



**FUTURE  
-READY  
SHIPPING  
2015**

**FORGING  
AHEAD**

## { Content }

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**The Conference at a Glance**  
 Future-Ready Shipping 2015: A Joint Singapore-IMO International Conference  
 on Maritime Technology Transfer & Capacity-Building

While great technological strides have been made towards enabling sustainable shipping, a gap between such advances and their wide-scale user implementation remain. Technology transfer and deployment need to be fast-tracked for the effective fulfilment of requirements for ships' energy efficiency under MARPOL Annex VI.

The two-day Future-Ready Shipping 2015, held in Singapore on 28-29 Sept 2015, sought to take a critical look at potential solutions that can lead the maritime industry towards improved energy efficiency and to raise awareness on green ship technology developments.

Some 200 maritime leaders and professionals attended this first joint conference by the Maritime and Port Authority of Singapore (MPA) and the International Maritime Organization (IMO).

Among the ideas mooted at the conference was the concept of a global network of Maritime Technology Cooperation Centres (MTCC) to accelerate capacity-building and technology transfer. Testing facilities, such as the Maritime Energy Test Bed at Singapore's Nanyang Technological University could be used to bolster maritime companies' readiness to deploy new technologies

Another idea was for the industry, for the existing fleet, to focus in the near term on optimising ship operations instead of emphasizing on hardware solutions. A way forward was the use of real-time monitoring and data analytics in planning voyages to increase energy-efficiency. Conference delegates also aired the view that seafarers should have a greater voice in initiatives to improve ships' energy efficiency.

The Conference also witnessed the launch of the Global Maritime Energy Efficiency Partnerships Project (GloMEEP), a pioneering joint initiative between the Global Environment Facility (GEF), the United Nations Development Programme (UNDP) and the IMO. Singapore is a Strategic Partner in this global endeavour.



**Ms Naoko Ishii**  
CEO and Chairperson  
GEF

*"The Global Environment Facility, or GEF, is investing in a ground-breaking new project to enable countries to pursue innovation and technology deployment...this is an exciting moment for the maritime transport sector."*



**Mr Andrew Hudson**  
Head  
UNDP Water and Ocean  
Governance Programme

*"The new GEF-UNDP-IMO GloMEEP Project has been designed to assist an initial suite of developing countries to put in place the necessary policy, legal and institutional reform for achieving compliance with the MEEF, including the Energy Efficiency Design Index and the Ship Energy Efficiency Management Plan."*



“The two-day Future-Ready Shipping 2015, held in Singapore on 28-29 Sept 2015, sought to take a critical look at the existing challenges and potential solutions.”

**Speakers & Moderators at Future-Ready Shipping 2015:**  
**A Joint Singapore-IMO International Conference**  
**On Maritime Technology Transfer & Capacity-Building**  
 28-29 September, Hilton Hotel, Singapore

**Mr Koji Sekimizu**  
Secretary-General  
IMO

**Mr Aziz Merchant**  
Executive Director  
Keppel Offshore &  
Marine Technology Centre

**Dr Sanjay Chittarajan Kuttan**  
Director & Country Manager  
Clean Technology Centre  
DNV GL

**Mr Joe Bradley**  
Deputy Director  
External Relations Division  
WIPO

**Ms Lolan Margaretha Eriksson**  
Ministerial Counsellor  
Ministry of Transport &  
Communications of Finland

**Dr Liang Yuan**  
Principal Officer  
China Maritime  
Safety Administration

**Dr Stefan Micallef**  
Director  
Marine Environment Division, IMO

**Mr Oh Joo-Won**  
Chairman  
IACS Machinery Panel  
Korean Registry

**Ms Beate Kvanstad-Lervold**  
Vice President Maritime  
MARINTEK

**Mr Mathew Trembaly**  
Vice President of Operations  
ABS Pacific Division

**Mr Eng Kiong Koh**  
Program Director  
Maritime Energy  
Research Institute, NTU

**Mr Yasushi Nakamura**  
Representative Director &  
Executive Vice President  
ClassNK

**Dr Edmund Hughes**  
Head  
Air Pollution & Energy Efficiency  
Marine Environment Division, IMO

**Ms Hassiba Benamara**  
Economic Affairs Officer  
Division On Technology & Logistics  
UNCTAD

**Ms Angela Png Lian Neo**  
Director (International)  
Maritime & Port Authority  
of Singapore

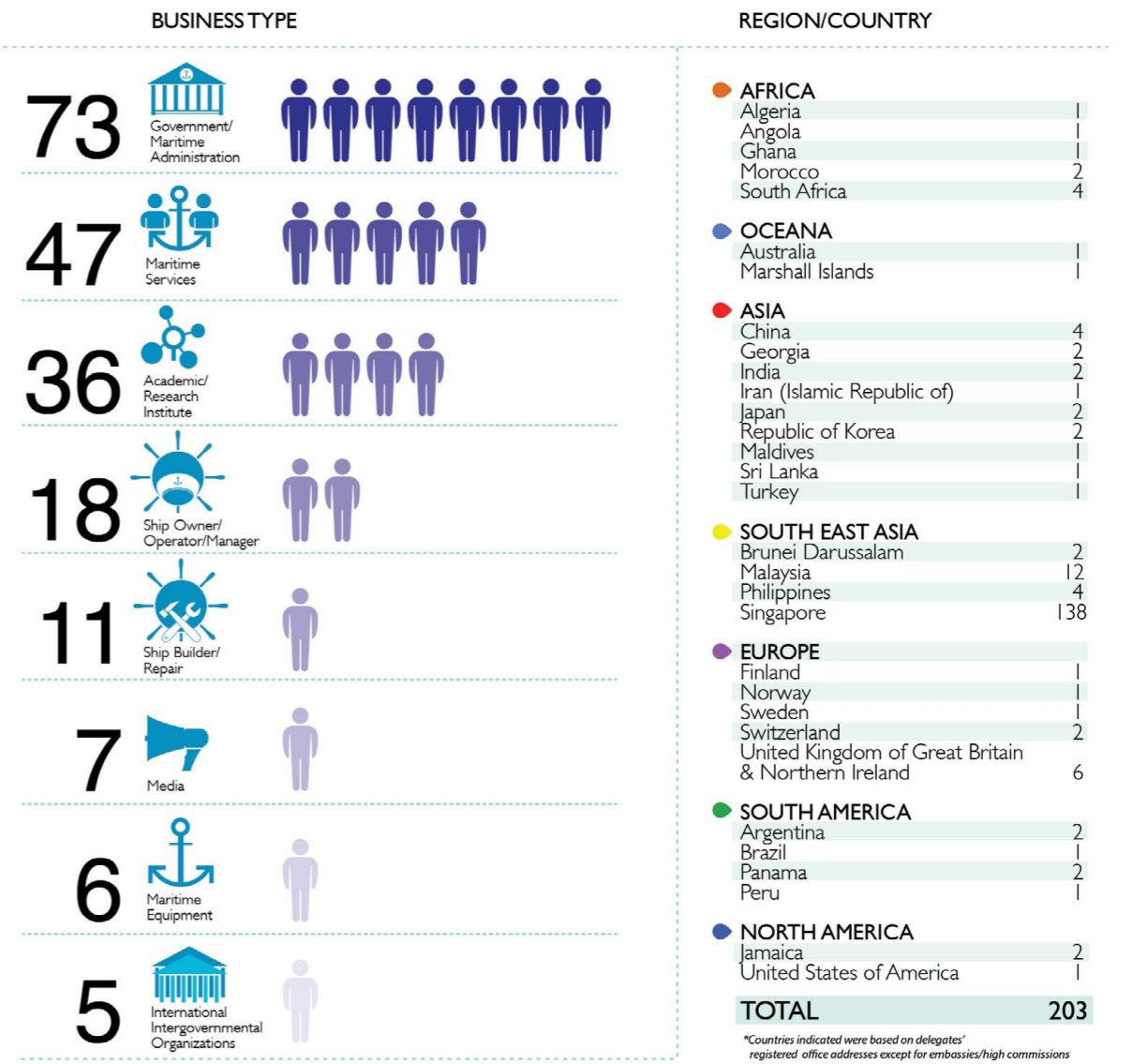
**Mr Dumisani Theophilus Ntuli**  
Minister, Maritime Affairs  
South African High Commission London  
Chairman, Ad Hoc Experts Working Group  
On Technology Transfer (AHEVG-TT)

**Capt Raphaël Baumler**  
Associate Professor  
World Maritime University

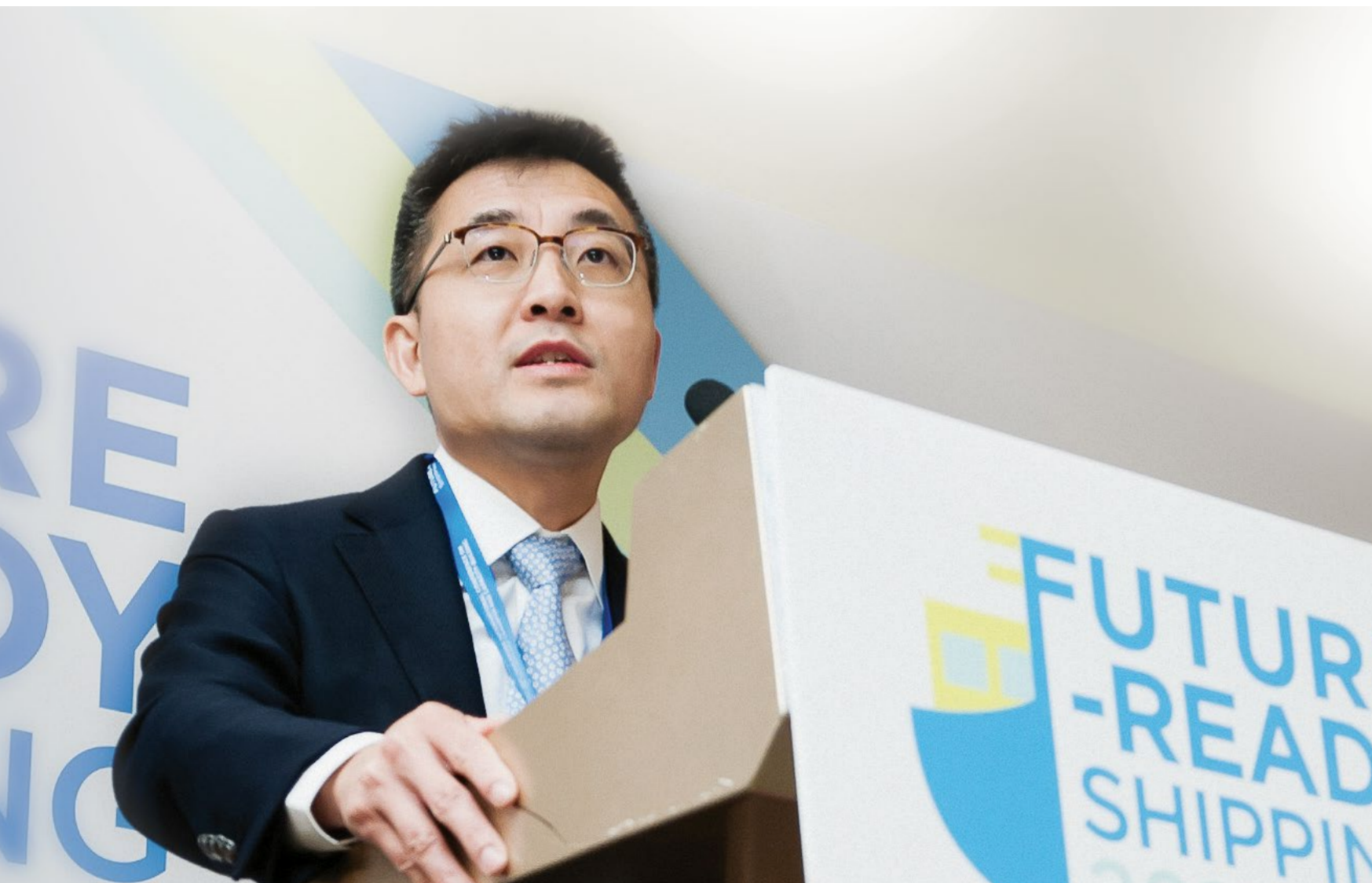
**Dr Jose Matheickal**  
Head, ITCP  
Implementation & Major Projects  
Chief Technical Advisor  
(GloBallast Partnerships) IMO

Hilton Singapore

**Conference Attendees at a Glance**



Opening Remarks by Mr Andrew Tan,  
Chief Executive of Maritime & Port Authority of Singapore  
at Future-Ready Shipping 2015: A Joint Singapore-IMO International  
Conference on Maritime Technology Transfer & Capacity-Building



“I am confident we can build a stronger partnership in steering global shipping towards a more sustainable future.”

Mr Koji Sekimizu, Secretary-General of the International Maritime Organization (IMO), Distinguished Speakers, Ladies and Gentlemen. Good Morning.

Let me extend a warm welcome to Mr. Sekimizu, our guest speakers and all who have travelled to Singapore to participate in the inaugural **Future-Ready Shipping Conference 2015**.

We are honoured to host the first international conference on maritime technology transfer and capacity building. We would like to thank the IMO for giving us this opportunity to play a role in its capacity building efforts.

#### Significance of the Conference

Today's conference coincides with this year's World Maritime Day and its theme on maritime training and education. I know the Secretary-General is a firm believer in training and education in all its forms. Events like this are great learning opportunities and I am pleased to see that the World Maritime University is also represented.

All of us will agree that the shipping industry faces many existing and new challenges ahead. The industry is facing growing economic volatility at a time when expectations of the industry to deliver safe, efficient and sustainable shipping have never been so high.

Yet the emergence of new technologies offers us opportunities to enhance the efficiency of the industry and reduce its carbon footprint. The evolution of ship design, more efficient engines, use of new materials, and operational research combined with data analytics and sensors all present opportunities.

Tackling these challenges will require all the stakeholders to come together. We often hear the call for a level playing field. This puts a great onus on bodies like the IMO to set global standards that are

realistic, practical and implementable. This requires deep knowledge of the issues, strong stakeholder engagement and professional expertise.

I am therefore pleased to see such a strong representation at today's event, covering both policy makers as well as industry experts from the classification societies and research institutions. Thank you for your participation.

The conference's proceedings have been designed to foster open dialogue on what decision-makers need to address in removing the barriers to energy-efficient measures. The panel discussions will look at technology transfer and new and existing environmentally-friendly technologies in shipping. This will lead us to tomorrow's panel sessions identifying the future modes of collaboration.

We will conclude with a breakout session to consolidate our ideas and best practices on fostering technology cooperation among countries and companies. This is intended to set the stage for a wider series of discussions on how best to establish a global network of maritime technology cooperation centres to share expertise among members.

The ideas garnered from this conference will also guide the planning of activities under the new global energy-efficiency project known as the **GloMEEP Project**. This project was jointly established by the Global Environment Facility (GEF), the IMO and the United Nations Development Programme (UNDP) to overcome the lack of know-how in implementing energy-efficient measures through training. Singapore is pleased to be IMO's Strategic

Partner in the GloMEEP Project in capacity as host and co-organiser of Future-Ready Shipping 2015.

#### Singapore's commitment to the IMO

As a believer in sustainable shipping, MPA has been a strong advocate of maritime R&D through initiatives such as the Maritime Innovation and Technology (or MINT) Fund, especially in the areas of marine environment protection and clean energy. Our Maritime Singapore Green Initiative, which provides funding to companies to develop and adopt environmentally-friendly technology solutions, is also now in its fourth year.

Moving forward, as an IMO Council member that takes its role seriously, Singapore is committed to supporting and partnering the IMO as it continues to develop its framework of technical and operational measures that now serves as a mandatory standard for enhanced energy-efficiency in shipping. The IMO has to demonstrate thorough leadership on this issue. The international community is watching us closely. Today's conference is therefore the first step in fostering a culture of international collaboration in the development, deployment and exchange of environmentally-sustainable maritime technologies.

Through today's conference, I am confident we can build a stronger partnership in steering global shipping towards a more sustainable future. Without further ado, let me invite Mr Sekimizu to deliver his keynote address.

Thank you and I wish you all a successful conference.



Keynote Speech by **Mr Koji Sekimizu**,  
Secretary General of International Maritime Organization  
at Future-Ready Shipping 2015: A Joint Singapore-IMO International  
Conference on Maritime Technology Transfer & Capacity-Building

“This FRS Conference today is a pioneering initiative to start a global dialogue on technology transfer.”



“And I would also like to highlight my goal to establish reduction target for individual ships.”

Excellencies, Mr. Tan, Distinguished Participants, Good Morning.

It is really a great pleasure for me to be invited to this Conference. As an introductory remark, I just want to say that: the world economy really relies on shipping. This is just a simple fact. Sustainable development will rely on a sustainable maritime transportation system (SMTS), and for sustainable shipping, technology will play a crucial and central role. A wide range of technologies will be required to support a sustainable maritime transportation system. But there are vast differences among the countries where those technologies will be deployed. Technology for an energy-efficient transportation system is particularly complex, as the available options are very dependent on so many variables.

In developing countries, technological capabilities are often limited and financial, institutional and other constraints pose serious challenges for innovation. Other developmental challenges, such as enhancing access to energy and sustainable livelihoods, are equally pressing. It is imperative to explore new ways and means of promoting innovation in the maritime sector. We must explore institutional arrangements that can advance technology and technological innovation to meet the future needs of the industry. This Conference: The Future-Ready Shipping (FRS) Conference is our answer from the International Maritime Organization.

The shipping industry is already the most energy-efficient mode of cargo transport. We all know this, but we need to make further progress. The need to reduce emissions from ships has been clearly understood by IMO. IMO has led the way in steering the shipping industry towards a clean, sustainable future. Efforts to reduce airborne emissions from ships started in 1990 and took a major step forward in 1997, with the adoption of the MARPOL Convention Annex VI which currently regulates air emissions from more than 95% of the world's shipping tonnage and work to build on the success of 1997 is already well underway. Further, more stringent global

measures to reduce emissions from individual ships by 30% by 2030 established through the 2011 amendments to MARPOL Annex IV are now in force.

Thirty percent reduction per ship by 2030, is my goal but this target will pose a global challenge in the form of technology transfer and capacity-building. The focus of this Conference is on energy-efficiency because of two reasons:

1. A new global climate change agreement is being negotiated and expected to be agreed in Paris later this year; and
2. The demand for shipping services will increasingly be from developing countries.

This FRS Conference today is a pioneering initiative to start a global dialogue on technology transfer. We have twin objectives:

1. To take a critical look at the existing baseline; and
2. To explore a realistic future scenario.

Today, we begin this pioneering Conference and I hope IMO will continue holding regular FRS Conferences in the coming decades.

I would like to congratulate Singapore on leading this initiative to set up this new, pioneering, global forum. I think it is very timely in the context of the climate change debate for the shipping industry and it is most needed in the shipping industry.

Let me now talk about energy-efficiency and technology transfer. The lack of an enabling environment is perhaps the single most important impediment to addressing energy-efficiency and climate change issues, especially in the maritime context. Chapter 4 of MARPOL Annex VI on the "Regulations on energy-efficiency for ships" and the supporting resolution MEPC.229 (65) call for technology transfer and capacity-building and we have already made some achievements in the Ad-Hoc Expert Working Group at

IMO-level which has been examining barriers to technological transfer.

We must emphasize the need to understand technology transfer as actions of cooperation and partnership – NOT a purely commercial transaction between developed and developing countries. In an effort to promote cooperation and partnership, IMO has already established:

- The ITCP programme, particularly the creation of a dedicated global programme under ITCP;
- IMO-KOICA (Republic of Korea) project on energy-efficiency;
- Held awareness-raising and train-the-trainer workshops;
- Initiated GEF-UNDP-IMO GloMEEP project, which is being launched today at this Conference, and which includes a significant private sector partnership to be named as Global Industry Alliance for Low Carbon Shipping;
- Organized a number of dedicated regional workshops that focus on technology transfer aspects; and
- Mobilized resources from bilateral donors.

My message to this Conference is three-fold. First, it is critically important to develop global partnership and networking mechanisms to accelerate cooperation in maritime technology transfer. Second, it is important to institutionalize the technology transfer and capacity-building effort to meet the unique needs of the maritime industry – the most international industry of all; and third, Government and industry leaders need to support this concept and to contribute to building this global partnership and network.

And I would also like to highlight my goal to establish a reduction target for individual ships. The per ship reduction target by 30% in 2030 is, in my honest view, possible. Suppose you have a pie of world emissions, the shipping contribution is just 2.2%. If you have a pie on your table, 2.2% is a very narrow sliver of the pie. If the world economy and world seaborne trade expand, the shipping industry capacity will need to

expand. But if the world economy does not grow, for example in another 15 years (to 2030), the scale of the pie will be the same, but we will have to reduce emissions from ships by 30%. Therefore, we can achieve a significant cut in the pie.

However, the world economy would need to grow, increasing seaborne trade or it is not sustainable. If the world economy grows by 40% by 2030, and if we achieve a 30% reduction target per ship by 2030, then we can achieve that. The total emissions from ships and the shipping industry will remain at the current total emissions level. If the world economy grows by 60%, the total emissions from the world may increase by 60%, but the shipping industry can only increase by 12% if we achieve 30% reduction. In my view, this is a significant contribution from the industry and we can achieve this via new ships and existing ships by 2030. In my judgement, 80% of current existing ships will be replaced. We should target the remaining 20% and reduce emissions. That is the reason for this Conference, to ensure technology transfer in order to achieve the target globally. This is the value of this Conference.

Taking this opportunity, I would like to touch upon the current

negotiations process leading up to Paris. I have prepared a statement to be released at today's FRS inaugural Conference. It is important to stress that IMO is, to date, the only international organization to have adopted global legislation to significantly reduce CO2 emissions from a particular industry. Nothing similar exists for any other industry or business sector. IMO has consistently and successfully, over time, explored new possibilities to improve upon existing technical, operational and management measures to reduce vessel-source air pollution, including greenhouse gas emissions. IMO continues to contribute to the global efforts to reduce greenhouse gas emissions in the context of the climate change debate.

These efforts are working. Through compliance with these IMO regulations, international shipping has taken a genuine leadership role in mitigating its contribution to climate change. According to figures contained in IMO's most recent study of greenhouse gas emissions, during the five years to 2012, the total contribution from international shipping to global emissions actually reduced from 2.8% to 2.2%. This was despite significant overall growth in seaborne trade and a corresponding growth in cargo-carrying capacity during the same period. Through compliance with IMO regulations

shipping can grow with the global economy and reduce emissions at the same time. This is a significant progress of what we have done.

But there is a need for further progress to be clearly recognized at IMO. Since the amendments to MARPOL Annex VI came into force in 2013, IMO has continued to develop practical assistance to support their uniform implementation throughout the global fleet, as well as to develop an all-encompassing data collection system for ships' fuel consumption. While the most recent proposal to further limit greenhouse gas emissions from ships was actually delayed citing the need for further study, there is no question that the work will continue at IMO. IMO regulations already in force will ensure that emissions per ship will be significantly reduced. I am confident 30% per ship reduction in 2030 is a realistic target. But what they cannot do, and what shipping cannot do, is control the total, global demand for cargo to be carried. This is directly related to growth in the world economy.

Of course, in a future low-carbon society, the growth of demand for oil, coal and gas may fall. This, in turn, may serve to limit the overall emissions from the shipping sector. But, if the global economy grows, demand for shipping will also grow;

which means that, even though emissions per ship will be greatly reduced under established IMO measures, the overall emissions from the sector may actually increase. History is certainly on the side of growth, seaborne trade has grown more than three-fold during the past four decades and the world fleet capacity has grown four-fold during the four decades. This may give rise to calls for other measures, beyond those already adopted, or currently under consideration, by IMO.

There is a good question; who should decide on such additional measures and where should this be done?

And I believe again IMO is the only place to take this debate forward, too. Indeed, this was already recognized in the Kyoto Protocol, where IMO was designated as the agency to deal with greenhouse gas emissions from shipping – a responsibility that it has diligently and successfully undertaken.

But, whatever world leaders decide with regard to shipping during the forthcoming climate change negotiations, they must first carefully consider the impact of any decisions in light of the enormous contribution that shipping makes to the world economy.

In the process leading up to the Paris meeting, world leaders might be tempted to consider specific measures aimed at reducing shipping's overall contribution of CO2 emissions, such as global overall cap. Such measures would artificially limit the ability of shipping to meet the demand created by the world economy, or would un-level the level playing field that the shipping industry needs for efficient operation, and therefore must be avoided.

If such measures are enforced, it will seriously distort the shipping industry and have a serious impact on the economy of almost all nations. Actually, increases in land-based emissions are significantly having a serious adverse impact.

In addition, fiscal measures such as a levy on fuel are under active consideration, but such measures really require careful analysis and development, considering a host of environmental, technical, economic and geopolitical factors. For these matters, so critical to the world's future, there are no simple answers. But IMO is the most capable and appropriate forum for such complex considerations to occur and be resolved.

IMO has a solid track record of solving problems with complex multinational dimensions.

For decades, by developing measures that are applied universally to the world's most international industry, IMO has served global society very well. As its record to date so clearly demonstrates, IMO should be entrusted to continue that work when it comes to addressing greenhouse gas emissions from shipping.

These are my views distinguished participants, but, I wanted to share these with you today, since the work of the Conference is directly relevant to the current climate change discussions and negotiations.

Today, I will release my statement in London, copies of my statement will be available to participants to this Conference.

Distinguished participants, IMO has established compulsory global measures to significantly reduce CO2 emissions from ships but your work on technology transfer is vital for the effective and global implementation of IMO measures to achieve our emission reduction goals.

I wish you fruitful discussions at this Conference and best of luck for all of us.

Thank you very much.



Session 1

# { Enabling Technology Transfer }

- What is technology transfer?
- What are the obstacles to the transfer and diffusion of technology energy-efficient technology?
- How can policy and legal tools help?
- How can partnerships help?



## Introduction

Technology transfer in the maritime sector to improve energy efficiency and reduce greenhouse gas (GHG) emissions is both important and complex. A consistent refrain among speakers and delegates at this session was the need for platforms to facilitate cooperation, information sharing and matchmaking between potential partners. They also noted that international, national and industry policy levers could play a major role in expediting or hindering technology transfer and uptake.

## What is technology transfer?

Dr Sanjay Chittarajan Kuttan, Director of DNV-GL Clean Technology Centre, said that technology transfer might be understood under two broad categories, namely technology transfer and technology diffusion. In turn, there are two types of technology transfers.

Vertical Technology Transfer (VTT) is the process of moving a technology from one stage of its development life cycle to the next. This indicates

the progression of a technological invention from concept to prototype and then to commercial adoption.

Horizontal Technology Transfer (HTT) refers to the transfer of a commercialised or operational and usually mature technology from one organisation in a specific socio-economic context to another in a different one, either through intra-firm, cross-industry, or cross-border channels.

Dr Kuttan shared that “interface mechanisms” existed to facilitate both VTT and HTT. For instance, VTT may occur through intellectual property licensing and the establishment of spin-off companies. Joint ventures (JVs), licensing agreements and acquisitions are other means for achieving both VTT and HTT.

Dr Kuttan added that the issue of technology transfer is complex, especially for the shipping industry. The challenge for the industry then is to simplify the process of technology transfer to reduce its GHG emissions.

A broader explanation of technology transfer was shared by Ms Lolan Margaretha Eriksson, Ministerial Counsellor of Finland’s Ministry of Transport and Communications, who referred to the definition used by the Intergovernmental Panel on Climate Change’s definition, which could be useful also in the maritime context: a broad set of processes covering the flows of know-how, experience and equipment for mitigating and adapting to climate change amongst different stakeholders (public, private, financial institutions, R&D, non-governmental organisations (NGOs)).

## What are the obstacles to the transfer and diffusion of energy-efficient technology?

While technology transfers were deemed to be beneficial, a host of hurdles stood in the way, said speakers and delegates.

For instance, a lack of understanding of the technology transfer process, exacerbated by its inherently complex nature is one barrier.

In addition, attaining energy efficiency itself may not be given due attention because of competing corporate priorities. To overcome this, external pressures may need to be introduced to change companies’ behaviour. Regulations may be one way to promote technology transfer and change how companies operate. However, policy levers on the international, national and industry levels can also work against technology transfer. A lack of resources channelled into technology transfer at the firm level, especially among small and medium



enterprises (SMEs), and at the national level, especially among low-income countries, can also inhibit technology transfer.

## How can policy and legal tools help?

It is essential to create enabling environments for energy efficient technologies and practices to be absorbed worldwide, and there is a need to identify what ship builders, ship owners and operators, and ports require to adopt energy efficient technologies.

Dr Kuttan shared that governments needed to create an innovation-friendly business climate. Their policy levers can act for or against specific technology transfer pathways. He used the example of China, where foreign direct investments are classified as encouraged, restricted, permitted or prohibited. Restrictions are imposed on foreign investment forms and shareholdings on certain key industrial sectors, including automotive, energy.

On the industry level, he pointed out, specific regulatory frameworks could incentivise technology development and deployment. He cited the United States’ Environmental Protection Agency’s Clean Power Plan and Singapore’s Building and Construction Authority’s Green Mark Scheme as examples.

In response to delegates’ comments, Dr Kuttan also agreed that more support should be given to SMEs in technology development and market distribution. He noted that SMEs found it difficult to gain access to resources. Because these companies are “pushing the boundaries a lot faster” than their larger counterparts, he said, “There must be a way to let these SMEs bubble up to the surface, for example, through pilot programmes.”

Government incentives can certainly play an important role in enhancing the shipping industry’s energy efficiency. Dr Liang Yuan, Principal Officer of China Maritime Safety Administration (MSA), said during the panel discussion that policies implemented by both MSA

and China’s Ministry of Transport (MOT) had had an impact on the country’s shipbuilding industry.

In 2014, MOT issued a subsidy scheme to deal with ageing ships. Shipowners who dismantle their old and low-efficiency ships and upgrade their ships for greater energy efficiency can receive funding. The scheme also encourages shipbuilders to build high-efficiency ships.

In addition, China’s Ministry of Industry and Information Technology (MIIT) annually issues guidelines on shipbuilding research projects before 2014, promoting technical innovations and R&D capabilities.

The role of intellectual property rights (IPRs) in technology diffusion was introduced by Mr Joe Bradley, External Relations Deputy Director of World Intellectual Property Organization (WIPO). In this context, IPRs refer to patents, which do not provide global protection. The development of new technologies is usually combined with patent protection in various jurisdictions where the relevant market is envisaged.

“The absence of a patent is not by itself a guarantee to technology transfer and diffusion,” said Mr Bradley. In fact, at the time of patent filing or grant, the technology is not commercially proven, and many patented technologies do fall by the wayside.

Rather, having a patent system contributes to a public disclosure of technological information.

Mr Bradley said that the WIPO PATENTSCOPE was a very useful patent information system and





played an important role in green technology innovation and diffusion. The search service provides a unique body of technological information. It comprises 49 million searchable patent documents in eight languages – Chinese, English, French, German, Japanese, Korean, Russian and Spanish.

The service provides information about new technologies to allow for the:

- Tracking of new technological developments in a field of particular interest, e.g. fuel cells or hydrogen technologies,
- Monitoring of the activities of particular actors, such as firms, inventors or institutes of interest, observing an oil company's research activities in alternative energy technologies, and
- Location and negotiation of partnerships with developers of complementary technologies, e.g. matching alternative power generation technologies with new electrical storage technologies.

WIPO's Patent Landscape Reports is another useful tool, this time for patent analysis. It shows:

- The technology trends in various geographical areas and how they have developed over time,
- The players who are the most active in a particular technology area and their specific focus and strategy,
- The other patents that are relevant for a company's activities or product development or commercialisation,
- The patents which are about to expire,
- The technologies which are moving into the public domain and provide business

- opportunities, and
- The patent portfolio of competitors and the impact on the company's portfolio and activities.

#### How can partnerships help?

A recurring theme during the panel session was the importance of partnerships. Mr Aziz Merchant, Executive Director of Keppel Offshore and Marine Technology Centre, said that closer cooperation was needed between academia and industry. He noted that both sides had to change their respective mindsets in measuring outcomes. Among academics, for instance, their motivation is to publish papers and be cited by their peers. Mr Merchant urged for a change in mindset from the academia and the industry and to achieve a balance between academic goals and profit-driven goals.

Dr Kuttan cited corporate laboratories as a prime example of closer cooperation. He also emphasised the importance of cross-industry collaboration, and illustrated his point using Singapore-based IPEX, which was set up in December 2014 to accelerate the deployment of low carbon technologies. A cross-industry consortium comprising ReEx Capital Asia and DNV GL, with the support of Asian Development Bank, formed IPEX. The company facilitates the transfer and deployment of new low-carbon technologies in developing Asia. It provides brokerage, advisory and market development services to technology suppliers and adopters. As a result, technological assets have been monetised while new and validated "clean technology" solutions were bridged into

developing parts of Asia.

Echoing the importance of alliance building was Ms Eriksson who noted the importance of adjusting to the changing world and the business environment, and the need for the policy makers to respond to global challenges.

To illustrate her point, she highlighted the Roadmap for Green Technology and Alternative Fuels, which was developed by private and public actors in the Baltic Sea Region. It identifies "what, how, who and when" regarding actions and for the development of new flagship projects. She added that in 2014, the Baltic Marine Environment Protection Commission (HELCOM) had established a subgroup to promote public-private dialogue to enhance the uptake and use of green technology and alternative fuels. The subgroup uses the Roadmap as a tool for structured dialogue.

Likewise, Mr Bradley said that access to patented technologies was only one aspect of technology transfer: Partnership plays a more important role. As such, WIPO seeks to identify partners like regional development banks.

He gave the example of a partner-finding platform, WIPO GREEN. Specifically, the platform seeks to bring together green technology providers and seekers of innovative solutions to combat environmental challenges. It comprises a database to search for green technologies and needs and a network to identify experts and cooperation partners. All users need to do is register, upload their needs for sustainable shipping-related technologies and search for partners, experts and solutions.

In the same vein, Ms Eriksson suggested that IMO could consider setting up a matchmaking platform for the shipping sector. She said IMO would seem to be very well placed to bring the maritime actors together at a global level with a view to match the need for assistance with the willingness and ability to provide support.



Session 2

## { Technologies In Action }

- What is the current reality for green maritime technologies?
- How are companies and research institutes responding?
- How should the maritime sector work towards increasing energy efficiency?

## Introduction

The session explored a wide range of issues vital to the adoption of green technologies. It looked at the latest state of ship energy-efficiency measures, technologies and alternative energy sources. For instance, LNG as fuel, ship electrification and fuel cell technologies came under the spotlight.

### What is the current reality for green maritime technologies?

An increase in environmental consciousness, coupled with a growing realisation of shipping's impact on the natural environment, has led to a rise in both international and national environmental regulations. Mr Oh Joo-Won, Chairman, International Association of Classification Societies (IACS), Machinery Panel, Korean Register, listed IMO's environmental regulations. Those that are in effect include:

- MARPOL 73/78 Annex I – Regulations for the prevention of pollution by oil
- MARPOL 73/78 Annex II – Regulations for the control of

- pollution by noxious liquid substances in bulk,
- MARPOL 73/78 Annex III – Prevention of Pollution by Harmful Substances Carried by Sea in Packaged Form
- MARPOL 73/78 Annex IV – Prevention of Pollution by Sewage from Ships
- MARPOL 73/78 Annex V – Prevention of Pollution by Garbage from Ships
- MARPOL 73/78 Annex VI – Prevention of air pollution from ships,
- Energy Efficiency Design Index,
- Oil Pollution Preparedness, Response and Cooperation (OPRC) Convention and Protocol dealing with Preparedness, Response and Cooperation to Pollution Incidents by Hazardous and Noxious Substances, and
- Anti-Fouling System (AFS) Convention – Control of harmful anti-fouling systems used on ships.

IMO environmental regulations, which have yet to come into force, include:

- International Convention for the Control and Management of Ships' Ballast Water and Sediments

- Convention), and
- Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships, (Hong Kong Convention).

At the national level, Ms Beate Kvamstad-Lervold, Vice President Maritime, Norwegian Marine Technology Research Institute (MARINTEK), gave the example of the Norwegian's government's "Blue growth for green future" maritime strategy. In line with this goal, the government "regulated the use of more green technologies and systems and more environmentally-friendly fuel for ships".

A delegate from the floor asked whether Norway's current regulatory framework was able to meet robust international standards, given the rapid development of green technologies for ships. Ms Kvamstad-Lervold replied, "The good thing about international regulations is the putting up of common goals, and it is important to be aiming for a common set of goals. For example, the Norway government is putting up official tenders for low- or zero-emission technologies for the maritime transportation system." She added, "It is important to include financial support with these official tenders. It is also necessary to provide support beyond the initial phase of the innovation periods."

Market conditions in the shipping market also affect the uptake of green maritime technologies. Ms Kvamstad-Lervold said that the maritime market situation in Norway presented many challenges and opportunities. The maritime industry's challenges include the slowdown in the global shipping

market and overcapacity in the shipbuilding and ship management fields. However, she added, there were opportunities in the area of fisheries and aquaculture, and renewable ocean energy.

For Matthew Tremblay, Vice President of Operations, ABS Pacific Division, getting future-ready began with "knowing" the future. He shared that the industry needed to consider "knows", including current and pending regulations, the availability and readiness of different technologies, and environmental concerns."

It also must take into account "unknowns", which include the energy price, breakthrough technologies, geopolitics and economic growth.

With these in mind, the maritime community then has to have a "willingness to act now" and address the future. It should look into re-engineering ship operations, undertake techno-economic analyses, and exercise corporate responsibility and sustainable development.

### Current Technological Capacity

Koh Eng Kiong, Program Director (Maritime Energy), Energy Research Institute at Nanyang Technological University, said that in addition to regulations, there were five types of innovation drivers:

- Fuel usage trends – At present, 90% of mainstream vessels use heavy fuel oil (HFO). By 2025, 30% of ships may be expected to use LNG as fuel. Mr Koh predicted that it would take a long time for LNG to be the main fuel for mainstream shipping. "The adoption of such fuel by vessels



- will need to come with changes to the infrastructure," he opined.
- The shipbuilding market, which is currently dominated by China. At the same time, China is a leading ship-owner country.
- Harsh environments – Examples include the Arctic or deep water. Vessels operating in such environments require complex machinery.
- Electrification of ships – At present, most ships are still mechanical. "In the long term," said Mr Koh, "true zero emission vessels will come from the use of full electric systems."
- Remote control and intelligence – In future, ships could be fully remote controlled.

Fuel cell technology was another hot topic raised during the session. On a question raised about its future prevalence, Mr Oh said, "Through collaboration with marine equipment manufacturers, we have ships that are already employing the fuel cell system. We are going to expand this capacity for conducting a full-scale on-board test. I am quite positive and optimistic that this technology can be utilised as an auxiliary marine power source in 10 to 20 years' time."

Mr Tremblay said that timeline-based regulations were required to allow for the development of technologies that satisfy progressively stricter emission standards. "Inevitably, such development will result in operational measures that can achieve the same results." In terms of air pollution control, regulatory standards and current technology options available to the shipping industry include Nitrogen Oxide (NOx) Tier III standard and the Sulphur Oxide (SOx) scrubbers, respectively.

However, the energy-intensive NOx Tier III standard will lead to a fuel-consumption increase. Therefore, the environmentally-friendly technology option has turned out to be less fuel efficient.

As for the SOx scrubbers, they can be configured to operate in open or closed circuit configurations. The current emission technologies of ships are already achieving far better results than the levels required by the regulation.

On the issue of shipping's carbon emissions, Mr Tremblay said that



many ships categorised under phase 0 Energy Efficiency Design Index (EEDI) already met stricter EEDI reduction rates required from 2015 and 2020 onwards.

"In fact, recently delivered ships are already meeting the phase 3 EEDI standard. There is very little room for improvement by applying more innovative technologies."

He also pointed out, "Current technologies can achieve far better results than the current regulations."

#### How are companies and research institutes responding?

Even so, companies and research institutions are responding to regulatory changes.

Mr Oh said KR created the world's first green ship equipment certification centre in response to IMO's greenhouse gas emissions reduction and maritime pollution regulations. The Korean Register Test and Certification Centre (KR-TCC) was set up in May 2015 to develop, test and certify core green ship equipment and green ship technologies.

So far, KR's green ship development efforts include the design and development of energy-saving devices such as fuel cell technology and hybrid power system, the design optimisation of corrosion protection system, hull, aft-body propeller, bulb and fore-body, and the model of vessels and also the certification of green ships.

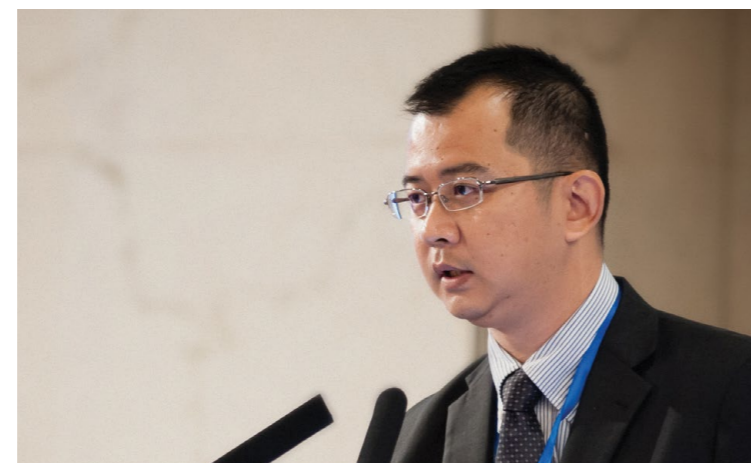
Between 2015 and 2020, its green technology efforts include the development and on-board performance verification of

megawatt hybrid power system, NOx and Volatile Organic Compounds (VOCs) reduction technology, SOx and particulate matter (PM) reduction technology and Waste Heat Recovery System (WHRS) technology.

Beyond 2020, KR's long-term plans include the development and on-board performance verification of LNG-fuelled ship, electric propulsion ship, and fuel cell powered ship, the Ship Energy Efficiency Management Plan (SEEMP) and e-navigation, Monitoring, Reporting and Verification (MRV) System and Transportation Management System (TMS).

Research institutions, like MARINTEK, are also doing their part to develop technologies that are in synch in regulations. Funding for these institutes come from a variety of sources.

Answering a question from a delegate, Ms Kvamstad-Lervold explained that a minimum portion of the funding is from the Norwegian government while the remainder comes from projects.



Explaining the process she added, "We have a broad network for building a consortium for our projects. We can involve partners that approach from different perspectives of research. Our partners help us to put together the plans and roadmaps for future research. They also bring financial support to the projects."

Among MARINTEK's partners is the Norwegian University of Science and Technology where most of its basic research is being conducted. MARINTEK also has several technology-focused laboratories, including those for cavitation, sloshing and marine cybernetics.

A major project MARINTEK is undertaking currently comes under Centre for Research-based Innovation (SFI) Maritime, which seeks to identify the largest potential areas for energy efficiency and emission reduction and to also develop and test simplified version of analytical models for identification and reduction of emission.

SFI Smart Maritime is a Norwegian Centre for improved energy efficiency and reduced harmful emissions.



The centre was the result of a collaboration among multiple industry and research partners. An important part of this collaboration is early-stage feasibility assessment, which aims to develop assessment models to enable early comparison of alternative ship designs in the design process. Among the centre's projects is the Zero Maritime Initiative, which seeks to provide solutions for the use of renewable energy in ships, such as combining fuel cells with combustion engines. The centre is also investigating the safe and effective use of low-impact fuels on ships.

On NTU's part, Mr Koh said, the university was working to transition green technology into the industry through various initiatives. With Rolls-Royce, NTU initiated the Maritime Energy Research Programme, which aims to develop green, carbon-neutral and energy management. In addition, the Rolls-Royce@NTU Corporate Lab started operations on 1 August 2013 with three core research areas:

Electrical Power and Control Systems, Manufacturing and Repair Technologies and Computational Engineering.

#### Developing countries' access to funds and projects

While the depth and breadth of green maritime technologies are extensive globally, delegates questioned if developing countries were able to gain access to funding and projects.

Mr Koh said, "From my experience with other developing countries, research can be seen as an investment. The countries themselves need to be aware of the latest developments and that there is an international community out there that is more than willing to work with them."

Mr Oh said that KR-TCC was open to everybody, adding, "We hope our TCC will be used as an international benchmark."

For MARINTEK, Ms Kvamstad-

Lervold said that while its main focus is to assist Norwegian companies, it is open to international collaborations.

#### How should the maritime sector work towards improving energy efficiency?

The speakers suggested a variety of ways by which the maritime industry could enhance energy efficiency.

Mr Koh pointed out that since automobiles were already using waste heat recovery technology, the maritime industry would benefit from adopting a similar technology on a larger scale.

During the lively Q&A session, Ms Kvamstad-Lervold answered a delegate who questioned the relative benefits of adopting new technology. She said that the respective cost-benefit equations for the industry and the environment could be very different. "However, if the business nature is beneficial to



the environment, it would mean that the technology can be both environmentally friendly and of interest to business."

The relative benefit of using LNG as a fuel was also a hot topic of debate.

Mr Tremblay noted, "Despite the drawbacks, LNG as a fuel appears to be aligned to the concept of being future ready. For now, more coastal vessels than international vessels are using LNG as fuel."

In measuring the benefits of a particular technology, the industry

has several yardsticks. Mr Tremblay highlighted the life cycle cost (LCC) approach, which was typically used to calculate the cost of each option. It considers trade routes, fuel options, fuel price projection, operational profile and SOx regulations. The best option can be derived from calculating the life cycle costs of various technologies.

He also noted that in addition to improving the design of ships, the efficiency of ship operations should also be improved.

He pointed out that ship operation

was seen as the next frontier of regulation, with the European Union implementing the MRV of Carbon Dioxide (CO<sub>2</sub>) emissions from 1 Jan 2018.

Thus in anticipation of any future regulations, ships should be able to take into account business, route and weather constraints to prescribe the best speeds needed to achieve their missions with the least CO<sub>2</sub> emissions.

Another important issue raised during the Q&A was training. Session moderator Dr Stefan Micallef, Director, Marine Environment Division, IMO, asked Mr Tremblay how education and training needed to be changed to energise seafaring careers.

Mr Tremblay said that while much of the discussion had been about the price of oil versus LNG and the cost of retrofitting a vessel to use LNG fuel, training for running LNG-fuelled vessels was commonly overlooked.

"Ship owners need to really look at the long-term impact of operating the vessels. The Norwegian sector is ahead of the world right now in terms of using LNG as fuel. This is an example of how intensive training courses can prepare people to operate new technologies."



Session 3

## { Perspective On Green Ship } { Technology Trends }

- How can shipping ride the wave of 'big data' and boost energy efficiency?
- How is shipping changing to reduce GHG emissions under the IMO's leadership?
- How is shipping changing the broader macro-economic context?

## Introduction

Speakers from the IMO, its sister UN organisation, the United Nations Conference on Trade and Development (UNCTAD) and classification society ClassNK addressed the issues surrounding green ship technology trends from the economic, regulatory and operational points of view respectively. Two clear messages emerged from their talks and the discussions that followed – the growing role of Asia in shipping, the increase in South-South trade, and the need for collaboration within the industry and flexibility from the regulator's side

### How can shipping ride on the wave of big data and boost energy efficiency?

Mr Yasushi Nakamura, Representative Director, Executive Vice President, ClassNK, said that the classification society functioned as both a regulator and an innovator.

One of ClassNK's solutions for optimising shipping operations is the ClassNK-NAPA GREEN ship efficiency software – a collaboration with Finland-based software house NAPA. The sensors and software are installed on the ship to collect and analyse data, including the route and speed as well as the effects of weather and trim, to improve fuel efficiency. A total of 6 million data points are collected each month.

Mr Nakamura said that full-scale trials show that ClassNK-NAPA GREEN had helped to achieve fuel savings of 7%. The software may be installed on existing vessels in addition to new vessels, which allows energy efficiency gains



for the whole fleet.

He added, "What we learnt from ClassNK-NAPA GREEN is that performance monitoring, analysis, optimisation, and the understanding of how vessels perform in actual sea conditions can provide even greater savings than hardware solutions, with faster payback times, and can be applied to a greater variety of vessels in a shorter period of time."

"Eco-ships are good", he declared, "but eco-shipping is even better."

"ClassNK has opened the Global Research & Innovation Center, and hopes this will trigger the technology transfer," added Mr Nakamura. He urged other classification societies join in on the projects in the Centre. In response to a question from the floor, Mr Nakamura shared that he had no objection to the transfer of manufacturing technology to developing countries. Nonetheless, he recommended that developing countries focused on information technology systems as such systems were more easily deployable.

### How is shipping changing to reduce

### GHG emissions under the IMO's leadership?

Dr Edmund Hughes, Head, Air Pollution and Energy Efficiency, IMO, said the third IMO GHG emissions study found that shipping CO2 emissions were projected to increase by 50% to 250% in the period to 2050, despite fleet average efficiency improvements of about 40%.

IMO has investigated three approaches to address GHG emissions from international shipping, namely:

- Technical – mainly applicable to new ships, such as EEDI,
- Operational – applicable to all ships in operation, such as SEEMP, and including additional guidance on the Energy Efficiency Operational Indicator (EEOI)
- Market-based measures (MBM) – could provide an economic incentive for the maritime industry to enhance energy efficiency and, depending on the measure, could potentially generate funds.

Dr Hughes noted that shipping companies had shifted from having

broad confidentiality concerns to being more open about sharing data to optimise energy-efficiency performance for the ships they manage. In his opinion, there is no such thing as being "future-proof" but a more flexible approach to the future adoption of new energy efficiency technologies would serve the industry well.

As a result, he said, "The challenge is for the shipping industry and IMO as its international regulator to respond and effectively support this transformation." In response to a suggestion that IMO could make voyage optimisation systems mandatory to optimise energy efficiency, Dr Hughes replied, "This would be stepping on the toes of the masters who need to be able to make decisions according to the prevailing conditions." He also acknowledged that in practice, optimising ship operations was difficult in the face of challenges like split incentives.

Expanding on the topic, panel

moderator Ms Lolan Margaretha Eriksson, Ministerial Counsellor, Ministry of Transport and Communications of Finland, asked how IMO was making the regulations on ship energy efficiency and emissions more flexible.

Dr Hughes replied that the IMO energy efficiency regulations were non-prescriptive in how the requirements were to be met, leaving it to the ship owner and ship designer to determine the most appropriate solution. IMO also could allow for a degree of flexibility in terms of implementing provisions where identified. Using the example of concerns for ships to be "gas-free" when going into dry docks, he pointed out, "We provide guidance in the form of circulars." Other examples include the interim guidelines for gas-fuelled ships which after further development have been adopted as the International Code of Safety for Ships using Gases or other Low-flashpoint Fuels (IGF Code).

Even so, he agreed with Ms Eriksson that there was a need for more pilot projects to demonstrate energy-efficiency technologies.

### How is shipping changing in the broader macro-economic context?

Ms Hassiba Benamara, Economic Affairs Officer, Division on Technology and Logistics, UNCTAD, told conference delegates that in the past four decades world trade had doubled every 10 years. In recent years, South-South trade, she added, had been the main driving force propelling this growth. According to a 2014 PWC report, she said, South-South trade was projected to increase by about 6% annually in the period to 2030 – almost twice the global average rate.

Ms Benamara said South-South cooperation and links were expected to deepen in the future. She added that Asian trade routes were among the fastest growing and included Asia-Middle East, Asia-Latin America





and Asia-Africa.

She further noted that some observers were expecting the Middle East and Africa to become new trade hubs, driven by economic integration with Asia, proximity to Europe, a capacity for low-cost production and growing domestic markets.

In 2020, China's exports to Europe are projected to be almost double those from the US. A decade later, China will account for the largest share of global top trade routes.

In addition, developing countries are suppliers of a host of maritime transport services, including shipbuilding, seafaring, ship scrapping, and terminal and ship operations.

Her conclusion was, "Developing countries are expected to regain their position as drivers of growth. Asia, in particular China, will be a leading actor."

On the availability of financial support for developing countries to deploy new shipping technologies, Ms Benamara said, "Emerging banks led by developing countries, such as New Development Bank BRICS and Asian Infrastructure Investment Bank, and climate finance under the United Nations Framework Convention on Climate Change

(UNFCCC) could provide additional and innovative sources of finance for both hard and soft infrastructure such as technology." When asked about the impact of the new global trading environment on small island developing states (SIDS), Ms Benamara pointed out that the SIDS' transport- and trade-related challenges were amplified by the small scale of their physical mass, populations, markets and economies.

She commented that SIDS were generally not well integrated into the global trading system as their national economies did not generate enough cargo to produce economies of scale and create a virtuous cycle that would attract business and shipping service providers. She further noted that reducing their dependence on oil, including for the propulsion of ship engines, and engaging in niche markets to generate cargo could help SIDS reduce transport costs and enable better integration into the global trading and transport networks.



Session 4

# { The Future & How To Create It Through Sustained Capacity Building }

- What is capacity building?
- Who are the key actors?
- How should the maritime sector build capacity?

## Introduction

Creating the future through sustained capacity building was the theme of Session 4. The panel of speakers highlighted the need for greater cooperation. Enhanced collaboration between countries, within the industry, between industry and academic institutions, between seafarers and their organisations are all vital to expediting technology diffusion and ultimately ensuring that ships worldwide deploy energy efficient technologies.

## What is capacity building?

Capt Raphaël Baumler, Associate Professor, World Maritime University (WMU), quoted Decision 4/CP.7 of the 2001 Marrakesh Accords' definition of capacity building, which was "a process which seeks to build, develop, strengthen, enhance and improve existing scientific and technical skills, capabilities and institutions". He noted that capacity building should enhance both individuals and institutions. This would then pave the way for "the widespread dissemination, application and development of environmentally sound technologies and know-how" to enable the implementation of the United Nations Framework Convention on Climate Change.

Capt Baumler underscored the importance of maritime education in both capacity building and technology transfer (TT). Education has two main approaches. The strategic approach, which explores the "what" and "why", looks at issues such as understanding mechanisms for successful TT and identifying their context. The tactical approach, which addresses the "how", covers various



aspects including the technologies to be transferred and the development of information centres.

Capt Baumler also highlighted the erosion to capacity building. For the maritime institutes, such cooperation would diversify their sources of funding, integrate industry needs and realities into the curriculum while preparing students for work. Conversely, industry gains from a diversification of research abilities, a more balanced R&D investment between in-house and external projects even as new knowledge is integrated into their respective organisations.

WMU itself is actively promoting TT. With the IMO's financial support, WMU organised train-the-trainer courses on the Ship Energy Efficient Management Plan (SEEMP), which seeks to assist the industry in managing the environmental performance of their ships, reduce their carbon emissions, and enhance the energy efficiency of ship operations. WMU is also involved in various research projects, such as Sustainable Approaches and Innovative Liaisons (SAIL) and the use of liquefied natural gas (LNG) as

a marine fuel. Mr Dumisani Theophilus Ntuli, Chairman, Ad Hoc Expert Working Group on Facilitation of Transfer of Technology for Ships (AHEWG-TT) at the IMO, also highlighted the need for collaboration to promote TT and the rapid deployment of Energy-Efficient Technologies for ships (EETs). In particular, such cooperation needs to take into account the lack of "an institutional and policy base to facilitate the absorption of new technologies" in less developed countries.

He added that while Resolution MEPC.229 (65) recognised that TT needed to respect intellectual property rights, a "permissive" approach would promote accessibility to technologies and stimulate innovation. In general, this means allowing the free use of certain patents for third-party imitation. Among the countries that have adopted this approach are the United States, Japan, Republic of Korea and now China.

He also highlighted that global coordination between countries like Islamic Republic of Iran and the United States, and China and

Sweden on separate projects at the IMO was playing a major role towards achieving AHEWG-TT's goals. These goals include the development of a model agreement for the transfer of financial and technological resources and capacity building between Parties, for the implementation of the regulations in chapter 4 of MARPOL Annex VI.

While international cooperation and coordination are essential to achieve TT and EETs for ships, seafarers too play a vital part in technology absorption. Responding to a question from the floor, Capt Baumler said that there was "definitely a gap"

between the seafarers and shipping companies. He added that seafarers should have a bigger voice as they could contribute more to the discussion on technology transfer and absorption by sharing their experiences on board ships with shipping companies, in particular; and the maritime industry, in general.

Mr Ntuli pointed out that at the IMO, seafarers and shipmasters are represented through various organisations.

Dr Jose Matheickal, Head, Integrated Technical Cooperation Programme Implementation and Major Projects,

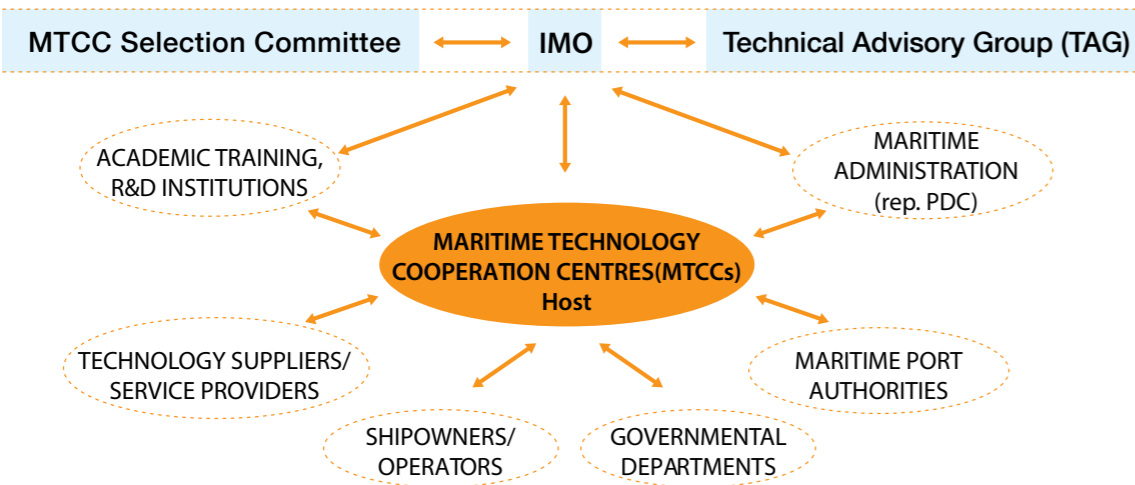
Marine Environment Division & Chief Technical Advisor (GloBallast Partnerships), in his presentation, talked about a number of capacity-building activities initiated by IMO to assist with the implementation of MARPOL Annex VI. These include a new Global Programme on Ships' Energy Efficiency under the IMO Integrated Technical Cooperation Programme (ITCP), the IMO-Republic of Korea International Co-operation Agency (KOICA) project on Maritime Energy Efficiency for East Asia, the Global Environment Facility (GEF)-United Nations Development Programme (UNDP)-IMO Global Maritime Energy Efficiency Partnerships (GloMEEP) project, among others. A large number of capacity-building tools and awareness-raising materials have also been developed as a result of these activities.

## International capacity building efforts towards TT

When it comes to capacity building, Dr Matheickal, said that technology cooperation was key to facilitating technology transfer and that the shipping industry could learn from other sectors. He shared a real-life example where technological cooperation through a network of medical centres of excellence across the globe helped to ensure that advanced medical treatment and medical technologies were accessible in less developed countries and saved lives. Similar global cooperation within the shipping industry could help facilitate TT and reduce GHG emissions through enhanced ship energy efficiency, as the public and private sectors share a common interest to promote sustainable development and global



Preliminary Concept of a Maritime Technology Cooperation Centre Network (MTCCN)



environmental health.

On the shape of things to come, Capt Baumlner said that maritime education would continue to play an important role. WMU is enhancing its curriculum. It is currently developing a complete Master of Science in Maritime Energy Management. The seven-module programme will be introduced in 2017.

Dr Matheickal said that while a host of global mechanisms and initiatives already existed, almost all of them focused on land-based industries. The complexity and international nature of the maritime sector might require a sector-specific technology cooperation centre network to facilitate technology transfer and capacity building. The Maritime Technology Cooperation Centre Network (MTCCN) would be a potential model to achieve these goals.

Its functions could include:

- Capacity building and training,
- Technology needs and market barrier analysis,
- Networking among MTCCs,
- Facilitate data collection and technology demonstration projects,
- Assisting policy and institutional strengthening, and
- Catalysing energy-efficiency financing.

Kick-starting the MTCCN could be achieved through a Global Project that could include some key components – establishing and enabling initially five MTCCs in five developing regions, regional-level capacity building and training through these MTCCs, and the MTCCs undertaking pilot and demonstration projects dealing with technology uptake and operations as well as data collection and reporting, and communication, dissemination and outreach.

“However, such an initiative would

need support from the international community, private sector, financial institutions and governments,” said Dr Matheickal.

Responding to question raised by Ms Angela Png, Director (International), Maritime and Port of Authority, over whether there were too many organisations with weak synchronisation and dispersing efforts, he said that it was not easy for a single network to address everyone’s needs and especially the complex needs of the maritime industry. He noted that needs differed from one country to another, especially between different regions.

“From this, we have the idea of separating these centres by region. One can also modify the networks to fit with the divergent needs”, said Dr Matheickal.



**Breakout Session on the last day of conference**  
at Future-Ready Shipping 2015: A Joint Singapore-IMO International  
Conference on Maritime Technology Transfer & Capacity-Building



A lively breakout session concluded the two-day Future-Ready Shipping Conference. The session was chaired by Dr Stefan Micallef, Director, Marine Environment Division of IMO. Dr Z Bazari, Managing Director, Energy and Emissions Solutions, skillfully facilitated the active discussion as participants forwarded a host of ideas and suggestions.

to lower emissions.

**National mandate and political will vital**

From the Philippines' Maritime Industry Authority (MARINA), Attorney Gloria Banas, Deputy Administrator for Operations, said that strong government will was needed to get the ball rolling. If the government provides a mandate towards a certain goal, the private sector would start off doing what was required because it was required.

However, she added, ***"If the private sector believes that it will eventually benefit them, then they will go ahead on their own."***

Dr Bazari succinctly summed up: "There needs to be a political will at the national level to get things done."

Mrs Azara Prempeh, Alternate Permanent Representative to the IMO, Ghana High Commission, said that for regulations to be effective, administrations of certain developing nations need capacity building. For IMO regulations to be effective, they need to be implemented by the member States. However, if the policy-making departments within a country are unable to conceptualise how to implement the regulation, the measures would be ineffective.

She said, ***"IMO may have to look at strengthen the existing initiatives and how to develop a structure to help these countries."***

**Building Capacity and facilitating technology cooperation through Maritime Centres of Excellence**

Participants also considered the prospects of creating a network of regional maritime centres of excellence, the Maritime Technology Cooperation Centre Network (MTCCN), to achieve capacity-building and technology transfer goals. This idea was mooted by

Dr Jose Matheickal, Head, Integrated Technical Cooperation Programme Implementation and Major Projects, IMO. Dr Matheickal suggested that functions of such a network of MTCCs may include capacity building and training, demonstration projects and technology needs and market barrier analysis, among others.

Mr Bertrand Smith, Director of Legal Affairs, Jamaica Maritime Authority believed that an MTCCN, with oversight from IMO, could help narrow the knowledge gap in developing countries. He added that it would be good for countries to have emission baseline information on vessels under their flag or vessels calling at their ports.

Mr Dumisani Theophilus Ntuli, Chairman, Ad Hoc Experts Working Group on Technology Transfer (AHEWG-TT), pointed out the importance of ensuring the centres' financial sustainability if the network is set up.

**Public-Private Sector Collaboration Essential**

The private sector could also play a pivotal role in this. Dr Matheickal pointed to an example such as the Australian government's Cooperative Research Centres (CRC) programme. The CRCs support industry-led collaborations between researchers, industry and the community. Industry, as members of the centres, sow the benefits of the research being carried out and so continue funding the centres and ensure their long-term viability.

Clearly, public-private sector collaboration is essential in the voyage towards sustainable shipping.

**"Carrot" versus "Stick"**

A major discussion point was the relative effectiveness of the 'carrot' versus the 'stick' approach in achieving cleaner shipping. Mr Simon Bennett, General Manager – Sustainable Development, Swire Pacific, said that shipping needed to take responsibility for the externalities ships are producing. In this regard, the stick has been shown to be more effective. He used the example of Hong Kong, China, which now required ships within port limits to switch from residual to distillate fuel. This move, he said, had improved the air quality there.

***"It would seem that with schemes around the world, the carrot is not making much of a difference. It needs to be the stick,"*** said Mr Bennett.

While Mr Warwick Norman, RightShip's Chief Executive Officer, agreed on the need for change, he believed the industry was not waiting for regulations before taking action. He shared on the use of emissions rating tools to exclude the most inefficient vessels or to offer port incentives, which was an important first step in his view. Mr Norman cautioned against the idea of a magic bullet – a single solution that would fully achieve cleaner shipping.

***"If we are talking about moving to low-carbon shipping, we first must know where our carbon shipping is at today. We have the capabilities and systems to measure it."***

After that, he added, both the carrot and the stick could be employed

***"Before the issue of carbon and greenhouse gas (GHG) emissions can be addressed, it must first be understood. Measuring the efficiency of today's ships is the logical precursor."***

Closing Remarks by **Dr Stefan Micallef**,  
 Director, Marine Environment Division, IMO  
 at Future-Ready Shipping 2015: A Joint Singapore-IMO International  
 Conference on Maritime Technology Transfer & Capacity-Building



“Considering the synergy between the Future-Ready Shipping (FRS) Conference and the GloMEEP Project, I am hoping that the FRS Conference would continue to act as the Global Forum for disseminating the outputs of such global initiatives.”

Ladies and Gentlemen,

We have come to the conclusion of this inaugural joint IMO-Singapore Conference on Maritime Technology Transfer and Capacity-Building which is aptly branded as “Future-Ready Shipping”. We can look back at a very successful and well participated event designed to let us all take stock of where we are today, in terms of availability of technologies, our current capacity to develop, transfer, deploy and diffuse energy efficient maritime technologies, and the current R&D efforts; and to envision how the future could look like when it comes to maritime technology transfer and capacity building, related institutional development, private sector engagement and the creation of a global network to promote technology collaboration and partnerships.

It has been a very busy and interesting two days, with discussions spanning the entire realm of technology development, technology transfer and capacity building aspects as well as policy and regulatory developments. This was an excellent opportunity for a dialogue among a wide range of stakeholders. I sincerely hope that the dialogue we initiated here could continue so that ships and shipping remain future-ready.

This conference could not have come at a better time. It has illustrated that the IMO and the maritime sector stand ready to support the global community to achieve its goals to address climate change that will be set in Paris later this year.

This IMO-Singapore joint inaugural conference was organized within the framework of the GEF-IMO-UNDP Global Maritime Energy Efficiency

Partnerships Project or simply GloMEEP Project.

Considering the synergy between the Future-Ready Shipping (or FRS) Conference and the GloMEEP Project, I am hoping that the FRS Conference would continue to act as the Global Forum for disseminating the outputs of such global initiatives. The Project Inception Meeting and the Global Project Task Force Meeting, which will happen tomorrow and the day after tomorrow, will be discussing these aspects in detail.

Ladies and Gentlemen, allow me to conclude by thanking those that have been involved in the lead up to and coordination of this very busy week of activities, and I know that you are many. Preparations for the various activities started almost a year ago and, since then, a number of people in several organisations have worked together to make sure that it came to fruition.

First and foremost, allow me to thank our hosts, the Government of the Republic of Singapore, for having the vision to embrace this extremely important and timely Conference and to join hands with IMO to organize this event.

I would start by singling out the Maritime and Port Authority of Singapore - Mr Andrew Tan, CEO of MPA: Thank you very much for your leadership and foresight. Thanks are also in order to MPA Senior Management; in particular, Mr Toh Ah Cheong and Ms Angela Png supported by the team, Mr Yow Liang Keon, Mr Benjamin Wong, Ms Chika Chow, Mr Princet Ang, and Ms Alexandra Khoo who have been involved in the excellent preparations for this week and who

have worked tirelessly and shown relentless dedication during the preparations.

I would also like to thank, on behalf of the IMO and MPA, the support and encouragement provided by our partnering organizations, supporting organizations and especially the support from the GEF and Government of Canada that provided the financial resources to facilitate the participation of a number of IMO member States in this important forum.

I would like to recognize all our excellent speakers and the session moderators who have provided their time and expertise in-kind to ensure that the objectives and goals of this conference were met. Without you, we could not have achieved.

I cannot close without thanking my colleagues in the Marine Environment Division of IMO for their hard work – especially Dr. Jose Matheickal and his team from the Implementation sub-division of my Division, and also to my colleagues Dr Edmund Hughes and his team from the Protective Measures sub-division for the technical support provided. I know that they have been working on the preparations for this week’s activities for a long time, and I am sure that they are extremely pleased to see the excellent fruit of all this work during this highly successful week.

Ladies and Gentlemen,

With that, I would like to acknowledge all of you for your active participation in the Conference and declare this Conference closed.

I wish you all a safe trip home.







**A JOINT IMO-SINGAPORE INTERNATIONAL CONFERENCE ON MARITIME TECHNOLOGY TRANSFER AND CAPACITY-BUILDING**  
28-29 SEPTEMBER 2015

Guest of Honour  
**Mr Koji Sekimizu**  
Secretary-General,  
International Maritime Organization

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