levels

(EUI in kWh/m^2)

MPA's Targets

121 kWh/m^2 by 2030

Indicator	Baseline	2023 Performance
EUI	135 kWh/m^2	110 kWh/m^2

Status

On track to meet the target.

Water Efficiency Index (WEI)

GreenGov.SG Targets

10%

reduction in WEI by 2030, from average of 2018-2020 levels

(WEI in litres/person/day)

MPA's Targets

GreenGov.SG WEI

28.6 L/person/day by 2030

Adjusted WEI

83.3 L/person/day by 2030

Indicator	Baseline	2023 Performance
GreenGov.SG baseline WEI	32 L/person/day	64 L/person/day
Adjusted baseline WEI	93 L/person/day	116 L/person/day

Status

GreenGov.SG baseline

By 2027, the WEI will increase significantly to about 74 L/person/day with the addition of three new buildings, which will be installed with water-cooled air-conditioning (AC) system to reduce the energy loading. An estimated 8,500 cubic metres (m^3) of water will be used monthly to run the water-cooled AC system, which will count towards the WEI.

A water-cooled AC chiller consumes 35% less electricity than an air-cooled AC chiller for the same cooling load[3].

Status

Adjusted baseline

For the purpose of establishing a more like-for-like comparison, MPA would meet its WEI target by about 11% by 2030 assuming water-cooled AC systems are used for MPA's current list of standard infrastructure.

Waste Disposal Index (WDI)

GreenGov.SG Targets

30%

reduction in WDI by 2030 from 2022 level

(WDI in kg/person/day)

MPA's Targets

0.351 kg/person/day by 2030

Indicator	Baseline	2023 Performance
WDI	0.502 kg/person/day	0.526 kg/person/day

Status

The bulk of the general waste is generated at MPA's public piers. In the coming year, we will conduct trials on various measures to reduce the generation of general waste and assess the efficacy of each measure.

3 35% energy savings for water-cooled AC chiller is derived from Table 2 in "Singapore Standards SS 530: 2014 + A1:2018 Code of practice for energy efficiency standard for building services and equipment" using Path A minimum efficiency integrated part-load value (IPLV) requirements for air-cooled, with condenser, electrically operated (≥ 528 kW, IPLV 4.137) and water-cooled, electrically operated, centrifugal (≥ 528 kW, IPLV 6.401). IPLV 4.137 = 0.2417 W electricity per W cooling and IPLV 6.401 = 0.1562 W electricity per W cooling. For each W cooling, water-cooled AC chiller consumes 0.0855 W (0.2417 W – 0.1562 W = 0.0855 W) less electricity than air-cooled AC chiller. This is about 35% less electricity (0.0855 W / 0.2417 W = 35 %).

Greenhouse Gas Emissions and Energy Utilisation Index[4]

In 2023, MPA's total Scope 1 and 2 GHG emissions amounted to 11,731 tonnes CO_2 equivalent (t CO_2e). Scope 1 emissions[5] accounted for 83 per cent while Scope 2 emissions[6] accounted for 17 per cent of the total emissions. MPA is on track to reduce EUI to 121 kWh/m^2 by 2030. However, MPA expects to peak its GHG emissions around 2027 due to the electricity consumption from three new buildings, with peak gross GHG emission expected to reach around 17,000 t CO_2e when the buildings are fully operational.

Emissions Performance Overview

Scope 1:

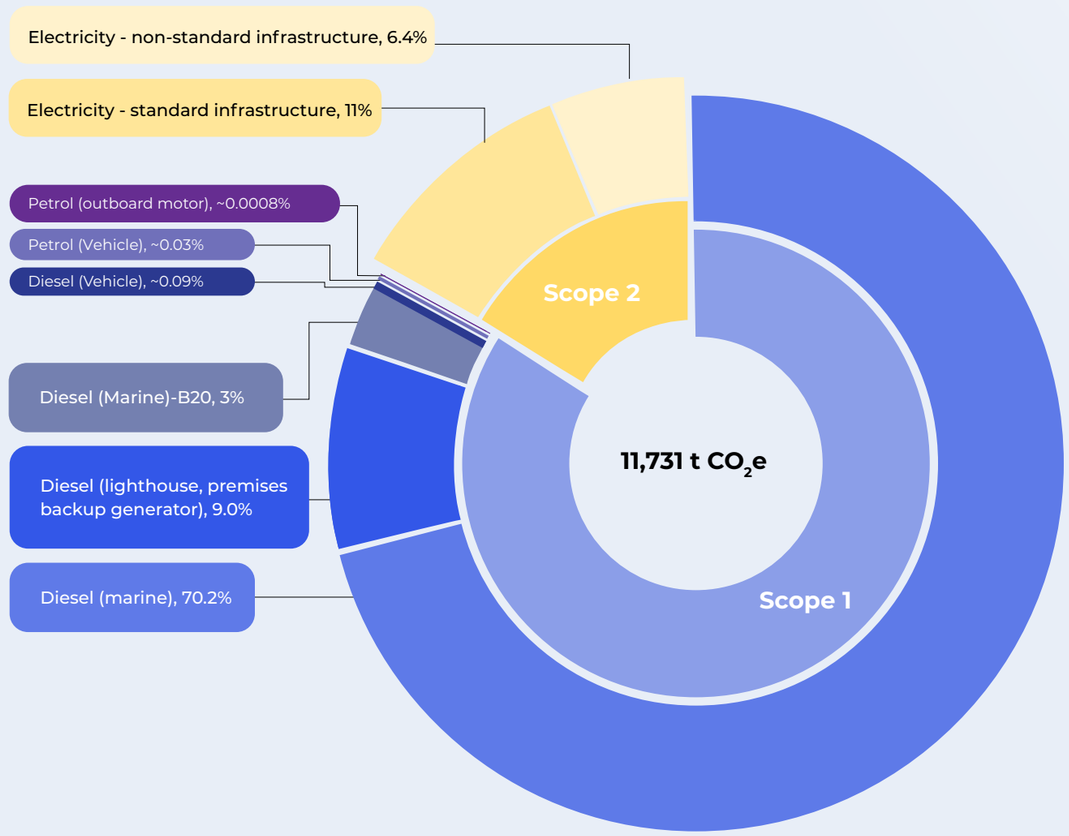
Vessels: Accounted for about 74 per cent of total emissions.

Vehicles and offshore sites: Contributed 9 per cent of total emissions.

Scope 2:

MPA facilities: Contributed 17 per cent of total emissions.

2023 Gross Emissions (t CO_2e)



	Scope 1	Scope 2	Total (Scope 1 and 2)
Gross Emission	9,694 t CO_2e	2,037 t CO_2e	11,731 t CO_2e
Emission Reduction		Renewable: 111 t CO_2e	111 t CO_2e
Net Emissions	9,694 t CO_2e	1,926 t CO_2e	11,620 t CO_2e

Notes:

1. MPA adopts the GHG Protocol Corporate Standard to calculate our GHG emissions. MPA's GHG emissions are calculated for our standard and non-standard infrastructure, operational vessels and operational motor vehicles.

2. Standard infrastructure refers to publicly accessible buildings with a computable gross floor area, such as MPA's offices and piers. Non-standard infrastructure refers to premises and assets that are either not publicly accessible or have no meaningful floor area, such as MPA's operational sites.

4 We use standards, methodologies, and assumptions based on the GHG Protocol and GreenGov.SG requirements for our GHG emission calculations. Fuel consumption data is sourced from monthly invoices and contractors.
Basic Formula: GHG Emissions (t CO_2e) = Activity Data × Emission Factor
Activity Data: The quantity of activity that results in GHG emissions, such as energy consumption, fuel use and production output.
Emission Factor: A coefficient that converts activity data into GHG emissions, typically expressed as emissions per unit of activity (e.g., kg CO_2e per kWh for electricity). The Emission Factor is based on the GHG Protocol's Emissions Factor for Cross-Sector Tools, 2006 IPCC Guidelines, and Singapore's Grid Emission Factor (GEF) from the Energy Market Authority (EMA). The GEF for 2023 onwards will be based on the GEF for 2022, the data for which is not available at the time of publication.

5 Scope 1 emissions are direct emissions from sources that are owned or controlled by the reporting entity.

6 Scope 2 emissions are indirect emissions that result from the use of purchased electricity, heat and steam.

Assumptions of projection:

Business As Usual (BAU) emissions: no extraordinary mitigation measures in place

Mitigation measure no. 1 (Scope 2 reduction):

- Three new buildings (TTG, MH, WAVES) are ZEB, SLE
- Lower EUI after office renovation and decommissioning of Data Centre
- Reduced office lease
- Other Energy Efficiency Measures (eg. Smart Building Management System)

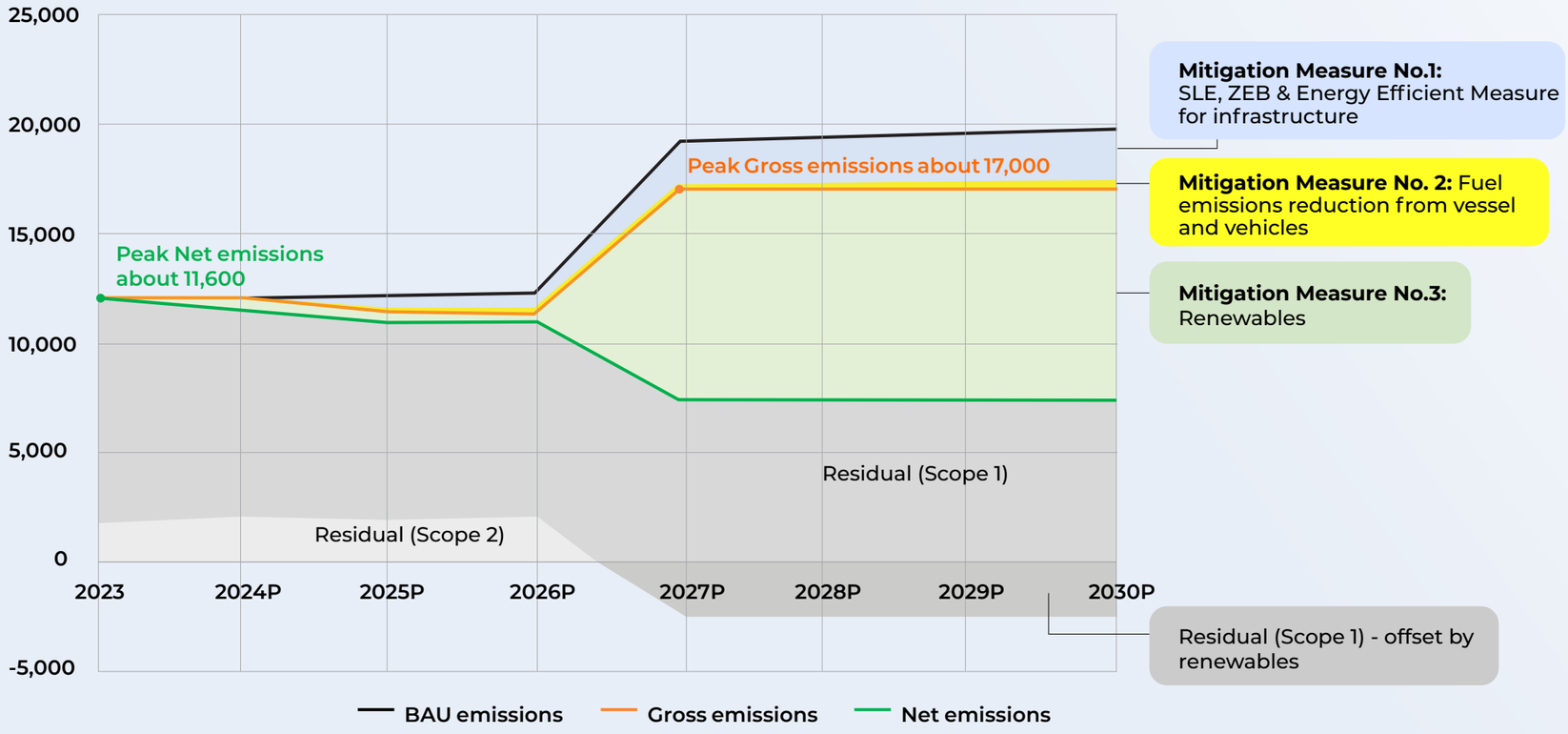
Mitigation measure no. 2 (Scope 1 reduction):

- Reduction of patrol craft and land vehicles
- Switch from fuel to solar for Raffles Lighthouse solarisation (net-zero) project

Mitigation measure no.3 (Gross emissions reduction):

- Use of renewables at Marina South Pier and MPA new buildings

Projected GHG emissions (BAU vs Gross vs Net Emissions) (t CO_2e)



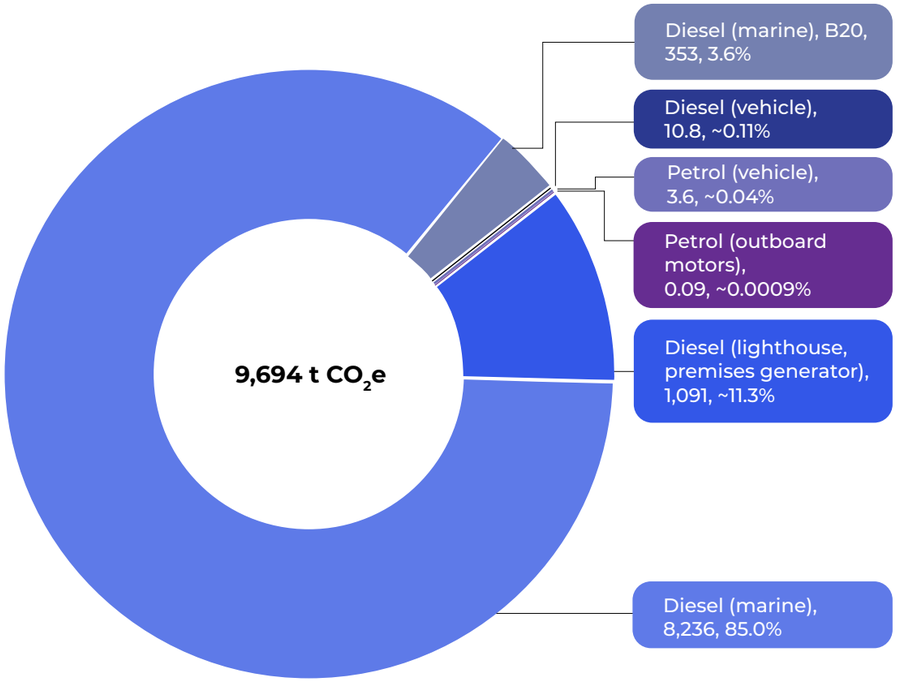
Total non-renewable energy consumption (GJ)	Total renewable energy consumption (GJ)	Total electricity consumption (GJ)	Total energy consumption (GJ)
125,110	6,863	17,599	149,572

Renewable Energy Category	Renewable Energy Source	Unit of Measure	Gross Total	Total (GJ)
Biofuel	Diesel (Marine) - B20	litres	163,420	5905
Solar	Solar Panels	kWh	265,970	958
Total				6,863

Scope 1

MPA's fleet of patrol craft, hydrographic vessels, garbage collection craft, and flotsam retrieval craft account for 89 per cent of our total Scope 1 emissions. The petrol and diesel used in our land vehicles, along with the diesel generators powering MPA's offshore operational equipment, account for 11 per cent of our Scope 1 emissions.

Scope 1 GHG Emissions (t CO_2e)



Our GreenGov.SG Strategy

1. **Leverage technology and greener fuels for patrol operations**
2. **Conduct remote and autonomous hydrographic operations**
3. **Reduce and electrify vehicles**
4. **Solarise offshore sites and waterfront facilities**

Mitigation Measures

1. **Patrol Operations:** The deployment of the patrol fleet is currently optimised for maximum coverage and minimal surveillance overlaps. MPA is exploring technology solutions to augment surveillance capabilities. By February 2025, the current fleet will be reduced from nine to eight patrol vessels. We will explore the use of electric and bio-fuelled patrol vessels for the next service contract in 2027.

2. **Hydrographic Operations:** MPA plans to make use of remote monitoring for maintenance of the navigation aids in our waters, with the aim of cutting physical inspection trips by half. All our aids to navigation are already being powered by solar energy. MPA also plans to make hydrographic surveys more efficient by using remote and autonomous technologies, so that we can potentially reduce our current fleet of five hydrographic vessels to four by 2026. Three of our five vessels can take biofuels. All our hydrographic vessels will be fully electric, compatible with net-zero fuels, or use B100 biofuel from 2030.

3. **Vehicle Reduction and Electrification:** MPA reduced its land vehicles from five to two in January 2024. The remaining two will be replaced with electric cars when their Certificates of Entitlement expire in 2025 and 2026 respectively.

4. **Solarisation of Offshore Sites and Waterfront Facilities:** MPA intends to harness a combination of solar, wind and micro-tidal energy across Tuas Port, MPA's piers and offshore locations, as set out in our renewable energy masterplan. By 2024, Pulau Satumu's Raffles Lighthouse will be outfitted with a solar photovoltaic (PV) and energy storage system with a planned solar generation capacity of up to 90,000 kWh per month. We are also exploring solarisation at Sultan Shoal Lighthouse. MPA's current solar generation capacity at Marina South Pier is 18,000 kWh per month on average. We plan to progressively increase the solar PV panel coverage at Marina South Pier to generate up to 1.7 million kWh per month. When fully implemented, Marina South Pier will become the first public maritime terminal to achieve net-zero emission. It will also be able to support charging of electric harbour craft (eHC) as part of the national eHC charging infrastructure.

Solar photovoltaic panels at Marina South Pier.

Scope 2

Electricity used to power MPA facilities and onshore operational equipment accounts for about 17 per cent of total GHG emissions.

Our GreenGov.SG Strategy

1 **Transition to green data centre**

2 **Implement smart facilities management**

3 **New net-zero and super low energy buildings**

Mitigation Measures:

1 Transition to Green Data Centre

Migration of on-premises IT servers to cloud:

By 2026, the IT server workload at the mTower data centre will be migrated to Government on Commercial Cloud (GCC) services and commercial cloud[7], such as Microsoft, AWS and Google, for systems supporting industry digitalisation. The decision on which commercial cloud to use will be based on their Power Usage Effectiveness (PUE) and sustainability considerations.

With migration to the cloud, all existing 28 Solaris physical servers, over 100 physical Windows servers and network equipment will be decommissioned. This is expected to save about 600,000 kWh of electricity a year.

In July 2023, Computer Room Air Conditioning (CRAC) cooling units in the mTower data centre were replaced with new more energy-efficient CRACs which has helped saved about 170,000 kWh in electricity consumption annually.

Green Mark Platinum Disaster Recovery Centre (DRC):

The DRC is an alternative data centre for mTower. It has been relocated to a new BCA Green Mark Platinum certified data centre. This new centre is designed with a Power Usage Effectiveness (PUE) of 1.3[8], compared to the PUE of 1.8 of the current DRC.

2 Smart Facilities Management (FM) for MPA Facilities

- In 2023, the number of light fittings in meeting rooms and pantries at mTower was reduced by 15 per cent.
- The indoor air temperature for central AC for mTower tenants was raised to 25 degrees Celsius from 24 degrees Celsius.
- Motion sensors and timers for lights were installed in corridors and pantries at mTower and Tanjong Pagar Complex. This is expected to save 1 to 2 per cent in total monthly electrical consumption.
- In 2023, all lights at MPA piers (Marina South Pier, West Coast Pier, and Changi Point Ferry Terminal) have been changed to LED lights.
- Daylight, occupancy and motion sensors, and time scheduling will be installed at mTower Level 20 and 21 new offices by 2024 and at POCC Vista by 2025.
- By 2027, a central integrated smart FM platform will be installed to monitor smart FM dashboards.

3 Net-Zero and Super Low Energy (SLE) Building Initiatives

MPA is also developing two net-zero energy and one Super Low Energy (SLE) buildings that can significantly reduce energy consumption and minimise carbon emissions. These new buildings are designed to achieve net-zero energy and SLE by integrating energy-efficient technologies, renewable energy sources, and intelligent building management systems. These include maximising natural ventilation and daylighting to reduce energy demand, implementing mixed-mode cooling, passive displacement cooling or active chilled beam cooling systems, LED lighting controlled by occupancy and daylight sensors, smart energy management system, and installing extensive solar photovoltaic panels with microgrid system. The three new buildings are slated for completion progressively over the next few years.

- **MPA Building at Tuas Terminal Gateway**

  This innovative green building will house MPA's operations and functions to support port operations in Singapore. It will also provide office space for shipping and port-related companies, and other complementary businesses within Tuas Port and the wider Tuas industrial district.

MPA Building at Tuas Terminal Gateway, the new Maritime House, and The WAVES are designed to maximise on-site generation of renewable energy, and achieve **energy savings of at least 60 per cent** above the 2005 BCA building codes commonly used as reference for Green Mark energy savings.

- **New Maritime House**

  This will be an inclusive facility that offers affordable accommodation for seafarers, a comprehensive international training and research hub, and a venue for international forums.

- **The WAVES at Marina South**

  This is envisioned to be a vibrant integrated maritime and lifestyle development, with sustainability embedded into the building's design. It will house various operations and maritime innovation hubs. The WAVES is also expected to provide an inviting waterfront space for families and communities to gather and have a great maritime experience.

Top: Artist's impression of the MPA Building at Tuas Terminal Gateway.
Bottom: Artist's impression of the new Maritime House building.

7 Migration to the cloud will involve only systems classified as Confidential (Cloud Eligible) and below. Critical Information Infrastructure (CII) systems are classified as Confidential and cannot be hosted on Government on Commercial Cloud. We will host CII systems in data centres with a lower PUE.

8 A PUE of 1.3 is the industry's gold standard for efficient data centre power utilisation.

Tuas Port: Trial of a Greener Innovative Foundation System

MPA partnered Nanyang Technological University (NTU) and PSA Singapore on this R&D project from 2018 to 2023 to develop an innovative Rigid Inclusion Piles foundation system to replace traditional reinforced concrete piles for constructing container yards. This new system uses soil arching to transfer loads from heavy container stacks to plain concrete columns embedded in the ground. Without any steel reinforcement, the Rigid Inclusion Piles foundation system is more cost-effective and faster to construct. It can also be demolished easily when the land is redeveloped. This method can greatly reduce the carbon footprint by:

- Using plain green concrete that incorporates recycled concrete aggregates and ground granulated blast-furnace slag (GGBFS)
- Eliminating the use of steel reinforcements
- Soil arching that replaces some concrete volume

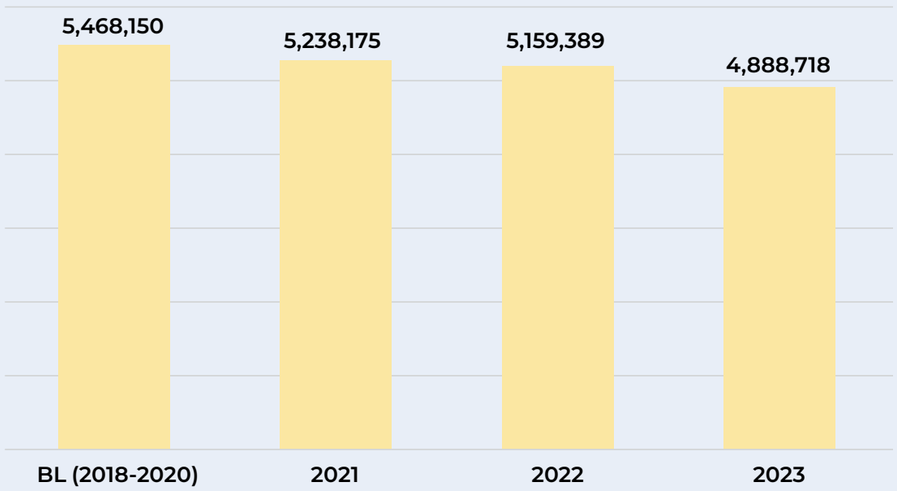
The pilot load test at PSA Tuas Port Phase 1 was completed in 2023 with positive results and feedback from the Building and Construction Authority (BCA).

The joint MPA-NTU-PSA team behind the innovative Rigid Inclusion Piles foundation system, a more cost-effective and sustainable solution.

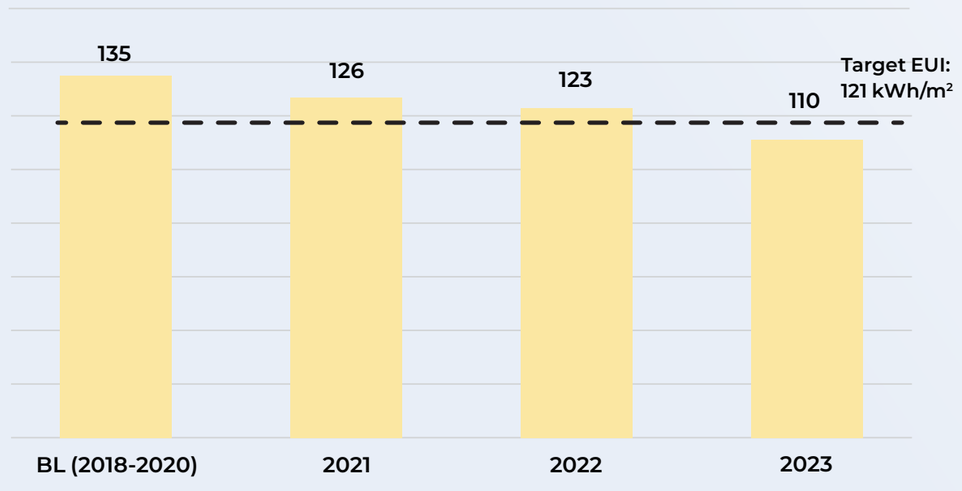
Electricity Performance Overview

Target: 10% reduction in EUI to 121 kWh/m² by 2030, compared to average of 2018-2020 levels.

Electicity Consumption (kWh)



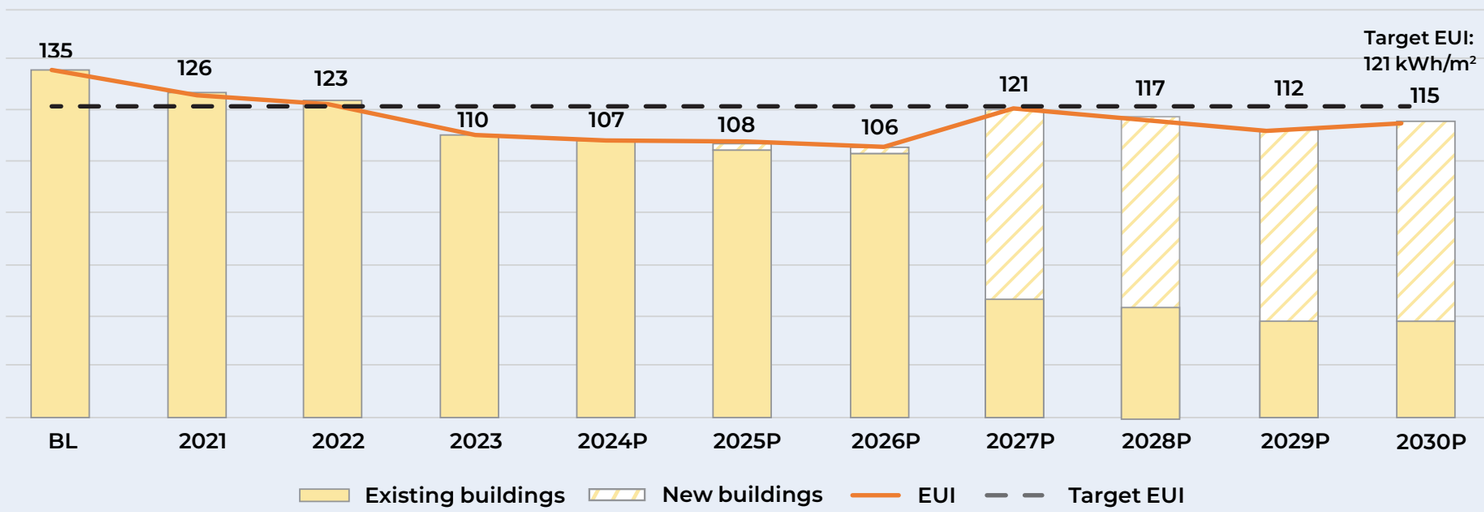
EUI (kWh/m²)



Notes:

1. EUI is defined as the total electricity consumed by a facility in one year divided by its total gross floor area (GFA).
2. The formula used to calculate the EUI is:
   (Total amount of electricity consumed in Year N) / (Total GFA in Year N)
3. Following GreenGov.SG requirements, electricity consumption is consolidated for both standard and non-standard infrastructure. EUI is calculated only for MPA's standard infrastructure.
4. Standard infrastructure refers to publicly-accessible buildings with a computable gross floor area, such as MPA's offices and piers. Non-standard infrastructure refers to premises and assets that are either not publicly accessible or have no meaningful floor area, such as MPA's operational sites.

EUI 2030 Projection (kWh/m²)



Our Water and Effluents Discharge Management

Water is used in all MPA's offices and facilities for both operations and amenities. MPA tracks our water consumption using two indicators: total water consumption and Water Efficiency Index (WEI).

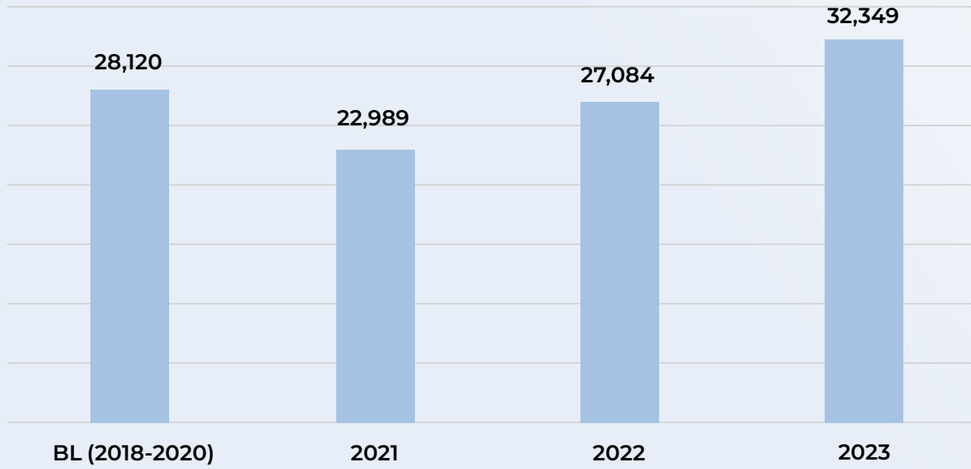
In 2023, MPA's total water consumption was 32,349 m^3. Marina South Pier (MSP) (61 per cent), West Coast Pier (WCP) (26 per cent), and Changi Point Ferry Terminal (CPFT) (5 per cent) accounted for around 90 per cent of the total consumption.

At MSP, a significant amount of water is used for maintenance activities. To reduce water consumption, we are using water-efficient jet spray at Pulau Brani Buoy Depot, and are exploring using seawater for initial cleaning of the landing steps at MSP followed by the use of minimal potable water.

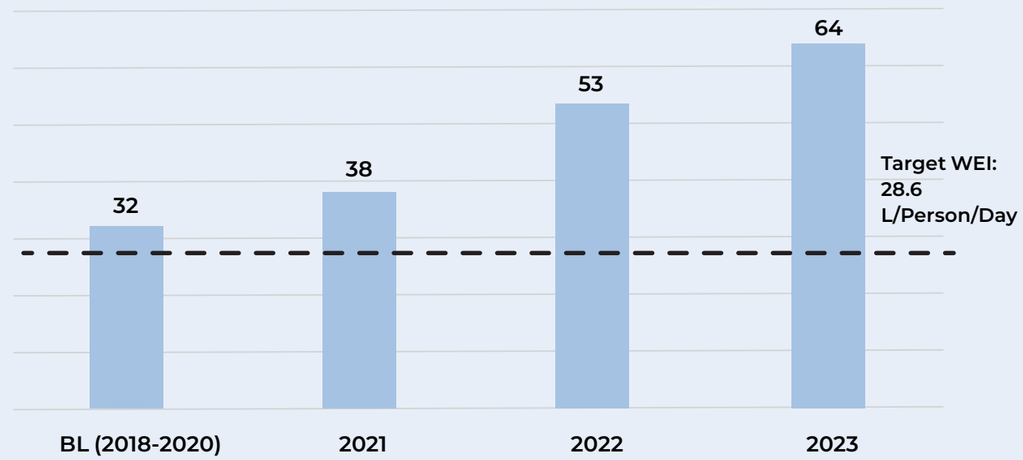
Water Performance Overview

Target: 10% reduction in WEI to 28.6 litres/person/day by 2030, compared to the average of 2018-2020 levels

Water Consumption (m^3)



WEI following GreenGov.SG Baseline (litres/person/day)



Notes:

1. WEI is defined as the water consumption per day divided by the total public officer headcount plus visitors.
2. The formula used to calculate WEI is:
   [Total amount of water consumed at all Agency premises in Year N × 1000] / [Average number of operational days in Year N at all Agency premises × (Average number of staff per day at all Agency premises + (0.25 × Average number of visitors per day at all Agency premises))]
3. The water consumed by MPA comes from a third-party water source – PUB, Singapore's National Water Agency.
4. Water consumption data is extracted from water utility bills.
5. Following GreenGov.SG requirements, water consumption is consolidated for both standard and non-standard infrastructure. WEI is calculated only for MPA's standard infrastructure where water consumption is managed by MPA.
6. Standard infrastructure refers to publicly-accessible buildings with a computable gross floor area, such as MPA's offices and piers. Non-standard infrastructure refers to premises and assets that are either not publicly accessible or have no meaningful floor area, such as MPA's operational sites.

Water Consumption Projection from 2027

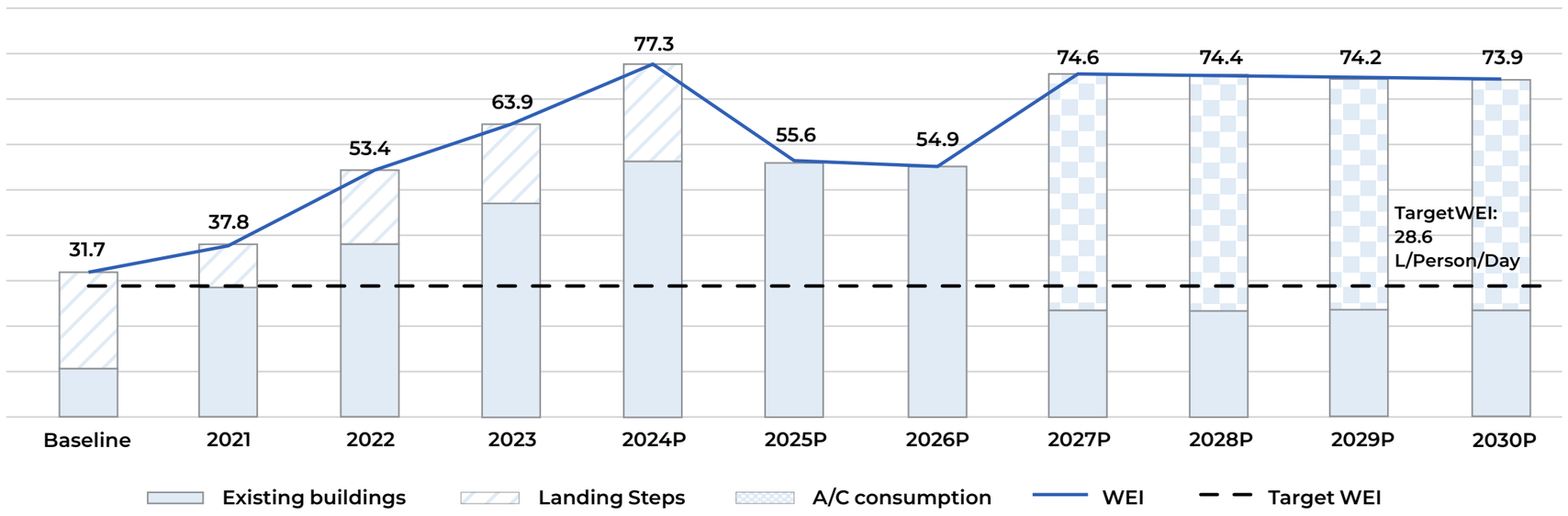
The 2030 target WEI of 28.6 L/person/day, set under GreenGov.SG, is a 10 per cent reduction from the average WEI measured between 2018 to 2020. This WEI baseline reference is low as most of the water consumed during that period were for amenities and facilities washing. With the addition of the three new buildings — MPA Building at Tuas Terminal Gateway, the new Maritime House, and The WAVES — we expect the total water consumption to increase to about 152,000 m^3 from the current 32,349 m^3 annually, primarily due to the use of water-cooled AC systems.

To conserve water, the new buildings will use energy-efficient AC systems featuring higher cycles of concentration (CoC)[9] and water-efficient fittings. The buildings will also be designed with lesser AC by maximising natural ventilated spaces and set higher temperatures in air-conditioned spaces. NEWater will also be used to replace water loss in the cooling cycle. The cooling tower will also be designed to minimise water droplets and mist from escaping in order to reduce water loss.

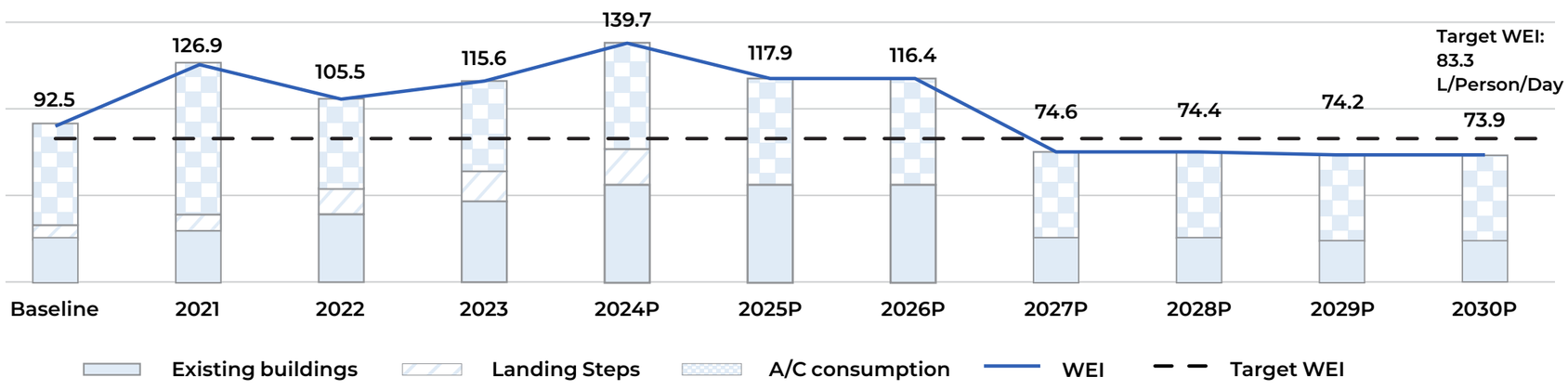
For the purpose of establishing a more like-for-like comparison, MPA would meet its target WEI by about 11 per cent by 2030 assuming that water-cooled AC systems are used for MPA's current list of standard infrastructure[10]. See WEI projection chart using adjusted baseline.

As for effluent discharge, we will ensure that the discharge from our facilities[11] complies with the regulatory limits under the Sewerage and Drainage Act (Chapter 294, Sections 72 and 74) and Sewerage and Drainage (Trade Effluent) Regulations enforced by PUB.

WEI projection following GreenGov.SG baseline (litres/person/day)



WEI projection following adjusted baseline (litres/person/day)



9 The theoretical number of times water circulates within the cooling tower system before being discharged. To increase the Cycles of Concentration (CoC), water quality monitoring system with automatic chemical dosage will be used.

10 Virtual AC water consumption from 2018 to 2026 is estimated using gross floor area from standard Infrastructure consisting of mTower, Integrated Simulation Centre and Maritime House, and deriving the cooling load (in RT) using typical cooling load from "BCA cooling load 2015 report" and typical cooling tower make-up water of 0.25 m^3/day/RT.

11 Facilities include mTower, Integrated Simulation Centre, Marina South Pier, West Coast Pier, Changi Point Ferry Terminal, POCC Changi, Woodlands Flotsam Jetty, and Pulau Brani.

Our Waste Management

Our target is to reduce general waste generation to 0.351 kg/person/day by 2030. As of 2023, our Waste Disposal Index (WDI) was 0.526 kg/person/day. Total waste generated was 279,878 kg. More needs to be done to meet our WDI target.

MPA currently engages the National Environment Agency (NEA)'s licensed e-waste collector to process our e-waste, such as data centre servers and equipment, office IT equipment and mobile devices.

	kg
Total Waste Generated[12]	**279,878**
General Waste[13]	263,260
Waste diverted from disposables by recycling	16,618
• Paper Waste	16,421
• Plastic Waste	90
• Metal/Can Waste	107

In 2023, we collected 16,618 kg of recyclables at our premises. To raise recycling rates, we have doubled the number of recycling bins at our sites, including MSP, WCP and CPFT, to encourage the public to minimise waste and recycle. We also intensified public education efforts with posters on recycling displayed at our sites, created in collaboration with environmental groups. We will continue to monitor the amount of general waste generated on a monthly basis and consider making improvements where we can.

Recycling Bins at Marina South Pier.

12 All waste is non-hazardous waste.

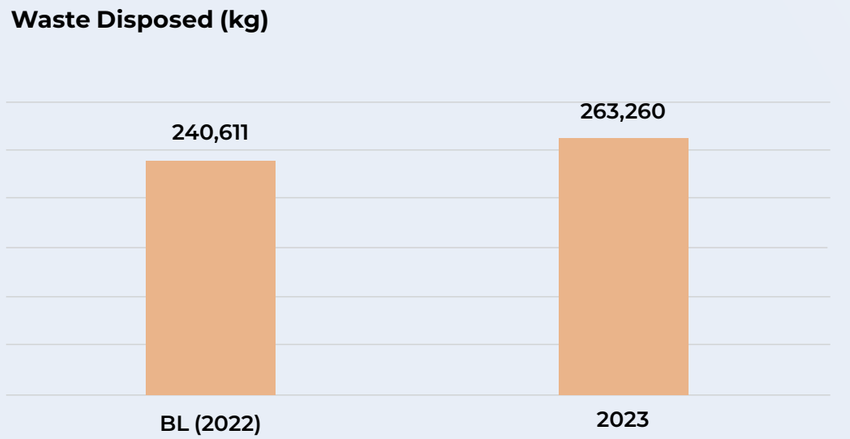
13 All general waste is diverted to disposal. MPA's waste is collected and disposed by the National Environment Agency.

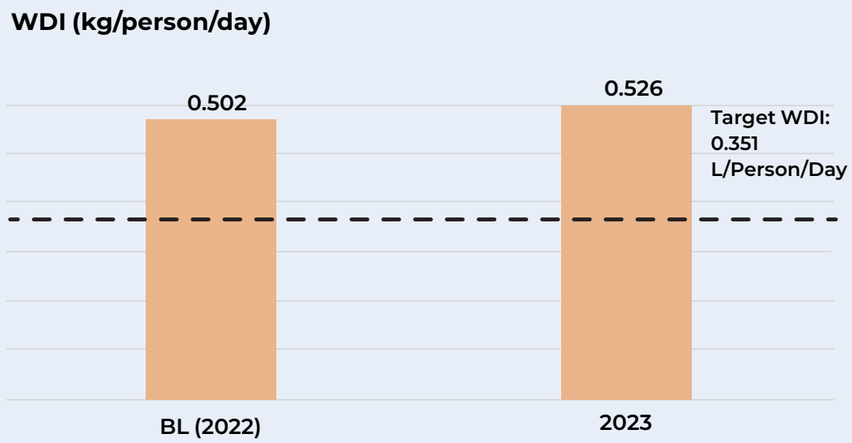
Waste Performance Overview

Target: 30% reduction in WDI to 0.351 kg/per/day by 2030, compared to 2022 levels.

Notes:

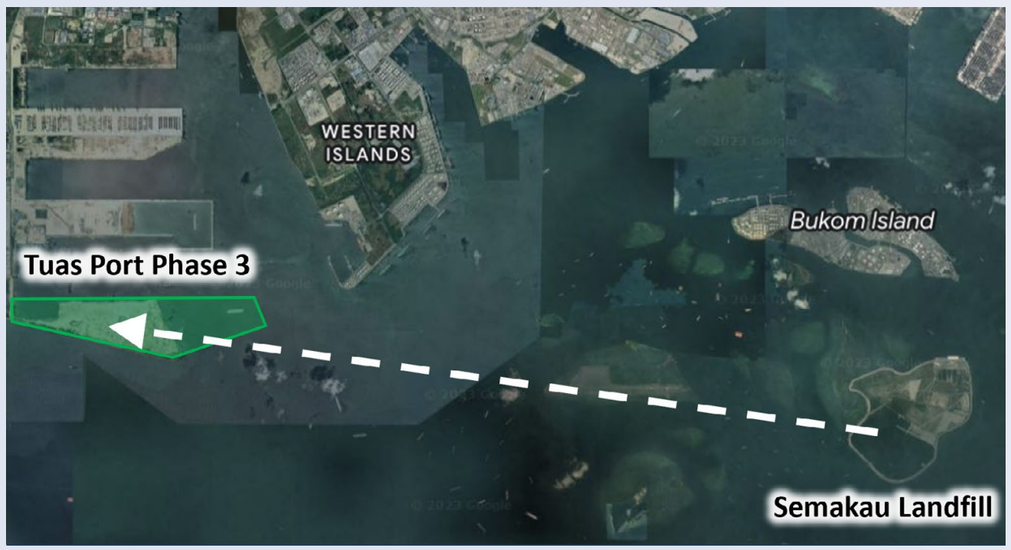
1. WDI is defined as the total waste disposed of per day divided by the total public officer headcount plus visitors.
2. The formula used to calculate WDI is: [Total amount of waste disposed of for all Agency premises in Year N] / [Average number of operational days in Year N for all Agency premises × (Average number of staff per day for all Agency premises + (0.25 × Average number of visitors per day for all Agency premises))]
3. Following GreenGov.SG requirements, waste disposed is consolidated for both standard and non-standard infrastructure. WDI is calculated only for MPA's standard infrastructure where waste disposal is managed by MPA.
4. Standard infrastructure refers to publicly-accessible buildings with a computable gross floor area, such as MPA's offices and piers. Non-standard infrastructure refers to premises and assets that are either not publicly accessible or have no meaningful floor area, such as MPA's operational sites.





Tuas Port: Exploring the Use of Treated Landfill Mixed Materials from Semakau Landfill for Land Reclamation

MPA is partnering NEA to explore using treated landfill mixed materials from Semakau Landfill as an alternative to sand for the reclamation works for Phase 3 of the Tuas Port development. To ensure that it is safe to use mixed materials for land reclamation, MPA and NEA are working with a geotechnical and environmental consultant as well as Institutes of Higher Learning to study the excavation and treatment of the landfilled mixed materials. If viable, this initiative will reduce a large amount of the sand required for reclamation fill and prolong the useful life of our Semakau Landfill site. Reclamation works for Phase 3 are expected to be completed in the mid-2030s.



Exploring the use of treated landfill mixed materials for the reclamation of Tuas Port Phase 3.

Responding to MPA's Climate Risks and Opportunities

MPA is proactively addressing climate risks and opportunities to future-proof Tuas Port. Built five metres above mean sea level, Tuas Port is designed to adapt to rising sea levels and extreme weather events.

The GeoSpace-Sea initiative by MPA provides sea level projections to support climate change adaptation plans. For example, the data is used by the Centre for Climate Research Singapore, operating under the NEA, to analyse rising sea levels. It is also used to develop PUB's Coastal-Inland Flood Model as well as analyses on the adequacy of coastal protection measures.

Risks and Opportunities	Potential Impacts	Potential Financial Implications	MPA's Response
Sea level rise and more extreme weather events like storm surge and strong wind gusts.	Disruption of port operations, such as flooding of the container terminal during storm surges.	Port operators may have lower revenue while facing higher operational expenses, such as maintenance costs to repair and replace damaged port equipment will rise.	1 Elevate Tuas Port to five metres above sea level. 2 Explore different strategies for flood protection and adaptation to maintain the port's resilience in the face of climate change effects. 3 Tuas Port Phase 1 and 2 use dredged seabed materials and excavated materials from land construction projects for land reclamation, so that there is circularity of resources. 4 For Phase 3, the use of landfill materials as alternative fill for reclamation is being considered.
Development of net-zero and super low energy buildings.	Minimise emissions with the lower energy requirement from these buildings.	Decreased expenditure as operational expenditure goes down because there is less use of energy.	In-depth energy modelling was carried out during early stages of the projects to identify the most practical pathway for each building to attain net-zero or super low energy.

CHAPTER 04:

SAILING WITH VALUES, ANCHORING ON PEOPLE AND CULTURE

At the heart of MPA's safety culture is a spirit of care and responsibility, of always looking out for one another. The senior management team leads by example to make safety a top priority. All MPA staff must be ready to talk about safety openly and easily, contribute ideas on how to strengthen the safety system, and raise concerns when there is a need to. MPA also has the responsibility to promulgate a safety-first culture in the maritime industry, and drive standards for the global maritime industry.

Anchoring Safety in the Workplace

MPA's Safety Management System

MPA has implemented a Safety Management System (SMS) which is aligned with industry best practices, including guidance as per the Ministry of Manpower document – "A Guide to the Workplace Safety and Health (Risk Management) Regulations". The SMS extends beyond our employees to include contractors working at MPA workplaces and sites.[14]

MPA's Chief Executive (CE) oversees the SMS, reporting directly to the Board. The CE is responsible for implementing our Environment, Health & Safety (EHS) policy and ensuring compliance.

The EHS Committee has representatives from various Divisions in MPA. It drives the commitment to safety across the organisation and facilitates communication on environment, health and safety issues between MPA and its stakeholders. There are regular meetings and engagement sessions to share safety information and updates. These include monthly updates on MPA's safety performance and systems, as well as relevant statistics. There are also regular site visits to understand on-site conditions and identify safety blind spots, so that we can proactively enhance safety processes. Six site walks were conducted in 2023.

The new EHS committee with MPA's Chief Executive, Mr. Teo Eng Dih at the 24 August 2023 Townhall.

14 In addition to our internal SMS, MPA also ensures compliance with the Ministry of Manpower's WSH requirements. These requirements include the Workplace Safety & Health (General Provisions) Regulations; Workplace Safety & Health (Incident Reporting) Regulations; WSH (Safety and Health Management System (SHMS) and Auditing) Regulations; WSH (Workplace Safety and Health Committees) Regulations; and Workplace Safety & Health (Risk Management) Regulations.

Hazard Identification, Risk Assessment & Risk Management

Under the SMS, we have established a Hazard Identification (HAZID) technique and Hazard and Operability (HAZOP) study process to swiftly identify, evaluate and mitigate potential hazards before an operation begins.

Safety is a priority for operations. MPA developed a detailed framework with industry, research institutes, unions and international partners to assess, test and conduct new fuel operations. Various components were progressively validated, and relevant personnel were trained before operations began. The lessons derived were then summarised for the international audience and submitted to partnership fora and the International Maritime Organization (IMO). One example was methanol, which has been carried as cargo for many years, but not used globally or on a large scale in new vessel engines for propulsion. Before carrying out the world's first ship-to-containership methanol bunkering operation in 2023, MPA worked with Institutes of Higher Learning and industry partners for over a year, conducting workshops, hazard analyses and emergency response drills. A HAZID and HAZOP workshop identified potential risks and developed corresponding prevention, control and mitigation methods. The effective risk management and preparedness during the methanol bunkering operation set a benchmark for the Port of Singapore's future use of new marine fuels and provides a reference for international standard setting.

National Maritime Safety at Sea Council

MPA formed the National Maritime Safety at Sea Council (NMSSC) in 2015. It brings together extensive expertise to promote safety, with members representing various maritime-related sectors and relevant government agencies. The Council serves as an advisory body to MPA on maritime safety matters, focusing on navigational safety issues. Besides raising maritime safety standards, it also supports safety initiatives and public campaigns to enhance awareness of navigational safety and promote the right practices.

There are four safety workgroups co-chaired by MPA and representatives from the industry.

The MPA-SSA Safety of Navigation Work Group focuses on improving the safety of navigation in and around Singapore waters.

The industry co-chair is from the Singapore Shipping Association (SSA).

The MPA-Harbour Craft Safety Work Group is dedicated to enhancing safety standards among harbour craft operators in Singapore.

The industry co-chair is from Tian San Shipping (Pte) Ltd.

The MPA-ARFO Safety Work Group's objective is to improve safety among regional ferry operators.

The industry co-chair is from the Association of Regional Ferry Operators (ARFO).

The MPA-Pleasure Craft Safety Work Group aims to raise safety standards in the pleasure craft community in Singapore.

The industry co-chair is from the Singapore Boating Industry Association.

Incident Reporting and Investigation

MPA management encourages staff to report incidents, near-misses and unsafe conditions without fear of blame, through the "myMPA" app. These reports are included in our Daily Situation Report (SITREP) emails and this enables timely intervention to address safety issues. Such reports will trigger immediate investigation by the affected division. The objective is to identify root causes and implement appropriate corrective and preventive measures. Findings from such investigations are reviewed at EHS meetings so that the lessons learned can be shared across the organisation. Incidents will be reported to senior management.

MPA also empowers our employees with the necessary knowledge and skills through a wide range of safety-related training. These cover the handling of emergencies, risk management, workplace safety, and community emergency preparedness. MPA's training programmes include first aid courses, safe transfer at sea training, firefighting courses, and occupational first aid. MPA officers have recorded at least 2,000 hours in such training programmes. MPA also provides specific-to-task training, such as methanol bunkering training for Marine Environment & Safety officers and managing work-at-height courses for marine surveyors and technicians.

Safe Transfer at Sea Task Force: Safe transfer of persons between vessels at anchorages

MPA and the Ministry of Manpower set up the Safe Transfer at Sea Task Force in March 2023 to develop protocols for the safe transfer of personnel at sea.

A Safety Alert[15] was also issued on July 2023 to remind workers about the measures they should take to ensure their personal safety and well-being when transferring between vessels. The following are the key recommendations of the Safety Alert.

Risk Assessment: Conduct thorough risk assessments to identify hazards associated with personnel transfers.

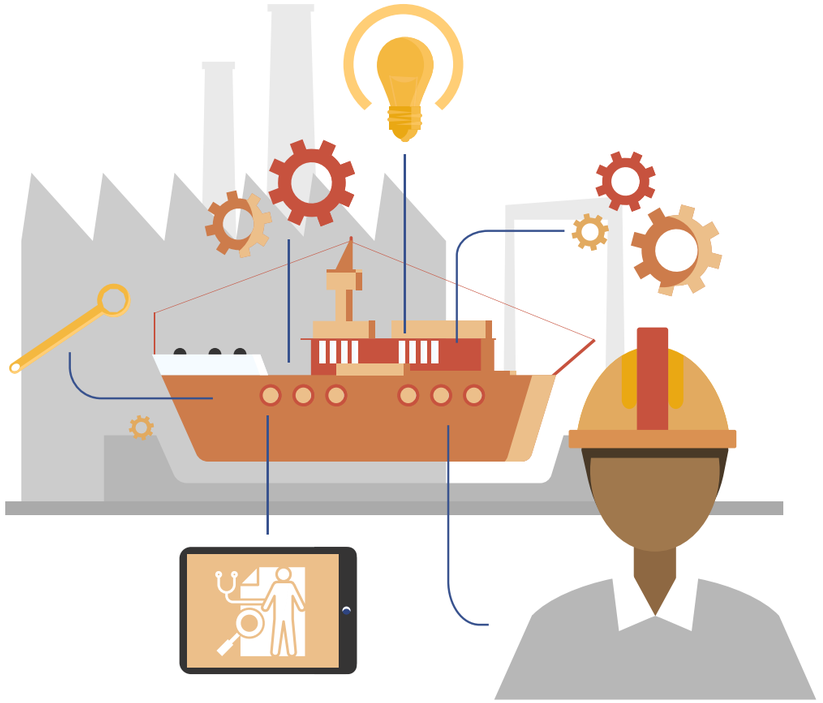
Improved Boarding Arrangements: Ensure safe and suitable boarding arrangements, such as properly rigged pilot ladders.

Personal Protective Equipment (PPE): Mandate the use of SOLAS type-approved lifejackets and other appropriate PPE.

Training and Awareness: Provide comprehensive training and safety alerts to enhance situational awareness among maritime personnel.

In 2023, four work-related incidents were reported. Two involved MPA employees who suffered minor injuries; these were not due to unsafe work conditions. Another two involved MPA contractors. One had a fall on a MPA patrol craft. The other collapsed while working at Tuas Port and passed away; the Ministry of Manpower has not completed its investigation into this incident.

	Employees		Workers	
	Number	Rate[16]	Number	Rate
Recordable work-related injuries	2	0.24	1	N.A.[17]
High-consequence work-related injuries	0	0	0	0
Fatalities	0	0	1	0



15 Shipping Division Safety Alert titled "No.1/2023 – Safe Transfer of Persons Between Vessel at Anchorages": https://go.gov.sg/mpa-srs-1-23

16 The rate is calculated using the formula: (Number of recordable work-related injuries/number of hours worked) per 200,000 hours worked.

17 The total number of contractor workers is not tracked and hence the hours worked by contractor workers are not recorded.

Safeguarding Maritime Safety and Public Health

Singapore is a key gateway for international trade and travel. Ensuring both maritime safety and public health not only sustains the economic and social benefits from maritime trade and activities, but also protects lives and the environment.

As the flag Administration for Singapore-registered ships, MPA oversees the Flag State Control to ensure that these ships comply with international and national rules and regulations covering maritime safety and security. MPA also performs Port State Control (PSC) inspections to check that visiting foreign ships comply with international regulations and ships leaving the port meet international safety and security standards. Click here for inspections conducted by MPA.

As a signatory of the MARPOL Convention, Singapore enforces stringent measures to prevent pollution. MPA patrol craft and the Port Operations Control Centre keep close watch on the activities of ships in our port waters. MPA also provides garbage collection services for vessels at the anchorages and operates a flotsam retrieval craft.

MPA demonstrated its commitment to the safety of seafarers, vessels and the maritime environment with some significant improvements and activities in 2023. These included:

- **Ferry Rescue Exercise (FEREX):** This is an annual multi-agency exercise to test Singapore's emergency response capabilities. In 2023, the exercise simulated an electric ferry mishap after it caught fire from an overheated battery. Over 180 personnel, eight vessels, and a helicopter were involved. Besides ferry operators, agencies such as the Singapore Police, Navy, Air Force and Civil Defence Force participated. Lessons from the exercise will be drawn for enhancements to our emergency response capabilities.

- **Medevac Operations and Rescue Operations:** MPA was involved in nine search and rescue operations and nine medical evacuations.

- **Vessel Traffic Information System (VTIS) Upgrade:** There was a mid-life upgrade of the VTIS and enhancement of radar systems at remote sites to improve vessel detection capabilities.

- **Integrated Port Operations C3 (IPOC) system:** MPA's incident response management and safety enforcement have been enhanced with the development of the IPOC system, which offers comprehensive situational awareness of the activities in our port waters. The IPOC capabilities will be progressively phased in from 2023 to 2026. Phase 1 of the IPOC system was delivered on 1 March 2024, augmenting MPA's capability to manage maritime incidents and streamline daily maritime safety enforcement operations.

- **Singapore Registry of Ships (SRS):** The SRS has very good safety and PSC records. It is ranked 3rd and 4th at Tokyo MoU and Paris MoU (Memoranda of Understanding) respectively. The MoUs, which cover the Asia-Pacific and North Atlantic regions, aim to eliminate substandard ships through harmonised inspections and enforcement measures.

Missing Singapore-Registered Vessel *Success 9* Found

MPA coordinated a multinational search operation to locate Singapore-registered ship *Success 9* following a distress call on 10 April 2023. The operation was supported by the Information Fusion Centre (IFC) at the Changi Command and Control Centre (CC2C), the Monrovia Regional Maritime Rescue Coordination Centre (MRCC) and coast guards and maritime administrations of Cameroon, Ivory Coast (Côte d'Ivoire), Ghana, Guinea, Liberia, Nigeria, and Sierra Leone, as well as passing commercial ships. MPA also used imagery technology supported by ST Engineering Geo-Insights & the National University of Singapore Centre for Remote Imaging, Sensing and Processing (CRISP) to help coordinate the search.

Success 9 was located on 15 April 2023 by the commercial vessel *Monjasa Sprinter* and all crew were found safe and in good health.

The MPA team coordinating the search for the missing *SUCCESS 9* vessel.

Working with the Community to Promote Maritime Safety

The International Safety@Sea Week was launched by then Acting Minister for Transport, Mr. Chee Hong Tat.

The Letter of Intent to establish METF was signed by MPA and 22 METF partners comprising global marine engine manufacturers, international organisations, classification societies, trade associations, unions, and Institutes of Higher Learning, at the SMW 2024 opening ceremony.

The annual International Safety@Sea (IS@S) Week is organised in collaboration with the National Maritime Safety at Sea Council (NMSSC). Maritime professionals from around the world meet at workshops and seminars to discuss safety issues and share best practices on maritime safety.

Volunteer Programme

During IS@S Week 2023, MPA and NMSSC announced that they were developing a new Community Volunteer Programme. This pilot initiative aims to build and train a network of community volunteers to support search and rescue efforts in Singapore waters.

International Safety@Sea Awards

This Award recognises outstanding contributions to maritime safety. In 2023, NYK Shipmanagement Pte Ltd (NYKSM) and Pacific International Lines (PIL) were honoured for their significant roles in Search and Rescue (SAR) operations.

Maritime Energy Training Facility (METF)

To strengthen our position as a leading bunkering hub, MPA is working closely with industry stakeholders to develop regulations and training standards for the safe handling of green fuels such as methanol and ammonia. The METF was conceptualised in 2023 as a key initiative to equip the maritime workforce with the necessary competencies to handle the new fuels that will support the industry's transition to cleaner energy. It will offer specialised training programmes and cutting-edge facilities to prepare maritime professionals for the challenges and opportunities presented by the new energy sources.

Collaboration for Public Health Crisis Preparedness

MPA is working with the Ministry of Health to review the responses for future pandemics. MPA also supports national efforts with border health screening at sea checkpoints to minimise the risk of importing diseases.

A Fair and Safe Workplace

People are central to MPA's performance and excellence. We strive to create a workplace that fosters a sense of belonging and pride. We attract talent through fair employment practices and equal opportunities. We strive to build an engaged and resilient workforce which values continuous learning.

MPA is committed to a non-discriminatory work environment. This is part of our ethics policy and informs conduct and discipline in our organisation. We ensure that all reports are processed and feedback is gathered from relevant parties to ensure the thorough and fair resolution of all reported cases. In 2023, there was one reported incident of discrimination which MPA investigated. Necessary actions were taken and the case was closed.

Our Fair Employment Practices

MPA's human resource strategies align with the Tripartite Guidelines on Fair Employment Practices by the Ministry of Manpower (MOM), National Trades Union Congress (NTUC) and Singapore National Employers Federation (SNEF). These guidelines help us maintain a diverse and inclusive workforce and safeguard the rights and welfare of every staff member. Our terms of employment are also guided by Singapore's legislation, including the Employment Act 1968 and the Retirement and Re-employment Act 1993.

MPA's comprehensive benefits package is extended to both full-time and part-time employees. This includes work related insurance, such as work injury compensation insurance, travel insurance, and a range of leave and benefit schemes to support officers' needs. These benefits include vacation leave, child-care leave, family care leave, medical outpatient schemes, annual health screening and flu vaccinations.

Family-friendly Employment Practices

MPA recognises the important role that both parents play in a child's development and support our employees' parenting journey by providing parental leave to both male and female employees.

During the reporting period, 31 employees took parental leave. Of these, 24 were males and seven females. 87 per cent of those who returned to work continued to remain in the organisation a year later.

	Female	Male
No. of employees who took parental leave	7	24
No. of employees who returned to work after taking parental leave	7	24
Return to work rate[18]	100%	
No. of employees who returned to work after parental leave ended in FY2022 and were still employed 12 months later	7	20
Retention rate[19]	87%	

MPA reviews our employment practices regularly to ensure our employees are able to balance work demands, personal time, and their various personal responsibilities at home. We offer flexible work arrangements such as staggered hours, part-time employment, job sharing and work from home. MPA is also aligned with the lead taken by the Public Service to raise retirement and re-employment age one year ahead of the national schedule.

MPA's commitment to fairness extends to our procurement practices. There is a growing trend towards open sourcing, with almost one-third of our purchases now done through open sourcing.

MPA respects all our employees and gives equal consideration to all applicants in our recruitment, regardless of ethnicity, gender, religion, nationality, age, and physical ability.

MPA is committed to diversity in our governance body (the Board) and workforce. We recognise the value of varied perspectives and experiences. In 2023, MPA's Board comprised 81 per cent males and 19 per cent females. Of these, four members were aged 30 to 50 years and 12 members were over 50 years old, highlighting a wealth of senior leadership experience.

18 The 'return to work-rate' is defined as the percentage of employees who returned to work after parental leave in comparison against the total number of employees due to return to work after taking parental leave.

19 The 'retention rate' is defined as the percentage of employees retained 12 months after returning from parental leave in the previous FY.

Staff Engagement

To better understand employee motivations and support MPA's transformation efforts, we have implemented various engagement initiatives. These activities are designed to enhance interaction and communication between management and staff throughout the year. Key initiatives include:

MPA Values Week – This is an annual celebration of our FIRST Values, and helps us foster unity and reinforce our core values. The one in 2023 featured lunch outings, a charity flea market, and our first townhall meeting of the year where staff were honoured with FIRST Awards.

Mr. Qamaruzzaman Bin Zainudin, Senior Driver (Procurement & Admin), and his two colleagues were recognised as MPA's Overall FIRST Champions.

MPA Townhalls – These are regular meetings to update officers on maritime developments, HR matters, and MPA CARES events. These sessions foster open dialogue between staff and leadership, and promote transparency and inclusiveness.

MPA Senior Management engaging MPA officers during the 19 January 2023 Townhall.

Dialogue Sessions and Site Visits with CE and Senior Management – In 2023, we held more than 10 dialogue sessions, including visits to vessels and the Port Operations Control Centre (POCC). These interactions were held during festive periods to show appreciation for the staff's dedication and to gain insights into their daily experience.

Mr. Chee Hong Tat, then Senior Minister of State for Transport, and MPA Senior Management visited POCC Vista and POCC Changi to celebrate Chinese New Year with MPA officers.

Employee Wellness and Well-being

MPA fosters a nurturing work environment with schemes that support personal and professional growth, as well as physical and mental health.

1. **Personal Development Fund**: This is available to employees with over two years of service and can be used for fitness activities or hobbies for a balanced lifestyle.

2. **Bursary Awards and Book Prizes:** These awards support the educational needs of employees' families and emphasise the importance of family and education.

3. **Annual Health Checks, Flu Shots, and Wellness Activities:** MPA sponsors our staff for annual health screenings and flu vaccinations. They also have access to wellness activities such as sports interest groups. This is to encourage and support them in maintaining good health and their well-being.

4. **Appreciation:** MPA gave tokens of appreciation to our staff in recognition of their hard work during the COVID-19 pandemic and to show our gratitude.

5. **Wellness Ambassadors:** In 2023, MPA introduced the Wellness Ambassadors initiative. The ambassadors are trained to offer a first round of mental and emotional support to their colleagues. The Wellness Ambassadors also help to organise welfare activities designed to enhance wellness and foster a supportive community. The activities included succulent potting, art jamming, and cardio kickboxing.

Workforce Upskilling and Reskilling

MPA has established technical competency frameworks for specialised roles and also used Whole-of-Government frameworks to draw up indicators that contribute to work productivity and good performance. This helps staff to identify ways by which they can improve to perform at their best.

The frameworks guide their learning and are complemented by over 100 courses offered by the MPA Academy (MPAA) to enhance technical skills and competencies. With this upskilling, our staff can gain niche certifications in their domains, such as Auditor Qualifications for International Safety Management, International Ship and Port Security, International Labor Organisation/ Maritime Labor Convention, and Certificate of Competency in Marine Engineering.

110 Average training hours per employee

Average training hours per employee	
Female 100	Male 116
Managers 151	Non-managers 101

Training and learning opportunities for MPA staff

Specialist Skills Development

Training for Vessel Operators, Supervisors, Marine Officers and Engineers ensures our team is equipped with the latest industry knowledge.

Professional Development Training

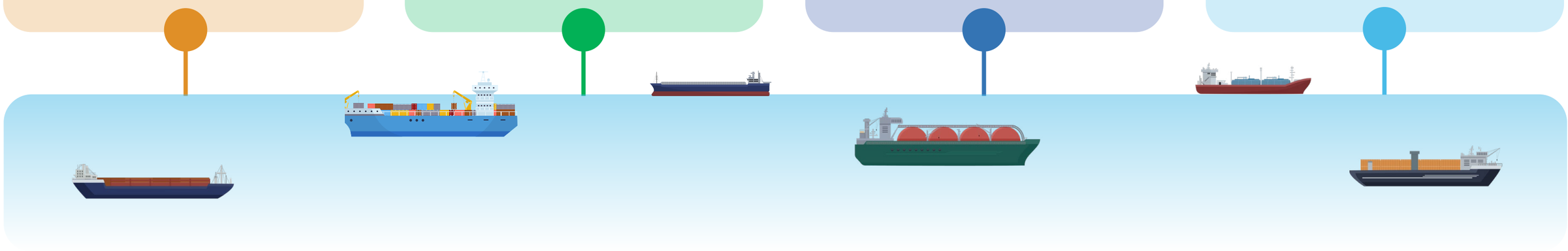
Courses on maritime decarbonisation, sustainability, and specialised training in methanol firefighting prepare our staff for innovations and future challenges.

Technology Proficiency Enhancement

Our staff take courses in Large Language Models, Prompt Engineering, and Robotic Process Automation (RPA) so that they can make good use of cutting-edge technology.

Industry Sharing

Sessions include geopolitical developments and strategies for preventing corrupt practices keep our staff informed and prepared.



Employee Advancement and Development

Beyond formalised training, we have developed four key initiatives in collaboration with our partners to provide career guidance.

On-the-job training in collaboration with industry partners

This offers our staff on-the-job training through overseas attachments with industry partners. MPA recently partnered with the American Bureau of Shipping to set up a Surveyor Attachment Programme. This provides overseas on-the-job training in advanced shipping technologies, remote surveys, and carbon efficiency evaluation.

MPA's In-Service Sponsorship Programme

This supports our staff when they want to acquire skills in new domains. It gives them opportunities to rotate to other jobs when there are openings. For example, an employee may transition from a role in Human Resources to formulating licensing measures and manpower development policies in the harbour craft sector.

Lifelong Employability & Accelerated Programme

This prepares experienced staff aged 50 and above for successful career transitions after they retire from MPA. There are three phases in the programme: Build Awareness to prepare them for the next phase of life; Training & Support to enable lifelong learning and employability; and Career Facilitation by providing career advisory and reimbursement for holistic training with the Personal Development Fund.

Certified Career Coaches and the Career Development Committee (CDC)

This provides ongoing career guidance and support in navigating professional journeys. The CDC is helmed by some members of our senior management team and meets regularly to discuss career and talent development matters. These include policies, implementation of new initiatives and career plans for our staff.

MPA has also appointed some staff to undergo career coach training to better support their colleagues. They also contribute to the Public Service's network of career coaches.

Sustainability Awareness and Education

MPA introduced the Sustainability Level 1 Course for our employees in December 2023. The course focuses on global warming trends, climate science, and Singapore's climate change policies. A set of sustainability-related training courses was also curated to deepen our staff's understanding of sustainability reporting, sustainable finance, carbon accounting, and sustainability practices.

In-house facilities operations managers will complete either the Green Mark Accredited Professional (GMAP) or Singapore Certified Energy Manager (SCEM) Professional certification.

MPA employees attending the Sustainability Level 1 Course to enhance their understanding of key environmental issues and sustainability practices.

Supporting Career Transitions for Older Employees

MPA is committed to supporting our older employees in making career transitions so that they can continue to do meaningful work and contribute their valuable experience to the organisation.

Ms. Noor Asiah Bte Nordin was transferred to the Singapore Maritime Gallery (SMG) on 1 April 2023. She now manages daily operations at SMG, helping to attend to visitors' queries and feedback, ensuring that the gallery exhibits are functioning, troubleshooting where necessary, and liaising with vendors and contractors.

Ms. Noor Asiah Bte Nordin at the Singapore Maritime Gallery.

Employee Performance Appraisal and Feedback

The formal staff performance appraisal process ensures that each staff member receives a comprehensive evaluation of their work which aligns their contributions with the organisation's goals. At the start of each year, all divisions must put up workplans which state the key projects and milestones to be achieved. These include development plans for upskilling their staff in their respective domains of expertise.

The workplans are reviewed by MPA's Senior Management, and then referenced in the mid-year and end-year appraisals when the staff is assessed on their work contributions. To ensure a holistic review of every person, competency frameworks are referred to and other managers are asked for their assessments.

Senior management and heads of departments are expected to conduct regular check-ins and maintain an open door policy so that they are more responsive to support staff members in their professional development and career decisions.

In 2023, all employees participated in the performance and career development review.

Fostering Positive Community Impact

MPA is committed to making positive contributions beyond our immediate professional work. We do so through philanthropic and community initiatives which make an impact. These include biodiversity awareness and conservation, often working in collaboration with like-minded partners.

MPA CARES

The MPA CARES Committee, headed by the Chief Care Officer (CCO), oversees the well-being and welfare of our employees and organises activities in support of MPA's adopted social service agencies. Through these community efforts, we aim to make a meaningful difference in the lives of those we serve.

Fund Raising Events

MPA Fund Raising Charity Bazaar 2023 with MINDS & REACH

In collaboration with Reaching Everyone for Active Citizenry @ Home (REACH) and Movement for the Intellectually Disabled of Singapore (MINDS), we organised a fundraising event that mobilised over 25 volunteers to set up and manage various bazaar booths. The event raised S$6,675, which was donated to the two charities.

Highlights include:

- A MINDS outreach booth providing information on programmes and activities.
- The sale of Chinese New Year goodies and handmade crochet bouquets and dolls.
- A REACH outreach booth sharing information on their programmes and activities.

MPA officers participating in the MPA Fund Raising Charity Bazaar 2023 with MINDS and REACH.

End of Year Fundraising Event

To celebrate the festive season, MPA CARES organised a Christmas party for beneficiaries of REACH and MINDS.

Appreciation of Arts

REACH's Wall Mural

MPA supported the creation of a wall mural at REACH's new welfare service centre at Teck Whye Vista. Over a dozen MPA volunteers collaborated with REACH's seniors to paint the mural and set up the new centre.

MPA officers participating in the wall mural painting at REACH's Teck Whye Vista welfare service centre.

Awareness Programmes

Ministry of Transport (MOT) Family Charity Outreach 2023

The event was organised by the MOT Family in partnership with Fei Yue Community Services in support of Community Chest. The event featured activities to promote planting greeneries and encourage gracious behaviour in the community.

Friends of Community Care (FOCC) Award 2023

The FOCC Awards by the Agency for Integrated Care (AIC) honour contributions to the Community Care sector by external partners. The criteria for the award include impact, commitment, and innovation. MPA received the 2023 FOCC Award in the Government and Public Institution Category for significant support to the Community Care sector.

Mr. Teo Eng Dih, MPA's Chief Executive, receiving the Friends of Community Care 2023 Award from Mr. Ong Ye Kung, Minister for Health.

Community Chest Awards 2023

MPA received the Community Chest Charity Bronze Award for our donations to Community Chest, and the SHARE Gold Award for our participation in SHARE contributions to support social service agencies and their beneficiaries.

Biodiversity Conservation and Environmental Stewardship Partnerships

MPA actively pursues and supports initiatives to promote biodiversity awareness and environmental stewardship, working closely with various stakeholders.

Pulau Satumu

Hawksbill turtle hatchlings emerging from nests along Pulau Satumu shoreline.

MPA worked with NParks to set up barricades to protect the hatchlings from predators.

Pulau Satumu's sandy shoreline, covering approximately 300 m^2, is a frequent nesting ground for turtles, including the endangered hawksbill turtle.

In 2023, during the nesting season from June to September, a total of

73 hatchlings

emerged from nests along this shoreline.

MPA's Hydrographic Division worked closely with the National Parks Board (NParks) to increase the hatchlings' chances of survival. NParks officers trained MPA's lightkeepers to identify the hawksbill turtle and their nests. During the nesting season, lightkeepers monitored the beach closely, and barricades were set up to protect the hatchlings from predators.

The upcoming implementation of the Solar PV and Energy Storage system at Pulau Satumu will include measures to minimise its impact on local biodiversity, such as reducing the impact on habitats of conservation significance, and avoiding work at night where practicable so that light does not disturb fauna activities.

MPA will continue to monitor and conserve the biodiversity habitats in the intertidal, nearshore and offshore areas around Pulau Satumu, with biodiversity surveys conducted in the first quarter of 2024.

Sustainability and Biodiversity Initiatives at the Singapore Maritime Gallery

The Singapore Maritime Gallery reopened in April 2023 with refreshed highlights on maritime innovation, digitalisation and decarbonisation. It now serves as a collaborative hub for events and programmes promoting sustainability and maritime biodiversity. The gallery drew over 21,000 visitors in 2023 after it reopened.

Key collaborations to enhance biodiversity awareness.

Crafted yarn corals were displayed on a life-size coral reef structure, symbolising coral conservation efforts.

Content was co-created with River Valley High School's Eco-Sustainability Leadership Academy to educate the public on the environmentally-friendly fuels which will be the future of green shipping.

Coastal Natives' award-winning augmented reality artworks under AR.T for the Ocean were showcased on World Oceans Day to highlight ocean conservation.

Intertidal Walk at Pulau Satumu

In November 2023, MPA collaborated with the Lee Kong Chian Natural History Museum to conduct an Intertidal Walk at Pulau Satumu for the public to learn more about the rich biodiversity in that area.

Participants of the intertidal walk organised by Lee Kong Chian Natural History Museum in collaboration with MPA in November 2023.

Singapore Regatta 2023 Coastal Clean-up

16kg
of litter collected

Volunteers from MPA joined forces with community partners to clean Pasir Ris Park.

Paddle for a Purpose 2023

500
participants came together for the ocean conservation and biodiversity cause

MPA supported the event organised by the Ocean Purpose Project, which combined sports, ocean conservation, music, film, and a beach clean-up.

Earth Hour 2023

1 HOUR
of reduced lighting across multiple sites

MPA switched off or dimmed all non-essential lighting at several facilities and patrol craft in support of global climate action.

CHAPTER 05:

KEEPING STANDARDS FIRST-RATE, STAYING SHIPSHAPE

Strong governance, defined by clear responsibilities and accountabilities, is fundamental to building trust with our stakeholders and ensuring that we meet our sustainability priorities effectively.

Sustainability Governance

The MPA Board is appointed by the Minister of Transport. Led by Chairman Mr. Niam Chiang Meng, the Board plays a crucial role in overseeing and shaping the organisation's sustainability efforts. It ensures that sustainability is integrated into MPA's strategic vision and operations, and guides policies that promote environmental responsibility, social equity and economic viability. By actively engaging with stakeholders and fostering a culture of accountability, the Board helps the organisation meet regulatory requirements and build long-term value and trust. (Learn more about our Members of the Authority).

The senior management team (SMT), led by the Chief Executive, translates the Board's strategic directions and goals into action plans. The SMT is responsible for meeting the environmental targets set under GreenGov.SG and the ESG metrics under GRI. It drives the digitalisation, decarbonisation and manpower development efforts of Maritime Singapore, and leads efforts to foster consensus, collaboration and partnerships at the international level in fora such as the International Maritime Organization, the International Association of Marine Aids to Navigation and Lighthouse Authorities, and the International Hydrographic Organization. (Learn more about our Senior Management.)

Gender Representation in Board and SMT (as at 31 December 2023)

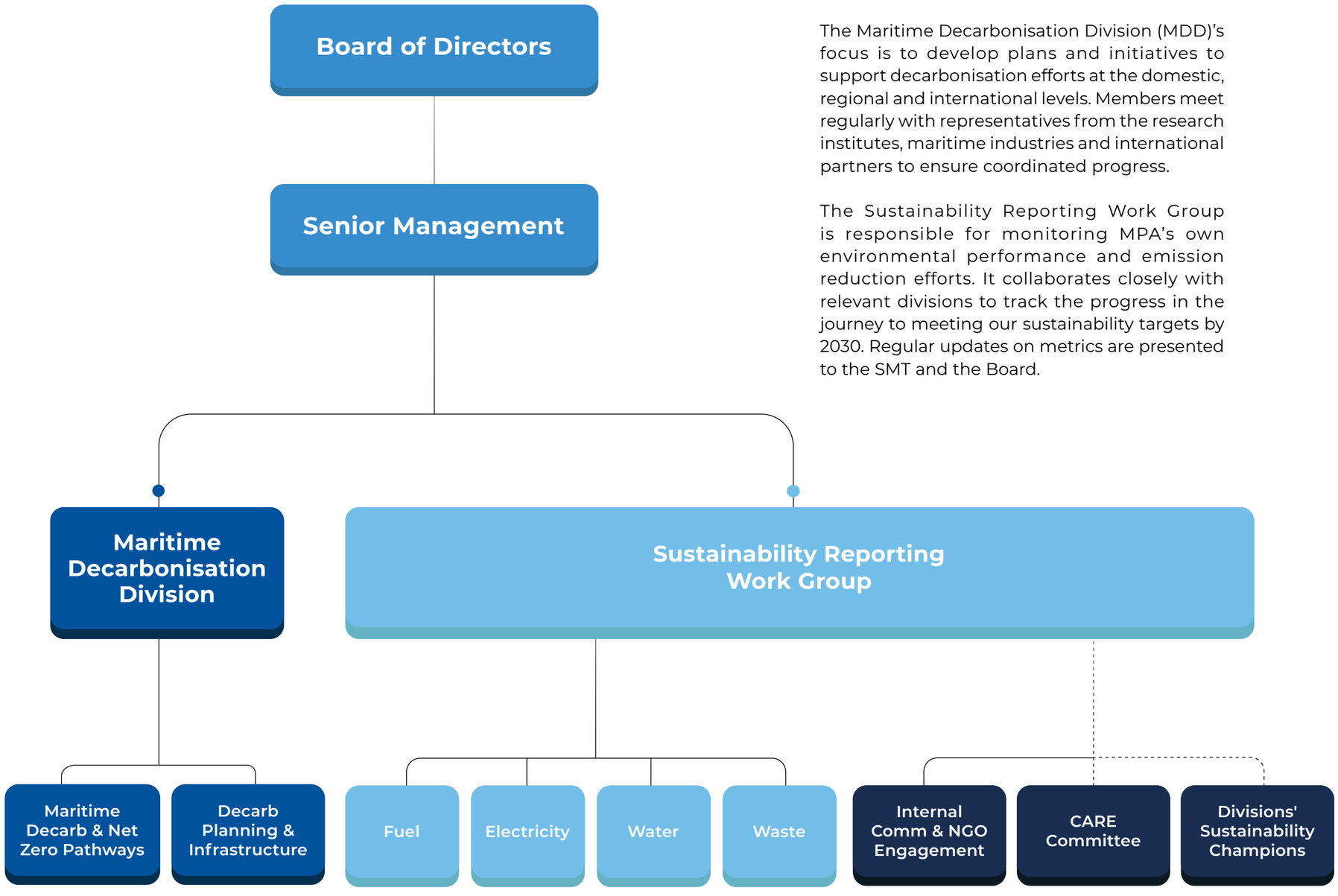
BOARD

Female	Male
3 (19%)	13 (81%)

SMT

Female	Male
7 (29%)	17 (71%)

MPA's Sustainability Governance Structure



Maritime Decarbonisation & Sustainability Reporting Teams

Two teams were set up to support the SMT in advancing sustainability initiatives.

The Maritime Decarbonisation Division (MDD)'s focus is to develop plans and initiatives to support decarbonisation efforts at the domestic, regional and international levels. Members meet regularly with representatives from the research institutes, maritime industries and international partners to ensure coordinated progress.

The Sustainability Reporting Work Group is responsible for monitoring MPA's own environmental performance and emission reduction efforts. It collaborates closely with relevant divisions to track the progress in the journey to meeting our sustainability targets by 2030. Regular updates on metrics are presented to the SMT and the Board.

Our Economic Impact

MPA emphasises the importance of making financially-sound decisions to ensure that we have sufficient funds for Maritime Singapore's development and operation needs.

MPA supports investments for the sustainable development of the maritime sector, focusing on business growth, innovation, and technology adoption. Our strategic emphasis on digitalisation and decarbonisation contributes to the sector's sustainable growth, increased business spending, activities and job opportunities in Singapore.

Some programmes we funded include:

- **Maritime Cluster Fund (MCF):** We support maritime enterprises to develop and expand their businesses and invest in human capital to increase productivity;

- **Maritime Innovation and Technology (MINT) Fund:** This fund helps build up technological capabilities and encourages the adoption of innovation and digitalisation in the maritime sector;

- **Maritime Sector Incentive - Approved International Shipping Enterprise (MSI-AIS):** We provide tax incentives to encourage international shipping companies with a demonstrable business plan to set up operations in Singapore; and

- **Maritime Singapore Green Initiative (MSGI):** The initiative promotes the development of clean and green shipping in Singapore including the adoption of green technologies.

Building Secure and Reliable Technological Infrastructure

As maritime systems become increasingly digitalised, MPA sees a critical need to manage cyber risks that can disrupt the flow of vessels and cargo at our ports. The maritime sector is one of the 11 cyber-critical sectors in Singapore, and ensuring cybersecurity is an essential aspect of our sustainability efforts. Cybersecurity underpins the resilience and operational continuity of our maritime information infrastructure.

MPA set up the Maritime Security Operations Centre (MSOC) in October 2018. This was enhanced with a Maritime Integrated Cybersecurity Operations Hub (MICOH) in December 2022, which makes use of advanced cyber and data security technologies and trained analysts. This has improved early threat detection, monitoring, response, and the sharing and analysis of intelligence and information for maritime critical information infrastructure (CII).

In 2023, MPA conducted a review to upgrade the MICOH to take a more proactive stance. The Maritime Cyber Assurance and Operations Centre (MCAOC) was developed to raise the maritime industry's cybersecurity posture and resilience. It aggregates the demand for cyber threat detection, monitoring and response capabilities. The cybersecurity systemic costs for our maritime ecosystem can be reduced as there will be sector-wide detection of cyber threats with real-time security monitoring, and cyber training and exercises. Companies can benefit from access to mitigation measures and system recovery advice. They can also share information for common situation awareness and get insights from analysis of the cyber data lake, including risk assessments and early warning to counter evolving threats.

MCAOC is positioned to safeguard maritime companies in the global maritime transport supply chain. In particular, it will benefit ships that call at Singapore and ships under the Green and Digital Shipping Corridor (GDSC) collaboration with MPA. The MCAOC also serves as a maritime hub that provides cost-effective maritime cybersecurity services which strengthen the MaritimeSG capabilities to mitigate and respond to cyber threats. Shipping lines can also tap into the R&D capability of the industrial-grade shipboard operational technology system testbed when building new vessels in accordance with the latest International Association Classification Societies Unified Requirements E27. This testbed was developed by the Singapore University of Technology and Design in collaboration with MPA.

MPA's Maritime Data and Cyber Security Department briefing Dr. Amy Khor, Senior Minister of State, Ministry of Transport and Ministry of Sustainability and the Environment, on the Maritime Cyber Assurance and Operations Centre at the MIL 2.0 Opening Ceremony on 25 October 2023.

Upholding Organisational Ethics and Standards

Organisational ethics and standards are the foundation for the integrity and credibility of MPA and public trust in us. Our Internal Audit Division (IAD) provides independent assurance that MPA's governance, risk management and internal control processes comply with established policies and procedures and are functioning effectively. It also has a whistleblowing channel that allows both MPA officers and the public to report suspected fraudulent activities, misconduct or wrongful acts, without fear of retaliation.

In 2023, there were no incidents of fraud or corruption.

The IAD produces the Risk Digest, an internal publication with articles that raise awareness of risks and cultivate a risk culture. The IAD also conducts educational workshops to discuss audit and risk-related topics with staff, including ways to enhance controls in various areas of work. During these sessions, IAD also shares lessons learnt from reported fraud and corruption cases and audit findings from other public agencies. These efforts demonstrate MPA's commitment to integrity and robust corporate governance. We have communicated our anti-corruption approach against unethical practices to our employees and business partners.

Risk Digest publication by IAD to encourage staff to report near-misses through the "myMPA" app.

Strengthening Sustainability Throughout Our Value Chain

MPA is committed to integrating sustainability into every aspect of our operations. We have incorporated Green Procurement requirements into our procurement specifications, so that our suppliers align with national environmental standards and best practices.

For events and functions organised by MPA, we adhere to the Best Practice Guide for Organising Environmentally-friendly Events Checklist issued by GreenGov.SG. This checklist guides us in selecting suppliers who implement environmentally friendly practices.

Our Best Practice Guide includes the following:

Singapore Maritime Week (SMW) 2023

SMW 2023 was held from 24 to 28 April 2023. There were 50 events which drew a total of nearly 26,000 participants. The theme was "Ambition Meets Action" and the programme was organised under the pillars of Decarbonisation, Innovation, Talent, and Services. This event showcased MPA's efforts to integrate sustainable practices within our value chain. We carefully selected suppliers who adopted the following environmentally responsible practices:

Mr. Chee Hong Tat, then Senior Minister of State for Transport, participating in the SMW Maritime Dialogue during the Singapore Maritime Week 2023.

1. **Fewer Single-use Materials:** There were digital and paperless solutions for marketing collaterals and signages, and simplified event launch mechanisms to minimise one-time use structures.
2. **Sustainable Food and Beverage Initiatives:** Catering quantities were optimised to minimise food waste, the use of reusable bottles was encouraged, and water dispensers with paper cups were provided to reduce single-use plastics.
3. **Energy Efficiency:** Air-conditioning was set at 25 degrees Celsius and office attire instead of jackets or suits was encouraged. This helped to maintain comfort levels and reduce the need for excessive cooling, thereby enhancing energy efficiency and achieving cost savings for these venues.

VENUE SELECTION & EVENT INVITATION	✓ If using external indoor venue, select Green Mark Platinum-rated or Water Efficient Building (WEB)-certified venues. ✓ Set indoor temperatures to 25°C or higher and suggest cooler attire as dress code for attendees. ✓ Provide public transport directions to the venue; encourage carpooling or offer shuttle services to nearest public transport hub if needed.
CATERING	✓ Cater accurately to avoid food waste, especially carbohydrates. ✓ Choose caterers who source sustainably; avoid dishes featuring endangered animals. ✓ Provide reusable crockery and cutlery or request guests to bring their own. ✓ Provide water dispensers; if using bottled/packaged water, ensure recycling bins are available.
EVENT MATERIALS & COLLATERALS	✓ Adopt paperless registration, e-marketing, and e-tickets. If printing is necessary, use double-sided Enhanced Singapore Green Label (SGLS+)-accredited paper. ✓ Avoid single-use bags. ✓ Print lanyards with designs suitable for reuse and collect them post-event; use ID cards without plastic holders. ✓ Reuse event set-ups and materials where possible.
ELECTRICITY	✓ Use energy-efficient lighting for event décor or stage lights, such as LED lamps.
WASTE MANAGEMENT	✓ Place trash and recycling bins together with clear instructions on what to place in each bin. ✓ Position bins near washing points for rinsing recyclables. ✓ Provide food waste bins for leftover food.

GRI CONTENT INDEX

Statement of use	Maritime and Port Authority of Singapore has reported the information cited in this GRI content index for the period 1 January 2023 to 31 December 2023 with reference to the GRI Standards. For the Content Index – Essentials With Reference option Service, GRI Services reviewed that the GRI content index has been presented in a way consistent with the requirements for reporting with reference to the GRI Standards, and that the information in the index is clearly presented and accessible to the stakeholders.
GRI 1 used	GRI 1: Foundation 2021

GRI Standard / Other Sources	Disclosure		Location
GENERAL DISCLOSURES			
GRI 2: General Disclosures 2021	2-1	Organisational details	Page 03 – 04
	2-2	Entities included in the organisation's sustainability reporting	Page 03
	2-3	Reporting period, frequency and contact point	Page 03
	2-4	Restatements of information	Page 03
	2-5	External assurance	Page 03
	2-6	Activities, value chain, and other business relationships	Page 10
	2-9	Governance structure and composition	Page 109 – 110 Refer to Our Annual Report, Page 09
	2-10	Nomination and selection of the highest governance body	Refer to Our Annual Report, Page 09
	2-11	Chair of the highest governance body	Page 109 – 110
	2-12	Role of the highest governance body in overseeing the management of impacts	Page 109 – 110
	2-13	Delegation of responsibility for managing impacts	Page 109 – 110
	2-14	Role of the highest governance body in sustainability reporting	Page 109 – 110
	2-15	Conflicts of interest	Processes to ensure that conflicts of interest are prevented and mitigated are set out in the Code of Conduct for MPA Board members. Instances of conflicts of interest are recorded but not disclosed to stakeholders as such involve business confidentiality and other sensitive matters.
	2-16	Communication of critical concerns	Page 87, 109, 110, 113, 114 Refer to Our Annual Report, Page 09
	2-17	Collective knowledge of the highest governance body	Page 110
	2-19	Remuneration policies	Refer to Our Annual Report, Page 09
	2-20	Process to determine remuneration	Refer to Our Annual Report, Page 09
	2-22	Statement on sustainable development strategy	Page 7 – 9, 23 – 26
	2-23	Policy commitments	Page 25 – 26, 109 – 110
			Environment, Health & Safety (EHS), Page 86
			Ethics Policy, Page 94
	2-24	Embedding policy commitments	Page 87 & 94
	2-25	Processes to remediate negative impacts	Page 93 & 94
	2-26	Mechanisms for seeking advice and raising concerns	Page 95, 114
	2-27	Compliance with laws and regulations	Page 78, 85, 114
	2-28	Membership associations	Page 47 – 48
	2-29	Approach to stakeholder engagement	Page 21 – 22
	2-30	Collective bargaining agreements	We work closely with the Amalgamated Union of Statutory Board Employees (AUSBE) to support our employees.

GRI Standard / Other Sources	Disclosure		Location
MATERIAL TOPICS			
GRI 3: Material Topics 2021	3-1	Process to determine material topics	Page 18
	3-2	List of material topics	Page 19 – 20
ECONOMIC PERFORMANCE			
GRI 3: Material Topics 2021	3-3	Management of material topics	Page 111
GRI 201: Economic Performance 2016	201-1	Direct economic value generated and distributed	Refer to Our Annual Report, page 07 of the Annual Financial Statements in the Annual Report 2023
	201-2	Financial implications and other risks and opportunities due to climate change	Page 81 – 82
INDIRECT ECONOMIC IMPACTS			
GRI 3: Material Topics 2021	3-3	Management of material topics	Page 29 – 32, 35 – 36, 67 – 70, 111 – 112
GRI 203: Indirect Economic Impacts 2016	203-1	Infrastructure investments and services supported	Page 29 – 32, 35 – 36, 67 – 70, 111 – 112
	203-2	Significant indirect economic impacts	Page 29 – 32, 35 – 36, 67 – 70, 111 – 112
ANTI-CORRUPTION			
GRI 3: Material Topics 2021	3-3	Management of material topics	Page 113 – 114
GRI 205: Anti-corruption 2016	205-3	Confirmed incidents of corruption and actions taken	Page 113 – 114
SECURE AND RELIABLE INFORMATION TECHNOLOGY INFRASTRUCTURE			
GreenGov.SG	/	Cyber Resilience and Digital Threat Preparedness	Page 111 – 112
	/	Green Information Technology	Page 69
ENERGY MANAGEMENT AND CLIMATE MITIGATION			
GRI 3: Material Topics 2021	3-3	Management of material topics	Page 69 – 72
GRI 302: Energy 2016	302-1	Energy consumption within the organisation	Page 61 – 62, 67 – 68, 73 – 74
	302-4	Reduction of energy consumption	Page 61 – 62, 73 – 74
GRI 3: Material Topics 2021	3-3	Management of material topics	Page 61 – 74
GRI 305: Emissions 2016	305-1	Direct (Scope 1) GHG emissions	Page 67 – 68
	305-2	Energy Indirect (Scope 2) GHG emissions	Page 69 – 74
	305-5	Reduction of GHG emissions	Page 63 – 66
CLIMATE RESILIENCE AND ADAPTATION			
GreenGov.SG	/	Advancing Eco Transportation	Page 67 – 68
World Ports Sustainability Programs	/	Infrastructure Resilience in Ports	Page 67 – 72
WATER AND EFFLUENT MANAGEMENT			
GRI 3: Material Topics 2021	3-3	Management of material topics	Page 75 – 77
GRI 303: Water and Effluents 2018	303-1	Interactions with water as a shared resource	Page 75 & 77
	303-2	Management of water discharge-related impacts	Page 77
	303-5	Water consumption	Page 75 – 76
BIODIVERSITY			
GRI 3: Material Topics 2021	3-3	Management of material topics	Page 103 – 106
GRI 304: Biodiversity 2016	304-3	Habitats protected or restored	Page 103 – 106
	304-4	IUCN Red List species and national conservation list species with habitats in areas affected by operations	Page 103 – 104
WASTE			
GRI 3: Material Topics 2021	3-3	Management of material topics	Page 79 – 81
GRI 306: Waste 2020	306-2	Management of significant waste-related impacts	Page 79
	306-3	Waste generated	Page 79 – 80
	306-4	Waste diverted from disposal	Page 79 – 80
	306-5	Waste directed to disposal	Page 79 – 80

GRI Standard / Other Sources	Disclosure		Location
SUPPLIER ENVIRONMENTAL ASSESSMENT			
GRI 3: Material Topics 2021	3-3	Management of material topics	Page 115 – 116
GRI 308: Supplier Environmental Assessment 2016	308-1	New suppliers that were screened using environmental criteria	Page 115 – 116
EMPLOYMENT PRACTICES			
GRI 3: Material Topics 2021	3-3	Management of material topics	Page 93 – 94
GRI 401: Employment 2016	401-2	Benefits provided to full-time employees that are not provided to temporary or part-time employees	Page 93
	401-3	Parental leave	Page 93 – 94
OCCUPATIONAL HEALTH AND SAFETY			
GRI 3: Material Topics 2021	3-3	Management of material topics	Page 85 - 86
GRI 403: Occupational Health and Safety 2018	403-1	Occupational health and safety management system	Page 85
	403-2	Hazard identification, risk assessment, and incident investigation	Page 86
	403-4	Worker participation, consultation, and communication on occupational health and safety	Page 87
	403-5	Worker training on occupational health and safety	Page 87
	403-6	Promotion of worker health	Page 96
	403-7	Prevention and mitigation of occupational health and safety impacts directly linked by business relationships	Page 96
	403-9	Work-related injuries	Page 88
TRAINING AND EDUCATION			
GRI 3: Material Topics 2021	3-3	Management of material topics	Page 97 – 98
GRI 404: Training and Education 2016	404-1	Average hours of training per year per employee	Page 97 – 98
	404-2	Programs for upgrading employee skills and transition assistance programs	Page 97 – 100
	404-3	Percentage of employees receiving regular performance and career development reviews	Page 100
DIVERSITY AND EQUAL OPPORTUNITY			
GRI 3: Material Topics 2021	3-3	Management of material topics	Page 93 – 94
GRI 405: Diversity and Equal Opportunity 2016	405-1	Diversity of governance bodies and employees	Page 93 – 94
NON-DISCRIMINATION			
GRI 3: Material Topics 2021	3-3	Management of material topics	Page 93 – 94
GRI 406: Non-discrimination 2016	406-1	Incidents of discrimination and corrective actions taken	Page 93
PORT SAFETY AND SECURITY			
Global Maritime Forum	/	Navigating Geopolitical & Threats of Terrorism	Page 07 – 09
GRI 3: Material Topics 2021	3-3	Management of material topics	Page 89 – 90
GRI 416: Customer Health and Safety 2016	416-1	Assessment of the health and safety impacts of product and service categories	Page 89 – 90
	416-2	Incidents of non-compliance concerning the health and safety impacts of products and services	Page 89 – 90
PUBLIC POLICY			
Global Maritime Forum	/	Defending Public Health	Page 92

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