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CONSULTATIVE DOCUMENT-1
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INDIAN OCEAN CENTRE FOR EXCELLENCE FOR SUSTAINABLE MARITIME TRANSPORT (IOCE-SMART)

Indian Ocean Centre for Excellence for Sustainable Maritime Transport (IOCE-SMarT) is a visionary initiative driven by the Ministry of Ports, Shipping and Waterways, Government of India, that seeks to establish a world class hub for training, research, and innovation in sustainable maritime practices in India. It is a transformative step towards fostering a sustainable, safe, and efficient maritime industry in the Indian Ocean region. Envisaging partnership with the IMO's global MTCC network, IOCE-SMarT seeks to advance the maritime sector in the Indian Ocean region through technological innovation, sustainable practices, digital proficiency, and technical cooperation.

IOCE-SMarT proposes the establishment of specialized verticals, each focusing on a critical area of maritime development. The IOCE-SMarT's verticals are designed to bridge the gap between theoretical research and practical applications, with a strong emphasis on industry partnerships.

Vertical	Objective
BMSMarRC	Foster maritime collaboration among BIMSTEC nations
DigiSMarT	Integrate digital technologies in maritime sector
LawSMarT	Advance maritime legal expertise and policy
FinSMarT	Develop sustainable financing for green maritime
InnovSMarT	Drive innovation and technological advancement
CollSMarT	Foster international partnerships and cooperation
EduSMarT	Enhance maritime education and skills
EcoSMarT	Promote environmental sustainability
TechSMarT	Advance maritime technology
GreenSMarT	Foster green technologies and practices

The proposed Governance and Management framework of the IOCE-SMarT adopts a blended governance model - integrating elements from Advisory, Cooperative, Patron, Policy Board, and Management Team models - and establishes a clear structure for decision-making, resource allocation, and accountability to drive its mission of advancing maritime excellence and sustainability.

The Ministry of Ports, Shipping, and Waterways (MoPSW) exercises policy and administrative control over IOCE-SMarT, ensuring its alignment with national maritime goals and broader regional objectives. The Ministry provides policy direction, facilitates intergovernmental collaboration, mobilizes resources, and oversees funding and financial accountability. A Chairman or Director General, preferably a seasoned maritime professional seconded from the Ministry or DG Shipping, leads the organization, offering strategic leadership and representing IOCE-SMarT at international forums. This role ensures operational efficiency, alignment with global maritime sustainability goals, and oversight of verticals like BMSMarTC.

The Governing Board, with a maximum of 11 members, serves as the primary decision-making body, representing ministries, government bodies, and maritime associations. It approves policies, budgets, and performance reports while fostering collaboration among verticals and external partners. A Technical Advisory Board of similar size provides technical guidance, informs best practices from industry and academia, and ensures alignment with the latest sustainability trends. Both boards have members serving fixed two-year terms, promoting balanced representation and governance efficiency.

Operational management is led by a CEO, also a seasoned maritime professional, who implements the Governing Board's strategies, coordinates with vertical heads and stakeholders, and ensures compliance with IOCE-SMarT's mission. Each vertical is headed by experts who focus on the relevant area with program and project managers execute specific initiatives, manage resources, and monitor outcomes. Academic and domain experts contribute to innovation, policy formulation, and capacity-building programs to maintain IOCE-SMarT's leadership in maritime innovation.

Steering committees, comprising senior representatives and technical experts, focus on advancing sustainable maritime technology and aligning projects with global sustainability goals. Support staff, supervised by a Registrar, handle administrative, financial, and logistical functions to ensure seamless operations across the organization. Collectively, this structure positions IOCE-SMarT as a lead institution driving sustainable development in the maritime sector.

The Maritime Training Institute (MTI) – Powai, Mumbai premises has been proposed to develop the IOCE-SMarT. Establishing the Indian Ocean Centre for Excellence for Sustainable Maritime Transport at the Maritime Training Institute (MTI) in Powai involves both initial capital expenditures (CAPEX) and ongoing operating expenditures (OPEX). To ensure sustainability, a financial strategy and implementation roadmap have also been highlighted in the DPR.

The National Green Shipping Policy (NGSP) is a strategic initiative designed to transition India's maritime sector toward environmental sustainability, technological innovation, and global competitiveness. As a cornerstone of India's economic growth, the shipping industry handles 95% of trade by volume, making it essential to adopt a unified policy framework that addresses decarbonization, compliance with international regulations, and the integration of green technologies. The NGSP envisions a sustainable maritime future, aligning national priorities with international goals and positioning India as a leader in green shipping.

India has demonstrated a strong commitment to maritime decarbonization through the Panchamrit framework, announced at COP-26. This multi-pronged strategy aims to achieve 500 GW of non-fossil energy capacity by 2030, reduce one billion tonnes of carbon emissions by 2030, and achieve net-zero emissions in the maritime sector by 2070. Key measures include integrating renewable energy in port operations, incentivizing green fuel adoption, and investing in advanced technologies such as green hydrogen and carbon capture.

India's maritime infrastructure is robust, comprising 12 major ports, 217 minor/intermediate ports, and plans for six new mega ports under the Sagarmala Programme. Government investments, including the Rs. 700 crores allocated for Sagarmala in the 2024–2025 budget, underline the sector's importance. The NGSP is positioned to further integrate environmental sustainability into this vital sector. By focusing on green shipping corridors, innovative port operations, and enhanced ship recycling practices, the policy aims to maximize operational efficiency while minimizing environmental impacts.

A comprehensive analysis of current maritime initiatives and identified policy gaps has shaped the NGSP's strategic vision and objectives. The policy is not only an environmental imperative but also a catalyst for economic growth and technological advancement. It aspires to reduce the carbon footprint of maritime operations through clean energy adoption and stringent emission control measures, thereby bolstering India's competitiveness in global trade. Simultaneously, it aims to promote innovation in green technologies, accelerate research and development in alternative fuels and electrification, and foster a collaborative environment among industry stakeholders, regulatory bodies, and financial institutions. This integrated approach ensures that India's maritime decarbonization efforts are aligned with international standards and sustainable development goals, ultimately enhancing the country's regulatory credibility and global market standing.

The NGSP is underpinned by a detailed scenario analysis that explores multiple growth rate scenarios, policy pathways, and emissions estimations, providing a robust basis for strategic decision-making. By examining medium-growth and conservative pathways alongside global emissions reduction targets, the policy framework is well-equipped to navigate the uncertainties of future maritime trends. In parallel, a comprehensive financing analysis identifies the necessary financial instruments to support green maritime investments, highlighting the role of international cooperation and risk-sharing mechanisms in mobilizing capital for the decarbonization of the maritime sector.

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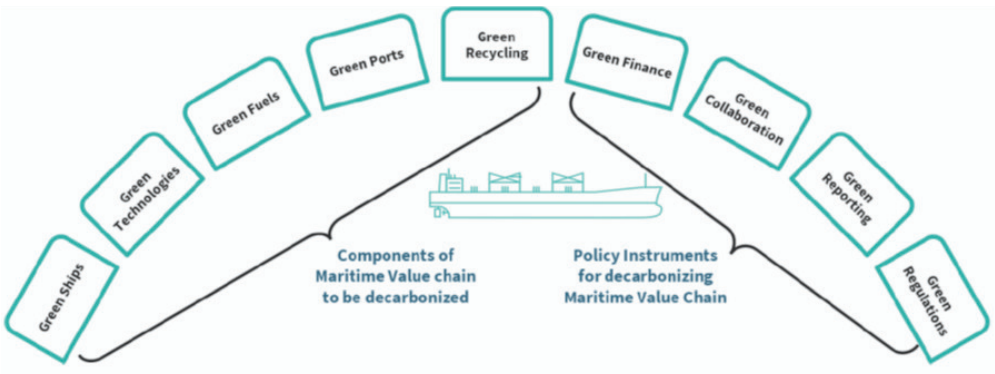
At its core, the NGSP delineates a series of interconnected policy actions that span the domains of green finance, green collaboration, and green regulations. In the realm of green finance, the policy outlines measures to incentivize the development of green technologies, including production-linked incentives for manufacturers of green technology components, tax benefits under the Make in India initiative, and the establishment of specialized economic zones dedicated to green maritime manufacturing. Similarly, financial support is extended to shipbuilders and port operators through enhanced shipbuilding financial assistance schemes, risk-sharing mechanisms for retrofitting, and dedicated funds for green innovation and workforce development. These financial instruments are designed to lower the cost barriers to adopting sustainable practices and stimulate investments in alternative fuels, renewable infrastructure, and advanced maritime technologies.



The policy also emphasizes the importance of green collaboration, fostering strategic partnerships between domestic and international stakeholders to accelerate the transfer of clean technology, promote skill development, and enhance research and innovation in the maritime domain. Concurrently, a comprehensive set of green regulations is being proposed to ensure real-time monitoring, robust environmental auditing, and transparent reporting across all maritime activities.

India's maritime sector is poised to transition towards sustainability with the formulation of a comprehensive Future Fuel Strategy (FFS). This strategy aims to position India as a leader in the global green fuel market by adopting cleaner fuels, developing essential infrastructure, and fostering international collaboration. The strategy's roadmap for implementation is structured around multiple scenarios to ensure a resilient and adaptable approach, aligning with India's broader decarbonization goals and commitments under the Maritime India Vision 2030 (MIV2030), Maritime India Amrit Kaal 2047, Harit Sagar and Harit Nauka vision.

Future Fuel Strategy for India: India's Future Fuel Strategy (FFS) is designed to transform the maritime sector by focusing on the adoption of sustainable fuels, infrastructure development, and supportive policy frameworks. The strategy aims to ensure energy security, reduce carbon emissions, and enhance India's position in the global green fuel market.

- **Adoption of Green Fuels:** The strategy includes a multi-fuel approach, focusing on green hydrogen, green methanol, green ammonia, advanced biofuels, and electrification to meet the energy demands of the maritime sector.
- **Infrastructure Development:** Establishing bunkering facilities, upgrading port electrical grids, and integrating renewable energy sources to support the adoption of green fuels.
- **Policy and Regulatory Framework:** Developing policies that provide incentives, subsidies, and support for green fuel adoption and infrastructure investments, ensuring alignment with international standards and commitments.

Future Fuel Scenarios and Analysis: The report extensively analyzes various scenarios to guide India's transition towards sustainable fuels in the maritime sector.

The Future Fuel Strategy for Maritime India considers scenarios which are based upon the maritime energy scenario forecast by the International Energy Agency 2023

- Green Hydrogen: Green Hydrogen Fuel demand is expected to be 0.026 million tonnes by 2030 and 0.3 million tonnes by 2050 .
- Green Ammonia: Green Ammonia Fuel demand is expected to be 0.025 million tonnes by 2030 and 4.4 million tonnes by 2050.
- LNG: LNG fuel demand is expected to be 0.66 million tonnes by 2030 and 0.3 million tonnes by 2050. The LNG for use in 2050 has to be green LNG or bio-LNG.
- Methanol: Methanol fuel demand is expected to be 0.037 million tonnes in 2030 and 0.272 million tonnes in 2050. The methanol used in 2050 has to be green methanol or bio-methanol
- LPG: LPG fuel demand is expected to be 0.017 million tonnes in 2030 and 0.124million tonnes in 2050.

- It is anticipated that carbon capture systems may be a possible solution to mitigating GHG emissions. For this, it is expected that Carbon Dioxide Reception Facilities may be required at Ports with annual capacity of 13 million tonnes in 2050.
- Nuclear Propulsion offers an exciting prospect for use in the marine industry (having already been utilized in naval applications). However, the present scenario does not forecast it's use considering the sizeable uncertainties and lack of updated regulatory requirements for maritime application at international level .at present. It is expected that Nuclear Propulsion may grow in popularity from the next decade and should be kept in consideration during revision of the Future Fuels Strategy.
- Electrification of Port Operations: Shore to Ship Power Systems (SPS) aim for 80% port coverage by 2035, reducing emissions through shore power connectivity, requiring an investment of $10 billion.

Roadmap for Implementation

- Infrastructure Enhancement: Establish bunkering facilities, expand renewable energy, and upgrade port grids. Estimated total investment: $80 billion by 2050.
- Policy and Regulatory Support: Align national policies with IMO's targets for net-zero emissions by 2050, provide subsidies, tax incentives, and create a $5 billion Green Shipping Fund to support early-stage projects.

Economic and Environmental Impacts

- Economic Benefits: Green fuels could reduce greenhouse gas emissions aiming to achieve net zero by 2050 saving $15 billion annually in fuel costs and creating over 200,000 new jobs.
- Environmental Impact: Potential reduction of over 120 million tonnes of CO_2 annually, improving air quality and public health.

Challenges and Mitigation

Challenges include high initial capital costs, regulatory reforms, and increased logistics expenses. Mitigation strategies include phased investments, public-private partnerships, and international funding support.
India's Future Fuel Strategy provides a clear roadmap for adopting green fuels, enhancing infrastructure, and implementing supportive policies. This positions India as a leader in sustainable maritime practices, contributing significantly to global decarbonization efforts while supporting economic growth.

- **Future Fuel Strategy for Maritime India**

The Future Fuel Strategy for Maritime India is an ambitious plan to establish India as a global leader in green maritime technology, driving sustainable transformation in the sector by implementing specific, time-bound measures. The strategy focuses on transitioning the fuel mix, developing green fuel production capabilities, upgrading port infrastructure, and establishing green corridors to ensure a cohesive transition. The roadmap, with clearly defined timelines, sets milestones for policy development, regulatory frameworks, financial models, and international collaboration, covering the period from 2025 to 2047. The short-term actions (2025-2030) prioritize policy formation, LNG adoption, green bunkering infrastructure, and incentives for early adopters of green technologies. In the medium term (2030-2040), the emphasis is on hydrogen and ammonia adoption, port infrastructure upgrades, multi-fuel bunkering, and capacity building, while long-term initiatives (2040-2047) focus on establishing advanced monitoring systems and expanding the adoption of green hydrogen and ammonia.

The strategy also highlights significant steps to enhance the existing maritime infrastructure, such as modernizing the fleet through the implementation of DGS Order No. 06 of 2023, retrofitting engines to accommodate alternative fuels, and ensuring the continuous upgradation of ports with a focus on green technology. Capacity building and training are essential components, with initiatives such as the establishment of the Maritime Energy Training Facility (METF) and partnerships with Singapore's Green Fuel Training Centre to train maritime personnel. A critical component of the roadmap is the development of green corridors, starting with the India-Singapore route, to foster low-emission maritime transport and enhance India's standing in sustainable international shipping.

In terms of financial support and incentives, the strategy introduces various funding mechanisms, such as the Green Shipping Fund, green bonds, public-private partnerships (PPPs), and tax benefits to encourage early adoption of green fuel technologies. Additionally, the strategy aims to secure international collaboration for technology transfer and financial support from global bodies like the Green Climate Fund (GCF) and the World Bank. The Monitoring, Reporting, and Verification (MRV) system will be developed to track progress, refine targets, and ensure adherence to international standards throughout the transformation. By following this detailed roadmap, India aims to achieve a significant reduction in greenhouse gas emissions, positioning itself at the forefront of the global green shipping movement by 2047.