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Green Shipping Conclave Outcomes D.G. Shipping - INMARCO 2022

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The world is facing a climate crisis and the IPCC AR 6 report states that "Global warming is reaching 1.5°C in the near-term, which would cause unavoidable increase in multiple climate hazards and present multiple risks to ecosystems and human."

Addressing the climate crisis is the need of the hour and the global shipping industry is faced with a once-in-a-generation transformation driven by the need for reducing the GHG emissions. This throws up a number of challenges as well as opens up new opportunities.

The Indian Maritime administration has taken a proactive approach in this respect and in recent years a number of initiatives have been taken up by the Directorate in partnership with IMO.

As a hard to abate sector, the challenges faced by the industry for successfully making this transition are enormous and these are further amplified by the vital role played by shipping in the world trade.

As we embark on this very challenging journey, it is vital to engage with all stakeholders and ensure that all voices are heard and we are all in the journey together. The Green Shipping Conclave has provided a unique opportunity of bringing together different stakeholders in the transition including ship owners, ports, financial institutions, fuel suppliers, equipment manufacturers to name a few.

The insights provided by this Green Shipping Conclave in partnership with IMEI will help set expectations and feasibilities for all the stakeholders and in shaping future discussions to further the goals.

-Shri Amitabh Kumar



Mr. Ajithkumar Sukumaran
Chief Surveyor cum Addl. D.G. Shipping (Engg.)

IMO's Initial Strategy for GHG reduction adopted in 2018 set targets for 2030 and 2050 and envisaged mid-, short- and long-term measures for achieving these targets. Of these, the short-term measures including EEXI and CII have been implemented and further mid-term measures are under consideration.

The above regulatory measures are expected to drive the transition to low and zero carbon fuels and will pose multi-dimensional challenges which will require all stakeholders to come and work together to rise above the challenges.

The shipping industry has witnessed a number of major regulatory changes in the past decade and has successfully come out of these, most recently the 2020 Sulphur cap and the Ballast Water Treatment Systems. However, the transition to low and net-zero fuels is different in the magnitude of changes necessary including the bunkering and port infrastructure and construction of ships capable of burning alternate fuels, as well as the pace at which this transition is to be accomplished to meet the ambitious targets of IMO.

As a major seafaring nation, India is well positioned to play a leading role in this important transition to near and net-zero shipping. Indian Maritime Administration as a proactive measure has shared the experience of the trials of the environment friendly biofuels blends gained in IMO and also have suggested the regulatory changes that are required to support a wider adoption of biofuels.

The Green Shipping Conclave organised in conjunction with the Institute of Marine Engineers (India) has brought together participants from several different industries to collaborate on finding solutions to the common problem of decarbonisation of the maritime industry and prepare us for the upcoming changes. It is hoped that this Green Shipping Conclave can open up more such opportunities and bring clarity for the future shipping from an Indian perspective.

-Mr. Ajithkumar Sukumaran

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Executive Summary for Policy Makers: Common Themes

The Green Shipping Conclave at INMARCO 2022, structured across 5 panel discussion sessions, brought industry leaders from across the overall shipping value chain together to discuss the potential solutions for Indian domestic shipping to achieve a 5% uptake in alternative fuels by 2030. The expert panel discussions cast light on key issues and heard stakeholder feedback on the potential methods of achieving the target, as well as the challenges and opportunities which lie ahead.

From each session, numerous solutions were identified and captured along with their individual action pathways, alongside analysis to identify specific recurring themes. Effective policy can be devised by identifying the common themes across the multitude of recommendations and removing barriers which act as hurdles for many of them. This can also demonstrate a means by which government resources are optimised and risk is fairly shared between the public and private sectors.

Four macro-level themes for policy development were identified from the discussions:

- **Theme 1: Establish the Baseline and Aggregate Demand:** A consistent area of action surfaced during discussions revolving around the level of uncertainty with regards to fuel choice, availability and timelines. Beyond this, mixed messages exist about the availability of resource such as land and infrastructure. A need to establish a baseline and sound a metaphorical starting gun therefore emerges, to ensure all efforts are aligned and working amongst common strategic priorities. Examples of action points which fall under this theme are:
 - Aggregating fuel demand. The uncertainty surrounding fuel choice has emerged as a barrier to investment. Rather than simply dictating the fuel choice, which will likely be decided by market forces in the long term, work can be undertaken to pool together the quantity, location and timeline expectations of any and all alternative fuel, to demystify the problem from the perspective of the fuel supplier, or consumer. A clear aggregate demand of known tonnes of fuel in known supply ports would de-risk investment into the infrastructure to supply the fuel, which can be developed in a way to be suitable for any emerging fuel types.
 - Establish specific targets, such as 5% fuel uptake by 2030, with a trajectory to meet the target in place. This can clarify the scope of the required technology and infrastructure changes, for example, by clarifying the role of retrofitting versus new building only.
 - Pool together the existing capability, resource, and infrastructure. Inertia and reluctance to invest in facilities for R&D or skill development can be significantly overcome by recognising the currently available resources which could be repurposed. For example, existing shipyard facilities, berth space or technology research centres which have focussed on other sectors such as oil and gas or ship recycling could feasibly be repurposed with minimal expense into centres that can contribute to the necessary development of green technology, thereby avoiding additional expenditure or risk. A nationwide tally across public and private capability as well as a means to activate it if necessary can create a strong starting position.
- **Theme 2: Collaboration beyond the localised supply chain:** The second identified theme of actions highlights the need for collaborations across the entire value chain of shipping, including actors which would not normally necessarily be considered within the traditional supply chain. Specifically, discussion frequently noted isolated cases of 2 or 3 party collaborations that can unlock a specific action. Broadly merging these cases identifies a need for an entirely joined up value chain conversation, either in specific projects or green corridors, or as a wider industry association platform. Such suggestions included:
 - A coastal shipping green corridor to stimulate interaction between specific ports that can supply bunker and the ship owners to ensure regular supply and demand. This would also serve as a platform for data sharing to enable digital solutions like Just-in-Time arrivals and would also incentivise ports to take fair responsibility in their role in determining a vessel's CII rating.

- Levelling the playing field for shore power. Interaction between national and state governments, ports and ship owners to harmonise the approach to shorepower and ensuring that any initiative do not suffer from uncompetitive disadvantage. This could further develop with land owners collaborating with terminal operators to further optimise the use of land, either to generate abundant solar power, or as a carbon sink through cross-funded reforestation programmes.
- Global collaboration with national focus. The IMO initiatives being discussed revealed room for developing nations to learn from and build upon similar projects occurring around the world.
- **Theme 3: Unlock access to de-risked funding:** A dominant area of discussion and clear indication of a barrier was highlighted as the problem of “who can pay for it?”. When discussing specific ship technology, port infrastructure or fuel production, there is a clear cost gap between current technology and the expected alternate fuels, especially in the short to medium term. Within this theme, solutions were explored which reflected on the fact that like other industries, money for transitional activities can be made available, however affordable finance currently has limited accessibility.
 - New streams of revenue. These can be opened through the establishment of a carbon market where savings from shipping can be sold on to other sectors. In similar fashion, both tourism opportunities and repurposing idle assets can be mechanisms by which new revenue can be reinvested. An alternative means, but similar outcome, could be a carbon levy or tax, however this was noted to be an initiative which needs global uptake rather than country specific, to ensure fair competition remains.
 - Sharing the risk with Public-Private Partnerships. Rather than the seemingly complex task of removing the risk of transitional efforts, which may be driven by science and technology limitations, there were various options noted by which the investor can de-risk their approach by others in the supply chain absorbing a fair share, including public sector. Partial credit guarantees or Concessional loans through the establishment of Public-Private Partnerships (PPP) between commercial banks and governments or MDBs emerged as a strongly favoured means of doing so, with clear historical context from other industries used to generate confidence in such a scheme. Direct funding opportunities were also considered, through a government or industry led R&D fund, noting previous success from EU funded development projects.
- **Theme 4 – Accelerate Green technology:** Access to the requisite green technologies and the skillsets to effectively use and manage them is critical to be able to successfully deliver on the decarbonisation targets. It was evident across the sessions that India would need to collaborate with countries ahead in the maritime decarbonisation curve to expedite the uptake of these technologies. A concerted effort through bilateral ties and regulatory agencies like IMO is required on this.

Green technologies are CAPEX intensive and have high gestation period. In order to shorten the adoption path it is important to ensure that there is proper sharing of knowledge and learnings. Suggestions include

- Engage global maritime experts and technology solution providers. There have been global efforts towards green shipping through technology innovation and design with some countries and companies already implementing green technologies at a large scale. There is a clear opportunity for India to pave its way in this journey by building a strong collaboration network with maritime and technology organisations that are leading in the green technology space. The idea is to ensure awareness, and a seamless flow of knowledge and technology developments across sectors and the world.
- Leverage the production capacity in India. The widespread presence of production units, such as for biofuel engines, and the service availability in India, can be utilised to gain traction for green technology production in the country. This will add value in two ways – it will give India exposure and access to global advancements in technology innovation and design; moreover, it will train the Indian labour pool in green technology production and operation.

- Practice one size ‘does not’ fit all. A gradual and diversified approach towards adopting green shipping technology is the most appropriate way forward in the Indian context. There might be a green technology solution that is accessible but not feasible for a certain vessel type, while there might be one which is feasible but not accessible. In the current scenario, India is not ready for hydrogen or ammonia run vessels. The immediate move for India must be to map and implement the available green tech solutions with the appropriate vessel types, for eg. LNG and CNG retrofits for small vessels, and carbon capture systems for larger vessels.
- Enhance India’s Green Ship Design Capability. With the ship design capability diminishing globally, India is poised to take up a lead role in efficient ship design and ship design with new technologies.
- A concerted effort through bilateral ties with countries, regulatory agencies like IMO as well as industries like automobile and aviation is required to drive this

This report further explores specific solutions and action pathways within each theme, structured by panel discussion session, demonstrating the potential for effective policy to penetrate deeply within individual issues and widely across multiple occurrences in order to overcome specific and numerous challenges.

Policy makers are subsequently recommended to establish a process to further identify specific policy mechanisms to target these themes. Top priority action areas on the basis of the identified themes and solutions are outlined as follows:

TOP 4 PRIORITIES	
•	Establish a Public-Private Partnership funding scheme to enhance access to affordable transition finance
•	Set clear domestic shipping targets with anticipated trajectories to focus effort in specific locations, timeframes and with common resource.
•	Consolidation of industry associations and establish yearly Green Shipping Conclaves to enhance interactions on green corridors and partnerships between government and private sector to resolve shore power constraints.
•	Develop Indian maritime technology capability to be a global leader by engaging with advance technology experts and leveraging production and design capacity in India

Panel Discussion 1: Green Fuel for Maritime India

Speakers & Panelists

Chair	
Mr. Vijay Arora	Managing Director, Indian Register of Shipping

Panel Convener	
Mr. CPK Kashyap	Executive Director Operations, Sanmar Shipping Ltd
Panelists	
Mr. Siddharth Mitra	Executive Director, IOCL
Mr. Mrinal Dutt	Senior Manager, GAIL
Ms. Prakriti Sethi	Chief India Representative, Methanol Institute
Mr. Arunesh Verma	Assistant VP NBD Hydrogen and Downstream Chemicals, Jindal Energy
Mr. Jan-Paul de Wilde	Head Decarbonization, Energy Transition and Innovation, RINA
Mr. Prabhat Jha	Group Managing Director and CEO, MSC Shipmanagement Ltd Cyprus
Experts	
Mr. George Thomas	GM Energy Transition, HPCL
Mr. Nitin Yadav	Chief Manager Strategy, Gas/LNG-BPCL
Mr. Thomas Abraham	Manager Green Energy Development, Larsen and Toubro Ltd



Summary

Alternative fuels are widely regarded as necessary to achieve complete decarbonisation of the shipping industry, in line with IMO trajectory of at least 50% absolute GHG emission reduction in 2050 compared to a 2008 baseline.

In particular, hydrogen and hydrogen-derived synthetic fuels (such as Ammonia or Methanol) are considered amongst the most scalable long-term solutions as marine bunker fuels. Current debate centres

around which hydrogen carrier has the best potential for use in Shipping, considering issues such as the cost of production, stability and safety implications, storage and bunkering infrastructure requirements and regulatory compliance.

Readiness and availability for these fuels remains lower than the transitional fuels, which may offer significant GHG emission savings in the short-medium term while building capability and infrastructure for the long-term success. These fuels, such as bio-mass derived oils or LNG can leverage existing technology and infrastructure to enable uptake while achieving GHG reductions anywhere in the order of 10-90% compared to HFO. Cross-sector demand and volatile pricing mechanisms can however increase the level of risk, along with uncertainty regarding the availability and compliance with new regulations.

Specifically, the opportunity for domestic policy focusing on the uptake of biofuels were discussed for India. Feedstock availability for 2nd and 3rd generation biofuels are challenged by current export demand, exposing the opportunity for this to be rediverted into domestic shipping use, taking advantage of the high technological readiness for uptake on existing vessels this decade. This is further complemented by likely availability coming from agricultural waste, used cooking oil and virgin palm oil, if deemed sustainable under the appropriate regulatory regime, such as Lifecycle analysis.

Growth of biofuels as well as Methanol and LNG were discussed, with the expansion of up to twenty-fold expected by 2030. While the current feedstock is reliant on fossil fuels, there is also scope to leverage the growing renewable energy supply in India into the production of green fuels.

E-fuels, while expected to have a larger impact from 2030 onwards, are also gaining focus. Cost, technical, and logistical challenges can be addressed by cross sectoral collaborations and parallels were drawn to EU-funded programmes which accelerate the R&D into these options.

For all such fuels, a consensus was reached on the need for clear demand aggregation, to unlock the chicken-and-egg scenario between the supply and demand actors in the industry. This clarity can be sought through industry collaborations, pilot projects to unlock technological maturity and recognition of the timescales involved between drop-in fuels and e-fuel development.



Action Pathways, Challenges and Opportunities

Solution	Key Challenges/ Opportunities	Possible Actions & Recommendations
<ul style="list-style-type: none"> LNG 	<ul style="list-style-type: none"> Bunkering Infrastructure is capital intensive – bunker providers do not want to invest unless they have a off-take guarantee 	<ul style="list-style-type: none"> Demand Aggregation – Govt should conduct a holistic demand-supply assessment and baselining for 2030 and 2050 targets Variable Gap Funding, PPP Finance - Govt. support to address the funding gap through VGF/ PPP models
	<ul style="list-style-type: none"> Price Volatility and potential relative cost difference between green fuels 	<ul style="list-style-type: none"> Use of long duration term contracts against spot market
	<ul style="list-style-type: none"> Methane Slip 	<ul style="list-style-type: none"> Reduce methane slip (Tank to Wake) through methane abatement technologies – Govt. support will be required for technology transfer and best practice dissemination. Source methane from less carbon footprint sources – e.g Qatar. Conduct studies to assess Well to Tank carbon footprint for the LNG sources
<ul style="list-style-type: none"> Biofuels (Blending) 	<ul style="list-style-type: none"> Small % blending can lead to high GHG reduction Immediate scalable solution (FAME, HVO) 	<ul style="list-style-type: none"> GOI’s National Biofuel Policy is aligned with the opportunity. Implementation of the same to be streamlined.
	<ul style="list-style-type: none"> Limited feedstock available, mostly imported, making cost of feedstock high 	<ul style="list-style-type: none"> GOI’s National Biofuel Policy is aligned with the opportunity. Implementation of the same to be streamlined.
<ul style="list-style-type: none"> Bio-Gas/ Bio LNG 	<ul style="list-style-type: none"> Abundant feedstock available – municipal waste, agri-waste etc. Challenge is the aggregation and liquefaction of biomass Easy adoption as TRL is high 	<ul style="list-style-type: none"> GOI has policies to incentivise CBG (compressed Bio-Gas) and Bio Gas based electricity generation. This needs to be extended to the production of bio-gas as feedstock for bio-LNG Mechanism to incentivise and streamline aggregation of biomass
<ul style="list-style-type: none"> Methanol 	<ul style="list-style-type: none"> High TRL (handling and storage is easier and require minimal modification in the handling infra) Underdeveloped bunkering infrastructure and standards 	<ul style="list-style-type: none"> Demand Aggregation – A holistic demand-supply assessment and baselining for 2030 and 2050 targets Govt. support to address the funding gap through VGF/ PPP models Encourage Class Societies to setup bunker rules and standards and get global alignment on rules
<ul style="list-style-type: none"> E-fuels 	<ul style="list-style-type: none"> Sufficient renewable energy supply, but uncertain specific technology needs 	<ul style="list-style-type: none"> Gradual ramp up of fuel blending in line with supply constraints

- Class rules (bunker standards, prescriptive rules). Lifecycle assessments



Panel Discussion 2: Green Ships & Green Technology Solutions in India

Speakers and Panelists

Chair	
Mr. Madhu Nair	CMD, Cochin Shipyard Ltd
Panel Convener	
Mr. J Dasgupta	President, Institution of Naval Architects India
Panelists	
Mr. Arjun Chowgule	Executive Director, Chowgule Group
Mr. Biju George	Director Shipbuilding, Mazagon Docks Limited
Mr. Hrishikesh Narasimhan	General Manager, L&T Shipbuilding Ltd
Mr. Suraj Dialani	MD, Vijai Marine Shipyards
Mr. Sandith Thandasherry	CEO, Navalt group
Mr. R.J. Shaji	General Manager, Water Transport at Kochi Metro Rail Ltd
Mr. Sahay Raj	MD, SHOFT Shipyard
Experts	
Mr.Sajeendra Kumar Nambiar	President IMDA
Mr. R Hariraj	General Manager, SEDS
Mr. Sumithran Sampath	General Manager, Class NK
Mr. Akshay Jain	CEO, VEDAM
Mr. N Girish	VP, Indian Register of Shipping
Mr. Pawan Kapoor	MD, ISF Group
Prof Siva Prasad	Professor Department of Ship Technology, CUSAT
Mr. Song	Senior Vice President, Korean Register



Summary

For both short sea voyage and longer voyages, green technology options offer varying pathways to achieving decarbonisation. Initial pilot projects focussing on the use of solar and battery hybridisation has been demonstrated for newbuilds, while retrofitting opportunities exist for vessels currently in operation.

It was recognised that the opportunity to accelerate growth of green technology capability is to ensure that the export and import sectors are in balance. Shipbuilding as a whole must be export focussed to capitalise and learn from international opportunities, while ensuring that the materials, equipment and components being used and developed are domestically developed, something which currently is not happening.

Of utmost importance is the design of the new vessels, which must be efficient in nature. Not only does such design ensure that vessels can be competitively produced, and is energy efficient by default up to 2030, but this can further complement and clarify the choice of alternative fuel. A significant part of the energy transition to green fuels journey can be achieved through the design of the vessel in a way that it minimizes the investment in terms of time and costs when shifting from one fuel to another. The lack of involvement by Indian ship designers in any new technology was also mentioned as a concern.

Production efficiency was highlighted as another key aspect as inefficiencies in manufacturing can lead to increased cost of energy. A reference was made to the Shipyards in Japan having efficient production technology and workflows. Japanese organisations involved in shipbuilding have heavily increased their investment in R&D with a specific focus on energy saving and environmental technologies. Japanese shipbuilders have utilized this new knowledge to come up with innovative solutions on a range of technical and practical issues related to ship construction. Building on this, a suggestion was made to have innovation funds in India dedicated to ship building research

India must utilize its strengths in terms of available and skilled workforce to produce and own global ships. Larger industrial associations and partnerships across shipyards, operators and ports spanning public and private actors along the value chain is critically important to make best use of resources, for example by repurposing idle infrastructure R&D facilities, focussing the industry into development of key new technology. Such R&D facilities could lead to addressing the cost gap of green technology and fuels, potentially leveraging existing public sector investment.



Action Pathways, Challenges and Opportunities

Solution	Key Challenges/ Opportunities	Possible Actions & Recommendations
<ul style="list-style-type: none"> More Efficient New Builds 	<ul style="list-style-type: none"> Efficiency in design 	<ul style="list-style-type: none"> Global Collaboration, knowledge transfers and trainings to improve design capability
	<ul style="list-style-type: none"> Efficiency in production process 	<ul style="list-style-type: none"> Thorough productivity assessments. This can also be driven through ESG reporting compliance requirements
	<ul style="list-style-type: none"> Indigenization - ancillaries/ equipment, (60% part of the ship is imported in terms of value) 	<ul style="list-style-type: none"> Govt needs to devise policies to incentivize production of ancillary units in India through tax benefits and incentives
<ul style="list-style-type: none"> Global Ship Design Hub 	<ul style="list-style-type: none"> India can develop as Green Ship Design Hub as the design skillset is depleting globally 	<ul style="list-style-type: none"> Global Collaboration and knowledge transfers to improve design capability – bilateral relations can be leveraged
<ul style="list-style-type: none"> New Builds with hybrid technologies and technologies offering easy refits (e.g. Diesel –Electric)– coastal shipping & deep sea shipping 	<ul style="list-style-type: none"> Export opportunity - India has opportunity to serve global market Cost gap makes in unviable 	<ul style="list-style-type: none"> A holistic demand-supply assessment and baselining for 2030 and 2050 targets Govt. support to address the funding gap through VGF/ PPP models
<ul style="list-style-type: none"> Larger Industrial associations 	<ul style="list-style-type: none"> R&D partnerships and repurpose infrastructure 	<ul style="list-style-type: none"> Global collaboration, consolidation of associations, PPP Scheme
<ul style="list-style-type: none"> Retrofit Manufacturing Hub 	<ul style="list-style-type: none"> Opportunity to Export Retrofit Solutions – as design, manufacturing and service hub 	<ul style="list-style-type: none"> Global collaboration and knowledge transfers Setup Innovation Funds in line with innovation funds in Japan
<ul style="list-style-type: none"> Electric Boats/ Ferries 	<ul style="list-style-type: none"> The shift is economically viable and can be commercially viable with VGF 	<ul style="list-style-type: none"> Government should consider and prioritise VGF for electric boats/ ferries

Panel Discussion 3: Green Ports, Shore Power, JIT-Green Corridor

Speakers and Panelists

Chair	
Mr. Rajeev Jalota	Chairman, Mumbai Port Trust and IPA
Panel Convener	
Mr. Vikrant Rai	Directorate General of Shipping
Panelists	
Mr. Niteen M. Borwankar	Chief Manager Mechanical & Electrical engineering and CEO - SEZ , JNPA
Mr. S.K. Mehta	Chairman, Deendayal Port Authority
Captain Unmesh Abhyankar	CEO, Adani Dredging
Mr. Rajnish Khandelwal	Sr. Vice President, J. Baxi & Co.
Ms. Astrid Dispert	Project Technical Manager, IMO Norway
Experts	
Shri Shobhit Kapoor	M&O Operations Manager SAW. Lloyd's Register India
Mr. Jan-Paul de Wilde	Head Decarbonisation Energy Transition and Innovation, RINA
Mr. Denzal Hargreaves	Area Manager, South East Asia and Indian Subcontinent, DNV



Summary

Green ports have a crucial role to play. Not only by optimising their operations but also as a base for green shipping, or becoming a bunkering destination for alternative fuels. There is also opportunity to optimise land use across landowner and terminal operator and contribute to space being used as a carbon sink or to generate green electricity. There are also potential green initiatives that the ports can engage in. The key areas outlined for these initiatives were the ones addressing marine pollution, ship recycling and promoting green fuels among others.

Shore power generation has a high scope in India. Only 2 ports in India have electrical licenses to produce electricity inside ports. Further, there are variations in electricity tariff and tax across various ports and states. Central government intervention was proposed to standardize the tariffs and tax across the country to avoid any cost advantage and ensure a seamless system of shore power supply to vessels.

Port technology must be the key focus to enable efficient operational and scheduling activities in order to avoid any energy cost implications. Just in time concepts and the use of efficient berthing technology can optimise the use of ports. It was noted during the discussion that the efficient design of ports can further maximise the potential of GHG savings by designing out excess redundancy caused by multi-purpose design. It was also highlighted that there is a significant dependency on port operation partners as well (e.g. train network for evacuation of containers) to achieve port efficiency and minimize GHG emissions.

Ports further face pressure from shipping providers due to their integral role in determining the CII ratings of the vessels. The CII for a vessel is calculated by dividing the annual CO2 emissions by the distance sailed in nautical miles. This means that the longer a vessel stays at the port, the higher will be the CII (CO2 emissions increase but the distance sailed does not due to no movement of the vessel). Hence ports must also accept responsibility for ensuring efficient operation.

There was a specific discussion on green dredgers and harbour crafts. A lot of regulations such as the EEXI are not applicable for harbour crafts currently. Further, there are maintenance gaps and a lack of training in energy efficiency. Many times the port operations are not in sync with dredging operations. A conclusion was stated defining the hybrid scenario as the best option for decarbonising dredgers.

The establishment of Green Corridors through global collaboration across governments and countries to make zero emission shipping more feasible through policy action also forms a key step in the energy transition journey.



Action Pathways, Challenges and Opportunities

Solution	Key Challenges/ Opportunities	Possible Actions & Recommendations
<ul style="list-style-type: none"> Green Corridors 	<ul style="list-style-type: none"> Needs concerted effort to identify, coordinate and mobilise the value chain players across countries to come together to agree on a green corridor 	<ul style="list-style-type: none"> GOI in collaboration with Industry bodies can spearhead the identification of possible Green Corridors and use its bilateral and multilateral international relationships to formalise Harmonise systems and use digital solutions
<ul style="list-style-type: none"> JIT/ Port Efficiency 	<ul style="list-style-type: none"> Port design and berthing scheduling – adapt the port design to be fit for purpose. Better optimise operation between small vessels and the port 	<ul style="list-style-type: none"> Efficient port design and Masterplan Effective Collaboration - efficiency depends on partners (- eg. evacuation of containers through train and road) Digitised port operations and intelligent devices Use CII regulation as a means for ensuring port efficiency National action plan to develop JIT further (e.g. Penalty system - if delay is caused by the port then the port pays for it- can incentivize ports to be more efficient)
<ul style="list-style-type: none"> Shore power 	<ul style="list-style-type: none"> Different power tariffs and tax across the states is a challenge Shore supply average cost is less in India than western countries 	<ul style="list-style-type: none"> Central government should collaborate with States to ensure standardized tariffs and taxes across all ports
	<ul style="list-style-type: none"> License to distribute power (only 2 ports have electrical license which allows to produce electricity inside ports) 	<ul style="list-style-type: none"> A policy in lines of the EV Charging Policy is required for shore power
	<ul style="list-style-type: none"> Land side infrastructure can be furthered with solar power and carbon sinks 	<ul style="list-style-type: none"> Port and landowner and the terminal needs to work together. Establish PPP fund for public investment into shore power infrastructure and land use
<ul style="list-style-type: none"> Greener Dredgers and Harbour crafts 	<ul style="list-style-type: none"> Many parameters like EEXI etc. are not applicable for dredgers, harbour crafts Maintenance gaps and lack of training in energy efficiency 	<ul style="list-style-type: none"> Hybrid dredgers – diesel-electric to be introduced Regulatory framework for energy transition – for e.g. phase out of harbour crafts based on efficiency

- Bunkering destination for Alternate Fuels

- India can become a bunkering destination like Fujairah, Singapore, Rotterdam (Hydrogen Hub)

- Demand Aggregation - A holistic demand-supply assessment and baselining for the region
- Concessional Finance/ Partial Credit Guarantees
- Collaboration across the value chain players



Panel Discussion 4: International co-operations for Green Technology & Green finance

Speakers and Panelists

Chair	
Mr. K.S. Bariar	Additional DG, Director General of Shipping
Panel Convener	
Mr. Rajeev Nayyer	Chairman, INMARCO 2022
Panelists	
Mr. Bart de Jong	Consulate General of the Kingdom of Netherlands
Ms. Nancy W Karigithu, CBS	Principal Secretary, State Department for Shipping and Maritime Kenya
Mr. Arsenio Dominguez	Director Marine Environment Division, IMO
Mr. Jose Matheickal	Chief of Department of Projects and Partnerships, IMO
Ms. Helene Tofte	Executive Director, Norwegian Shipowners Association
Mr. Varun Hallikeri	Infrastructure Finance Specialist, World Bank
Mr. Sriramkrishna Swami	Advisor Shipping Finance
Experts	
Mr. Ambrish Bansal	SVP Consultancy, Lloyd's Register Mumbai
Mr. Kumar Pranav	Associate Director Consultancy, Lloyd's Register Mumbai
Mr. Vijendra Kumar Jain	President, IME(I)



Summary

Financing green transitions pose inherent risks for investors for a number of reasons. Co-ordinated action plans and sharing of learning amongst initiatives is a key enabler to progress the transition. The IMO, through the development of partnerships and initiatives strives to bring a level of harmonisation into the industry and facilitate necessary actions from private and public actors. Some current projects were outlined during the discussion, making note especially of the globally diverse nature of such schemes and the focus that they apply to developing countries.

In particular, developing nations have a right to continue to develop, whilst finding a balance of doing so in a sustainable manner, often further complicating the investment risk that exists.

Whilst the establishment of green bonds and sustainably linked financing structures exists in many well-developed banking sectors, including India, it is often found during transitional activities that there is a constraint on the accessibility of affordable commercial banking to fund the transition. This comes down to a number of factors that contribute to the higher level of risk, such as the initially high Capex costs, the fragmented nature of ownership and the technology risk posed by new and immature solutions.

To combat this, it was noted that other sectors have found mechanisms to de-risk the investment and thus encourage and enhance the ability of commercial banks to offer supportive finance. To address the high Capex, investment decisions should be made over a longer-term lifecycle Total Cost of Ownership period, by changing business models to ensure the profitability of the asset over its entire lifetime, by example, by aligning charter party agreements over a much longer period.

The investment can be further de-risked by offering partial credit guarantees or lower cost loans through the establishment of Public-Private Partnerships between commercial banks and governments or development banks. It was noted the effect of PPPs in funding significant infrastructure projects globally and the historical success in enabling other sectors' transitional activities.

Lastly, opportunities to monetise the existing assets were discussed, by establishing a carbon finance mechanism whereby the carbon savings gained by green shipping can be commercialised and sold outside of the sector, offering potential new income streams into shipping to further enable the investment case into green shipping.



Action Pathways, Challenges and Opportunities

Solution	Key Challenges/ Opportunities	Possible Actions & Recommendations
<ul style="list-style-type: none"> • Access to affordable banking 	<ul style="list-style-type: none"> • High Risk profile - cyclical nature of shipping, high upfront cost, the fragmented nature of ownership, future fuel uncertainty, credit ratings, etc. 	<ul style="list-style-type: none"> • Partial credit guarantees or Concessional loans through the establishment of Public-Private Partnerships (PPP) between commercial banks and governments or MDBs. • Investment decisions should be made over a longer-term lifecycle Total Cost of Ownership period, by changing business models to ensure the profitability of the asset over its entire lifetime. (e.g. by aligning charter party agreements over a much longer period) • Incentives in the form of tax reliefs and other indirect means such as CRR (cash reserve ration can be considered)
<ul style="list-style-type: none"> • The monetization of the existing asset/ production 	<ul style="list-style-type: none"> • Carbon credit is not effectively monetized by as a lot of the credit is lost due to inefficient accounting • Use of Asset Recycling as an additional stream of finance 	<ul style="list-style-type: none"> • Improve awareness of the Carbon Credit Framework • Integrate it in the corporate reporting requirements • The government is all set to launch a domestic carbon market, The domestic carbon market will enable the domestic companies to trade carbon credits efficiently and help push through energy transition goals
<ul style="list-style-type: none"> • Setup new sources of Finance 	<ul style="list-style-type: none"> • New sources of finance will be required to address the demand 	<ul style="list-style-type: none"> • Dedicated Green Shipping Fund (pooling from the sovereign funds, pension funds etc.) will ensure strategic investment in technologies for which commercial feasibility is not established
<ul style="list-style-type: none"> • International Collaboration and sharing of learnings and best practices 	<ul style="list-style-type: none"> • Green technologies (new build/refit) are capital and time intensive 	<ul style="list-style-type: none"> • Technology Transfers and training through global collaboration • Govt can leverage its bilateral ties with countries ahead in the curve for technology transfer and training

Panel Discussion 5: Green Technology Solutions for Existing Ships Including Concepts of Carbon Capture

Speakers and Panelists

Chair	
Mr. Anil Kumar	Business Development Manager South Asia, Lloyd's Register Kuala Lumpur
Panel Convener	
Mr. Mudit Mehrotra	Assistant Vice President, GESCO
Panelists	
Mr. Cristian Valdes Carter	Director of Innovation Norway's operation - India
Mr. Sachin Kulkarni	Head Marine Power Sales (South Asia), WARTSILA
Mr. P S Gopalakrishna	Director-marine segment, AB Volvo Penta
Mr. Santosh Kumar	Manager Sales, MAN
Mr. P Varadarajan	Head Technical, Cummins
Mr. Kiran Dakle	Manager Technical, KPIT
Experts	
Mr. Shobhit Kapoor	M&O Operations Manager SAW. Lloyd's Register India
Mr. Devrup Kabi	Senior Principal Surveyor, IRS



Summary

Advanced technological solutions and applications are the biggest catalysts towards the energy transition objectives across the world. Technology companies are constantly coming up with innovative solutions to

support the global objective of reduced carbon emissions across various sectors, with a wide landscape of opportunities prevailing in the Maritime sector.

There are 2 autonomous electric vessels built at the Cochin shipyard which are currently in trials in Norway. Post the trials these vessels are to be utilised in the east coast of Norway for logistical activities. India's collaboration with Norway has been a major milestone in India's journey towards Green Shipping. Zero emission shipping is growing rapidly in Norway, which is driven by widespread public private collaboration in electrification and alternative fuels. Norway is running multiple projects on green technology solutions such as bunkering station for pressurized hydrogen, hydrogen fuel bulk carrier with energy production and battery energy storage, green ammonia tanker, and the first carbon free ammonia fuel bunker network. The backbone of the technology developments in Norway is the centres of excellence and clusters formed by engaging governments, research companies, maritime organisations, and technology experts. The knowledge and technology transfer through these clusters enable the development of innovative solutions, and this is the system that India can leverage not only through its collaboration with Norway but also by engaging various Indian stakeholders.

In terms of propulsion technology, recent order activities in the short sea segment show a significant deviation from classic propulsion solutions, with more hybrid solutions with electrified abilities and low noise being adopted instead. Small size vessels such as pilot boats and river ferries in the inland waterways segment can be fully integrated with a green technology system such as electrical, solar or hybrid.

India is producing materials to provide for worldwide manufacturing operations. There is a production unit in Aurangabad producing L21/31 engines approved for all biofuels with the future scope of methanol approved engine production. Further, engine production for electromobility technology is being run in India. An opportunity lies ahead for India with its largescale service availability for maritime engine and equipment manufacturing.

It was highlighted that there needs to be a mindset shift towards green technology which can be done through policy intervention on the evaluation criteria for vessels, going beyond the price by including emissions and technology as additional criteria. It was notable in the discussion that the software capabilities to integrate maritime operations with green technology are also available in the market. Further by assessing the trends in the adjacent sector developments such as the automobile industry, combined with the scale of the maritime sector, it was pointed that there is a need for support from not only the regulations in terms of infrastructure, but from the customers as well in terms of the high cost of ownership they might face.

An important implication of adopting green systems and technology are the space and weight constraints. For the same amount of fuel, the space taken by battery in terms of space and weight is significantly higher. In the Indian context, the space and the number of batteries required will have a high cost due to the lack of domestic manufacturers since most systems are designed and imported from outside India. There is a need for more manufacturers to come in with associated technologies.

Carbon capture systems are at a very nascent stage which ongoing trials with scrubber units, storage units etc. The amount of carbon these systems can capture is limited and regulations related to these technologies must be devised. At present, coastal ships don't have space to manage the carbon capture systems, whereas for the bigger vessels on the coast it would be a feasible step forward.

Action Pathways, Challenges and Opportunities

Solution	Key Challenges/ Opportunities	Possible Actions & Recommendations
<ul style="list-style-type: none"> Access to technology for refit & new builds 	<ul style="list-style-type: none"> India engine suppliers have technologies to serve the demands for refit and new builds Many of the European countries are ahead on the marine decarbonisation journey and India can benefit from their knowhow and learnings 	<ul style="list-style-type: none"> GOI funded projects to establish the commercial feasibility & technology readiness Knowledge Transfer and Best Practice dissemination through bilateral relations
<ul style="list-style-type: none"> Improved Technology knowhow & Service availability 	<ul style="list-style-type: none"> Most of the Engine Manufacturers like Wartsila, MAN, Cummins etc have good local technical skillset and networks of service providers 	<ul style="list-style-type: none"> Industry collaboration to disseminate technology knowhow and service capabilities
<ul style="list-style-type: none"> India as Green Technology Manufacturing Hub 	<ul style="list-style-type: none"> Export possibilities Lower cost for domestic use Benchmarking with Automobile – India better green technology maturity which can be easily used for maritime green technology upgrade 	<ul style="list-style-type: none"> Incentives to setup manufacturing facilities for green technologies Collaboration with Auto Manufacturing Industries and supply chain players to address the supply chain gaps
<ul style="list-style-type: none"> Hybrid Propulsion System 	<ul style="list-style-type: none"> Hybrid Propulsion System provides higher efficiency than the conventional engine but requires more space High cost because of weak supply chain Mostly imported components and design Solar – Hybrids can be used for vessels with less space constraints like Bulkers 	<ul style="list-style-type: none"> To be used for vessels which does not have space constraint Supply Chain Gaps to be addressed Type approved equipment to be manufactured in India
<ul style="list-style-type: none"> Carbon Capture & Sequestration 	<ul style="list-style-type: none"> CCS assembly entails additional space and weight Technology is still at a nascent stage and mostly chemical amines based Rules and Regulations need to be developed 	<ul style="list-style-type: none"> Evaluate CCS for bigger Coastal vessels R&D for novel technologies

CEO Forum: Opinions of Top Maritime CEOs

The discussion was chaired by Shri Amitabh Kumar IRS- Director General of Shipping. CEOs shared their perspective on the challenges/ opportunities with the Green Shipping requirements for India and what policy level supports already exists and where policy level support will be required to meet the Green Shipping Targets.

Speakers and Panelists

Chair	
Mr. Amitabh Kumar	Director General of Shipping, IRS
Convener	
Mr. S. M. Rai	Fellow, Institute of Marine Engineers (India)
CEO Panelists	
Capt. B.K. Tyagi	Chairman & MD, SCI
Mr. Anil Devli	CEO, INSA
Mr. C.V. Subba Rao	MD, Sanmar Shipping
Mr. Clayton Pinto	CEO, Seven Islands Shipping
Mr. Prabhat Jha	Group Managing Director and CEO, MSC Shipmanagement Ltd Cyprus
Capt. Rajesh Unni	Founder and CEO, Synergy Marine Pvt Ltd



Key outcomes from the discussion

- Average age across Indian vessels is 20 years. The average lifespan of a ship is 25-30 years. This means that a lot of these vessels will be going into scrap and recycling in the near future. It was suggested that rather than investing in technology at a large scale for existing ships nearing the end of life, the focus should be on improving the efficiency of operations. The focus should be to optimize operational efficiency such as maintenance, voyage planning, bunker consumption, and preparing the fleet for shore connection supply. The need for efficient data capture using automatic data acquisition and high-quality analytics to make data-driven decisions was also emphasised.
- For the vessels that have sufficient years of operations left, alongwith the operational measures, green refit technologies should also be explored. There are a lot of new technologies that have not been fully utilized, and while these technologies are capital-intensive, the returns they provide are very attractive. A reduction of up to 30% in fuel consumption by retrofitting 70% of the vessels with energy efficiency technology was quoted by a speaker.
- LNG seems to be a feasible green transition fuel to meet the 2030 target. LNG is easily available and LNG technologies are quite mature.
- Further, it was suggested that India must utilise its potential in biomass and solar energy through regulatory incentives to drive the generation of Bio LNG and eFuel.
- Upgrading the skillsets of seafarers to make them ready to operate ships with new technologies and fuel is of critical importance. The current training syllabus is very old and there is a need to incorporate new technologies into the curriculum. It was acknowledged that the time is right for Indian seafarers to shine globally.
- It was emphasised that there needs to be a national effort towards the green shipping goal and the ministry should take a lead on chairing this. There are distinct stakeholders and aspects involved in the shipping value chain such as shipowners, cargo owners, fuel suppliers, custom policies and so on. The government needs to play a crucial role in green compliance by devising policies that are in the best interests of all
- Green compliance is likely to make shipowners with delayed compliance lose out on business (cargo), which may lead them to go out of the market. Further, most of the existing Indian fleet is not designed to be upgraded. Hence it is important to engage cargo interests while devising long-term solutions
- Setting up of a dedicated green maritime fund was supported. The use of IFSC as a medium for managing funds was suggested
- CO2 Levy / Carbon tax was indicated to be a better measure compared to Cap & Trade mechanism. The impact on ship owners because of the Carbon Tax will have to be effectively offset by supporting their green shipping initiatives through easy access to the green shipping funds
- The need to standardise the measurement, reporting and verification system was also highlighted to ensure correct and consistent GHG details are being calculated and used across India. This is a prerequisite before getting into the Carbon tax regime.
- India needs to become more vocal at international forums like IMO to raise concerns regarding the regulatory policies to ensure that the policies are just and equitable. At the same time, since shipping decarbonisation is a global challenge, it is important that it is governed by global rules. Regionalisation of rules to favour a select few should be discouraged.

- There is a need for regulation to ensure that the levies by the private port on ships are reasonable. Currently, there is no control over the money that vessels get charged at ports.



Policy Maker Forum

The Green Shipping Conclave concluded with the Policy Maker Forum discussion. The discussion was chaired by Dr Sanjeev Ranjan, IAS, Secretary to Government of India, Ministry of Ports, Shipping and Waterways. At the forum it was acknowledged that success to Green Shipping and Green Policy rests with the initiative and commitments from those who would translate them at ground level successfully and to a sustainable level.

Speakers and Panelists

Chair	
Dr. Sanjeev Ranjan	Secretary Minister of Ports, Shipping and Waterways, IAS
Policy Maker Panelists	
Mr. Amitabh Kumar	Director General of Shipping, IRS
Mr. Rajeev Jalota	Chairman, Mumbai Port Trust and IPA
Mr. Madhu Nair	CMD, Cochin Shipyard Ltd



Key outcomes from the discussion

- The challenge of green shipping is also an opportunity for India. Green and sustainable development has been a traditional way of life in India. India is one of the leading countries for solar power with a target of 5000 gigawatts of power by 2030. The FAME scheme for electric vehicles has been able to create an ecosystem to drive the transition to an electric vehicle regime for road transport and the learnings can very easily be replicated by shipping.
- The Prime Minister's Gati Shakti program will aid the green transition as it aims to bring all the major infra players on one platform. The new National Logistics Policy further drives this agenda by addressing the logistics supply chain as a whole.
- Coastal and inland waterways are certainly far cheaper and more sustainable means of transport than road or rail and therefore is a golden opportunity.
- India also has a good opportunity to develop itself as a global hub for green vessels production and green fuel production, by leveraging existing capability into R&D and innovating with new technology options.
- There is a need to do a proper inventorisation of the greenhouse gas emissions for ports and the shipping sector. DG shipping is bringing out a portal that will try to capture this on the shipping front and make this available to all the stakeholders. IPA is planning to drive it for ports by bringing all the ports (the major ports and all other ports under the state maritime boards). The platform will also help in taking actions to ensure just-in-time arrivals at the ports
- One of the major constraints in the provisioning of shore power to the vessels at ports is the cost of power provided to the ship. The ports as of now cannot become distribution licensee and there needs to be some amendment done in the Central Electricity Act 2003 in India so that ports become distribution licensee. Once the ports become a distribution licensee, they will be regulated by the Electricity Regulatory Commission and under this regulation, only particular markup is allowed on the cost of procurement and cost of distribution. This will help allay fears of the shipping industry in getting a very costly power at certain ports. Ports actually need to gear up in abetting and helping the shipping industry in reducing their carbon intensity helping them achieve their CII indicators. There needs to be a task force set up at the national level for which IPA can take a leading role along with the DG shipping
- Considering the fact that multi-fuelled vessels are the future there is a need for a focused group working on various bunkering solutions that need to be provided at the ports. A working group at the level of Mumbai Port along with some shipping industry players and oil PSUs is already in place
- There is a need to work out a very clear GHG reduction road map – 30 – 20 - 10-year road maps with intermediate milestones. A clear road map will provide confidence to private enterprises to invest.
- India needs to have clear age norms, and avoid an abrupt decision. A 10-year time frame was suggested. In the 10-year time frame, the age norms should be defined.
- Green transitions come at a cost. Once the solutions become commercially acceptable or commercially viable they will become the order of the day but at the start, there will be a requirement for viability gap funding. Reference to successful international gap fundings like in Japan and Norway was made.
- There is a need to create a brand India solution for which all players in the shipping value chain – private and public will need to collaborate

- It was acknowledged that coastal and inland waterways will need different solution approach to deep sea going vessels.
- India is a huge importer of fossil fuel and the economy built on fossil fuel inherently makes it less competitive than others. The transition to green fuel gives it a new opportunity to come up with creative solutions that can make its industry and logistics chain more competitive than what it has been till now. So the focus on R&D and innovation has to be promoted
- Ship buildings subsidy scheme has been around for quite some time but the off take from that scheme has been somewhat limited and that has been area of concern. DG shipping is trying to boost it and address problem which is holding the money. There is a need to set it right in a manner so that the requirements of green shipping and the new challenges can also be addressed
- With new green technologies being introduced there is a need to upgrade the skillset of the seafarers to ensure a just transition.
- There is a demand for ship repair dry docking. India has 1500 vessels but not even 10 percent of the vessels get dry docked India. Shipyards have an opportunity to upgrade themselves to cater to this existing demand
- Government is contemplating adding maritime manufacturing sectors to the PLI scheme. Shipping containers have already been included in PLI
- ABG/ Reliance under NCLT to be cleared soon to make these idle capacities available for production.



Launch of India's first Centre of Excellence for Green Ports and Shipping



A defining moment on the last day of INMARCO was the launch of India's first centre of excellence for green ports and shipping by the **Honourable Shri. Sarbananda Sonowal**, Union Cabinet Minister of Ports, Shipping and Waterways. The MOU was signed between **The Energy and Resource Institute (TERI)** and **V. O. Chidambaranar Port Authority** (formerly Tuticorin Port Trust), **Paradip Port Authority**, **Deendayal Port Authority** and **Cochin Shipyard Limited**, under the leadership of **Honourable Minister Shri. Sarbananda Sonowal**, **Dr. Sanjeev Ranjan**, & **Shri. Amitabh Kumar**, and co-supported by **Shri. Rajesh Kumar Sinha**, Additional Secretary (MoPSW), **Dr. T. K Ramachandran** - Chairman, V.O. Chidambaranar (VOC) Port Authority, **Shri. Sanjay K. Mehta** - Chairman, Deendayal Port Authority, Kandla, **Shri. P. L Haranadh** - Chairman, Paradip Port Authority, **Shri. Madhu S Nair** - Chairman & Managing Director, Cochin Shipyard Ltd., and **Dr. Vibha Dhawan** - Director General, TERI.



Further work: Developing a draft policy framework for Green Shipping in India

In line with the most ambitious national and international shipping bodies, India has an opportunity to devise a domestic shipping target and policy framework to achieve a breakthrough of 5% alternative fuel uptake by 2030. The Green Shipping Conclave at INMARCO 2022 has pooled together key national actors to collaboratively explore possible solutions to setting and achieving the target. These solutions have been synergised into common themes, challenges, and opportunities where policy development cycles can be initiated.

Ultimate intended outputs of this process are the formation of a domestic shipping policy as well as a position on international issues within the IMO. To develop both, the Green Shipping Conclave provides the basis for identifying specific pathways and actions to pursue.

Building upon this reports summary of the outcomes of discussions held at the Conclave as well as the initial recommendations multiple workstreams may emerge which use detailed assessments and feasibility studies to craft specific action plans. An example of which can be a policy workstream, which undertakes further work to identify the policy needs and mechanisms available to implement them.

The spirit of collaboration with the wider industry remains a necessary component, for example where specific technical projects are undertaken to implement the strategy, working hand in hand with the development of supportive policy.

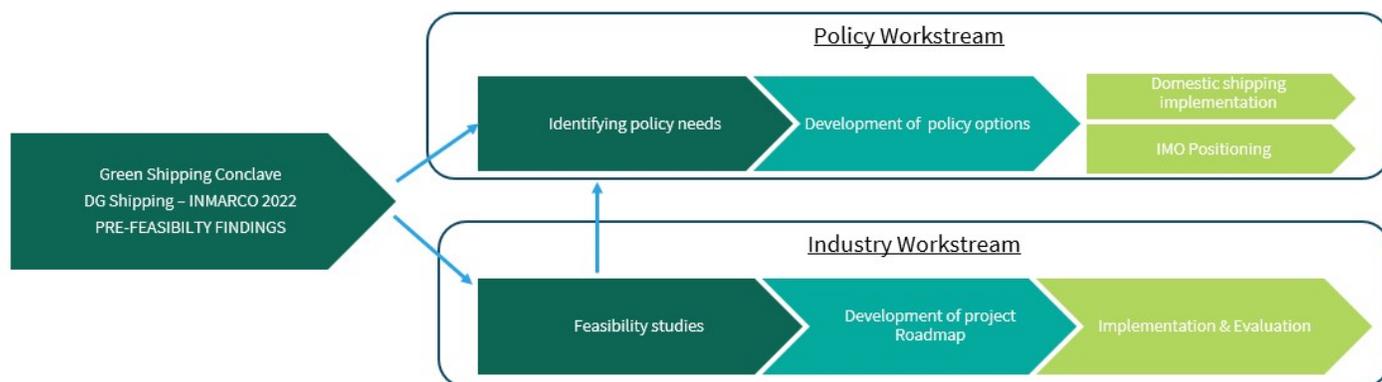


Figure 1: Potential workstream development options



Contact Persons

Anil Kumar

Anil.kumar@lr.org

Lloyd's Register Maritime Decarbonisation Hub

Shane Balani

Shane.balani@lr.org

Lloyd's Register Business Advisory

Ambrish Bansal

Ambrish.bansal@lr.org

Kumar Pranav

Kumar.pranav@lr.org

Bhavya Bhasin

Bhavya.bhasin@lr.org

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www.lr.org

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Enquiries should be addressed to Lloyd's Register, 71 Fenchurch Street, London, EC3M 4BS.

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