1 Introduction

Shipping is a crucial and strategic sector, by providing the link via maritime supply chains; shipping is the backbone of international trade. The maritime transport industry is also recognised as one of the cleanest modes of global transport. Being an economic, reliable and safe mode of transport, ships providing sea mode of transportation are key enablers of globalisation. Driven by the growing world population and economic activity, the demand for shipping services is set to grow (UNCTAD, 2018). Maritime transport accounts for the largest share of tonne-kilometres and in the baseline scenario of ITF study (OECD/ITF, 2017); this is predicted to grow from 71% of total transport in 2015 to 75% by 2050.

Maritime shipping remains the most carbon efficient and cost-effective medium of transport for long-distance trade. The predictions of increased trade raise concerns for the associated GHG emissions caused by the combustion of fuel on-board ships. The business as usual (BAU) scenarios raise concerns over the negative externalities from the sector such as environmental degradation, including air emissions. The potential damage of these negative externalities will intensify if BAU is maintained (IMO, 2015). Although shipping is the most carbon efficient mode of transportation, according to the IMO’s Third GHG Study (IMO, 2015), between the years 2007 and 2012, international shipping was responsible for an annual average of approximately 866 million tonnes of CO₂ emissions, which was about 2.4% of global greenhouse gas (GHG) emissions. These emissions are a
The direct consequence of the fuels (maritime bunker) used to power a ship’s internal combustion engines and particulate matter (PM) released. The IMO has played the leading role in taking several measures to reduce the GHG from ships in collaboration with shipowners/operators and shipbuilders.

The global nature of shipping and climate change mitigation requires coordinated solutions at the international level. International commitment and cooperation are key in achieving sustainable development. The role of maritime transport in addressing the global sustainability imperative is increasingly recognised. Safe, secure, energy-efficient, affordable, reliable, low-carbon, climate-resilient and rule-based maritime transport systems contribute to achieving an economically efficient, socially equitable and environmentally sound development (UNCTAD, 2018). However, for this role to effectively materialise, unsustainable maritime transport practices that result in wide-ranging external costs need to be addressed.

As early as 1992, Langlois argued that using technology “is not an end-product but a means to an end or to a variety of ends” (Langlois, 1992). In this respect, the current capabilities of conventional maritime information systems (IS) are only sufficient to fulfil the needs of the customers of traditional service providers. In these context initiatives of information sharing platforms, collecting and dispersing data and information from multiple stakeholders, in a logical framework, needs adoption at large scale to meet the targets of diverse stakeholders in relation to the efficiency, safety and sustainability of the industry.

2 Sustainable Development and Impact of Shipping

The concept of sustainability first appeared in the Brundtland Report published in 1987. This document, which was also referred to as Our Common Future, was elaborated for the United Nations in order to warn about the negative environmental consequences of economic development and globalisation. It was written with the aim of offering solutions to the problems arising from industrialisation and population growth. Today, sustainability attempts to secure present needs without compromising the future generations. Sustainable development embraces environmental, social and economic objectives, to deliver long-term equitable growth which benefits current and future generations. Sustainability means understanding the future risks and acting on these risks (Fig. 1).

To achieve sustainable development, it is crucial to harmonise three core elements: economic growth, social inclusion and environmental protection, which are interconnected and are equally crucial for the well-being of individuals and societies. Environmental protection, to many, is the primary concern of the future of humanity. It defines how we should study and protect ecosystems, air quality, integrity and sustainability of our resources and focusing on the elements that place stress on the environment.

Sustainability demands that day-to-day operations must now routinely consider the UN Sustainable Development Goals (SDGs) in decisions and actions. Envi-
Fig. 1 Three elements of sustainable development

Environmental sustainability is awareness of risks associated with carbon emissions, ocean health and other impacts influenced by the associated operations. Moving towards more sustainable patterns of production and consumption was globally agreed upon as an essential part of the United Nations’ Agenda 2030 on Sustainable Development and its 17 associated SDGs, which provide an important driver for progressing from a linear to a circular economy.

Of the three, the environmental dimension is widely addressed in the maritime sector and has been at the forefront of recent global issues, mostly in relation to ships and port equipment. Ships generate emissions at sea and within ports, while port equipment adds to the emissions within ports. While in port, ships engaged in cargo operations emit GHGs, such as NOx, SOx, CO2 and particulate matter. The negative impact from these emissions on the health of adjacent urban and coastal populations is estimated in various studies (Bouman, Lindstad, Rialland, & Strømman, 2017; Huang, Wen, Geng, Zhou, & Xiao, 2018). The maritime sector has been less active in dealing with environmental issues in the past due to a lack of visibility and interaction with society when compared to the aviation and land transportation sectors. Among the several international organisations, the IMO has played the leading role in taking measures to reduce GHG emissions from ships and ports in collaboration with shipowners/operators, shipbuilders and ports.

With 12 of the 17 SDGs depending directly on the sustainable use of natural resources, increasing resource efficiency is a key strategy. The contemporary maritime sector is faced with the challenge of understanding the economic, social and environmental benefits of achieving the SDGs and minimising climate change. As a matter of urgency and driven by regulatory and economic factors, various solutions have been adopted at different levels in isolation from a global standardised approach. Several international developments continue to contribute to the implementation of the 2030 Agenda for Sustainable Development. The Paris Agreement under the United Nations Framework Convention on Climate Change and various IMO instruments provide the foundation for sustainable, low-carbon and resilient development in a changing climate (UNCTAD, 2019).
3 Sustainability in Shipping

In order to provide a seamless and reliable service in the most efficient manner, the maritime transportation system must deliver safe, secure, efficient, and reliable transportation of goods across the world, while minimising pollution, maximising energy efficiency, and ensuring resource conservation. To achieve this, the complexity of the interrelationships among actors in the maritime transportation system should be recognised and considered when addressing specific actions. Benamara, Hoffmann, and Youssef (2019) identify the linkages between shipping and sustainable development and highlight the stakeholders, trade-offs, policy issues, obstacles and enablers of sustainable shipping and the role of international institutions, including the IMO and UNCTAD (Fig. 2).

Underlying requirements for a sustainable maritime transportation system are well-organised maritime administrations that co-operate internationally and promote compliance with global standards through proactive participation. To achieve a high efficiency, the coordination and support from shore is intrinsic for shipping. And most importantly, the data required to achieve the sustainability will need digital data sharing in standardised format across a common platform. Trust among stakeholders is a must to have completeness and transparency of shared data (Fig. 3).

Maritime transportation involves many stakeholders, where one decision and action can affect the whole logistic chain. Ships and ports are two crucial entities, and their operational performance determines the level of efficiency achieved. Information exchange across the maritime logistic chain is still very traditional in the majority of the developing world. As a result, all associated activities are often exposed to last minute changes and negatively impact planned actions and their

![Sustainable Maritime Transport](image)

**Fig. 2** Sustainable maritime transport (adapted from Benamara et al., 2019)
efficiency. Such lack of coordination in data exchange among all involved actors usually results in a significant waste of time, which leads to a decrease in efficiency. This has direct impact on the environmental and economic sustainability aspects.

4 IMO and Its Role in Environmental Sustainability

The IMO is the UN specialised agency responsible for setting global standards for the safety, security and facilitation of international shipping and the prevention of pollution by ships. The IMO’s regulatory framework covers various technical matters pertaining to the safety of ships and of life at sea, efficiency of navigation and the prevention and control of marine and air pollution from ships.

The Paris Agreement, signed in 2016, is an agreement within the United Nations Framework Convention on Climate Change, dealing with greenhouse gas emissions mitigation, adaptation, and finance, signed in 2016. It appeals for a global response to combat the threat of climate change. Efforts from every industry are being structured around reducing GHG emissions through the use of alternate fuels or energy efficiency measures. While the Paris Agreement does not include international shipping, the preceding UN Kyoto Protocol recognised the significantly increasing contribution of shipping emissions to the global climate change, and a mandate was given to the IMO to deal with maritime GHG emissions. The IMO has implemented a number of strategies formulated and implemented through the organisation’s Marine Environment Protection Committee (MEPC), such as the development of MARPOL (The International Convention for the Prevention of Pollution from Ships) Annex VI-Prevention of Air Pollution from Ships and IMO
Initial GHG Strategy adopted by MEPC (MEPC 72) in April 2018. The IMO has so far published three greenhouse gas studies:

1. The 2000 study estimated that international shipping in 1996 contributed about 1.8% of the global total anthropogenic CO₂ emissions.
2. The 2009 study estimated international shipping emissions in 2007 to be 880 million tonnes, or about 2.7% of the global total anthropogenic CO₂ emissions.
3. The 2015 study estimated international shipping emissions in 2012 to be 796 million tonnes, or about 2.2% of the global total anthropogenic CO₂ emissions. The study also updated the CO₂ estimates for 2007 to 885 million tonnes, or 2.8%.

In 2011, the IMO became the first international body to adopt mandatory energy efficiency measures for an entire industry sector with a suite of technical and operational requirements for new and existing vessels entering into use on and after 2013. By 2025 new ships built must be 30% more energy efficient than those built in 2014. The initial IMO strategy, which will be revised in 2023 and reviewed in 2028, includes an overall vision for decarbonisation, GHG reduction targets through to 2050, a list of potential short-, mid- and long-term measures to meet these targets, barriers to achieving the targets and supportive measures to help achieve them, and criteria for future review. The strategy incorporates quantitative carbon intensity and GHG reduction targets for the international shipping sector, including:

- At least a 40% reduction in carbon intensity by 2030 and pursuing efforts towards a 70% reduction by 2050, both compared to 2008 levels
- Peak GHG emissions from international shipping as soon as possible and reduce them by at least 50% by 2050 compared to 2008 levels while pursuing efforts towards phasing them out consistent with the Paris Agreement temperature goals
- New phases of the EEDI, to be reviewed within MEPC

5 Accounting for GHG Emissions from Shipping

The Kyoto Protocol, adopted in 2007, is an international treaty which extends the 1992 UN Framework Convention on Climate Change (UNFCCC) that commits state parties to reduce GHG emissions, based on the scientific consensus that global warming is occurring, and it is extremely likely that human-made CO₂ emissions have predominantly caused it. The Protocol calls for GHG emissions from fuels used for both international aviation and maritime transportation (bunker fuels) to be accounted for and reduced through initiatives from the International Civil Aviation Organization (ICAO) and the IMO, respectively. However, the Intergovernmental Panel on Climate Change (IPCC) guidelines for the preparation of GHG inventories requires that emissions from international aviation and maritime transport (international bunker fuel emissions) be calculated as part of the national GHG inventories of parties but should be excluded from national totals and reported
separately. This is due to the nature of shipping where a vessel plying trade for a country might opt to register with country’s registry (flag). The emissions of the vessel will be accounted for by the flag state of the vessel. The IMO’s Data Collection System (DCS) will collect international bunker consumption figures from the flag states for the vessels registered to them regardless of their region(s) of operation.

IMO Mandatory Data Collection and Reporting MARPOL Annex VI Chapter 4 Regulation 22A adopted by MEPC (MEPC 70) in October 2016 entered into force on March 1st, 2018 with a mandatory requirement that all commercial ships of 5000 gross tonnage and above collect data on their fuel oil consumption (each type of fuel used) and transport work parameters. These data are to be submitted in annual reports to their flag state. Once the flag state has verified that the Ship Energy Efficiency Management Plan (SEEMP) and the data reported are in accordance with the requirements outlined in Regulation 22A and the 2017 Guidelines for Administration Verification of Ship Fuel Oil Consumption Data, it will issue a Certificate of Compliance to the ship. The flag state will subsequently transfer the data to the IMO Ship Fuel Oil Consumption Database, and the data will then be used to produce an annual report to MEPC. The Data Collection System (DCS) is the first step of a three steps approach (data collection and reporting \(\rightarrow\) data analysis \(\rightarrow\) decision-making) by the IMO for developing a comprehensive strategy on the reduction of GHG emissions from ships.

The DCS is expected to provide the IMO with reliable data which, when analysed, will inform relevant decisions and policies in the MEPC. The data can also be used by ship operators to improve their ships’ Energy Efficiency Operational Index (EEOI). Data collection began on January 1, 2019, with first reporting for calendar year 2019 by Spring 2020, as shown in Fig. 4.

The mandatory data collection system for ship fuel oil consumption will provide a robust dataset on which future decisions on additional measures, over and above those already adopted, can be made. These data can then be analysed applying Maritime Informatics techniques discussed in the third section of this book.

Fig. 4 IMO DCS roadmap
The IMO has set ambitious targets for the shipping industry. In addition to the recently enforced 2020 Global Sulphur Cap and carriage ban, shipowners and operators must consider the GHG targets for 2030 and even more ambitious emissions goals for 2050. The IMO contributes to international cooperation to facilitate access to clean-energy research and technology, in particular energy efficiency and advanced, cleaner fossil-fuel technology, and promotes investment in energy infrastructure and clean-energy technology. In response to increasing concerns about the IMO’s effort to mitigate climate change from the impact of shipping, the IMO, through its Marine Environment Division, has undertaken bold initiatives aimed at supporting the uptake and implementation of energy-efficient measures in shipping.

6 Global Maritime Energy Efficiency Partnerships: A GEF-UNDP-IMO Project

The Global Maritime Energy Efficiency Partnerships (GLoMEEP) project supports 10 lead pilot countries for the purposes of championing:

- Legal, policy and institutional reforms
- Awareness raising and capacity building activities
- Establishment of public private partnerships to encourage technology transfer

The lead pilot countries are Argentina, China, Georgia, India, Jamaica, Malaysia, Morocco, Panama, the Philippines and South Africa. The GLoMEEP project offers considerable assistance in form of toolkits to the global community in the technical requirements for energy efficiency in shipping. Focussing on developing countries, where shipping is increasingly concentrated, GloMEEP has created global, regional and national partnerships to build capacity to address maritime energy efficiency and for countries to bring this issue into the mainstream within their own development policies, and dialogues. GloMEEP recently launched the Global Industry Alliance to Support Low-Carbon Shipping, in which a group of world-leading private companies from different sectors of the industry are coming together to contribute to tackling the challenges of decarbonizing the shipping sector (IMO, 2018). GloMEEP is an opportunity to demonstrate the power and use of Maritime Informatics.

7 The Global MTCC Network Project

Another key initiative is the Global MTCC Network (GMN) project, formally entitled ‘Capacity Building for Climate Mitigation in the Maritime Shipping Industry’. This project enables developing countries, especially least developed
countries and small island developing states, in five target regions (Africa, Asia, Caribbean, Latin America and Pacific), to effectively implement energy efficiency measures through technical assistance, capacity building and promoting technical cooperation. The project is funded by the EU and implemented by the IMO through contractual partnerships with five centres of excellence across the developing world. The Maritime Technology Cooperation Centres (MTCCs) act as regional focal points for a wide range of activities including (IMO, 2017):

- Building compliance with existing and future international energy efficiency regulations
- Help participating countries develop national energy efficiency policies and measures for their maritime sectors
- Promoting the uptake of low-carbon technologies and operations in maritime transport
- Establishing voluntary pilot-data collection and reporting systems to inform the global regulatory process

The individual MTCCs are positioned to have considerable impact in their respective regions through pilot projects, capacity building and stakeholder engagement with all level of industry including policymakers and operational personnel within governmental bodies. Many of the MTCCs have created academic, government and private sector industry partnerships. For example, The Caribbean region is impacted by the operations of MTCCs, which provides a significant opportunity for the region to make strides in addressing the complex issues of climate action in the maritime industry (Singh & Rambarath-Parasram, 2018). The MTCC Caribbean established an online voluntary reporting system in June 2017 as a pilot. Data were collected on the use of equipment and machinery on-board, including air emissions abatement and energy efficiency technologies. Ships of 400 GRT and above are encouraged to submit fuel oil consumption and voyage data on a voluntary basis at each port of call while operating in the region. The reporting system provided the baseline of energy-efficient technology and fuel consumption for ships trading in the Caribbean region.

8 The Role of Data in Maritime Transport Sustainability

In shipping, digitalisation and the use of data is continuing to have a huge impact. Digitalisation is shaping the shipping industry’s future in every aspect, whether on-board or ashore, taking advantage of new designs and technologies to improve efficiency and safe operations. Environmental sustainability has become a top priority for regulators and shipowners alike. Decarbonisation in the maritime space is not achievable in the absence of consequential operational data. An understanding of a ship’s operational output requires measurement and analysis of fuel efficiencies before it can be used as an influence within carbon reduction strategies. The number of possible interactions between a ship and its environment are significant and
harnessing this information is critical. Data is essential to understand, optimise and ensure compliance within day-to-day activities. Ships are becoming sophisticated sensor hubs and data generators, producing and transmitting data in real time. Regulatory mandates, such as IMO DCS and EU MRV require the collation and reporting of emissions data. Digital innovation with various information technology (IT) solutions has supported the shipping companies with compliance to advance decarbonisation in the industry.

The improvement in availability and connectivity of satellite communication has increased the ability to transfer large volumes of data at ever-lower cost. These digital data flows are driving the automation of processes and functions, and they can have a positive impact on safety and commercial and environmental performance. Therefore, combining data streams from multiple sources allows the maritime industry to be more efficient and responsive. The sustainability impact of digitalisation with respect of economic implication is considered more important than the other dimensions (Kayikci, 2018). The environmental implications of digitalisation have most impact on reducing waste, pollution, and the emission of greenhouse gases. Digitalisation of logistics is still in an early maturation phase. However where implemented, digitalisation and improved connectivity on-board ships and between shore and ship offered improved environmental footprint and safety performance. Data continues to play a significant role in ship operations specially in reducing operating costs. Route and arrival optimisation has helped vessels reduce fuel consumption. However, the data can vary from simple estimated time of arrival (ETA) required for port scheduling to very complex data on specific components on-board vessels. To explore maximum benefits, some form of standardisation is required. For this reason, the role of data in sustainability can be further explored, and we expect such developments in the future.

9 What’s Next

Since the IMO’s announcement of its initial GHG strategy in April 2018 with the ambition of reducing total annual GHG emissions by at least 50% by 2050 compared to 2008, digitalisation has been viewed as a key enabler to meet this goal. Industry action has been driven by this ambitious target. More and more shipping companies are taking a long-term perspective focused on decarbonisation. Shipowners and operators are continuously exploring optimum technical solutions to meet the decarbonising needs for their fleets. Digitalisation can make decarbonisation faster and more effective. Energy efficiency gains in shipping operations can be achieved only by data-enabled decisions. Digitalisation will provide the means to measure energy efficiency by providing management of data allowing informed decisions on decarbonisation. Digitalisation is imperative in the journey to zero carbon shipping. Sustainable maritime transport will also be essential in the achievement of the UN’s vision for sustainable development by providing an energy efficient, reliable and economical means of freight transport.
Maritime transport has been identified as a laggard sector in the Industry Digitalisation Index (Morgan Stanley, 2016). But recent regulatory and sustainability demands have provided the momentum to fully embrace digital transformation. While implementation has been slow in relation to other sectors various industry stakeholders are collaborating towards implementing digital transformation. Digitalisation and joint collaborative platforms and solutions enabled by new technologies and innovations are increasingly used by the shipping industry, transforming business and partnership models. ABS and Daewoo Shipbuilding & Marine Engineering (DSME) have signed a joint development project (JDP) agreement to explore decarbonisation and digitalisation strategies for very large crude carriers (VLCC) and ultra large container ships (ULCS). The JDP aims for DSME to develop ABS approved VLCC and ULCS vessel designs, which offer potential solutions to the IMO’s 2030 decarbonisation goals. The JDP also covers onshore remote monitoring, SMART criteria (specific, measurable, achievable, relevant and time-bound) and autonomy technology, as well as the development and review of cybersecurity aspects associated with the DSME Smart Ship platform (Digital Ship, 2019). In a similar way, the Lloyds Register (LR) and China State Shipbuilding Corporation (CSSC) collaborative research programme will look at the use of blockchain and digital twin technologies and will evaluate ship propulsion systems, including various clean-energy sources and their certification. FPSO, FLNG and FSRU design concepts will also be assessed (NafsGreen, 2019). Pilot projects utilising new technologies have demonstrated tangible results and offered new opportunities to achieve greater sustainability in shipping and ports and improved performance and efficiency.

Digitalisation and automation are transforming the shipping sector. To achieve digitalisation uniformly in the maritime world, it is essential that ships and ports are data enabled and data ready. Recognising the growing need for well-managed big data connectivity on merchant vessels, Ship Earth Station (SES) networks are working in tandem with shipping companies to ensure that their digital strategies are achieved in a simple, cost-effective way. High-quality satellite broadband underpinned by superior ground infrastructure and optimal VSAT (very small aperture terminals) can make a difference by having the capability and realising the full potential of the investment in digital solutions. New technologies on the horizon for the coming 10 years include cellular networks in coastal areas; VDES (new data service on the VHF band); Wi-Fi in ports; and, most importantly, satellite communications, improving coverage and bandwidth. Currently, the maritime industry contributes to the growth in deployment of VSAT equipment on-board ships. According to COMSYS, the number of active maritime VSAT installations quadrupled from 2008 (6001) to 2014 (21,922) and the number exceeded 40,000 by 2018. By 2020, most classed vessels were broadband capable. Also, the VSAT network capacity is increasing owing to the introduction of new high throughput satellite (HTS) systems, with 2–10 times higher throughput than classical satellites. The overall VSAT network capacity covering maritime regions will experience at least a tenfold growth to some 200 Gbps in 2025, implying a massive increase in data transfer rates and decreased costs per bit for the connected vessels. Ships, systems
and components are already accessible from almost any location. At the same time, combining data streams from multiple sources will boost performance management (including fleet utilisation, routing, trim, fuel consumption, emission management) and asset integrity management, building on remote condition monitoring as well as allowing for an increased level of automation. This could reduce lead times and fuel consumption by optimising arrival times and allow related efficiencies on the shore side too (and vice versa) (DNV GL, 2020). The aim is to promote efficient and secure trade, including offering greater supply-chain visibility and use of electronic documents, ultimately benefitting customers who rely on shipping industry services (UNCTAD, 2019).

Forecasting remains an inexact science, and the data it depends upon can be inconsistent and incomplete. Lack of transparency leads to failure of understanding among supply-chain stakeholders. However, increased transparency not only enables stakeholders to respond efficiently to disruptions but also provide capability to anticipate them. In addition, the further development and study of Maritime Informatics will be most important in prescribing how the supply chain should operate. For example, the aim is not simply to achieve optimal environmental efficiency by route and arrival optimisation but to enhance the capability to proactively inform the many stakeholders across the entire chain as applicable to circumstances and enable them to operate in a dynamic mode to modify plans accordingly.

Industry action, aligned with similar principles as the IMO’s Global Industry Alliance to Support Low-Carbon Shipping (GIA), is already focusing on the vessels that can implement Just In Time (JIT) arrivals at a global level (IMO, 2018). Currently JIT is not a common industry practice, and IMO’s Facilitation Committee discussed the idea of providing vessels with regular updates concerning the availability of berths, mostly in the 12 h prior to a port arrival. By timing their arrival, ships would be able to optimise their speed; by slowing down for JIT arrival, they reduce the carbon footprint of shipping as well as saving fuel. The GIA discussions also concluded that JIT arrival is not a problem, but operationally unreliable/inaccurate data is a major impediment to securing a reliable berthing window. Contractual solutions are required in the case of tankers and bulk ships to allow a ship to arrive during a 12-h berthing window.

Other ongoing developments include the PortCDM concept, for maritime services based on standards and open interfaces. The concept is built on information sharing and collaborating to optimise the maritime transport chain while increasing safety and sustainability. In addition to supporting the key performance indicators (KPIs) of duration time, waiting time, berth productivity, capacity utilisation, predictability and punctuality, the various timestamps that are shared include the arrival and the departure times of ships and/or the duration of the services provided to ships during their port calls. These data are a very valuable contributor to the data set needed to measure the efficiency of resources. Wherever possible, the data required to evaluate the KPIs and to provide data for other useful efficiency analyses should be shared by machine-to-machine interaction using a standard data format such as the S-211 port call message format and the timestamps that underpin
PortCDM and data sharing (Lind et al., 2019). Monitoring performance through the KPIs and associated analyses enables the different actors to improve their operations and utilisation of physical infrastructure and variable resources.

## 10 Issues for Discussion

In summary, embracing digitalisation prepares the maritime sector for the demands of future. Extensive understanding of Maritime Informatics and its role in keeping maritime transport sustainable is a relevant imperative for the industry. This understanding of digital transformation is beyond technology and improving processes. It is more about change management, “a company’s ability to evolve its corporate culture to not only take advantage of emerging technology but to also critically embrace the new business strategies that those technologies drive” (Accenture, 2016), especially in the maritime sector which has been very traditional and lagged behind in many aspect of its operations.

Further research on the implementation of sustainability in the maritime sector is obligatory, and it must consider peculiarities in shipping and the port sector covering intermodal transport, port governance, development strategy, and policies because they will influence implementation and policies of sustainability and intervention policy (Lee, Kwon, & Ruan, 2019). The decision-making and planning processes often lack sufficient coordination, and they create potential for conflicts. Policy coherence can be enhanced by using common platforms to take advantage of interrelationships. This can be further enhanced by conducting comprehensive policy analysis, defining institutional mechanisms for monitoring and collecting data and proposing strategies that will take advantage of identified interrelationships (Singh & Rambarath-Parasram, 2018). Research and data collection for enhancing sustainability, particularly in developing economies, is at an embryonic stage and voluntary in nature. Despite a body of knowledge, the adoption of best practices, lessons learnt, modern technologies, and sustainability continues to remain a challenge as part of mainstream shipping practices. Countries will need to combine a wide range of policies, from support to technology, research and development to behavioural measures, adequately supported by the required legal and institutional framework. In our opinion the solution may be in understanding the philosophy.

The significant restrictions put in place during the Covid-19 outbreak reduced GHG emissions dramatically. Are we ready to continue with drastic steps to help maintain this reduction or will we wait until we are forced to do so? Can the industry develop the required trust or streamline its principle to be an ethical and ecologically sustainable business?
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