

**Government  
eProcurement  
System**

**eProcurement System Government of India**

**Tender Details**

Date : 28-Jul-2026 02:37 PM

Print

### Basic Details

|                                             |                                 |                                              |     |
|---------------------------------------------|---------------------------------|----------------------------------------------|-----|
| <b>Organisation Chain</b>                   | Directorate General of Shipping |                                              |     |
| <b>Tender Reference Number</b>              | 13-39/5/2025-O/o ENGG-DGS       |                                              |     |
| <b>Tender ID</b>                            | 2026_DGS_919490_1               | <b>Withdrawal Allowed</b>                    | Yes |
| <b>Tender Type</b>                          | Open Tender                     | <b>Form of contract</b>                      | EOI |
| <b>Tender Category</b>                      | Services                        | <b>No. of Covers</b>                         | 1   |
| <b>General Technical Evaluation Allowed</b> | No                              | <b>ItemWise Technical Evaluation Allowed</b> | No  |
| <b>Payment Mode</b>                         | Not Applicable                  | <b>Is Multi Currency Allowed For BOQ</b>     | No  |
| <b>Is Multi Currency Allowed For Fee</b>    | No                              | <b>Allow Two Stage Bidding</b>               | No  |

### Cover Details, No. Of Covers - 1

| Cover No | Cover                         | Document Type | Description                     |
|----------|-------------------------------|---------------|---------------------------------|
| 1        | Fee/PreQual/Technical/Finance | .pdf          | Eligibility Criteria document   |
|          |                               | .pdf          | Qualification criteria document |

### Tender Fee Details, [Total Fee in ₹ \* - 0.00]

|                                     |      |                       |     |
|-------------------------------------|------|-----------------------|-----|
| <b>Tender Fee in ₹</b>              | 0.00 |                       |     |
| <b>Fee Payable To</b>               | Nil  | <b>Fee Payable At</b> | Nil |
| <b>Tender Fee Exemption Allowed</b> | No   |                       |     |

### EMD Fee Details

|                        |       |                              |     |
|------------------------|-------|------------------------------|-----|
| <b>EMD Amount in ₹</b> | 0.00  | <b>EMD Exemption Allowed</b> | No  |
| <b>EMD Fee Type</b>    | fixed | <b>EMD Percentage</b>        | NA  |
| <b>EMD Payable To</b>  | Nil   | <b>EMD Payable At</b>        | Nil |

[Click to view modification history](#)

### Work /Item(s)

|                                             |                                                                                                                                                                                            |                                  |                      |                              |        |
|---------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|----------------------|------------------------------|--------|
| <b>Title</b>                                | Request for Expression of Interest (REOI) for Selection of Consultancy Services for the Strategic Technical Support Unit (STSU) for the National Maritime Decarbonization Policy Framework |                                  |                      |                              |        |
| <b>Work Description</b>                     | Request for Expression of Interest (REOI) for Selection of Consultancy Services for the Strategic Technical Support Unit (STSU) for the National Maritime Decarbonization Policy Framework |                                  |                      |                              |        |
| <b>Pre Qualification Details</b>            | Please refer Tender documents.                                                                                                                                                             |                                  |                      |                              |        |
| <b>Independent External Monitor/Remarks</b> | NA                                                                                                                                                                                         |                                  |                      |                              |        |
| <b>Show Tender Value in Public Domain</b>   | No                                                                                                                                                                                         |                                  |                      |                              |        |
| <b>Tender Value in ₹</b>                    | 0.00                                                                                                                                                                                       | <b>Product Category</b>          | Consultancy          | <b>Sub category</b>          | NA     |
| <b>Contract Type</b>                        | Tender                                                                                                                                                                                     | <b>Bid Validity(Days)</b>        | 180                  | <b>Period Of Work(Days)</b>  | NA     |
| <b>Location</b>                             | Directorate General of Shipping                                                                                                                                                            | <b>Pincode</b>                   | 400042               | <b>Pre Bid Meeting Place</b> | Online |
| <b>Pre Bid Meeting Address</b>              | Link has been mentioned in the EOI                                                                                                                                                         | <b>Pre Bid Meeting Date</b>      | 07-Aug-2026 12:00 PM | <b>Bid Opening Place</b>     | Online |
| <b>Should Allow NDA Tender</b>              | No                                                                                                                                                                                         | <b>Allow Preferential Bidder</b> | No                   |                              |        |
| <b>Tenderer Class</b>                       | As per Tender Document                                                                                                                                                                     |                                  |                      |                              |        |

### Critical Dates

|                                            |                      |                                          |                      |
|--------------------------------------------|----------------------|------------------------------------------|----------------------|
| <b>Publish Date</b>                        | 28-Jul-2026 04:00 PM | <b>Bid Opening Date</b>                  | 21-Aug-2026 03:00 PM |
| <b>Document Download / Sale Start Date</b> | 28-Jul-2026 04:00 PM | <b>Document Download / Sale End Date</b> | 20-Aug-2026 03:00 PM |

|                                  |                      |                                |                      |
|----------------------------------|----------------------|--------------------------------|----------------------|
| <b>Clarification Start Date</b>  | 29-Jul-2026 10:00 AM | <b>Clarification End Date</b>  | 07-Aug-2026 06:00 PM |
| <b>Bid Submission Start Date</b> | 29-Jul-2026 10:00 AM | <b>Bid Submission End Date</b> | 20-Aug-2026 03:00 PM |

### **Tender Documents**

|                     |      |                    |                |                       |                       |
|---------------------|------|--------------------|----------------|-----------------------|-----------------------|
| NIT Document        | S.No | Document Name      | Description    | Document Size (in KB) |                       |
|                     | 1    | Tendernotice_1.pdf | Notice for EOI | 3368.65               |                       |
|                     |      |                    |                |                       |                       |
| Work Item Documents | S.No | Document Type      | Document Name  | Description           | Document Size (in KB) |
|                     | 1    | Tender Documents   | EOI.pdf        | EOI Document          | 3352.34               |
|                     |      |                    |                |                       |                       |

### **Bid Openers List**

| <b>S.No</b> | <b>Bid Opener Login Id</b> | <b>Bid Opener Name</b> | <b>Certificate Name</b>  |
|-------------|----------------------------|------------------------|--------------------------|
| 1.          | pravin.kapale.mmd@gov.in   | Pravin V Kapale        | PRAVIN VISHWANATH KAPALE |
| 2.          | kmranjan.dgs@gov.in        | Krishan Murari         | KRISHAN MURARI RANJAN    |
| 3.          | navdeep.kharb@gov.in       | Navdeep Kharb          | NAVDEEP KHARB            |

### **GeMARPTS Details**

|                            |               |
|----------------------------|---------------|
| <b>GeMARPTS ID</b>         | QM6GS1B9RLN3  |
| <b>Description</b>         | Not available |
| <b>Report Initiated On</b> | 28-Jul-2026   |
| <b>Valid Until</b>         | 27-Aug-2026   |

### **Tender Properties**

|                                        |     |                                                       |                       |
|----------------------------------------|-----|-------------------------------------------------------|-----------------------|
| <b>Auto Tendering Process allowed</b>  | No  | <b>Show Technical bid status</b>                      | Yes                   |
| <b>Show Finance bid status</b>         | Yes | <b>Stage to disclose Bid Details in Public Domain</b> | Technical Bid Opening |
| <b>BoQ Comparative Chart model</b>     | NIL | <b>BoQ Compative chart decimal places</b>             | 2                     |
| <b>BoQ Comparative Chart Rank Type</b> | NIL | <b>Form Based BoQ</b>                                 | No                    |

### **TIA Undertaking**

| S.No | Undertaking to Order               | Tender complying with Order | Reason for non compliance of Order |
|------|------------------------------------|-----------------------------|------------------------------------|
| 1    | <a href="#">PPP-MII Order 2017</a> | Agree                       |                                    |
| 2    | <a href="#">MSEs Order 2012</a>    | Agree                       |                                    |

### **Tender Inviting Authority**

|                |                                                                                             |
|----------------|---------------------------------------------------------------------------------------------|
| <b>Name</b>    | DDG                                                                                         |
| <b>Address</b> | 9th Floor Beta Building, i-Think Techno Campus, Kanjurmarg East, Mumbai, Maharashtra 400042 |

### **Tender Creator Details**

|                     |                      |
|---------------------|----------------------|
| <b>Created By</b>   | Krishan Murari       |
| <b>Designation</b>  | UDC                  |
| <b>Created Date</b> | 28-Jul-2026 02:28 PM |



**DIRECTORATE GENERAL OF MARITIME ADMINISTRATION, MUMBAI**

**Request for Expression of Interest (REOI)  
for  
Selection of Consultancy Services for the Strategic Technical  
Support Unit (STSU) for the National Maritime Decarbonization  
Policy Framework**

REOI Ref. No.: 13-39/5/2025-O/o ENGG-DGS

Date of Issue: 28/07/2026

**ISSUING AUTHORITY:**  
**DIRECTORATE GENERAL OF MARITIME ADMINISTRATION, MUMBAI**  
Postal Address: 9th Floor Beta Building, I-Think Techno Campus, Kanjurmarg (East), Mumbai  
- 400 042 (India)

Tel. No.: 91-22-25752040/41/42/43/45  
(From 9:30 A.M. to 6:00 P.M.)

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## Part I: REOI Process

### SECTION I: Request for Expression of Interest (REOI)

#### 1. Invitation

##### Organisation Background / About DGMA

The Directorate General of Maritime Administration (DGMA), an attached office of the Ministry of Ports, Shipping and Waterways, Govt. of India, deals in matters relating to merchant shipping. The DGMA deals with all matters concerning the Maritime Administration, Maritime Education and Training, development of Shipping Industry and other related subjects.

This Directorate deals with implementation of shipping policy and legislation so as to ensure the safety of life and ships at sea, prevention of marine pollution, promotion of maritime education and training in co-ordination with the International Maritime Organisation, regulation of employment and welfare of seamen, development of coastal shipping, augmentation of shipping tonnage, examination and certification of Merchant Navy Officers, Supervision and Control of the allied departments and officer under its administrative jurisdiction.

The details about DGMA and its functions are available at website [dgma.gov.in](http://dgma.gov.in)

The Directorate General of Maritime Administration (DGMA) through (hereinafter referred to as 'the Authority', 'the Head of Procurement', 'the Procuring Entity' and 'the Procuring Organisation' respectively), invites Request for Expression of Interest (hereinafter referred as the 'REOIs') from eligible and qualified Indian companies/agencies for shortlisting for the delivery of Consultancy Services as described in 'Part II: Schedule of Requirements' (hereinafter referred to as 'the Services'). Interested Consultants should provide sufficient and relevant information demonstrating that they meet the specified eligibility criteria and have the required qualifications to be shortlisted for providing the Services. This Request for Expression of Interest (REOI) Document, reference number, REOI/ xxxx, details the process of such shortlisting. As part of this procurement process, a Request for Proposals (RFP) for selecting Consultants shall be subsequently issued to only such shortlisted Consultants.

#### 2. Instructions for REOI

##### 2.1 Important Dates

| Sr No. | Particulars                                                                                                                                                                                | Date                   |
|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| 1.     | Date of availability of REOI on CPPP portal                                                                                                                                                | 28/07/2026; 16:00 Hrs. |
| 2.     | Start date for submission of EOI response                                                                                                                                                  | 29/07/2026; 10:00 Hrs. |
| 3.     | Seek Clarification Start Date                                                                                                                                                              | 29/07/2026; 10:00 Hrs. |
| 4.     | Seek Clarification End Date                                                                                                                                                                | 06/08/2026; 18:00 Hrs. |
| 5.     | Pre bid meeting Date<br>Link:<br><a href="https://teams.microsoft.com/meet/485844821246027?p=rkRnSuEE86PBZ5capk">https://teams.microsoft.com/meet/485844821246027?p=rkRnSuEE86PBZ5capk</a> | 07/08/2026; 12:00 Hrs. |
| 6.     | Last date for submission of EOI response                                                                                                                                                   | 20/08/2026; 15:00 Hrs. |

| <b>Sr No.</b> | <b>Particulars</b> | <b>Date</b>            |
|---------------|--------------------|------------------------|
| 7.            | Opening of Bids    | 21/08/2026; 15:00 Hrs. |

## 2.2 Advertisement of REOI

The REOI document shall be published on Central Public Procurement Portal – CPPP (<https://www.eprocure.gov.in>), official website of DGMA (dgma.gov.in). All corrigenda, addendums, amendments, date change to REOI shall be posted at the aforesaid portals and no separate notification shall be issued.

## 2.3 Governing Language and Law

The REOI submitted by the consultants and all subsequent correspondence and documents relating to the REOI exchanged between the consultant and the DGMA, should be written in the language specified in Section II: Appendix (or English if nothing is specified - hereinafter referred to as the ‘REOI Language’). However, the language of any printed literature furnished by a consultant in connection with its REOI may be written in any other language provided a certified translation accompanies the same in the REOI language. For interpretation of the REOI, translation in the language of the REOI shall prevail.

The REOI process shall be subject to the laws of the Union of India and the exclusive jurisdiction of courts relevant to the address of the Tender Inviting Authority.

## 2.4 Acronyms

The following Acronyms have been used in this REOI document:

| <b>Acronym</b> | <b>Full Form</b>                                   |
|----------------|----------------------------------------------------|
| REOI           | Request for Expression of Interest                 |
| DGMA           | Directorate General of Maritime Administration     |
| MoPSW          | Ministry of Ports, Shipping and Waterways          |
| KYC            | Know Your Customer                                 |
| GST            | Goods and Services Tax                             |
| QCBS           | Quality and Cost-Based Selection                   |
| ISO            | International Organization for Standardization     |
| GSTIN          | Goods and Services Tax Identification Number       |
| JV/C           | Joint Venture/Consortium                           |
| RFP            | Request for Proposal                               |
| MoU            | Memorandum of Understanding                        |
| NMDP           | National Maritime Decarbonization Policy Framework |
| STSU           | Strategic Technical Support Unit                   |

## 2.5 The Contents of the REOI document

This REOI document provides the relevant information and instructions to assist the prospective consultant’s in preparing and submitting REOIs. It also includes the mode and procedure for receipt/ opening, evaluation of REOIs, and shortlisting of consultants.

The REOI document consists of the following parts. If additional sections/ appendices are included in a specific REOI, these would be detailed in Section II: Appendix.

**Part I: REOI process**

- 1) Section I: Request for Expression of Interest (REOI)
- 2) Section II: Appendix
- 3) Section III: Qualification Criteria

**Part II: Schedule of Requirements**

- 1) Section IV: Terms of Reference

**Part III: REOI Submission Formats**

- 1) Form 1: REOI Form (Covering Letter)
  - a) Form 1.1: Consultant Information
  - b) Form 1.2: Eligibility Declarations
- 2) Form 2: Qualification Criteria – Compliance
  - a) Form 2.1: Performance Capability Statement
  - b) Form 2.2: Financial Capability Statements
    - i) Form 2.2.1: Financial Statement
    - ii) Form 2.2.2: Average Annual Turnover
- 3) Form 3: Checklist for consultant
- 4) Form 4: Declaration for No Conflict of Interest
- 5) Form 5: Details of ineligibility for corrupt or fraudulent practices / blacklisted with any of the Government or Public Sector Units
- 6) Form 6: Authorisation to Attend Pre-REOI Conference
- 7) Form 7: Other information required

**2.5.1 Section II: Appendix**

Variable parameters and information related to this specific REOI process are summarised in the appendix.

**2.5.2 Section III: Qualification Criteria:**

This section lays down the Qualifying Criteria for shortlisting consultant. The consultant must have requisite experience with assignments similar in nature in general and specific sectors relevant to the subject assignment. It may indicate the extent of dispensation, if any, allowed for Start-ups under Clause 5.1 below. Unless otherwise stated in Section II: Appendix, consultant may associate with other firms to enhance their qualifications but should indicate clearly whether the association is in the form of a joint venture/consortium (JV/C) and/or a sub-consultancy. In response to this section, consultant must submit Form 2: Qualification Criteria – Compliance and its sub-forms 2.1, 2.2, 2.2.1 and 2.2.2.

**2.5.3 Section IV: Terms of Reference (TOR)**

‘Section IV: Terms of Reference (TOR)’ describes the background, purpose/ objectives, description/ scope, deliverables/ outcomes, and timelines of Services (hereinafter called the ‘Service’) required. The ‘Service’ may include incidental Goods, Works, and other Services if so indicated therein. Any generic reference the ‘Service’ shall be deemed to include such incidental Goods, Works, and other Services.

### 2.5.4 REOI Formats for submission (To be filled, digitally signed, and uploaded by consultant)

The consultant must fill, digitally sign and upload the REOI in the Formats given in Part III: REOI Submission Formats.

## 2.6 Corrigenda/Addenda to the REOI document

- 1) Before the deadline for submitting REOIs, the DGMA may update, amend, modify, or supplement the information, assessment or assumptions contained in the REOI document by issuing corrigenda and addenda. The corrigenda and addenda shall be published in the same manner as the original REOI document. The consultants must check the website(s) for any corrigenda/ addenda. Any corrigendum or addendum thus issued shall be considered a part of the REOI document.
- 2) If considered necessary, the DGMA may suitably extend the REOI submission deadline to give reasonable time to the prospective consultants to take such corrigendum/ addendum into account in preparing their REOI. After the DGMA makes such modifications, any consultant who has submitted his REOI shall have the opportunity to either withdraw his REOI or re-submit his REOI superseding the original REOI within the extended time of submission as per Clause 8.4 below.
- 3) The DGMA may extend the deadline for the REOI submission by issuing an amendment. In such a case, all rights and obligations of the DGMA and the consultants previously subject to the original deadline shall then be subject to the new deadline for the REOI submission.

## 3. Right to reject any or all REOIs

The issue of the REOI document does not imply that the Procuring Entity is bound to shortlist consultants. The Procuring Entity reserves its right to accept or reject any or all REOIs, abandon/ bypass/ cancel the REOI process and issue another REOI for the same or similar Services before or after shortlisting consultants. It would have no liability to the affected consultants or any obligation to inform the affected consultants of the grounds for such action(s).

## 4. Participation IN REOI – Eligibility Criteria

### 4.1 Eligibility Criteria

Subject to other provisions in the REOI document, participation in this shortlisting process is open to all consultant who fulfil the ‘Eligibility’ and ‘qualification’ criteria. The consultant should meet the following eligibility criteria as of the date of their REOI submission and should continue to meet these until the subsequent RFP process and contract award. The consultant shall be required to demonstrate fulfilment of the Eligibility Criteria in Form 1.2 (Eligibility Declarations). The consultant unless otherwise stipulated in Section II: Appendix.

| EC # | Condition    | Criteria                                                                                                                                                                                                          | Supporting Document                                                                                                                         |
|------|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| EC1  | Legal Entity | The Consultant / Lead Consultant must be a private entity (a Consulting Company/ LLC/ LLP /Partnership firm/ Society registered in India under the Companies Act, 1956, 2013, 2020 / LLP Act, 2008 and subsequent | Copy of certificate for Registration<br><br>To be submitted for - <ul style="list-style-type: none"><li>• Single Bid - Consultant</li></ul> |

| EC # | Condition                                                                | Criteria                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Supporting Document                                                                                                                                                                          |
|------|--------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|      |                                                                          | amendments thereto), a public Entity (Government-owned enterprise or institution), or unless otherwise stipulated in Section II: Appendix - Joint Venture/ Consortium (an association of several persons, firms, or companies - hereinafter referred to as JV/C).                                                                                                                                                                                                                                                                                                                   | <ul style="list-style-type: none"> <li>Consortium Bid – Lead Consultant</li> </ul>                                                                                                           |
| EC2  | <b>Registration Certification by the concerned authority /government</b> | The Consultant / Lead Consultant must have valid registration regarding GSTIN, PAN, EPF equivalent registration certificate issued by the concerned authority/government as applicable to the subject Services.                                                                                                                                                                                                                                                                                                                                                                     | <p>Copy of certificate for Registration</p> <p>To be submitted for -</p> <ul style="list-style-type: none"> <li>Single Bid – Consultant</li> <li>Consortium Bid – Lead Consultant</li> </ul> |
| EC3  | <b>Declaration of Insolvency, Bankruptcy, etc.</b>                       | The Consultant / Lead Consultant must not be insolvent, bankrupt, in receivership, under winding-up proceedings, have its affairs managed by a court or judicial officer, have its business activities suspended, or be subject to any legal proceedings for these reasons.                                                                                                                                                                                                                                                                                                         | <p>Declaration by authorised signatory in Form 1.2</p> <p>In case of:</p> <ul style="list-style-type: none"> <li>Single Bid – Consultant</li> <li>Consortium Bid – All members</li> </ul>    |
| EC4  | <b>Blacklisting by Govt.</b>                                             | <p>i. The Consultant / Lead Consultant must Not stand declared ineligible/ blacklisted/ banned/ debarred by the Procuring Organisation or its Ministry/ Department from participation in its procurement processes; and/ or</p> <p>ii. Not be convicted (within three years preceding the last date of EOI submission) or stand declared ineligible/ suspended/ blacklisted/ banned/ debarred by appropriate agencies of the Government of India from participation in procurement processes of all its entities, for:</p> <p>a. offenses involving moral turpitude in business</p> | <p>Declaration by authorised signatory in Form 1.2</p> <p>In case of:</p> <ul style="list-style-type: none"> <li>Single Bid – Consultant</li> <li>Consortium Bid – All members</li> </ul>    |

| EC # | Condition                       | Criteria                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Supporting Document                                                                                                                                                                           |
|------|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|      |                                 | <p>dealings under the Prevention of Corruption Act, 1988 or any other law; and/or</p> <p>b. offenses under the Indian Penal Code or any other law for causing any loss of life/ limbs/ property or endangering Public Health during the execution of a public procurement contract and/ or</p> <p>c. suspected to be or of doubtful loyalty to the Country or a National Security risk as determined by appropriate agencies of the Government of India.</p> <p>iii. Not have changed its name or created a new “Allied Entity”, consequent to having declared ineligible/ suspended/ blacklisted/ banned/ debarred as above</p> |                                                                                                                                                                                               |
| EC5  | <b>Conflict of Interest</b>     | <p>The Consultant / Lead Consultant must not have any conflict of interest (as defined in Clause 4.5, ‘Conflict of Interest’ below) that could substantially affect fair competition. The Consultant / Lead Consultant shall not attempt to induce any other Consultant to submit or refrain from submitting an EOI in order to restrict competition.</p>                                                                                                                                                                                                                                                                        | <p>Declaration by authorised signatory in Form 1.2</p> <p>In case of:</p> <ul style="list-style-type: none"> <li>• Single Bid – Consultant</li> <li>• Consortium Bid – All members</li> </ul> |
| EC6  | <b>Recognized Organizations</b> | <p>The Consultant must be a Recognized Organization (RO) i.e. an organization recognized by the Government of India as per the Gazette Notification No. S.O. 3316(E) dated December 26, 2014.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                | <p>Declaration on RO’s letterhead</p>                                                                                                                                                         |

| EC # | Condition | Criteria                                                                                   | Supporting Document |
|------|-----------|--------------------------------------------------------------------------------------------|---------------------|
|      |           | In case of a Joint Venture /Consortium, the Lead member must comply with this requirement. |                     |

## 4.2 Eligibility of consultant from Restricted Countries

### 4.2.1 Restrictions based on Reciprocity.

Entities from countries (if so, identified in Section II: Appendix) as not allowing Indian companies to participate in their Government procurement shall not be allowed to participate (directly or as a sub-contractor or as a member of a JV/C) on a reciprocal basis in this REOI process under the “Public Procurement (Preference to Make in India) Order 2017<sup>1</sup>” (MII – para 10 -d) of Department for Promotion of Industry and Internal Trade, (DPIIT). The consultant must apprise themselves of the latest version of this order.

### 4.2.2 Restrictions based on Land Borders

Order (Public Procurement No. 1) issued by the Government of India (Ministry of Finance Department of Expenditure Public Procurement Division) restricting procurement from consultant from certain countries that share a land border with India shall apply to this procurement. The consultant must apprise themselves of the latest version of this order. Any consultant from a country that shares a land border with India, excluding countries to which the Government of India has extended lines of credit or in which the Government of India is engaged in development projects (as listed on the website of the Ministry of External Affairs), – hereinafter called ‘Restricted Countries’ shall be eligible to participate in this REOI, only if the consultant is registered with the Registration Committee constituted by the Department for Promotion of Industry and Internal Trade (DPIIT). The consultant shall enclose the certificate in Form 1 - REOI Form.

## 4.3 Sub-Consultants/Sub-Contracting

The consultant may propose to associate Sub-consultants for specialised parts of the Services provided their names and details are clearly stated in the REOI. Such Sub-consultants should not circumvent the eligibility condition laid down above. The value of such sub-contracts shall not exceed the limit specified (25% of the contract price, if not specified) in Section II: Appendix. Nevertheless, the consultant shall solely remain responsible for sub-contracted portions of the Services. Key and non-key personnel, whether full-time employees or on contract, shall not be considered sub-consultants. Procurement of incidental goods, equipment hires, or labour engagement shall not be treated as sub-contracting.

## 4.4 Joint Venture/Consortium (JV/C)

- 1) In the case where a consultant is or proposes to be a Joint Venture/ Consortium (that is, an association of several persons, firms, or companies - hereinafter referred to as JV/C), then unless otherwise specified in Section II: Appendix, in JV/C:
  - a) members should not be more than four (04)
  - b) no member should have less than 10% participation.
  - c) members having participation between 10% and 20% shall be termed as non-substantial members.

- d) Members having more than 20% participation shall be termed as substantial members.
  - e) The Lead member must have at least 40% participation.
  - f) The lead member/consultant and various categories of members of the JV/C must be identified.
  - g) Number of non-substantial members shall not be more than one (01)
- 2) The JV/C and all members must satisfy all the eligibility requirements in this REOI document.
  - 3) JV/C and its members must jointly meet the qualification criteria in Section III– Qualification Criteria. The technical/ experience qualification of all JV/C members (substantial members, Lead member and non-substantial members) shall be evaluated jointly as per Evaluation Criteria. However, for financial criteria of qualification, credentials of substantial and lead members (excluding non-substantial members) shall only be considered.
  - 4) All the members shall be jointly and severally liable for the entire contract if selected in the RFP Process.

#### **4.5 Conflict of Interest**

- 1) Any consultant with a conflict of interest that affects fair competition shall not be eligible to participate in this procurement process. REOIs found to have a conflict of interest shall be rejected as nonresponsive. Consultant shall be required to declare the absence of such conflict of interest in Form 1.2 - Eligibility Declarations. A consultant in this procurement process shall be considered to have a conflict of interest if the consultant:
  - a. directly or indirectly controls, is controlled by or is under common control with another Consultant; or
  - b. receives or has received any direct or indirect subsidy/ financial stake from another consultant; or
  - c. has the same correspondence address or same legal representative/ agent as another consultant for purposes of this REOI; or
  - d. has a relationship with another consultant, directly or through common third parties, which puts it in a position to have access to information about or influence the REOI of another consultant; or
  - e. would be providing goods, works, or non-consulting services resulting from or directly related to consulting services that it provided (or were provided by any affiliate that directly or indirectly controls, is controlled by, or is under common control with that firm) for the procurement planning (inter-alia preparation of feasibility/ cost estimates/ Detailed Project Report (DPR), design/ technical specifications, terms of reference (TOR)/ Activity Schedule/ schedule of requirements or the REOI/ RFP Document etc) of this procurement process; or
  - f. has a close business or family relationship with a staff of the Procuring Organisation who:
    - i. are directly or indirectly involved in the preparation of the REOI document or Terms of Reference of the procurement process and/or the evaluation in REOI and/ or RFP process; or
    - ii. would be involved in the implementation or supervision of the resulting contract
    - iii. Any conflict stemming from such a relationship must be reported and resolved in a manner acceptable to the Procuring Entity throughout the REOI and RFP processes and execution of the contract.

- iv. A consultant may participate as a sub-consultant in more than one bid but only in that capacity (i.e., without bidding in an individual capacity). Bids submitted in violation of this procedure will be rejected.
- 2) Participation of only One Entity from Affiliates: Only one entity from among a consultant and its affiliates (that directly or indirectly control or are controlled by or are under common control with that firm) individually or as part of a joint venture or as a Sub-consultant shall be permitted to participate in REOI.
- 3) The consultant shall furnish information on commissions and gratuities, if any, paid or to be paid to agents or any other party relating to this REOI and RFP process.

## **5. Purchase preference policies of the government.**

### **5.1 Relaxation in Prior Turnover and Experience to Start-ups**

*Intentionally Removed*

## **6. Downloading the REOI document, clarifications and pre-EOI conference**

### **6.1 Availability and Downloading of the REOI Document**

The REOI Document containing the details of qualification criteria, submission requirement, brief objective & scope of work, etc. is enclosed. REOI document is also available for downloading from the CPPP Portal (<https://eprocure.gov.in/eprocure/app>) and from DGMA website [www.DGMAshipping.gov.in](http://www.DGMAshipping.gov.in). Further details, if any, may be obtained from Shri. Pravin kumar roy, Engineer & Ship Surveyor-cum-Dy.DG(Tech), The Directorate General of Maritime Administration, email id: [pravin.roy-dgs@gov.in](mailto:pravin.roy-dgs@gov.in), 9th Floor, BETA Building, I-Think Techno Campus, Kanjur Village Road, Kanjurmarg (E), Mumbai-400042.

Interested consultants should provide sufficient and relevant information demonstrating that they meet the specified eligibility criteria and have the required qualifications to be shortlisted for providing the Services.

### **6.2 Clarifications**

A Consultant may seek clarification of the REOI document through the eProcurement portal (<https://eprocure.gov.in/eprocure/app>) before the date and time prescribed in Section II: Appendix (or, if not mentioned, before fourteen days of the deadline for the REOI submission). This deadline shall not be extended in case of any intervening holidays. No other means of submission of queries shall be entertained. All such queries shall relate to the REOI document alone, and queries related to a detailed analysis of Reference, payment terms and mode of selection shall only be entertained during the RFP Process. The Procuring Entity shall respond no later than seven days before the deadline for REOI submission. The query and clarification shall be shared with all prospective consultants on the portal without disclosing its source. If required, the Procuring Entity may modify the REOI document that may become necessary due to the clarification through an Addendum/ Corrigendum issued as per clause 2.6 above

### **6.3 Pre-EOI Conference**

- 1) If a Pre-EOI conference is stipulated in Section II: Appendix, prospective consultants interested in participating in this REOI may attend a pre-EOI conference to clarify the conditions of the REOI process at the venue, date and time specified therein. Participation in the Pre-EOI conference is not mandatory but is restricted to prospective consultants who have registered for the pre-EOI conference.

- 2) The date and time by which the written queries for the pre-EOI must reach the authority and the last date for registration for participation in the pre-EOI conference are also mentioned in Section II: Appendix. If the dates are not mentioned, such date and time shall be seven days before the date and time of the pre-EOI conference.
- 3) Delegates participating in the pre-EOI conference must provide a photo identity and an authorization letter in case of physical meeting: “Authorization to Attend Pre-EOI Conference” from their organization; else, they shall not be allowed to participate. The Pre-EOI conference may also be held online at the discretion of the Procuring Entity.
- 4) After the Pre-EOI conference, minutes of the pre-EOI conference (including the questions asked in writing and those asked during the meeting (without identifying the source) and the responses given, together with any responses prepared after the meeting, shall be published on the Procuring Entity’s Portal within seven days from the pre-EOI conference. If required, a clarification letter and corrigendum to the REOI document shall be issued, containing amendments, if any, of various provisions (including the TOR, if required) of the REOI document, which shall be deemed part of the REOI document. As per clause 2.6 above, the Procuring Entity may suitably extend by at least three days the deadline for the REOI submission to give reasonable time to the prospective consultants to consider such clarifications in preparing their REOIs.

## **7. Preparation of REOI**

### **7.1 REOI Submission Formats:**

The consultant must fill and submit the REOI in the Formats in Part III - REOI Submission Formats’. REOI by the consultant shall include inter-alia duly signed or digitally signed scanned copies of the original documents in pdf format.

### **7.2 EOI Validity**

- 1) Unless specified to the contrary in Section II: Appendix, REOIs shall remain valid for a period not less than 60 (sixty) days from the deadline for the REOI submission stipulated in Section II: Appendix. An REOI valid for a shorter period shall be rejected as nonresponsive.
- 2) In case the day up to which the REOIs are to remain valid falls on/ subsequently declared a holiday or closed day for the Procuring Entity, the REOI validity shall automatically be deemed to be extended up to the next working day.
- 3) In exceptional circumstances, before the expiry of the original time limit, the Procuring Entity may request the consultant to extend the validity period for a specified additional period. The request and the consultants’ responses shall be made in writing or electronically. A consultant may agree to or reject the request. A consultant who has agreed to the Procuring Entity’s request for extension of EOI validity, however, in no case he shall be permitted to modify his REOI.

## **8. Signing and uploading of REOIs**

### **8.1 Relationship between Consultant and eProcurement Portal**

The Procuring Entity is neither a party nor a principal in the relationship between the consultant and the organization hosting the e-procurement portal (<https://eprocure.gov.in/eprocure/app>) (hereinafter called the portal). Consultants must comply with the rules, conditions, regulations, procedures, and implied conditions/ agreements of the eProcurement portal, including registration, compatible Digital Signature Certificate (DSC) etc. Consultants shall settle clarifications and disputes, if any, regarding the portal directly with them. In case of conflict between provisions of

the portal with the REOI document, provisions of the portal shall prevail. Consultants may study the resources provided by the Portal for Consultants.

## **8.2 Signing of REOI**

The individual signing/ digitally signing the REOI or any other connected documents should submit an authenticated copy of the document(s), which authorizes the signatory to commit and submit REOIs on behalf of the Consultant along with Form 1.1: Consultant Information.

## **8.3 Submission/Uploading of REOIs**

### **8.3.1 Submission/Uploading to the Portal**

- 1) REOIs must be uploaded on the eProcurement Portal (<https://eprocure.gov.in/eprocure/app>) mentioned in Section II: Appendix until the submission deadline. If the office happens to be closed on the deadline to submit the REOIs as specified above, this deadline shall not be extended. No manual REOIs shall neither be made available nor accepted for submission. REOI submitted through modalities other than those stipulated in Section II: Appendix shall be liable to be rejected as nonresponsive.
- 2) In the case of downloaded documents, Consultants must not make any changes to the contents of the documents while uploading, except for filling in the required information. Otherwise, the REOI shall be rejected as nonresponsive. Uploaded Pdf documents should not be password protected. Consultants should ensure the clarity/ legibility of the scanned documents uploaded by them.
- 3) The date and time of the e-Procurement server clock, which is also displayed on the dashboard of the consultant, shall be taken as the reference time for deciding the closing time of REOI submission. Consultants are advised to ensure they submit their REOI within the deadline of REOI submission, taking the server clock as a reference, failing which the portal shall not accept the REOIs. No request on the account that the server clock was not showing the correct time and that a particular consultant could not submit their REOI because of this shall be entertained. Failure or defects on the internet or heavy traffic at the server shall not be accepted as a reason for a complaint. The Procuring Entity shall not be responsible for any failure, malfunction or breakdown of the electronic system used during the e-Tender process.
- 4) Only one copy of the REOI can be uploaded, and the Consultant shall digitally sign all statements, documents, and certificates uploaded by him, owning sole and complete responsibility for their correctness/ authenticity as per the IT Act 2000 as amended from time to time. An REOI submitted by a Joint Venture shall be digitally signed by an authorized representative who has a written power of attorney signed by each member's authorized representative to be legally binding on all members.
- 5) All REOIs uploaded by consultants to the portal shall get automatically encrypted. The encrypted REOI can only be decrypted/ opened by the authorized persons on or after the due date and time. They should ensure the correctness of the REOI before uploading and take a printout of the system-generated submission summary to confirm successful REOI upload.

### **8.3.2 Implied acceptance of procedures by Consultant**

Submission of REOI in response to the REOI document is deemed to be acceptance of the procedures and conditions of the e-Procurement and REOI document.

### **8.3.3 Responsibility of the Consultant to declare all changes.**

Consultant must advise DGMA immediately in writing of any material change to the information provided in their REOI submission, including any substantial change in their ownership, eligibility, or financial or performance capacity. For shortlisted Consultants, this requirement applies until a contract is awarded in the following RFP process. For the consultant successful in the RFP process, this requirement shall apply till the execution of the resultant contract.

## **8.4 Modification, Resubmission and Withdrawal of REOIs**

### **8.4.1 Modification and Re-submission**

Once submitted in e-Procurement, Consultant cannot view or modify their REOI since it is locked by encryption. However, resubmission of the REOI by Consultants for any number of times superseding earlier REOI(s) is allowed up to the submission deadline by following procedures prescribed by the portal. Resubmission of an REOI shall require uploading all documents afresh. The system shall consider only the last REOI submitted.

### **8.4.2 Withdrawal**

The consultant may withdraw his REOI before the submission deadline by following procedures prescribed by the portal, and it shall be marked as withdrawn and shall not get opened during the REOI opening. No REOI should be withdrawn after the submission deadline and before its validity period expires.

## **9. REOI opening**

REOIs received shall be opened on date and time in Section II: Appendix. If the specified date of EOI opening falls on or is subsequently declared a holiday or closed day for the Procuring Entity, the EOIs shall be opened at the appointed time on the next working day.

## **10. Evaluation of REOIs and shortlisting of consultants**

### **10.1 General Norms**

#### **10.1.1 Evaluation is based only on declared criteria.**

- 1) The evaluation shall be based upon scrutinising and examining all relevant data and details submitted by SI in its/ his EOI and other allied information deemed appropriate by DGMA. Evaluation of EOIs shall be based only on the criteria/ conditions included in the REOI document.
- 2) Information relating to the evaluation of EOIs, and shortlisting results shall not be disclosed to any participant or any other persons not officially concerned with such process until the notification of shortlisting is made in accordance with clause 10.2.5 below.
- 3) The determination shall not consider the qualifications of other firms, such as the consultant's subsidiaries, parent entities, affiliates, or any other firm(s) different from the consultant.

#### **10.1.2 Clarification of REOIs and shortfall documents**

- 1) During the evaluation of REOIs, the DGMA may, at its discretion, but without any obligation to do so, ask consultants to clarify its EOI by a specified date (or, if not specified, seven days from the date of receipt of such request). The consultant should answer the clarification within that specified date. The clarification request and response shall be submitted in writing or electronically. No change in the substance of the EOI shall be sought, offered, or permitted that may grant any undue advantage to such a consultant. Any clarification submitted by a

consultant regarding its EOI that is not in response to a request by the Purchasing Entity shall not be considered.

- 2) DGMA reserves its right to, but without any obligation to do so, seek any shortfall information/ documents. Provided such information/ documents are historical, which pre-existed at the time of the EOI opening and which have not undergone change since then and do not grant any undue advantage to any Consultant. There is a provision on the portal for requesting Short-fall documents from the consultants. The system allows taking the shortfall documents from consultants only once after the EOI opening.
- 3) If the consultant fails to provide satisfactory clarification and/or missing information, its EOI shall be evaluated based on available information and documents.

### **10.1.3 Contacting Procuring Entity during the evaluation**

From EOI submission to shortlisting of Consultants, no Consultant shall contact DGMA on any matter relating to the submitted EOI. If a Consultant needs to contact DGMA relating to this EOI, it should do so only in writing or electronically. Any effort by a Consultant to influence DGMA during the REOI process shall be construed as a breach of the Code of Integrity, and EOI shall be liable to be rejected as non-responsive in addition to other punitive actions for such a breach as per the REOI document.

## **10.2 Evaluation of REOIs and Shortlisting**

In evaluating the EOI, conformity to the eligibility and qualification criteria to those in the REOI document is ascertained. Additional factors incorporated in the REOI document shall be considered as indicated therein.

### **10.2.1 Determining Responsiveness**

Only substantively responsive EOIs shall be evaluated for shortlisting. A substantively responsive EOI is complete and conforms to the REOI document's essential terms and conditions. Unless otherwise stipulated in Section II: Appendix, the following are some of the crucial aspects for which an EOI shall be rejected as nonresponsive:

- 1) The EOI is not in the prescribed format or is not submitted as per the stipulations in the REOI document.
- 2) The consultant is not eligible to participate in the EOI as per laid down eligibility criteria.
- 3) The EOI validity is shorter than the required period.
- 4) The EOI departs from the essential requirements stipulated in the EOI document.
- 5) Non-submission or submission of illegible scanned copies of stipulated documents/ declarations if any
- 6) The consultant fails to provide and/ or comply with the required information, instructions etc., incorporated in the REOI document or gives evasive information/ reply against any such stipulations.
- 7) The consultant furnishes wrong and/ or misleading data, statement(s) etc. In such a situation, besides rejecting the EOI as nonresponsive, it is liable to attract other punitive actions under relevant provisions of the REOI document for breach of the Code of Integrity

### **10.2.2 Evaluation of Eligibility**

DGMA shall determine, to its satisfaction, whether the consultants are eligible as per Clause 4 above to participate in the REOI process as per submission in 'Form 1.2: Eligibility Declarations'. The eligibility evaluation shall be on a "pass" or "fail" basis. A consultant

must achieve a “pass” on all the criteria to proceed to the next step. Any consultant not achieving a ‘pass’ in any of the eligibility criteria shall be rejected as nonresponsive.

### **10.2.3 Evaluation of Qualification Criteria**

- 1) DGMA shall determine whether the Consultants are qualified and capable in all respects to be shortlisted to provide the ‘Services’ (subject to dispensation, if any, for Start-ups, as per clause 5.1 above), as per Section III: Qualification Criteria and submission in Forms listed in Part II: ‘EOI Submission Formats’. The determination shall not consider the qualifications of other firms, such as the consultant’s subsidiaries, parent entities, affiliates, or any other entity different from the consultant. DGMA reserves the right to waive minor deviations in the qualification criteria if they do not materially affect the capability of a consultant to perform the contract. The Experience of Key Experts are not included in the shortlisting criteria but shall be evaluated at the RFP stage.
- 2) Consultant’s planning to subcontract any of the Key Activities indicated in Part II Schedule of Requirements to Sub- consultants in accordance with clause 4.3 above, shall specify the activity(ies) or parts of the Services to be subcontracted in their EOI identifying the proposed Sub-consultants in their EOI. Experience (but not Financial Qualifications) of such proposed Sub-consultant(s) can be used to meet the experience requirements specified in Section III Qualification Criteria.
- 3) Unless otherwise stipulated in Section II: Appendix, assignments completed by the consultant’s individual experts working privately or through other consulting firms cannot be claimed as the relevant experience of the Consultant or that of the consultant’s partners or sub-consultants in Form 2.1: Performance Capability Statement.

### **10.2.4 Verification of Original Documents at RFP Process**

The DGMA reserves its right to call for verification, originals of all self-certified copies of uploaded documents from the consultant’s during the following RFP Process. If the shortlisted consultant fails at that stage to provide such originals or, in case of substantive discrepancies in such documents, it shall be construed as a breach of the Code of Integrity (see clause 12 below). Such RFP proposals shall be liable to be rejected as nonresponsive in addition to other punitive actions for such a breach.

### **10.2.5 Declaration of Shortlisted consultant**

- 1) EOIs of consultant that succeed in the above evaluation shall be shortlisted. Provisionally shortlisted consultant will be informed of the condition(s) that must be met before submitting their Proposal in the RFP process. Such shortlisting shall remain valid for a period specified in Section II: Appendix (six months from the date of declaration, if not so specified).
- 2) Only shortlisted (including provisionally shortlisted) consultant shall be invited to participate in the following RFP process. If stipulated in Section II: Appendix, if there are a larger number of consultants meeting the evaluation criteria, the shortlist shall be restricted to a specified number of consultant (if not specified, eight (8) consultants) based on higher Average Turnover (or any other criteria, if so, stipulated therein).
- 3) The name and address of the shortlisted consultant (s) shall be published in the portal and notice board/ bulletin/website of DGMA. All consultants shall be advised about shortlisting of their EOIs or otherwise without disclosing the comparative position of their EOIs with that of others. Shortlisted consultants must not advertise or publish the same in any form without the prior written consent of the Procuring Entity.

- 4) Shortlisting a consultant is an administrative process and does not confer any legal or contractual rights on him. Since original documents/ certificates are not being called for and examined at this stage, all shortlisted shall be conditional upon final verification of such documents/ certificates during the RFP Process.

### **10.3 Publication of RFP following with REOI**

DGMA shall publish a Request for Proposal (RFP) addressed exclusively to shortlisted consultant for the following procurement process through the eProcurement portal (<https://eprocure.gov.in/eprocure/app>). DGMA/ the Portal may issue notifications/ alerts to such consultant but without any liability. Such consultant shall be responsible for being on the lookout for the RFP on the portal. While publishing the RFP, the Procuring Entity reserves its right to elaborate further on the brief overview of the proposed procurement/scope of work, qualification Criteria and other terms & conditions without vitiating the shortlisting process. Shortlisted consultant shall have no claim in this regard.

## **11. Grievance redressal/complaint procedure**

- 1) Consultants have the right to submit a complaint or seek de-briefing if he is not shortlisted in this REOI process, in writing or electronically, within ten days of the declaration of REOI evaluation results. The complaint shall be addressed to the Head of Procurement.
- 2) Within five working days of receipt of the complaint, the Tender Inviting Authority shall acknowledge the receipt in writing to the complainant, indicating that it has been received. The response shall be sent at the right time after a detailed examination.
- 3) The Tender Inviting Authority shall convey the final decision to the complainant within 15 days of receiving the complaint. No response shall be given regarding the confidential process of evaluating EOIs before the results are notified, although the complaint shall be kept in view during such a process. However, no response shall be given regarding the following topics explicitly excluded from such complaint process:
  - a) Only a consultant who has participated in the REOI process and has not been shortlisted can make such a representation. Complaints regarding shortlisting or exclusion of other consultants shall not be entertained.
  - b) No third-party information (REOIs, eligibility/ qualification) shall be sought and must not be included in the response.
  - c) Following decisions of the DGMA shall not be subject to review:
    - i) Determination of the need for procurement.
    - ii) Complaints against eligibility and qualification criteria except under the premise that they are either vague or too specific to limit competition.
    - iii) Choice of the selection procedure.
    - iv) Provisions limiting the participation of consultants in the REOI process, in terms of policies of the Government.
    - v) Provisions regarding purchase preferences to specific categories of consultants in terms of policies of the Government.
    - vi) Cancellation of the REOI process except where it is intended to subsequently re-tender the same Services.

## **12. Code of integrity in public procurement, misdemeanours, and penalties**

Code of Integrity and penalties for violating the Govt of India, Ministry of Finance, Department of Expenditure shall apply to this REOI process. Procuring authorities, consultants, suppliers, contractors, and consultants should observe the highest standard of integrity and not indulge in

prohibited practices or other misdemeanours, either directly or indirectly, during the entire procurement Process (including this REOI) or the execution of resultant contracts.

Note: For further details, please refer to appended Section II: Appendix.

Digitally Signed by

Tender Inviting Authority (TIA)

Shri. Pravin kumar roy, Engineer & Ship Surveyor-cum-Dy.DG(Tech), The Directorate General of Maritime Administration, email id: pravin.roy-dgs@gov.in

### **13. Audit by Third Party**

DGMA at its discretion may appoint third party(s) for auditing the activities of onsite services and operations of entire services provided to the DGMA. The services shall include, not limited to, hardware's supplied to DGMA, Software's etc.

## Section II: Appendix

Request for Expression of Interest Document No. 13-39/5/2025-O/o ENGG-DGS

Consultancy Title: REOI for .....

Publisher: Directorate General of Maritime Administration (DGMA), Govt of India

| 1.0 Basic REOI Details                     |                                                                                                                                                                  |                                                                    |                                                                                                                      |
|--------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|
| Tender Title                               | Request for Expression of Interest for Consultancy Services                                                                                                      |                                                                    |                                                                                                                      |
| Name of Project                            | Selection of Consultancy Services for the Strategic Technical Support Unit (STSU) for the National Maritime Decarbonization Policy Framework                     |                                                                    |                                                                                                                      |
| Tender Reference Number                    | 13-39/5/2025-O/o ENGG-DGS                                                                                                                                        | Tender ID                                                          | Refer CPPP Portal                                                                                                    |
| Tender Type                                | Expression of Interest                                                                                                                                           | Tender Category                                                    | Services                                                                                                             |
| No. of Covers                              | Single Cover                                                                                                                                                     | Product Category                                                   |                                                                                                                      |
| Domestic/ Global Procurement               | Domestic Procurement                                                                                                                                             | Organisation:                                                      | Directorate General of Maritime Administration (DGMA)                                                                |
| The Procuring Entity:                      | Directorate General of Maritime Administration (DGMA)                                                                                                            | Authority on whose behalf EOI is invited                           | The President of India, through the Head of Procurement of the Directorate General of Maritime Administration (DGMA) |
| Through the                                | Directorate General of Maritime Administration (DGMA)                                                                                                            | Tender Inviting Authority (TIA)                                    | Directorate General of Maritime Administration (DGMA)                                                                |
| Address                                    | Directorate General of Maritime Administration, Govt. of India<br>9th Floor, Beta Building,<br>i-Think Techno Campus, Kanjurmarg (East), Mumbai - 400 042, India |                                                                    |                                                                                                                      |
| 2.0 Critical Dates (Clause 6; 7; 8, and 9) |                                                                                                                                                                  |                                                                    |                                                                                                                      |
| Published Date                             | Refer CPPP                                                                                                                                                       | EOI Validity (Days from the date of EOI Opening) – REOI Clause 7.2 | 60 days from Bid opening date                                                                                        |
| Document Download Start Date & Time        | Refer CPPP                                                                                                                                                       | Document Download End Date & Time                                  | Refer CPPP                                                                                                           |
| Clarification Start Date & Time            | Refer CPPP                                                                                                                                                       | Clarification End Date & Time                                      | Refer CPPP<br>[Normally not later                                                                                    |

|                                                                                                     |                                                                                         |                                    |                                                               |
|-----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|------------------------------------|---------------------------------------------------------------|
|                                                                                                     |                                                                                         |                                    | <i>than Fourteen days before the EOI submission deadline]</i> |
| EOI Submission Start Date & Time                                                                    | Refer CPPP                                                                              | EOI Submission Closing Date & Time | Refer CPPP                                                    |
| EOI Opening Date & Time                                                                             | Refer CPPP                                                                              |                                    |                                                               |
| <b>3.0 Eligibility and Qualification Criteria (Clauses 2.5.2, 4.1 to 4.5, 10.2 and Section III)</b> |                                                                                         |                                    |                                                               |
| Nature of Consultants eligible and association with sub-consultants/ JV                             | <i>As mentioned above</i>                                                               |                                    |                                                               |
| Maximum number of JV/C members etc., as per clause 4.4.-1)                                          | <i>As mentioned above</i>                                                               |                                    |                                                               |
| <b>4.0 Obtaining the REOI document and clarifications (Clauses 6 &amp; 8)</b>                       |                                                                                         |                                    |                                                               |
| eProcurement and Procuring Entity’s Portal/ Help Desk                                               | <a href="https://eprocure.gov.in/eprocure/app">https://eprocure.gov.in/eprocure/app</a> | Refer CPPP                         |                                                               |
|                                                                                                     | <a href="https://www.DGMAhipping.gov.in/">https://www.DGMAhipping.gov.in/</a>           |                                    |                                                               |
| Cost of REOI document (INR)                                                                         | Nil                                                                                     |                                    |                                                               |
| Office/ Contact Person/ email for clarifications                                                    | Email id:                                                                               |                                    |                                                               |

|                                                                             |                                                                                                                       |
|-----------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|
| <b>5.0 Pre-EOI Conference (Clause 6.3)</b>                                  |                                                                                                                       |
| Is a Pre-EOI Conference proposed to be held?                                | Yes/ No                                                                                                               |
| Place, time, and date of the Pre-EOI Conference                             | <i>Meeting date:</i><br><i>Time:</i><br><i>Link:</i>                                                                  |
| <b>6.0 Preparation and Submission and Opening of EOIs (Clauses 7 and 8)</b> |                                                                                                                       |
| EOIs to be Addressed to                                                     | President of India, Through Head of Procurement, Directorate General of Maritime Administration (DGMA), Govt of India |
| Instructions for Online EOI Submission                                      | Refer CPPP                                                                                                            |
| Language of Submission                                                      | English                                                                                                               |

|                                               |                                                   |                           |                        |
|-----------------------------------------------|---------------------------------------------------|---------------------------|------------------------|
| EOI Opening Place                             | Online CPP Portal                                 |                           |                        |
| 7.0 About RFP that would follow – clause 10.3 |                                                   |                           |                        |
| RFP to be issued                              | Limited to shortlisted consultant/s from this EOI | Form of Contract from RFP | To be mentioned in RFP |
| Selection Method                              | QCBS                                              | Bid Security Requirements | To be mentioned in RFP |
| Performance Security                          | Yes – shall be detailed in the RFP                |                           |                        |

### Section III: Qualification Criteria

REOI document No. ....

Title: REOI for Selection of Consultancy Services for the Strategic Technical Support Unit (STSU) for the National Maritime Decarbonization Policy Framework

Note for Consultant: Regarding this section, consultants shall submit the following forms:

- 1) Form 2: Qualification Criteria – Compliance
  - a) Form 2.1: Performance Capability Statement
  - b) Form 2.2: Financial Capability Statements
    - i) Form 2.2.1: Financial Statement
    - ii) Form 2.2.2: Average Annual Turnover
  - c) Form 3: Checklist for Consultant
  - d) Form 4: Declaration for No Conflict of Interest
  - e) Form 5: Details of ineligibility for corrupt or fraudulent practices / blacklisted with any of the Government or Public Sector Units
  - f) Form 6: Authorization to Attend Pre-EOI Conference
  - g) Form 7: Other information required.
  - h) Relevant date when the specified period ends for different supporting reports shall be:
    - i) For all annual reports, the periods mentioned end date with the financial year.
    - ii) For other statements, the periods mentioned end on the month before the last date of EOI submission.

| S.NO<br>QC # | Condition                                        | Criteria                                                                                                                                                                                                                                                                                                                                                             | Supporting Document                                                                 |
|--------------|--------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| <b>A</b>     | <b>Criteria 1 General and Similar Experience</b> |                                                                                                                                                                                                                                                                                                                                                                      |                                                                                     |
| 1.           | <b>General Experience</b>                        | 1) The consultant must have at least 3 Years' experience in consultancy services to any of the State/Central Government Departments / Organisations / Public Sector Undertakings<br><br>2) During the last <i>SEVEN</i> years, Consultancy Assignments completed or substantially completed (at least 80% payments received) should be at <i>least 3</i> assignments | Form 1.1: Consultant Information<br><br>Form 2.1: Performance Capability Statement. |
| 2.           | <b>Similar Experience</b>                        | The Consultant must demonstrate successful completion of similar consultancy assignments during the last <b>five (5) years</b> reckoned from the last date of bid submission, meeting <b>any one</b> of the following:<br><br>One (1) similar assignment of value not less than Rs. 2,88,00,000;                                                                     |                                                                                     |

| S.NO<br>QC # | Condition                                | Criteria                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Supporting Document                                                                                                                                                                         |
|--------------|------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|              |                                          | <p>OR</p> <p>Two (2) similar assignments of value not less than Rs. 1,80,00,000 each;</p> <p>OR</p> <p>Three (3) similar assignments of value not less than Rs. 1,44,00,000 each.</p> <p>In case of JV/Consortium the Lead member must meet at least 50% of the technical experience requirement on its own.</p> <p>For assignments in foreign countries, the credentials shall be evaluated using the applicable foreign exchange rate prevailing on the date of publication of the RFP.</p> <p>“Similar assignment” means consultancy services relating to maritime decarbonization, green shipping, green shipbuilding, ship recycling, green finance, green skill, green &amp; alternative fuels, pollution prevention, green ports, green technology etc.</p> |                                                                                                                                                                                             |
| <b>B</b>     | <b>Criteria 2 - Financial Capability</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                             |
| 3.           | <b>Turnover</b>                          | <p>The Consultant must have a minimum average annual turnover of Rs. 7.2 Crores during the last three (3) financial years ending as evidenced by audited financial statements.</p> <p>In case of Consortium / Joint Venture</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <p>Form 2.2: Financial Capability Statements</p> <p>In case of:</p> <ul style="list-style-type: none"> <li>• Single Bid – Consultant</li> <li>• Consortium Bid – Lead Consultant</li> </ul> |

| S.NO<br>QC # | Condition        | Criteria                                                                                                                                                                                                                                            | Supporting Document |
|--------------|------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
|              |                  | The Lead Consultant must meet at least 50% of the turnover requirement. The combined turnover of all Consortium Members must meet 100% of the required turnover.                                                                                    |                     |
| 4.           | <b>Net worth</b> | <p>The Consultant must have a positive net worth for the last three (3) consecutive financial years as evidenced by audited financial statements.</p> <p>In case of a Joint Venture /Consortium, all members must comply with this requirement.</p> |                     |

*Note to consultant: During RFP Process, while original documents/ certificates are called for to authenticate the qualification claimed*

## **Part II: Schedule of Requirements**

### **SECTION IV: Terms of Reference (TOR)**

#### **1. Introduction**

India's maritime sector plays a critical role in supporting national trade, logistics, industrial growth, energy security and economic development. As the sector expands and integrates with evolving global supply chains, it is increasingly being influenced by international climate commitments, emerging decarbonization regulations, alternative fuel transitions, sustainable finance requirements, technological innovation and growing expectations regarding environmental performance.

To guide this transition, the National Maritime Decarbonization Policy Framework (NMDP) has been developed under the Maritime INDIA @ Net Zero initiative as India's integrated framework for achieving a low-carbon, climate-resilient, technologically advanced and globally competitive maritime sector. The framework seeks to align maritime decarbonization with industrial development, energy transition, logistics competitiveness, environmental sustainability, innovation, workforce development and long-term economic growth through a coordinated national implementation architecture.

The NMDP has been structured around eight interconnected pillars:

1. Green Shipbuilding and Retrofits
2. Green Ports
3. Green Ship Recycling
4. Green Finance
5. Green Skills
6. Alternate Fuels
7. Green Technology
8. Pollution Prevention

Collectively, these pillars encompass the entire maritime value chain and require coordinated action across multiple stakeholders, including government ministries and agencies, regulators, ports, shipyards, shipowners, financial institutions, fuel producers, academic institutions, research organizations and international partners.

Given the scale, complexity and cross-sectoral nature of the maritime transition, effective implementation of the NMDP will require sustained technical expertise, continuous monitoring of global developments, stakeholder coordination, analytical support and implementation assistance across a broad range of specialized domains. Establishment of a dedicated Strategic Support Unit is therefore proposed to provide the technical and implementation support necessary for effective execution of the framework and achievement of its intended outcomes.

#### **2. Objectives of the Assignment**

The primary objective of the Strategic Support Unit shall be to provide multidisciplinary technical, strategic, analytical and implementation support for effective execution of the National Maritime Decarbonization Policy Framework (NMDP).

The Strategic Support Unit shall support implementation of the framework across all eight pillars by facilitating technical assessments, policy and regulatory analysis, stakeholder coordination, project development, monitoring and evaluation, capacity building and knowledge support. The Unit shall also assist in ensuring that implementation of the NMDP remains aligned with evolving international developments, emerging technologies and global

best practices, thereby supporting achievement of the framework's short-term, medium-term and long-term objectives.

Implementation of the National Maritime Decarbonization Policy Framework represents a long-term sectoral transformation programme that extends beyond conventional policy administration. Effective implementation will require sustained technical engagement, multidisciplinary expertise and continuous coordination across a diverse range of stakeholders and thematic areas.

The framework envisages development and operationalization of technical standards, certification systems, monitoring and reporting frameworks, implementation roadmaps, pilot and demonstration projects, digital platforms, financing mechanisms, capacity-building programmes and stakeholder engagement processes. These activities require specialized technical inputs and sustained implementation support over an extended period.

Further, the global maritime decarbonization landscape continues to evolve rapidly through developments in international regulations, alternative fuel technologies, emissions accounting methodologies, sustainability standards, green finance mechanisms and emerging maritime technologies. Continuous monitoring and assessment of these developments, and evaluation of their implications for India's maritime sector, will be essential to ensure that implementation of the NMDP remains aligned with global best practices and emerging regulatory requirements.

The scale, complexity and multidisciplinary nature of the framework necessitate a dedicated institutional mechanism capable of providing technical, analytical and implementation support across all eight pillars of the NMDP. Accordingly, it is proposed to establish a Strategic Support Unit to serve as the technical backbone for implementation of the framework and to support effective execution, coordination, monitoring and continual advancement of NMDP initiatives.

### **3. Scope of Services**

The Strategic Support Unit shall comprise ten (10) technical experts with specialized domain expertise in maritime decarbonization and associated disciplines. The experts shall be deployed through Recognized Organizations (ROs) to provide dedicated technical and implementation support for the National Maritime Decarbonization Policy Framework.

The Strategic Support Unit shall operate through a dual-location deployment model comprising:

- Six (6) experts deployed at the Directorate General of Maritime Administration (DGMA)
- Four (4) experts deployed at the National Centre of Excellence for Green Ports and Shipping (NCoEGPS), TERI

The Strategic Support Unit shall function as an integrated technical support mechanism and shall provide support across all pillars of the NMDP. The experts shall work in close coordination with DGMA, NCoEGPS and other relevant stakeholders to support implementation, monitoring, stakeholder engagement, technical assessments, project development and knowledge support activities under the framework.

The allocation and deployment of resources shall be determined based on the requirements, complexity and implementation priorities of the respective pillars and cross-cutting thematic areas under the NMDP

The Strategic Support Unit shall collectively possess expertise across the thematic areas covered under the National Maritime Decarbonization Policy Framework.

The Strategic Support Unit shall provide technical, analytical and implementation support for effective execution of the National Maritime Decarbonization Policy Framework across all eight pillars. The key functions of the Unit shall include:

- Providing technical and strategic support for implementation of policy measures, initiatives and programmes under the NMDP.
- Supporting development of technical standards, guidelines, frameworks, roadmaps and implementation strategies.
- Undertaking technical assessments, studies, analytical reviews and evidence-based evaluations to support policy implementation and decision-making.
- Monitoring international regulatory, technological and market developments relevant to maritime decarbonization and assessing their implications for India.
- Supporting development and implementation of pilot projects, demonstration initiatives and other priority interventions under the framework.
- Facilitating stakeholder consultations, inter-institutional coordination and engagement with industry, academia, research organizations and other relevant stakeholders.
- Supporting development of monitoring, reporting and evaluation mechanisms for tracking implementation progress and outcomes under the NMDP.
- Assisting in preparation of technical reports, policy briefs, concept notes, knowledge products and other implementation-related documentation.
- Supporting capacity-building initiatives, knowledge dissemination and adoption of best practices across the maritime sector.
- Providing technical inputs for international cooperation initiatives, partnerships and engagement with relevant regional and international organizations.

The resources may be directed by the client to work on any and all aspects of work related to the NMDP and its incidentals.

#### **4. Team Composition and Qualification**

The Strategic Technical Support Unit (STSU) shall comprise ten (10) full-time experts, including one Team Leader and nine Subject Matter Experts.

##### **1. Team Leader (1 Resource)**

- Minimum Bachelor's Degree in Engineering, Maritime Studies, Environmental Sciences, Public Policy, Management or any other relevant discipline.
- Minimum 15 years of professional experience in maritime, shipping, ports, decarbonization, sustainability, climate transition, infrastructure or other related domains.
- Demonstrated experience in leading multidisciplinary teams, stakeholder engagement, project/programme management, strategic advisory, or implementation support assignments.

##### **2. Subject Matter Experts (9 Resources)**

- Minimum Bachelor's Degree in Engineering, Naval Architecture, Maritime Studies, Environmental Sciences, Energy Systems, or any other relevant discipline.
- Minimum 10 years of professional experience, with specific experience in one or more domains relevant to the National Maritime Decarbonization Policy Framework (NMDP), including but not limited to:
  - Green Shipping and Maritime Decarbonization
  - Green Ports and Infrastructure
  - Green Ship Recycling

- Green Finance and ESG
- Green Skills and Capacity Building
- Alternative Fuels
- Green Technology and Digitalization
- Pollution Prevention and Environmental Compliance
- Carbon Accounting and MRV
- Maritime Policy and Regulatory Affairs
- Project Management and Stakeholder Coordination

### 3. Additional Requirements

- The combined team should collectively demonstrate expertise across all eight pillars of the NMDP and relevant cross-cutting thematic areas.
- Experience in maritime, ports, logistics, shipping, sustainability, climate transition, energy, environmental management, public policy, or related sectors shall be preferred.

## 5. Reporting Requirements

The resources are required to submit detailed Monthly Progress Reports along with Attendance records and list of deliverables

## 6. Terms of Payment

The payments will be on the basis of actual deployment of resources on a quarterly basis.

## **PART III. REOI Submission Formats**

### **Form 1: REOI Form (Covering Letter)**

(On Consultant's Letterhead)

Consultant's Name \_\_\_\_\_

[Address and Contact Details]

Date.....

To

Directorate General of Maritime Administration, 9th Floor,  
BETA Building, I-Think Techno Campus,  
Kanjur Village Road, Kanjurmarg (E),  
Mumbai-400042

**Ref: Your REOI document No. ....**

**REOI Title: Selection of Consultant for .....**

Sir/ Madam

Having examined the above mentioned REOI document, we, the undersigned, hereby submit/ upload our Expression of Interest (REOI) for being shortlisted for the performance of the Services.

1) About us:

We, M/s \_\_\_\_\_, hereby certify that We are a firm (or members of our JV/C are) of proven, established, and reputed Consultant having the required Experience, Past performance, Personnel, and financial capability, with offices at \_\_\_\_\_.

2) Our Eligibility and Qualifications to participate:

- a) We comply with all the eligibility criteria stipulated in this REOI document, and the relevant declarations are made along with documents in Form 1.2 of this REOI-Form.
- b) We fully meet the qualification criteria stipulated in this REOI document, and the relevant details are submitted along with documents in Form 2: 'Qualification Criteria – Compliance' and its sub-forms.
- c) We undertake to provide originals of all self-certified copies of uploaded documents during the RFP Process. We have understood the ramifications of failure to do so as detailed in clauses 10.2.4 and 10.2.5 of Section I: REOI.
- d) We have / don't have any conflict of interest with any other Consultant as per clause 4.5 of Section I: REOI.
- e) No commissions and gratuities have been paid or are to be paid to agents or any other party by us relating to this REOI and RFP processes.

Following commissions and gratuities have been paid/ are to be paid to agents or any other party by us relating to this procurement process: -----

3) Affirmation of terms and conditions of the REOI document:

We have understood the complete terms and conditions of the REOI document. We accept and comply with these terms and conditions without reservations, although we are not signing and submitting some of the sections of the REOI document.

4) Abiding by the REOI Validity

We agree to keep our REOI valid for acceptance for a period up to -----, as required in the REOI document, or for a subsequently extended period, if any, agreed to by us.

5) Non-tempering of Downloaded REOI documents and Uploaded Scanned Copies

We confirm that we have not changed/ edited the contents of the downloaded REOI Formats. We realise that any such change noticed at any stage, including after the contract award, shall be liable to punitive action in this regard stipulated in the REOI document. We also confirm that scanned copies of documents/ affidavits/ undertakings uploaded along with our REOI are valid, true, and correct to the best of our knowledge and belief. We shall be responsible if any dispute arises regarding the validity and truthfulness of such documents/ affidavits/ undertakings. Upon our successful shortlisting, we undertake to submit for scrutiny, on-demand by the Procuring Entity, originals and self-certified copies of all such certificates, documents, and affidavits/ undertakings.

6) Signatories:

We confirm that we are duly authorised to submit this REOI and make commitments on behalf of the consultant. Supporting documents are submitted in Form 1.1, annexed herewith. We acknowledge that our digital/digitised signature is valid and legally binding.

7) Rights of the Procuring Entity to Reject REOI(s):

We understand that you are not bound to accept the lowest or any REOI you may receive against your above-referred REOI document.

.....

(Signature with date)

.....

(Name and designation)

Duly authorised to sign REOI for and on behalf of name, address, and seal of the  
Consultant]

**Form 1.1: Consultant Information**  
**(On Consultant's Letterhead)**

Consultant's Name \_\_\_\_\_

[Address and Contact Details]

Date.....

REOI document No. ....

Tender Title: Selection of Consultant for .....

*Note: Consultant shall fill in this Form following the instructions indicated below.*

Consultant shall enclose certified copies of the documentary proof/ evidence to substantiate the corresponding statement wherever necessary and applicable. Consultant's wrong or misleading information shall be treated as a breach of the Code of Integrity. Such REOIs shall be liable to be rejected as nonresponsive, in addition to other punitive actions provided for such a breach in the REOI document.

(Please tick appropriate boxes or strike out sentences/ phrases not applicable to you)

1) Consultant/ Contractor particulars:

|    |                                                      |  |
|----|------------------------------------------------------|--|
| a) | Name of the Consultant's Organisation:               |  |
| b) | Corporate Identity No. (CIN):                        |  |
| c) | Registration, if any, with The Procuring Entity:     |  |
| d) | Date of incorporation/ start of business:            |  |
| e) | Place of Registration/ Principal place of business": |  |
| f) | Number of Years in Business:                         |  |
| g) | Number of Years in ERP implementation                |  |
| h) | Consultant's Website URL:                            |  |
| i) | Complete Postal Address:                             |  |
| j) | Pin code/ ZIP code:                                  |  |
| k) | Telephone nos. (with country/ area codes):           |  |
| l) | Mobile Nos.: (with country/ area codes):             |  |
| m) | Contact persons/ Designation:                        |  |
| n) | Email IDs:                                           |  |
| o) | PAN Number:                                          |  |
| p) | GSTIN No:                                            |  |

**NB: In the case of JV/C, repeat these details for all members**

Submit documents to demonstrate eligibility as per REOI Clause 4.1-1) - A self-certified copy of registration certificate – in case of a partnership firm – Deed of Partnership; in case of Company – Notarised and certified copy of its Registration; In case of JV, letter of intent to form JV or JV agreement and in case of Society – its Byelaws and registration certificate of the firm.

- 2) Consultant/JV's Organisation Structure: Submit the overall organisation structure of the firm.
- 3) Consultant/JV's Overall profile: Submit the overall profile of the firm, highlighting technical and managerial capabilities.

Authorisation of Person(s) signing the REOI on behalf of the consultant

Full name: \_\_\_\_\_

Designation: \_\_\_\_\_

Signing as:

- A sole proprietorship firm. The person signing the REOI is the sole proprietor/ constituted attorney of the sole proprietor,
- A partnership firm. The person signing the REOI is duly authorised being a partner to do so under the partnership agreement or the general power of attorney,
- A company. The person signing the REOI is the constituted attorney by a resolution passed by the Board of Directors or in pursuance of the authority conferred by the Memorandum of Association/ Articles of Association.
- A Society. The person signing the REOI is the constituted attorney.
- A Joint Venture/ Consortium. The person signing the bid is the designated lead member, as named in the JV/C agreement/ MOU or similar document in connection with the formation of the JV/C or are all future proposed members, in case (JV/C) has not been legally constituted at the time of bidding.

Documents to be submitted: Registration Certificate/ Memorandum of Association/ Partnership Agreement/ Power of Attorney/ Board Resolution Consultant's Authorized Representative Information

Name:

Address:

Telephone/ Mobile numbers:

Email Address:

(Signature with date)

.....

(Name and designation)

Duly authorised to sign REOI for and on behalf of name, address, and seal of the Consultant]

DA: As above

## Form 1.2: Eligibility Declarations

### (Ref REOI Clause 2.5)

*(On Consultant's Letterhead, supported with copy of Incorporation Certificates (for all member in case of consortium), and copy of PAN, GST registration certificate)*

REOI document No. ....

Title: Selection of Consultant for .....

Consultant's Name .....

[Address and Contact Details]

Date.....

[Note: The list below is indicative only. You may attach more documents as required to confirm your eligibility criteria.]

### Eligibility Declarations

(Please tick appropriate boxes or cross out any declaration not applicable to the consultant)

We hereby confirm that we comply with all the stipulations of REOI Clause 4.1 of the REOI document and declare as under and shall provide evidence of our continued eligibility to the DGMA as and when it may be requested:

**1) Legal Entity of Consultant:** We are:

- a) : ..... relevant documents enclosed)
- b) We are a consultant with valid registration regarding GSTIN, PAN, EPF, ~~ESI, Labour, or equivalent~~ registration certificate as applicable to the subject Services.

**2) Eligibility:** We solemnly declare that we (including our affiliates or subsidiaries, or constituents):

- a) are not insolvent, in receivership, bankrupt or being wound up, not have our affairs administered by a court or a judicial officer, not have our business activities suspended and are not the subject of legal proceedings for any of these reasons;
- b) (including our affiliates or subsidiaries, or constituents for any part of the assignment):
  - i) Do not stand declared ineligible/ blacklisted/ banned/ debarred by the Procuring Organisation or its Ministry/ Department from participation in its procurement processes; and/ or
  - ii) Are not convicted (within three years preceding the last date of REOI submission) or stand declared ineligible/ suspended/ blacklisted/ banned/ debarred by appropriate agencies of the Government of India from participation in procurement processes of all its entities for offences mentioned in REOI document in this regard.
  - iii) We have neither changed our name nor created a new "Allied Entity", consequent to the above disqualifications.
- c) Do not have any association (as consultant/ partner/ Director/ employee in any capacity) with such retired public official or near relations of such officials of DGMA, as counter-indicated, in the REOI document.
- d) We have no conflict of interest, which substantially affects fair competition. The quoted prices are competitive without adopting unfair/ unethical/ anti-competitive means. No attempt has been made or shall be made by us to induce any other consultant to submit or not to submit an REOI to restrict competition.
- e) We certify that we fulfil other additional eligibility conditions if prescribed in the REOI document.

- 3) We certify that we are not an entity from a country identified to restrict Consultants from India from participation in their Government Procurements as per REOI clause 4.2.1
- 4) **Restrictions on procurement from consultants from a country or countries or a class of countries under Rule 144 (xi) of the General Financial Rules 2017:**

"We have read the clause regarding restrictions on procurement from a consultant of a country which shares a land border with India and on sub-contracting to contractors from such countries, and solemnly certify that we fulfil all requirements in this regard and are eligible to be considered. We certify that:

- a) we are not from such a country or, if from such a country, we are registered with the Competent Authority (copy enclosed). and;
- b) we shall not subcontract any assignment to a contractor from such countries unless such a contractor is registered with the Competent Authority.

**5) Start-up Status:**

We confirm that we are (Certificate of Recognition issued by the Department for Promotion of Industry and Internal Trade (DPIIT) enclosed herewith)/ are not a Start-up entity as per the Department of Promotion of Industrial and Internal Trade – DPIIT.

**6) Penalties for false or misleading declarations:**

We hereby confirm that the particulars given above are factually correct and nothing is concealed and undertake to advise any future changes to the above details. We understand that any wrong or misleading self-declaration would violate the Code of Integrity and attract penalties.

.....  
(Signature with date)

.....  
(Name and designation)

Duly authorised to sign REOI for and on behalf of

.....

..... Name, address, and seal of the consultant

DA: As in Sr 1 to 5 above, as applicable

## Form 2: Qualification Criteria – Compliance

(On consultant's Letterhead)

(Ref REOI Clause 2.4, Section III: Qualification Criteria)

(Along with supporting documents, if any)

REOI document No. ....

Title: Selection of Consultant for .....

Consultant's Name .....

[Address and Contact Details]

Date.....

*Note to consultant: The Procuring Entity reserves its right to call for verification originals of all self-certified copies of stipulated documents supporting the fulfilment of qualifying criteria during the following RFP Process. If the shortlisted consultant fails at that stage to provide such originals or, in case of substantive discrepancies in such documents, it shall be construed as a breach of the Code of Integrity (see clause 12 below). Such RFP proposals shall be liable to be rejected as nonresponsive in addition to other punitive actions for such a breach.*

### Summary of Response to Qualification Criteria

| #  | Criteria | Qualification Criteria Met (Yes, or No) |
|----|----------|-----------------------------------------|
| a) |          |                                         |
| b) |          |                                         |
| c) |          |                                         |
| d) |          |                                         |
| e) |          |                                         |

*Note: consultants shall provide evidence of their continued qualification to perform the Services satisfactorily to the Procuring Entity, as the Procuring Entity may request at any stage during the RFP process that would follow this REOI.*

.....  
(Signature with date)

.....  
(Name and designation)

Duly authorised to sign REOI for and on behalf of

..... Name, address, and seal of the consultant

DA: As above, if any

## Form 2.1: Performance Capability Statement

### Statement of Performance of Services

(Ref REOI Clause 2.5, Section III: Qualification Criteria)

(On consultant's Letterhead)

REOI document No.....

Title: Selection of Consultant for .....

Consultant's Name\_\_\_\_\_

[Address and Contact Details]

Date.....

*Note to consultant:*

1. *Consultant or member of a Joint Venture/Consortium (JV/C) must fill in this Form to prove conformance to Section III Qualification Criteria. Mention contracts in which a consultant or a member of a JV/C is or has been a party, whether as a consultant, affiliate, associate, subsidiary, or any other role. The list below is indicative only. You may attach more documents as required to highlight your past performance. Add additional details not covered elsewhere in your REOI in this regard. Statements and Documents may be mentioned/ attached here.*
2. *List only those assignments for which the consultant was legally contracted as a company or was one of the joint venture members. Assignments completed by the consultant's individual experts working privately or through other firms cannot be claimed as the relevant experience of the consultant or that of the Consultant 's partners or sub-consultant s but can be claimed by the Experts themselves in their CVs. Assignments of Sub-consultant (s) can be used to meet the Experience requirements specified in Section III, Qualification Criteria. The consultant should be prepared to substantiate the claimed experience by presenting copies of relevant documents and references if the Client requests.*
  - 1) **The number of years of experience in Consultancy Services:** *Provide evidence for the required length of experience in Consultancy Services and cross-reference the list of assignments below.*
  - 2) **In the specified period, list similar Services assignments completed or completed in a tabular form** (Period specified in Section III – Qualification Criteria Note: List only the most important and relevant ones. List the largest value and most relevant projects to this assignment first)
    - a) country, client, (source of funding),
    - b) For completed Project: Project title, project reference number, project value, project period brief description of the consultant 's role in the project
    - c) For Substantially Completed Project: project title, project reference number, project value, project period
    - d) brief description of the consultant's role in the project
    - e) # of international staff months, # of national staff months deployed by you on the project
    - f) Is it a Similar Experience as per Section III: Qualification Criteria (Yes or No)
    - g) Is it in General Sector as per Section III: Qualification Criteria (Yes or No)
    - h) Is it in Specific Sector as per Section III: Qualification Criteria (Yes or No)

.....  
(Signature with date)

.....  
(Name and designation)

Duly authorised to sign REOI for and on behalf of

.....

..... Name, address, and seal of the Consultant]

DA: Performance records/ contracts

## Form 2.2 Financial Capability Statements

(Ref REOI Clause 2.5, Section III: Qualification Criteria)

(On Consultant 's Letterhead)

REOI document No. ....

Tender Title: Selection of Consultant for .....

Consultant 's Name .....

[Address and Contact Details]

Date.....

*Note to consultant: Fill out this Form for the consultant and each member of a joint venture or other association that is a party to the consultant to highlight conformance to Criteria 2: Financial Capability. The list below is indicative only. You may attach more documents as required. Add additional details not covered elsewhere in your REOI in this regard.*

### Form 2.2.1: Financial Statements

*Note: Each consultant or member of a Joint Venture/Consortium making up a must fill in this Form.*

| Financial Data for Previous Three (3) Years |         |         |         |
|---------------------------------------------|---------|---------|---------|
|                                             | Year 1: | Year 2: | Year 3: |
| Information from the Balance Sheet          |         |         |         |
| Total Assets                                |         |         |         |
| Total Liabilities                           |         |         |         |
| Net Worth                                   |         |         |         |
| Current Assets                              |         |         |         |
| Current Liabilities                         |         |         |         |
| Working Capital                             |         |         |         |
| Information from Income Statement           |         |         |         |
| Total Revenues                              |         |         |         |
| Profits Before Taxes                        |         |         |         |
| Profits After Taxes                         |         |         |         |

Attached are copies of financial statements (either audited financial statements supported by audit report or certified financial statements supported by Income tax returns), complying with the following conditions.

- 1) All such documents reflect the financial situation of the consultant or a member of a Joint Venture or other association and not a sister or parent company.
- 2) A Chartered accountant must audit historical financial statements.
- 3) Historical financial statements must be complete, including all notes to the financial statements.
- 4) Historical financial statements must correspond to accounting periods already completed and audited (no statements for partial periods shall be requested or accepted).

.....  
(Signature with date)

.....  
(Name and designation)  
Duly authorised to sign REOI for and on behalf of

.....  
..... Name, address, and seal of the consultant]

### Form 2.2.2: Average Annual Turnover

(Ref REOI Clause 2.5, Section III: Qualification Criteria)

(On consultant's Letterhead)

REOI document No. ....

Tender Title: REOI for Selection of Consultant for .....

Consultant's Name .....

[Address and Contact Details]

Consultant's Reference No. ....

Date.....

*Note: Each consultant or member of a Joint Venture/Consortium must fill in these forms.*

| Annual Turnover Data (Rs Crores) for the Last Three (3) Financial Years |                       |                                                                                                      |
|-------------------------------------------------------------------------|-----------------------|------------------------------------------------------------------------------------------------------|
| Year                                                                    | Total Turnover Amount | Turnover from Consultancy Services<br>(supported by a certificate from the<br>Chartered Accountants) |
|                                                                         |                       |                                                                                                      |
|                                                                         |                       |                                                                                                      |
|                                                                         |                       |                                                                                                      |
| Average Annual<br>Turnover                                              |                       |                                                                                                      |

.....  
(Signature with date)

.....  
(Name and designation)

Duly authorised to sign REOI for and on behalf of

.....

..... Name, address, and seal of the consultant

*"Certificate of CA with UDIN*

*This is to certify that the information given in the above table is derived from audited B/S and P/L account and are true and correct reflection of company's financial performance and capability".*

### Form 3: Checklist for Consultant

Ref REOI Clause 2.5)

(On consultant's Letterhead)

Consultant's Name \_\_\_\_\_

[Address and Contact Details]

Consultant 's Reference No. \_\_\_\_\_

Date.....

REOI document No. ....

Tender Title: Selection of Consultant for .....

*Note to consultant's: This checklist is merely to help the consultants to prepare their REOIs. It does not override or modify the requirement of the REOI. consultants must do their due diligence also.*

| Sr No. | Documents submitted, duly filled, signed                                                                                             | Yes/ No/ NA |
|--------|--------------------------------------------------------------------------------------------------------------------------------------|-------------|
| 1.     | Form 1.- REOI Form (to serve as covering letter and declarations)                                                                    |             |
| 2.     | Form 1.1: consultant's Information and Power of attorney and Registration Certificates etc.                                          |             |
| 3.     | Form 1.2: Eligibility Declarations, along with supporting documents                                                                  |             |
| 4.     | Form 2: Qualification Criteria - Compliance                                                                                          |             |
| 4.a    | Form 2.1, 2.2 (and its sub-forms) to support Form 2 along with supporting documents                                                  |             |
| 5.     | Form 3: Checklist for consultant                                                                                                     |             |
| 6.     | Form 4: Declaration for No Conflict of Interest                                                                                      |             |
| 7.     | Form 5: Details of ineligibility for corrupt or fraudulent practices / blacklisted with any of the Government or Public Sector Units |             |
| 8.     | Form 6: Authorization to Attend Pre-EOI Conference                                                                                   |             |
| 9.     | Form 7: Other information required                                                                                                   |             |
| 10.    | Any other requirements, if stipulated in Section II: Appendix; or if considered relevant by the consultant                           |             |

.....  
(Signature with date)

.....  
(Name and designation)

Duly authorised to sign REOI for and on behalf of.....

[Name, address, and seal of the consultant]

**Form 4: Declaration for No Conflict of Interest**  
**<<To be submitted on the Company Letter head of the Lead Consultant>>**

Date:

To

Directorate General of Maritime Administration  
9<sup>th</sup> Floor, Beta Building,  
i-Think Techno campus  
Kanjurmarg (East), Mumbai - 400042

Sir,

Sub: Undertaking on No Conflict of Interest

I / We as Consultant (SI) do hereby undertake that there is absence of, actual or potential conflict of interest on our part, on part of our Consortium partner (in case of a Consortium) due to prior, current, or proposed contracts engagements, or affiliations with Directorate General of Maritime Administration, Government of India.

I / We also confirm that there are no potential elements (time frame for service delivery, resource, financial or other) that would adversely impact our ability to complete the requirements of this RFP.

We undertake and agree to indemnify and hold Directorate General of Maritime Administration, Government of India harmless against all claims, losses, damages, costs, expenses, proceeding fees of legal advisors (on a reimbursement basis) and fees of other professionals incurred (in the case of legal fees & fees of professionals, reasonably) Directorate General of Maritime Administration, Government of India and / or its representatives, if any such conflict arises later.

Yours faithfully,

Authorized Signatory

Designation

Date

Time

Seal

**Business Address**

**Form 5: Details of ineligibility for corrupt or fraudulent practices /  
blacklisted with any of the Government or Public Sector Units**

**<<On the letterhead of the Bidding Organization>>**

**<<In case of consortium, separate certificates to be submitted from respective authorized  
representatives>>**

Date:

To:

Directorate General of Maritime Administration  
9<sup>th</sup> Floor, Beta Building,  
i-Think Techno campus  
Kanjurmarg (East), Mumbai - 400042

**Subject:** Declaration for not being under an ineligibility for corrupt or fraudulent practices or blacklisted with any of the Government or Public Sector Units in India

Dear Sir,

We, the undersigned, hereby declare that

We are not under a declaration of ineligibility / banned / blacklisted by any State or Central Government / any other Government institutions in India for any reason as on last date of submission of the Bid or convicted of economic offence in India for any reason as on last date of submission of the Bid.

Thanking you,

Yours faithfully

(Signature of the Authorized signatory of the Bidding Organization)

Name :

Designation :

Date :

Company Seal :

Business Address :

**DRAFT NATIONAL MARITIME DECARBONISATION POLICY  
FRAMEWORK 2026- Yet to be notified**



सत्यमेव जयते

Ministry of Ports,  
Shipping & Waterways  
Government of India

# NATIONAL MARITIME DECARBONISATION POLICY



FRAMEWORK  
2026

Prepared By:



# NATIONAL MARITIME DECARBONISATION POLICY-FRAMEWORK

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## PART I: Evolution & Status Assessment

*A Primer for Administrators and Inter-Ministry Peers*

### PURPOSE OF THIS DOCUMENT

This primer provides the foundational context for India's Maritime Decarbonisation Policy by establishing the global, national, and sectoral developments that shape the decarbonisation agenda. It is intended to build a common understanding among generalist administrators and inter-ministry stakeholders of the regulatory, institutional, and strategic context within which maritime decarbonisation must be positioned.

The document is structured in four sections. **Section 1** charts the evolution of global environmental governance, from the Stockholm Conference of 1972 through major international frameworks including IMO conventions, UNFCCC instruments, the UN Global Compact, the Sustainable Development Goals, and ILO frameworks, establishing the ideational and legal foundations of climate action and decarbonisation. **Section 2** examines India's domestic environmental governance trajectory, covering the legislative foundations, climate commitments, green growth initiatives, and emerging carbon market architecture that collectively shape India's national decarbonisation pathway. **Section 3** provides a comprehensive overview of the international maritime regulatory architecture, including key conventions, technical and operational measures, alternative fuel pathways, and evolving market-based mechanisms, alongside India's adoption, adaptation, and ongoing green shipping initiatives. **Section 4** builds on this foundation to present the rationale, strategic direction, and policy interventions required for a dedicated Maritime Decarbonisation Policy for India.

Taken together, the document serves as an introductory guide to the core principles, regulatory architecture, and policy imperatives of maritime decarbonisation, enabling stakeholders to engage meaningfully with the detailed policy pillars and implementation roadmap.

### SECTION – 1: GLOBAL ENVIRONMENTAL GOVERNANCE: THE EVOLUTION OF CLIMATE ARCHITECTURE

The international community's engagement with environmental governance has unfolded over five decades, progressing from awareness of ecological fragility through treaty frameworks targeting specific harms to today's comprehensive net-zero commitments. India has been an active participant, and in several instances a leading voice, at every stage of this evolution. This section traces that arc as the essential foundation for India's current decarbonisation position.

# HISTORY OF GLOBAL ENVIRONMENTAL GOVERNANCE FROM STOCKHOLM TO DECARBONISATION



**1972**  
Stockholm  
Conference on  
the Human  
Environment

**First major global conference on environmental issues held in Stockholm, Sweden.**

- Established the principle that environmental protection and economic development are interconnected.
  - Led to the creation of the United Nations Environment Programme (UNEP).
- Beginning of coordinated international environmental governance.



**1987**  
Brundtland  
Report  
("Our Common  
Future")

**Published by the World Commission on Environment and Development.**

- Introduced the concept of sustainable development: *"development that meets the needs of the present without compromising the ability of future generations to meet their own needs."*
- Highlighted climate change, resource depletion, and pollution as global challenges requiring collective action.



**1992**  
Rio Earth  
Summit  
(UNCED)

**United Nations Conference on Environment and Development in Rio de Janeiro, Brazil.**

- Reinforced the concept of sustainable development.
  - Key outcomes: Agenda 21, Rio Declaration.
  - Established the United Nations Framework Convention on Climate Change (UNFCCC).
- Laid the foundation for international climate negotiations.



**1997**  
Kyoto  
Protocol

**Adopted under the UNFCCC.**

- Set legally binding greenhouse gas emission reduction targets for developed countries.
- First international treaty specifically aimed at reducing emissions contributing to climate change.



**2015**  
Paris  
Agreement

**Adopted at COP21 in Paris.**

- Nearly all nations agreed to limit the increase in global average temperature to well below 2°C above pre-industrial levels and pursue efforts to limit warming to 1.5°C.
  - Countries commit to submitting and strengthening their Nationally Determined Contributions (NDCs).
- Decarbonisation becomes a central element of global climate policy.



**2015**  
United Nations  
Sustainable  
Development  
Goals (SDGs)

**UN adopted the 2030 Agenda for Sustainable Development.**

- Comprises 17 Sustainable Development Goals (SDGs).
- Key goals relevant to decarbonisation include:



**2020s  
and Beyond**  
Net-Zero Agenda  
& Sectoral  
Decarbonisation

**Governments, financial institutions, and industries accelerate commitments toward net-zero emissions by 2050.**

- International Maritime Organization (IMO) adopts increasingly ambitious GHG reduction targets.
  - Focus on energy efficiency, low-carbon fuels, and innovative technologies across sectors, especially shipping.
- Transition to a low-carbon, climate-resilient global economy.



## WHERE WE ARE TODAY

Environmental protection has evolved from a national issue to a global priority integrated into economic, financial, and industrial policy. Decarbonisation is now an environmental imperative and a strategic priority for businesses to ensure regulatory compliance, operational resilience, access to sustainable finance, and long-term competitiveness.



## 1.1 Stockholm Conference (1972): The Birth of Global Environmental Governance

The United Nations Conference on the Human Environment, held in Stockholm in June 1972, is the founding moment of international environmental governance. Convened against a backdrop of growing scientific alarm over industrial pollution, species loss, and transboundary environmental degradation, Stockholm produced two foundational outputs: the Stockholm Declaration, comprising 26 principles articulating the right to a healthy environment and state responsibility for

transboundary harm, and the Stockholm Action Plan, establishing the United Nations Environment Programme (UNEP) as the anchor institution for international environmental governance.

### **INDIA AT STOCKHOLM: THE CBDR PROTOTYPE**

Prime Minister Indira Gandhi's address at Stockholm established India's enduring moral framing: environmental protection and poverty alleviation are inseparable, and the global community bears differentiated responsibility for the crisis it created. Her formulation, that the poor nations did not cause the pollution crisis yet would bear its heaviest burden, anticipated the CBDR-RC principle by two decades. This framing has anchored India's multilateral environmental positioning ever since.

Stockholm catalysed the creation of national environment ministries worldwide, including India's Ministry of Environment established in 1980, and inspired a generation of domestic environmental legislation. It also established the foundational norm of science-based environmental assessment that underpins all subsequent climate frameworks.

### **1.2 UNCLOS (1982): The Legal Foundation for Ocean Governance**

The United Nations Convention on the Law of the Sea (UNCLOS), opened for signature in 1982 and entering into force in 1994, is the overarching legal framework for all human activities in the ocean, including international shipping. Its relevance to maritime decarbonisation is structural rather than operational:

- Jurisdictional architecture: UNCLOS defines the rights and duties of flag states (jurisdiction over vessels), port states (authority to inspect and detain non-compliant vessels), and coastal states (authority over vessels in territorial waters and EEZs). This three-tier jurisdictional structure is the enforcement architecture on which all IMO environmental regulations, including MARPOL and the GFI framework, rely.
- Article 192 — General Obligation: 'States have the obligation to protect and preserve the marine environment.' This provision provides the foundational legal duty from which all more specific maritime environmental regulations derive authority.
- Article 211 — Pollution from Vessels: Requires states to establish international rules for vessel-source pollution through the competent international organisation (IMO): the direct legal basis for MARPOL and all subsequent IMO environmental conventions.
- India's ratification: India ratified UNCLOS in 1995. As a coastal state with one of the world's longest coastlines (11,098.81 km) and an Exclusive Economic Zone of 2.02 million km<sup>2</sup>, India has both significant rights and significant responsibilities under UNCLOS in respect of marine environmental protection.

### **1.3 The Montreal Protocol (1987): Proof of Concept for Multilateral Environmental Agreements**

The Montreal Protocol on Substances that Deplete the Ozone Layer (1987) is widely considered the most successful multilateral environmental agreement in history and the direct template for subsequent climate instruments. Its contributions to the decarbonisation framework are several:

- Technology transition at scale: The phase-out of CFCs required global industry to reformulate refrigerants, aerosols, and fire suppressants within commercially defined deadlines: the first

instance of a multilateral treaty mandating industrial fuel and technology transition at global scale. The parallel to the shipping fuel transition under the GFI framework is direct and deliberate.

- Differentiated timelines: Article 5 Parties (including India) were granted extended compliance timelines, establishing the CBDR-RC precedent that climate negotiators formalised at Rio and that India advocates today at MEPC.
- Multilateral Fund: The Protocol created the first permanent international fund for developing country compliance: the direct architectural precedent for climate finance debates at UNFCCC and IMO's own transition support fund discussions.
- Climate co-benefit: CFCs are potent greenhouse gases. The Montreal Protocol's success removed an estimated 135 billion tonnes CO<sub>2</sub>-equivalent from projected emissions: the largest single climate intervention in history, demonstrating that well-designed environmental instruments can deliver compound benefits.

#### 1.4 The Brundtland Report (1987): Defining Sustainable Development

The World Commission on Environment and Development, chaired by Norwegian Prime Minister Gro Harlem Brundtland, produced its landmark report “Our Common Future” in 1987, the document that first gave international currency to the concept of sustainable development, defined as development that meets the needs of the present without compromising the ability of future generations to meet their own needs. This formulation became the organising principle of every major environmental framework that followed: Rio 1992, the Kyoto Protocol, the SDGs, and the Paris Agreement all trace their philosophical lineage to the Brundtland Commission’s insight that environment and development are inseparable imperatives. For maritime decarbonisation, the Brundtland framing is directly operative: a just fuel transition must deliver economic development for seafarer-supplying nations and green fuel-producing economies while meeting the environmental imperative of net-zero by 2050; this is precisely the tension that CBDR-RC principles at MEPC seek to resolve.

#### 1.5 The UNFCCC Architecture: Rio to Paris

The United Nations Framework Convention on Climate Change (UNFCCC), opened at the Rio Earth Summit in June 1992 and in force since March 1994, established the foundational architecture of international climate governance. Its five principles in Article 3, namely CBDR-RC, special circumstances of developing nations, the precautionary principle, the right to sustainable development, and the open international economic system, have governed climate negotiations for three decades and remain directly operative in India's MEPC positions today.

| Instrument / Year | Scope & Significance                                                                                                                                                                                           |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1992 — UNFCCC     | Foundational architecture: CBDR-RC, precautionary principle, right to sustainable development. 197 Parties. International aviation and shipping excluded from national inventories; delegated to ICAO and IMO. |

| Instrument / Year       | Scope & Significance                                                                                                                                                                                     |
|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1997 — Kyoto Protocol   | First binding Annex I targets. Clean Development Mechanism (CDM), Joint Implementation, Emissions Trading. Demonstrated ratcheting ambition; CBDR-RC operationalised through differentiated obligations. |
| 2007 — IPCC AR4         | Unequivocal scientific consensus on anthropogenic climate change. 1.5°C / 2°C thresholds quantified. Catalysed political momentum toward Copenhagen and Paris.                                           |
| 2015 — Paris Agreement  | NDC architecture; well-below 2°C / 1.5°C goal; Article 6 carbon markets; LT-LEDs framework; Loss and Damage. All countries covered. Shipping implicitly within emissions budget.                         |
| 2021 — Glasgow (COP 26) | Fossil fuel phase-down; Coal Commitment; methane pledge; tripling of climate finance; India's Panchamrit announced; SDR Special Drawing Rights for climate finance.                                      |
| 2023 — Dubai (COP 28)   | First Global Stocktake; transition away from fossil fuels; tripling renewable capacity by 2030; doubling energy efficiency. UAE Consensus acknowledged emissions gap.                                    |

## 1.6 The Basel Convention (1989): Hazardous Waste and the Ship Recycling Link

The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (1989, in force 1992) is directly relevant to maritime decarbonisation through its connection to ship recycling. End-of-life vessels contain substantial quantities of hazardous materials, including asbestos, polychlorinated biphenyls (PCBs), heavy metals, tributyltin (TBT) compounds, and residual hydrocarbons, whose disposal is regulated under Basel. The 1995 Ban Amendment which entered into force in 2019, prohibits the export of hazardous wastes from OECD to non-OECD countries for disposal.

The Basel-IMO interface has been a persistent regulatory tension: major ship recycling nations (India, Bangladesh, Pakistan, Turkey) receive vessels from OECD-flag owners containing hazardous materials that arguably constitute Basel-regulated waste exports. The Hong Kong Convention (discussed in Section 2) was designed specifically to resolve this tension by establishing a self-contained ship recycling framework that, in the view of IMO member states, satisfies Basel's objectives within the maritime regulatory system.

### **1.7 The London Protocol (1996): Ocean Dumping and Carbon Sequestration**

The London Protocol on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (1996), updating the 1972 London Convention, prohibits the dumping of all waste and other matter at sea except for a permitted list of materials. Its relevance to decarbonisation has evolved in an unexpected direction: the 2006 amendment to the London Protocol, which came into force in 2019, specifically addresses the storage of carbon dioxide streams in sub-seabed geological formations, thereby establishing the regulatory framework for marine carbon capture and storage (CCS) as a climate mitigation tool.

For India, with its significant offshore sedimentary basins in the Arabian Sea and Bay of Bengal, the London Protocol's CCS provisions create a potential future framework for offshore geological sequestration: a component of the long-term net-zero toolkit that maritime infrastructure (offshore vessels, subsea pipelines) would need to serve.

### **1.8 The UN Global Compact (2000): Mainstreaming Corporate Climate Responsibility**

Launched by Secretary-General Kofi Annan in 2000, the UN Global Compact is the world's largest corporate sustainability initiative with over 17,000 participating companies across 160+ countries. Its ten principles across human rights, labour, environment, and anti-corruption, particularly the environmental triad of Principles 7, 8, and 9 (precaution, greater environmental responsibility, and clean technology diffusion), create voluntary decarbonisation obligations that predate and complement IMO regulation.

The Sea Cargo Charter (2020) and the Poseidon Principles (2019) are the maritime sector's direct expressions of the Global Compact ethos: voluntary industry commitments that translate sustainability principles into measurable, disclosed commercial practice. India's engagement with this framework is significant, with over 500 Indian companies, including major shipping and port infrastructure operators, participating as Global Compact signatories. This strengthens a market-driven governance layer that supports decarbonisation investments beyond formal regulatory requirements.

### **1.9 UN Sustainable Development Goals (2015): The Integrating Framework**

The 2030 Agenda's 17 SDGs and 169 targets are the integrating framework within which maritime decarbonisation must be understood. The most relevant SDGs are SDG 7 (Clean Energy), SDG 9 (Infrastructure and Innovation), SDG 13 (Climate Action), SDG 14 (Life Below Water), and SDG 17 (Partnerships). India's SDG India Index, administered by NITI Aayog, tracks all States and UTs annually across 290 indicators.

#### **INDIA'S SDG ACHIEVEMENTS: SELECTED SCORECARD (2024–25)**

SDG 7: Renewable capacity exceeded 200 GW; 100% rural electrification under Saubhagya; LPG to 100+ million households under PMUY. SDG 9: National Infrastructure Pipeline (INR 111 lakh crore); PM GatiShakti; Sagarmala port-led development; Green Hydrogen Mission targeting 5 MMT/year by 2030. SDG 13: Updated NDC (2022), 45% intensity target; Net-Zero 2070 LT-LEDS. SDG 14: Blue Economy Policy 2021; Deep Ocean Mission (INR 4,077 crore); Coastal Aquaculture Authority

expansion. India co-founded the International Solar Alliance and the Coalition for Disaster Resilient Infrastructure, positioning itself as a multilateral climate institution builder.

### **1.10 The ILO and the Just Transition Imperative**

The International Labour Organisation's Guidelines for a Just Transition (2015) establish that the shift to a low-carbon economy must maximise social and economic opportunities while minimising disruption to workers and communities. The four pillars, namely social dialogue, social protection, active labour market policies, and rights at work, apply directly to the maritime workforce as conventional propulsion systems are phased out over the coming decades.

India's stake in the maritime sector is substantial, with nearly 3.23 lakh Indian nationals employed at sea globally, making seafaring India's second-largest services export category after the IT sector. The fuel transition requires new competencies in LNG, methanol, ammonia, and hydrogen handling. India's maritime training institutions, including Indian Maritime University and its affiliated institutes, must develop and deliver STCW-aligned curricula for alternative fuels, creating a training export opportunity that reinforces India's position as the world's premier seafarer-supplying nation. The ILO Maritime Labour Convention (MLC 2006), the 'fourth pillar' of international maritime law, governs the welfare and transition provisions applicable to seafarers facing displacement from automation and fuel system changes.

### **1.11 Climate Finance: Article 6, Green Climate Fund, and CBAM**

#### **Article 6 — Paris Agreement Carbon Markets**

Article 6 of the Paris Agreement establishes frameworks for internationally transferred mitigation outcomes (ITMOs), that is, carbon credits traded between countries, and a centralised crediting mechanism (Article 6.4). For maritime decarbonisation, Article 6 is relevant in two respects: the IMO GFI's 'remedial units' (credits earned by zero-emission fuel users) are designed to be Article 6-compatible, allowing Indian green fuel producers to generate internationally tradeable carbon credits from maritime clean fuel supply; and India's Carbon Credit Trading Scheme (CCTS) is being designed with Article 6 linkage capability.

#### **The Green Climate Fund**

The Green Climate Fund (GCF), established under the UNFCCC in 2010 and capitalised at USD 12.8 billion for its first replenishment cycle, is the primary multilateral vehicle for climate finance flows to developing countries. India has accessed GCF resources for renewable energy and adaptation projects. The GCF's maritime portfolio is nascent but growing; port resilience, coastal adaptation, and green bunkering infrastructure are eligible categories. India's maritime decarbonisation investment case can be structured to access GCF grant and concessional loan instruments.

#### **EU Carbon Border Adjustment Mechanism (CBAM)**

The EU Carbon Border Adjustment Mechanism (CBAM), fully operational from 2026, imposes a carbon price on imports of carbon-intensive goods (steel, cement, aluminium, fertilisers, electricity,

hydrogen) from non-EU countries that lack equivalent carbon pricing. CBAM's direct maritime relevance is twofold: first, vessels carrying CBAM-covered Indian exports to the EU will face increased scrutiny of their voyage emissions in the context of the EU ETS for shipping (in force 2024); second, CBAM creates urgency for India's domestic CCTS development: a credible domestic carbon price could qualify India's exports for CBAM relief. The shipping of CBAM-affected goods generates Scope 3 emissions for Indian exporters, creating market pressure for green shipping services on India-EU trade lanes.

### **EU ETS and FuelEU Maritime**

The European Union's Emissions Trading Scheme (EU ETS) was extended to maritime transport from 1 January 2024, covering CO<sub>2</sub> emissions from large ships (5,000 GT+) on voyages to, from, and within EU ports. From 2024, 40% of reportable emissions are covered; this rises to 70% in 2025 and 100% from 2026. FuelEU Maritime, in force since 1 January 2025, establishes binding lifecycle GHG intensity limits for marine fuels used by ships calling at EU ports, serving as a regional precursor to the IMO GFI and creating immediate compliance pressure for Indian-flag vessels and foreign-flag vessels carrying Indian trade. Together, the EU ETS and FuelEU Maritime represent the most advanced regional carbon pricing and fuel-regulation framework for shipping and have accelerated the commercial case for alternative fuel investment ahead of the IMO's expected 2028 implementation timeline.

## **SECTION – 2: INDIA'S DOMESTIC ENVIRONMENTAL GOVERNANCE EVOLUTION**

India's domestic environmental governance trajectory has been shaped by its active international engagement, its own ecological imperatives as a country of enormous biodiversity and climate vulnerability, and the imperatives of balancing environmental protection with development for 1.4 billion citizens. This section traces that domestic evolution: from the legislative foundations of the 1970s through to today's comprehensive climate and green economy commitments.

### **2.1 The Legislative Foundation: Water, Air, and Environment**

#### **Water (Prevention and Control of Pollution) Act, 1974**

India's first comprehensive pollution control statute established the Central Pollution Control Board (CPCB) and State Pollution Control Boards (SPCBs) as primary regulatory authorities. Its institutional architecture, including consent procedures, effluent standards, and penalties, provided the template for all subsequent environmental regulation. For the maritime sector, the Water Act's provisions on industrial effluents and coastal water quality remain directly relevant to port operations, vessel discharge management, and the regulation of ballast water and sewage treatment systems.

#### **Air (Prevention and Control of Pollution) Act, 1981**

Extending the Water Act's architecture to atmospheric emissions, the Air Act gave CPCB authority to set National Ambient Air Quality Standards (NAAQS) and regulate emission sources. The Act's emission monitoring framework is the domestic regulatory context within which port air quality management, including SO<sub>x</sub>, NO<sub>x</sub>, and particulate matter from vessels at berth, is governed. The Act also provides the precedent for India's approach to shipping emission standards as a public health as well as a climate issue.

#### **Environment (Protection) Act, 1986**

Enacted in the aftermath of the Bhopal gas tragedy, the EPA is India's principal umbrella environmental legislation. It provides the Central Government with broad enabling powers: setting emission and discharge standards, restricting industrial operations, prohibiting hazardous substance handling, and mandating environmental impact assessments. The EPA's enabling architecture has been used to promulgate the Coastal Regulation Zone (CRZ) notifications governing port development and coastal infrastructure, and provides the legal basis for any future domestic maritime emission standards that may complement India's IMO obligations.

### **LEGISLATIVE SEQUENCING: INDIA'S ENVIRONMENTAL LAW ARCHITECTURE**

Water Act (1974) → Air Act (1981) → EPA (1986): India's environmental legislative sequence demonstrates the institutional logic of building from specific sectoral statutes to an umbrella enabling framework. The emerging maritime decarbonisation architecture follows the same logic: specific instruments (MARPOL implementation, EEXI/CII compliance) leading toward the comprehensive Maritime Decarbonisation Policy. The EPA's breadth also means that domestic

maritime emission standards, green port requirements, and alternative fuel regulations can all be grounded in existing primary legislation.

## 2.2 National Action Plan on Climate Change (NAPCC)

India's National Action Plan on Climate Change (NAPCC), launched in 2008 under Prime Minister Manmohan Singh, established eight National Missions as the architecture of India's domestic climate response. Each mission is relevant to the maritime decarbonisation context:

| Instrument<br>Year                                      | Scope & Significance                                                                                                                                                                                            |
|---------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| National Solar Mission (JNNSM)                          | Target: 100 GW solar by 2022 (achieved ~73 GW; revised to 500 GW by 2030). The solar electricity cost reduction driven by JNNSM is the foundation of India's green hydrogen competitiveness for maritime fuels. |
| National Mission for Enhanced Energy Efficiency         | PAT Scheme: Perform, Achieve and Trade. Covers energy-intensive industries through tradeable energy efficiency certificates. Precursor to the CCTS framework. Port trusts included as designated consumers.     |
| National Mission on Sustainable Habitat                 | Green building codes; urban transport; waste management. Drives electrification of port equipment and terminal operations as part of broader urban sustainability.                                              |
| National Water Mission                                  | Water use efficiency; conservation. Port and ship operations water management; ballast water treatment infrastructure planning.                                                                                 |
| National Mission for Sustaining the Himalayan Ecosystem | Glaciology; climate monitoring. Provides scientific baseline for sea level rise projections affecting Indian port infrastructure planning.                                                                      |
| National Mission for a Green India                      | Afforestation; carbon sink enhancement. Carbon sink accounting contributes to India's NDC targets, contextualising the relative contribution of maritime emission reductions.                                   |
| National Mission for Sustainable Agriculture            | Climate-resilient agriculture; soil carbon. Bioenergy feedstock development (including for bio-methanol and bio-LNG for ships) sits within this mission's broader biomass framework.                            |

| Instrument / Scope & Significance<br>Year                  |                                                                                                                                                                                                                          |
|------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| National Mission on Strategic Knowledge for Climate Change | Research; capacity building; international cooperation on climate science. IMO technical submissions, IPCC participation, and GFI methodology development are supported through this mission's knowledge infrastructure. |

## 2.3 Mission Amrit Kaal Vishwa Guru (MAKV): India's 2047 Aspiration

Mission Amrit Kaal Vishwa Guru represents India's centenary ambition: to emerge by 2047 as a Viksit Bharat (Developed India) that is simultaneously a global leader in sustainable development, clean technology, and multilateral governance. MAKV's energy export ambition, positioning India as a net exporter of clean energy including green hydrogen and ammonia, makes the maritime sector a strategic vehicle: green fuel produced in India must be shipped to global markets, and India's ports must become world-class green bunkering hubs to serve the global fleet on East-West and India-Africa trade routes.

## 2.4 Panchamrit and the Net-Zero 2070 Pathway

India's Panchamrit commitments, announced at COP 26 (2021) and formalised in the Updated NDC (August 2022), define the near-term and long-term climate trajectory:

|                                                                     |                                                                                                 |                                                     |
|---------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|-----------------------------------------------------|
| <b>500 GW</b><br>Non-fossil electricity by 2030                     | <b>50%</b><br>cumulative electric power installed capacity from non-fossil fuel sources by 2030 | <b>45%</b><br>Emissions intensity reduction vs 2005 |
| <b>1 Bn TCO<sub>2</sub>e</b><br>Cumulative carbon reduction by 2030 | <b>2070</b><br>Net-Zero Target Year                                                             |                                                     |

Each Panchamrit element has direct maritime implications. The 500 GW renewable target creates the electricity base for green hydrogen electrolysis, the feedstock for green ammonia marine fuel. The 50% renewables share accelerates shore power decarbonisation at Indian ports. The 45% intensity reduction shapes the CCTS architecture that will progressively cover maritime emissions. The Net-Zero 2070 horizon means ships ordered in 2025–2030, with 20–25 year design lives, will be operating at the critical 2045–2055 juncture of the net-zero trajectory, making today's fleet procurement decisions consequential for 2070 compliance.

## **2.5 National Green Hydrogen Mission (2023)**

The National Green Hydrogen Mission, approved by the Cabinet in January 2023 with an initial outlay of INR 19,744 crore, is perhaps the most consequential domestic policy decision for maritime decarbonisation. Its targets, comprising 5 million tonnes per annum (MMTPA) of green hydrogen production by 2030 and creation of 600,000 jobs, directly address the supply-side constraint on maritime fuel transition. The Mission's components include:

- SIGHT (Strategic Interventions for Green Hydrogen Transition): production-linked incentive for green hydrogen and green ammonia manufacturing, targeting domestic and export markets.
- Green Hydrogen Hubs: dedicated industrial zones for green hydrogen production, with anchor demand from industry, fertiliser production, and, critically, export and maritime bunkering.
- R&D framework: electrolyser technology development, fuel cell technology, and storage systems: the same technology base that underpins shipboard hydrogen propulsion.
- Export pathway: USD 8 billion in export revenues from green hydrogen and derivatives by 2030; maritime bunkering, given India's port geography and the scale of the global fleet, is a primary target market.

The Green Hydrogen Mission is the most direct bridge between India's domestic climate policy and maritime decarbonisation. A Maritime Decarbonisation Policy that creates domestic demand for green hydrogen bunkers, sourced from Indian-flag vessels, from foreign-flag vessels at Indian ports, and from a regulatory framework that incentivises early adopters, is the demand-side complement to the Mission's supply-side investments.

## **2.6 India's Carbon Market and ESG Architecture**

- Energy Conservation (Amendment) Act 2022: Carbon Credit Trading Scheme (CCTS): India's domestic carbon market. Registry, MRV, and trading platform under development by BEE and power exchanges. Designed for Article 6 compatibility. Ports and shipping not yet in Phase 1 scope but enabled by primary legislation.
- BRSR and Corporate Disclosure: Business Responsibility and Sustainability Reporting (BRSR) mandatory for top 1,000 listed companies from FY 2022–23. Scope 1, 2, and 3 emissions covered. Alignment with IFRS S1/S2 underway through MCA. Listed shipping and port companies face climate risk disclosure obligations.
- CBAM Exposure: India's steel, cement, aluminium, and fertiliser exports to the EU face CBAM from 2026. The embodied carbon of these goods includes shipping-related Scope 3 emissions, creating supply chain pressure on Indian exporters to use lower-carbon shipping services: a market-driven decarbonisation signal independent of IMO regulation.

## **SECTION – 3: MARITIME: THE COMPLETE REGULATORY ARCHITECTURE AND INDIA'S POSITION**

This section provides a comprehensive treatment of the international maritime regulatory framework in the context of greening and decarbonisation, covering the full spectrum from foundational safety conventions through pollution prevention, ship recycling, ballast water, anti-fouling, the complete MARPOL GHG trajectory, alternative fuels, operational and technical measures,

and the emerging market-based mechanisms, followed by India's adoption, adaptation, and domestic initiatives.

### **3.1 The Foundational Architecture: IMO, SOLAS, and STCW**

#### **International Maritime Organisation**

The International Maritime Organisation (IMO), established as a UN specialised agency in 1958, is the global standard-setting authority for the safety, security, and environmental performance of international shipping. With 176 Member States, IMO develops conventions adopted into domestic law by flag states and enforced through port state control. India has been an IMO Member since its founding, regularly serves on the IMO Council, and is an active participant in MEPC, MSC, and all subsidiary bodies relevant to decarbonisation.

#### **SOLAS — Safety of Life at Sea**

The International Convention for the Safety of Life at Sea (SOLAS, current version 1974) establishes minimum standards for ship construction, equipment, and operation. Its decarbonisation relevance has expanded significantly: the IGF Code (International Code of Safety for Ships using Gases or other Low-flashpoint Fuels, in force 2017) governs the safe use of LNG and other alternative fuels on ships, and is being extended through IMO's Sub-Committee on Carriage of Cargoes (CCC) to cover methanol, ammonia, and hydrogen. SOLAS Chapter II-1's provisions for alternative design and arrangements provide the regulatory pathway for hydrogen fuel cell vessels, wind-assisted propulsion, and other novel propulsion technologies to achieve flag state approval.

#### **STCW — Seafarer Training and Certification**

The International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW, 1978, revised 1995 and Manila 2010) establishes global qualification standards for seafarers. Its 2010 Manila Amendments introduced certification requirements for ships using low-flashpoint fuels (LNG). Current STCW work at IMO's Sub-Committee on Human Element, Training and Watchkeeping (HTW) is developing competency frameworks for methanol, ammonia, and hydrogen, directly relevant to India as the world's largest seafarer-supplying nation. India achieved STCW White List status, recognising its training and certification system meets international standards, and its maritime training institutions are positioned to become regional centres for alternative fuel competency.

### **3.2 MARPOL: The Environmental Convention Architecture**

The International Convention for the Prevention of Pollution from Ships (MARPOL 73/78) is the principal environmental convention for shipping. Its six Annexes collectively constitute the comprehensive framework for reducing shipping's environmental footprint across all pollution vectors:

| Annex / Subject                         | Scope & Significance                                                                                                                                                                                                                                    |
|-----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Annex I — Oil                           | Prevention of pollution by oil from operational and accidental discharges. Oily water separators, oil record books, special areas. Foundation of maritime pollution prevention.                                                                         |
| Annex II — NLS                          | Noxious liquid substances in bulk. Pre-washing requirements, residue discharge standards. Protects marine environment from chemical cargo contamination.                                                                                                |
| Annex III — Packaged Harmful Substances | Standards for packaging, marking, labelling, documentation, and stowage of harmful substances in packaged form. Integrated with IMDG Code.                                                                                                              |
| Annex IV — Sewage                       | Prevention of pollution by sewage from ships. Sewage treatment plants, holding tanks, discharge standards. Protects coastal and port water quality.                                                                                                     |
| Annex V — Garbage                       | Prevention of pollution by garbage. Prohibition on plastic discharge; special area provisions; garbage management plans. Directly addresses marine plastic pollution.                                                                                   |
| Annex VI — Air Pollution & GHG          | The GHG and climate-relevant Annex. SO <sub>x</sub> caps (Global 0.5% from 2020; 0.1% in ECAs), NO <sub>x</sub> Tier I/II/III limits, EEDI, SEEMP, EEXI, CII, and the forthcoming GFI framework. The operative instrument for maritime decarbonisation. |

### 3.3 IMO 2020 Sulphur Cap: The Largest Marine Fuel Change in History

The IMO 2020 global sulphur cap, which reduced the maximum sulphur content in marine fuel oil from 3.5% to 0.5% m/m from 1 January 2020, was the most significant change to marine fuel specifications in the history of shipping. Its environmental impact was immediate and substantial: maritime SO<sub>x</sub> emissions fell by approximately 77% in the first year, delivering major public health benefits for port cities and coastal populations worldwide. Its relevance to the decarbonisation agenda extends beyond the direct environmental benefit:

- Technology demonstration: IMO 2020 proved that the global fleet could transition to a new fuel specification on a defined schedule: the same institutional confidence that underpins the GFI framework's ambition.
- Infrastructure learning: The build-out of VLSFO (Very Low Sulphur Fuel Oil) blending, storage, and bunkering infrastructure in 2018–2020 demonstrated the global maritime fuel supply chain's adaptability. The green fuel bunkering infrastructure challenge is qualitatively more complex, but the IMO 2020 transition is the reference point for planning timelines and logistics.
- Scrubber pathway: The IMO 2020 transition also saw widespread adoption of exhaust gas cleaning systems (scrubbers) that allow continued use of high-sulphur fuel. The GFI

framework's lifecycle accounting explicitly addresses scrubber carbon penalties, ensuring that compliance cost minimisation through exhaust treatment does not create perverse incentives on the GHG trajectory.

- In Emission Control Areas (ECAs), covering North America, the North Sea, the Baltic, and the Mediterranean, the 0.1% sulphur limit has been in force since 2015, and NOx Tier III standards apply to new ships. India is exploring designation of Indian Ocean ECAs around its major ports, which would further drive clean fuel adoption on coastal and port approaches.

### **3.4 Black Carbon and Short-Lived Climate Forcers**

Black carbon (BC), a fine particulate matter produced by incomplete combustion of fossil fuels, biofuels, and biomass, is a potent short-lived climate forcer with a global warming potential approximately 3,200 times that of CO<sub>2</sub> over a 20-year horizon. In the Arctic, black carbon deposition on ice and snow accelerates albedo loss and sea ice melt, making shipping's BC emissions from vessels transiting Arctic routes a specific climate concern that has gained significant attention at MEPC since 2011.

MEPC has been developing recommendations on BC reduction from shipping since MEPC 65 (2013). The current focus is on the development of a definition and measurement methodology for BC from shipping, leading to potential mandatory measures. The transition to alternative fuels, particularly LNG, methanol, and hydrogen, substantially reduces or eliminates BC emissions relative to conventional HFO combustion, providing a direct co-benefit of the fuel transition that strengthens the decarbonisation investment case for vessels trading on Arctic-adjacent routes.

### **3.5 Ballast Water Management Convention (2004)**

The Ballast Water Management Convention (BWMC), adopted in 2004 and entering into force in 2017, requires ships to manage their ballast water and sediments to remove, render harmless, or avoid the uptake or discharge of aquatic organisms and pathogens. Its connection to decarbonisation is operational rather than direct: ballast water treatment systems (BWTS) installed to comply with the BWMC consume shipboard electrical power, adding to the energy demand that must be accounted for in CII calculations. The optimisation of BWTS energy consumption, through UV treatment systems, hybrid approaches, and intelligent operational scheduling, is a component of the holistic ship energy management that underpins CII rating improvement programmes.

India is yet to ratify the Convention. Nevertheless, Indian shipping is progressively aligning with IMO ballast water management standards through regulatory guidance, Statement of Compliance mechanisms, and survey oversight by notified Recognised Organisations (ROs), supporting compliance readiness for vessels operating on international routes.

### **3.6 The AFS Convention and Biofouling: The Hidden Efficiency Lever**

The International Convention on the Control of Harmful Anti-fouling Systems on Ships (AFS Convention, 2001, in force 2008) prohibits the use of organotin compounds (tributyltin, TBT) in anti-

fouling paints, which had previously been highly effective but caused widespread marine toxicity. The AFS Convention's significance for decarbonisation extends well beyond its intended scope:

- **Hull fouling and fuel consumption:** Marine organisms accumulating on a ship's hull can increase hydrodynamic drag by 10–40%, directly increasing fuel consumption and GHG emissions. The development of effective, non-toxic anti-fouling systems, such as silicone-based coatings, nano-coatings, and hull-air lubrication systems, is therefore a direct decarbonisation measure.
- **Biofouling management guidelines:** MEPC.1/Circ.811 (2011) provides voluntary guidelines for the management of biofouling to minimise the transfer of invasive aquatic species, but the guidelines also explicitly address the energy and emissions benefits of hull cleaning and optimised coating selection. A vessel maintaining a clean hull can reduce fuel consumption by 5–10% relative to a heavily fouled hull, representing one of the highest-return, lowest-cost decarbonisation measures available to fleet operators.
- **In-water cleaning:** The development of in-water hull cleaning technology, including robotic cleaning systems that can maintain hull condition without dry-docking, is a growing industry with direct relevance to Indian ship repair and port service sectors. IMO is developing guidelines for in-water cleaning that will inform future mandatory measures.

India has ratified the AFS Convention. Indian-flag vessels are prohibited from applying TBT-based anti-fouling systems, and DGS surveys include AFS compliance. The development of anti-fouling technology and robotic hull cleaning services at Indian ship repair yards represents an opportunity in the growing green shipping services market.

### **3.7 The Hong Kong Convention (HKC, 2009): Safe and Environmentally Sound Ship Recycling**

The Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships (HKC), adopted at a Diplomatic Conference in Hong Kong in May 2009 and entering into force on 26 June 2025, is among the most consequential IMO conventions for India. Its entry into force represents a fundamental transformation of the global ship recycling industry, an industry in which India, through the Alang shipbreaking yards in Gujarat, holds a dominant global position.

#### **The Convention's Scope and Requirements**

The HKC applies to ships of 500 GT and above flying the flag of a Party, and to ship recycling facilities operating under the jurisdiction of a Party. Its principal requirements are:

- **Inventory of Hazardous Materials (IHM):** All ships must carry a continuously maintained Inventory of Hazardous Materials documenting the presence and location of asbestos, heavy metals, PCBs, ozone-depleting substances, and other listed hazardous materials. The IHM has three parts: Part I (present on the ship), Part II (operational wastes), Part III (stores). New ships must have an IHM from the keel-laying stage; existing ships must develop IHMs for flag state approval.
- **Ship Recycling Plan (SRP):** When a ship is to be recycled, the owner must develop a Ship Recycling Plan tailored to the specific ship and the specific recycling facility. The SRP must address the safe and environmentally sound management of all materials identified in the IHM.
- **Authorised Ship Recycling Facility:** Ships may only be recycled at facilities authorised under the Convention's requirements, which include impermeable floors for work areas, hazardous

waste management systems, worker health and safety standards, and environmental management systems. Facilities must be listed on the IMO's authorised facility list.

- Statements of Compliance and Completion: Ships receive a Ready for Recycling Certificate prior to demolition; recycling facilities issue a Statement of Completion upon completion of recycling, creating a documentary chain that enables verification of compliance.

### **ALANG AND THE HKC: INDIA'S COMPETITIVE TRANSFORMATION**

Alang-Sosiya in Gujarat handles approximately 30–35% of global ship recycling tonnage, making it one of the world's largest ship recycling centres by volume. India's ratification of the HKC and the development of HKC-compliant facilities at Alang, supported by the Ship Breaking Code, the Recycling of Ships Act, 2019, and recent SBFAS provisions including the Shipbreaking Credit Note mechanism, position India to capture a significant share of the global scrapping market. Ships from countries with stringent environmental regulations, including the EU, Norway, and Japan, are expected to increasingly prefer HKC-compliant facilities. The HKC's entry into force in June 2025 transforms compliance from a competitive advantage to a market prerequisite.

### **HKC and the Decarbonisation Nexus**

The HKC's connection to maritime decarbonisation is direct and multi-dimensional:

- Fleet renewal catalyst: HKC compliance imposes additional costs on ship owners, including IHM preparation and surveys for existing vessels, making the recycling of older, less efficient ships more commercially viable than continued operation. This incentivises fleet renewal with modern, energy-efficient, and alternative-fuel-ready vessels, directly advancing the CII compliance and GFI transition agenda.
- Circular economy for marine materials: The HKC's hazardous material management framework ensures that steel and other materials recovered from end-of-life ships are processed through environmentally sound channels. For India's steel industry, a major CBAM-affected sector, having access to large volumes of ship steel recycled under certified environmentally sound conditions is a supply chain sustainability credential of growing commercial value.
- Green recycling premium: As ESG requirements tighten for ship owners under BRSR, Poseidon Principles, and investor sustainability criteria, the ability to certify that a vessel's end-of-life recycling was conducted at an HKC-authorised facility becomes a reportable sustainability metric. This creates a commercial premium for HKC-compliant recycling that the Alang industry is well-positioned to capture.
- India's regulatory implementation: The Recycling of Ships Act, 2019 (India) gives domestic legislative effect to the HKC, establishing the framework for facility authorisation, IHM documentation, and enforcement. The Alang Ship Recycling Yard has multiple facilities that have achieved Statement of Compliance under the new Act, and the process of obtaining full HKC authorisation is well advanced.

### **3.8 The EEDI/EEXI/CII Regulatory Progression**

MARPOL Annex VI's GHG regulatory framework has evolved through three paradigm shifts:

#### **Paradigm 1 — Technical Efficiency: EEDI (2013 onwards)**

The Energy Efficiency Design Index (EEDI), in force since 2013, established the first mandatory global CO<sub>2</sub> standard for new ships. Phase 0 through Phase 3 tighten the required value by up to 30% relative to the 2008 fleet baseline. Phase 3 for most ship types took effect from 2025, requiring new builds to incorporate significant efficiency technology: optimised hull forms, waste heat recovery systems, air lubrication, improved propeller design, and in some cases alternative propulsion. The EEDI's methodology, measuring attained CO<sub>2</sub> per unit of transport work versus a required value, provided the conceptual framework adapted for subsequent instruments.

#### **Paradigm 2 — Operational Performance: EEXI and CII (2023 onwards)**

The Energy Efficiency Existing Ship Index (EEXI), adopted at MEPC 76 and in force since January 2023, extended the design-index concept to the existing fleet. Most ships comply through engine power limitation (EPL), a technical measure that limits maximum continuous rating, effectively mandating a degree of slow steaming. The Carbon Intensity Indicator (CII), also in force since January 2023, assigns an annual A–E rating to cargo ships of 5,000 GT+ based on actual operational CO<sub>2</sub> intensity (grams CO<sub>2</sub> per deadweight tonne-nautical mile for most ship types). Required values tighten annually through 2030. Ships rated D for three consecutive years or E in any single year must submit corrective action plans within their SEEMP Part III.

#### **Paradigm 3 — Fuel Transition: GFI and IMO Net-Zero Framework (2028 onwards)**

MEPC 80 (July 2023) adopted the Revised IMO GHG Strategy, establishing net-zero greenhouse gas emissions from international shipping by or around 2050 as the headline goal. At MEPC 83 (April 2025), IMO Member States reached agreement in principle on the IMO Net-Zero Framework, including the Goal-based Fuel Intensity (GFI) standard, which proposes lifecycle (well-to-wake) GHG intensity thresholds for marine fuels, alongside an economic measure to disincentivise high-emission fuels and incentivise zero- and near-zero emission alternatives through tradable compliance units. Formal adoption through MARPOL Annex VI amendments remains pending, with entry into force expected around 2028.

#### **MRV Infrastructure: IMO DCS and EU MRV**

The GFI framework rests on a mature data infrastructure. The IMO Data Collection System (DCS), in force under MARPOL Annex VI since 2019, requires ships of 5,000 GT and above to collect and report fuel oil consumption data to their flag state, which in turn aggregates and submits the data to the IMO Ship Fuel Oil Consumption Database. This provides the ship-level fuel consumption and operational data necessary for emissions accounting and compliance assessment under the GFI framework. In parallel, the EU Monitoring, Reporting and Verification (MRV) Regulation, in force since 2018 for vessels calling at EU ports, established a more granular voyage-level reporting requirement that has driven shipping companies to invest in digital emissions tracking systems ahead of the broader IMO DCS timeline. Together, IMO DCS and EU MRV have built the data governance infrastructure on which the GFI economic instrument and the CII rating system depend: without

verified fuel consumption and voyage data at ship level, neither the remedial unit mechanism nor the A-E rating system is enforceable. India's Directorate General of Shipping administers IMO DCS compliance for Indian-flag vessels; building domestic MRV capacity that aligns with both IMO and EU requirements is a prerequisite for Indian shipping companies operating on international and EU-trading routes.

### 3.9 Alternative Fuels: The Full Technology Spectrum

The transition to zero- and near-zero emission fuels is the core of Paradigm 3. The full technology spectrum ranges from near-term transitional fuels that reduce emissions incrementally, to medium-term fuels that can achieve significant GHG reductions, to long-term fuels capable of achieving net-zero on a well-to-wake basis:

| Instrument / Year             | Scope & Significance                                                                                                                                                                                                                                                                                                                             |
|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| LNG — Liquefied Natural Gas   | Reduces CO <sub>2</sub> by 20–25% vs HFO on a TtW basis; methane slip risks can negate WtW benefits if not managed. Near-term bridge fuel; over 900 LNG-capable vessels in service globally. India: Petronet LNG at Kochi and Dahej could serve coastal LNG bunkering.                                                                           |
| LPG — Liquefied Petroleum Gas | Lower carbon than HFO; available through existing LPG infrastructure. Limited to smaller ship classes (VLGCs); growing adoption in gas carriers. India: existing LPG import and distribution infrastructure provides near-term bunkering pathway.                                                                                                |
| Methanol                      | 15-30% CO <sub>2</sub> reduction (grey methanol) to near-zero (green methanol from biomass or electrolytic hydrogen + CO <sub>2</sub> ). Low flashpoint requires IGF Code compliance. Maersk, Stena operating methanol dual-fuel vessels commercially. India: green methanol production potential from biomass and stranded renewables.          |
| Ammonia                       | Zero CO <sub>2</sub> at combustion (nitrogen oxide management required). Green ammonia (electrolytic hydrogen + Haber-Bosch) achieves near-zero WtW. Toxicity and handling challenges require new safety standards. MAN ES and WinGD developing ammonia engines. India's fertiliser industry provides existing ammonia infrastructure base.      |
| Green Hydrogen                | Zero emissions at combustion; near-zero WtW if produced from renewables. Storage challenges (cryogenic or high pressure) limit to short-sea and ferry applications near term. Long-term deep-sea option via fuel cells or combustion engines. India's Green Hydrogen Mission targets 5 MMT/year; maritime bunkering is a primary offtake market. |

| Instrument / Year               | Scope & Significance                                                                                                                                                                                                                                                                                     |
|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Bio-LNG / Bio-methane           | Biomethane produced from organic waste, agricultural residue, or dedicated energy crops. Near-zero to negative WtW depending on feedstock. Compatible with LNG infrastructure. India: significant agricultural waste feedstock potential; National Bioenergy Programme.                                  |
| Bio-methanol                    | Produced from biomass; similar WtW profile to bio-LNG. Compatible with methanol engine infrastructure. India: sugar industry molasses stream; lignocellulosic biomass. Can be blended immediately with grey methanol.                                                                                    |
| FAME / HVO (Biofuels)           | Fatty Acid Methyl Esters (biodiesel) and Hydrogenated Vegetable Oil as drop-in fuel blends (B20, B30) for existing engines. Immediate emission reduction potential; GFI lifecycle accounting applies. India: National Biofuel Policy 2022 targets 5% blending in shipping fuel by 2030.                  |
| Nuclear Propulsion              | Zero operational emissions. Currently limited to naval and icebreaker applications; commercial regulatory framework under development at IAEA/IMO. Long-term option for large vessels on specific trade routes. India: civil nuclear programme provides technological context.                           |
| Fuel Cells                      | Direct conversion of hydrogen or ammonia to electricity; high efficiency; zero emissions at point of use. Currently deployed on ferries and small vessels; scaling to large ships in development. Waterstoff-powered ferries operating in Norway; hydrogen fuel cell tanker concepts in development.     |
| Wind-Assisted Propulsion (WAPS) | Rotor sails (Flettner rotors), rigid wing sails, kite sails, and suction sails reduce main engine load. Fuel savings of 5–30% depending on trade route and wind conditions. MEPC developing technical guidelines. Pyxis Ocean (sails); Vale ore carriers (flapping wing); growing commercial deployment. |
| Solar / Battery Hybrid          | Photovoltaic panels supplementing shipboard power; battery energy storage for peak shaving and cold ironing connection. Suited to short-sea, ferries, and port operations vessels. India: coastal ferry electrification programme; battery-electric tugs in deployment.                                  |

### 3.10 Technical and Operational Efficiency Measures

The fuel transition to alternative energies is a paradigm-3 ambition. The immediate decarbonisation opportunity, delivering emission reductions in the 2025–2035 window, lies in the full deployment of technical and operational efficiency measures across the existing fleet. These measures are often

overlooked in favour of the more technologically exciting fuel transition narrative, yet they represent the largest near-term emissions reduction opportunity at lowest cost:

### **Technical Measures**

- Hull form optimisation and retrofitting: Bulbous bow optimisation, stern appendages, and hull coating upgrades reduce resistance and fuel consumption by 3–8%.
- Propeller efficiency: Propeller boss cap fins (PBCF), ducts, pre-swirl stators, and contra-rotating propellers improve propulsive efficiency by 3–5%.
- Air lubrication systems (ALS): Micro-bubbles injected under the hull reduce frictional resistance by 5–10%. Silverstream Technologies, DAMEN, and Mitsubishi commercial systems in service.
- Waste heat recovery (WHR): Recovering exhaust heat through steam turbines or organic Rankine cycle systems generates supplementary electricity, reducing auxiliary engine fuel consumption by 3–10%.
- Engine tuning and retrofit: Turbocharger upgrades, fuel injection optimisation, derating, and variable speed auxiliary engines reduce fuel consumption on existing machinery.
- Shaft generators / PTOs: Power take-off from main engine to generate electricity when at sea improves overall energy system efficiency.

### **Operational Measures**

- Speed optimisation and slow steaming: A 10% reduction in vessel speed reduces fuel consumption by approximately 19–27% (cubic relationship). Slow steaming, the single most cost-effective operational measure, is already widespread but has not been systematically mandated. The CII's declining trajectory incentivises continued speed management.
- Just-in-time (JIT) arrival: Vessels notified of berth availability in real time can reduce speed when berth congestion would otherwise require waiting at anchor, eliminating unnecessary fuel burn. IMO has published JIT arrival guidelines and is working toward industry-wide adoption through the Port Collaborative Decision Making (PortCDM) framework.
- Voyage optimisation and weather routing: AI-assisted route planning and real-time weather routing can reduce voyage fuel consumption by 3–8% by optimising speed profiles and avoiding adverse weather.
- Port turnaround efficiency: Reducing time at anchor through berth pre-booking, faster cargo handling, and port community system (PCS) digitisation reduces auxiliary engine running hours and eliminates idle fuel burn.
- Trim and draft optimisation: Adjusting vessel trim to its hydrodynamically optimal condition reduces resistance by up to 2%; managing cargo distribution to optimise draft similarly contributes.
- Cargo planning and load factor optimisation: Maximising cargo per voyage reduces the carbon intensity per tonne of cargo moved, directly improving CII ratings.
- Autopilot and manoeuvring optimisation: Efficient autopilot settings, reduced course deviations, and optimised port approach manoeuvring reduce fuel consumption on coastal and port approaches.

## Digital and AI-Enabled Efficiency

The digitalisation of shipping operations, through vessel performance monitoring systems (VPMS), IoT sensor arrays, digital twins, predictive maintenance, and AI voyage optimisation platforms, represents the most scalable near-term efficiency lever. Key developments:

- Digital twins: Real-time computational models of vessel hydrodynamics, machinery, and cargo loading allow operators to continuously optimise speed, trim, and route for minimum fuel consumption. Wärtsilä, Kongsberg, and ABB deploy commercial digital twin platforms.
- Predictive maintenance: AI analysis of engine and machinery sensor data predicts component wear before failure, enabling maintenance that maintains peak efficiency and avoids fuel-wasting degraded performance.
- Autonomous and AI-assisted navigation: Reduces human-error-driven inefficiency in manoeuvring and passage planning; Rolls-Royce/Intel and Kongsberg have demonstrated autonomous vessel operation.
- Port community systems and e-documentation: Reducing port pre-arrival documentation burden and enabling real-time berth data sharing enables JIT arrival; India's PORTNET system and the National Logistics Policy's single-window goals are the domestic implementation.

### 3.11 Shore Power (Cold Ironing) and Green Ports

Shore power, which connects vessels to onshore electricity supply while at berth rather than running auxiliary diesel engines, is the most immediate and cost-effective decarbonisation measure for port-side operations. A vessel at berth typically runs auxiliary engines consuming 1–4 tonnes of fuel per day; shore power eliminates this entirely when supplied from a decarbonised grid. The environmental co-benefit extends beyond CO<sub>2</sub>: NO<sub>x</sub>, SO<sub>x</sub>, and particulate matter from vessels at berth are a major source of urban air quality degradation in port cities.

India's Harit Sagar (Green Port) Guidelines, issued by the Ministry of Ports, Shipping and Waterways in 2023, establish the framework for India's port decarbonisation programme. Key provisions include:

- Mandatory shore power connectivity at all major ports for cruise ships, ferries, and bulk carriers by specified timelines.
- Renewable energy targets: all major ports to achieve 60% renewable electricity consumption by 2030.
- Green hydrogen and ammonia bunkering infrastructure: identification of pilot ports (JNPT, Kandla, Visakhapatnam, Paradip, Kochi, Chennai) for green fuel bunkering infrastructure development.
- Port equipment electrification: replacement of diesel-powered harbour craft, forklifts, reach stackers, and terminal tractors with electric or hydrogen-powered alternatives.
- Environmental Management Systems: ISO 14001 certification for all major ports.
- Carbon footprint reporting: annual port-level GHG inventory and reduction targets, aligned with the IMO Port Carbon Intensity Indicator (PCII) framework.

The Green Tug Transition Programme, a specific initiative under Harit Sagar, targets replacement of diesel-powered harbour tugs at major Indian ports with LNG, hydrogen, or battery-electric tugs, with a phased timeline beginning with pilot deployments at JNPT and Kochi. The programme is modelled on the successful green tug transitions at the Port of Singapore and Abu Dhabi ports.

### **Port-Side Regulatory Measures: Port CII, Just-in-Time Arrival, and MARPOL Port Reception Facilities**

The decarbonisation regulatory framework does not apply to vessels alone; ports are integral nodes in the emissions architecture. Three port-side instruments are of direct relevance to India's maritime decarbonisation programme:

**Port Carbon Intensity Indicator (Port CII):** Unlike the Carbon Intensity Indicator (CII) under MARPOL Annex VI, which is a ship-specific metric applicable to vessels of 5,000 GT and above, port decarbonisation in India is guided through carbon accounting and environmental performance monitoring under the Harit Sagar Green Port Guidelines. Harit Sagar requires major ports to prepare greenhouse gas inventories, track carbon emissions per tonne of cargo handled, and monitor progress through defined Environmental Performance Indicators aligned with global sustainability reporting practices such as the Green Reporting Initiative (GRI). Strengthening these carbon accounting and benchmarking mechanisms would create measurable baselines, support targeted green infrastructure investments, and enhance the competitiveness of Indian ports as low-carbon logistics hubs on key trade corridors.

**Just-in-Time (JIT) Arrival:** JIT arrival is the practice of optimising a vessel's speed and routing so that it arrives at port precisely when a berth is available, eliminating the common practice of sailing at full speed and then waiting at anchor. Studies indicate that JIT arrival can reduce voyage fuel consumption by 5–14% on affected port calls. IMO has developed guidelines for JIT port calls under the MEPC-NCSR joint working group, and several port authorities, including Singapore MPA and Port of Rotterdam, have implemented real-time berth information systems to enable JIT. India's PORTNET system provides the digital infrastructure for JIT deployment at major Indian ports; integrating real-time berth availability data with vessel traffic services (VTS) and formalising JIT protocols under the Maritime Decarbonisation Policy would deliver immediate, low-cost emission reductions across the Indian port network.

**MARPOL Port Reception Facilities (PRF):** MARPOL Annexes I through VI require ports to provide adequate reception facilities for ship-generated waste, including oily bilge water, sewage, garbage, scrubber washwater, and exhaust gas cleaning residues. Inadequate PRF availability is a longstanding compliance gap at many Indian ports, creating incentives for illegal at-sea discharge. MEPC has adopted the Comprehensive Manual on Port Reception Facilities and an online PRF reporting system (GISIS module). India's Maritime Decarbonisation Policy should mandate PRF adequacy assessments at all major and non-major ports, establish minimum standards aligned with MARPOL Annex VI scrubber residue management, and integrate PRF planning into Harit Sagar's green port certification. Adequate PRFs are both a MARPOL compliance obligation and a prerequisite for India's aspiration to be a responsible, high-standard maritime nation.

### **3.12 Green Corridors, the Clydebank Declaration, and IMO GreenVoyage2050**

## **Green Shipping Corridors**

Green shipping corridors are specific trade routes between two or more ports along which zero-emission shipping solutions are demonstrated and scaled. The concept, pioneered by the Getting to Zero Coalition and formalised through bilateral government agreements, focuses the early deployment of alternative fuel bunkering infrastructure on high-traffic specific routes rather than attempting a simultaneous global transition. Notable established or announced corridors include Shanghai–Rotterdam (hydrogen/ammonia), Vancouver–Yokohama, and the Maersk-operated green methanol corridors.

For India, green corridor development on key trade routes such as Mundra/JNPT to Rotterdam, Kochi to Singapore, and Visakhapatnam to Yokohama, offers a pathway to demonstrate green bunkering capability, attract zero-emission fleet deployment to Indian ports, and build the commercial relationships with foreign shipping companies and cargo owners that accelerate adoption at scale. The Ministry of Ports, Shipping and Waterways has engaged with the Global Maritime Forum and Getting to Zero Coalition on India corridor development.

### **The Clydebank Declaration (2021)**

The Clydebank Declaration, launched at COP 26 with 22 signatory states (growing to 30+ by 2024), commits participating governments to support the establishment of at least six green shipping corridors by the mid-2020s. The Declaration's significance for India is that it represents the leading edge of government-level commitment to specific route decarbonisation: the policy instrument that creates the enabling conditions (port infrastructure, fuel supply guarantees, regulatory sandboxes) within which private investment in zero-emission shipping operates. India's accession to or engagement with the Clydebank Declaration would signal commitment to corridor-level action complementing IMO fleet-level regulation.

### **IMO GreenVoyage2050**

IMO GreenVoyage2050 is a capacity-building project funded by Denmark, Finland, France, Germany, the Netherlands, and Norway, and implemented by the IMO to assist developing countries in implementing short-term GHG reduction measures and preparing for long-term maritime decarbonisation. India is a project partner, with DGS engaged in implementation of the voluntary JIT arrival guidelines, SEEMP Part III compliance support, and development of the national framework for CII reporting. The project provides technical assistance, training, and pilot project development resources that supplement India's own domestic capacity, an example of the international technology transfer and capacity-building provisions India advocates for in MEPC negotiations.

## **3.13 The Poseidon Principles, Sea Cargo Charter, and Getting to Zero Coalition**

### **Poseidon Principles**

The Poseidon Principles (2019), now with 30+ signatory banks representing approximately USD 185 billion of ship finance portfolios, commit lenders to assess and disclose the climate alignment of their shipping portfolios against the IMO GHG Strategy trajectory. Ships persistently above the alignment threshold face financing constraints: higher margins, shorter tenors, or exclusion from

Poseidon lenders' portfolios. For Indian shipping companies accessing international capital, Poseidon creates near-regulatory compliance pressure ahead of IMO's formal instruments.

### **Sea Cargo Charter**

The Sea Cargo Charter (2020), a complementary initiative for cargo owners and charterers, commits signatories to assess and disclose the climate alignment of their chartered shipping. Major commodity traders (Cargill, Louis Dreyfus), mining companies (Rio Tinto, Vale), and energy majors are signatories. The Sea Cargo Charter creates demand-side pressure: Indian cargo owners and exporters whose counterparties are Sea Cargo Charter signatories face scrutiny of the carbon intensity of the vessels they charter, creating a commercial incentive for Indian shippers to deploy or charter lower-carbon vessels.

### **Getting to Zero Coalition**

The Getting to Zero Coalition, a partnership between the Global Maritime Forum, Friends of Ocean Action, and the World Economic Forum, brings together 200+ companies across the maritime value chain, including shipowners, fuel producers, ports, cargo owners, and financiers, committed to having commercially viable zero-emission vessels in operation by 2030. The Coalition's corridor workstream, fuel pathway analysis, and policy advocacy complement and accelerate the IMO regulatory trajectory. India's engagement with Coalition members, particularly on green corridor development and green fuel offtake agreements, creates the commercial anchoring for domestic green fuel investment.

### **3.14 India's Adoption of IMO Frameworks and Domestic Institutions**

India's adoption of IMO conventions occurs through the Merchant Shipping Act, 1958 (and amendments), with the Directorate General of Shipping (DGS) serving as the flag state administration and statutory survey and certification functions delegated to seven notified Recognised Organisations (ROs):

- MARPOL Annex VI: Implemented through Merchant Shipping (Prevention of Air Pollution from Ships) Rules. Indian-flag vessels carry IAPP Certificates; DGS has issued CII compliance guidance circulars; IRS is an authorised CII verifier.
- STCW: India on STCW Whitelist. IMU and affiliated institutes deliver STCW Basic and Advanced training; extension to alternative fuel competencies in development.
- Ballast Water Management Convention: India is yet to ratify the Convention. Nevertheless, ballast water management practices in Indian shipping are progressively being aligned with IMO standards through regulatory guidance, operational controls, and survey oversight by notified Recognised Organisations (ROs).
- AFS Convention: India ratified; TBT prohibition enforced; hull coating standards incorporated into IRS survey requirements.
- HKC (Recycling of Ships Act 2019): Domestic legislation enacted; Alang facilities advancing toward full HKC authorisation; Ship Breaking Code revised to align with HKC standards.
- London Protocol: India a party; CCS provisions noted in context of offshore sequestration potential.

### **3.15 Maritime India Vision 2030 and Harit Sagar: The Domestic Platform**

Maritime India Vision 2030 (MIV 2030), launched at the Maritime India Summit 2021, provides the strategic framework across 10 themes and 150 initiatives. Its decarbonisation-relevant dimensions include the Sagarmala port-led industrialisation programme (INR 4 lakh crore), ship repair and recycling hub development, inland waterway expansion (National Waterways electrification), coastal shipping promotion, and cruise sector development. MIV 2030 creates the infrastructure platform on which Harit Sagar's decarbonisation requirements are deployed.

The overlap between MIV 2030, Harit Sagar, the Green Hydrogen Mission, MAKV, and Panchamrit creates a powerful strategic alignment: every green maritime investment simultaneously advances the port-led development agenda, the clean energy export ambition, the 2030 climate targets, and the 2047 Viksit Bharat vision. A Maritime Decarbonisation Policy is the instrument that activates and coordinates this alignment across ministries and regulatory bodies.

### **3.16 India's GFI Position and CBDR-RC Advocacy**

India's position at MEPC on the GFI and IMO Net-Zero Framework is nuanced: neither blanket endorsement nor blanket opposition. India supports GFI Tier 1 compliance trajectories that are technically feasible, equitably structured, and do not disadvantage developing countries through asymmetric fuel access or infrastructure readiness. India advocates for meaningful CBDR-aligned transition support; revenue from the IMO economic instrument directed to green fuel infrastructure in developing countries; lifecycle accounting that recognises India's biofuel and green hydrogen potential; differentiated compliance timelines reflecting fleet age profiles; and infrastructure parity conditioning before penalty imposition.

#### **INDIA'S MEPC POSTURE: CONSTRUCTIVE AMBITION AT MEPC**

India's active engagement across MEPC, ISWG-GHG intersessional meetings, and IMO Council reflects a posture of constructive ambition, supporting the net-zero goal while ensuring its operationalisation reflects equity principles. India co-sponsors proposals on capacity-building funds, advocates for well-to-wake accounting that rewards its green hydrogen and biofuel potential, and has contributed substantively to the GFI text. This posture gives India credibility as a constructive multilateral actor, a credibility that reinforces its broader diplomatic positioning in climate negotiations.

## **SECTION – 4: RATIONALE: WHY DECARBONISE MARITIME?**

The regulatory architecture and India's positioning having been established, the case for maritime decarbonisation rests on four strategic anchors that together constitute a rationale far more compelling than the sector's share of national emissions.

### **ANCHOR 1: ENERGY & STRATEGIC SECURITY**

India's renewable cost advantage creates globally competitive green fuel economics. Maritime anchor demand makes green hydrogen and ammonia production commercially viable, converting chronic hydrocarbon import dependency into a clean fuel export surplus with strategic energy security dividends.

### **The Solar-to-Fuel Cost Chain**

India's average solar irradiation of 4.5–6.5 kWh/m<sup>2</sup>/day drives utility-scale solar LCOE below USD 0.03/kWh, among the world's lowest. Electrolyser power input constitutes 60–70% of green hydrogen production cost; at Indian renewable prices, green hydrogen approaches commercial parity with grey hydrogen on a 5–10 year horizon. Green ammonia inherits this cost advantage. Both fuels are the leading zero-emission candidates for deep-sea shipping. India's solar advantage is a strategic asset in the future marine fuel market, but only if a domestic demand anchor is created through a maritime decarbonisation programme.

India imports approximately 85% of crude oil requirements at over USD 130 billion annually. Domestic green fuel production for maritime, combined with green bunkering services at Indian ports on the East-West and India-Africa routes, converts import expenditure into domestic industrial value, creates energy price stability, and generates export revenues from the global fleet's transition demand. The Green Hydrogen Mission's 5 MMTPA target by 2030 creates the supply base; a Maritime Decarbonisation Policy creates the demand certainty that makes large-scale electrolyser investment commercially bankable.

### **ANCHOR 2: MARITIME AS LEAD SECTOR FOR INDIA'S NET-ZERO 2070**

Of all sectors on India's net-zero pathway, maritime is the most transition-ready and its global regulatory framework is the most advanced, its technology pathways are the most clearly defined, and its 20–25 year capital replacement cycle is the most amenable to planned intervention. Early action catalyses the broader economy through green fuel scale effects, MRV infrastructure spillovers, and demonstration credibility.

### **Sectoral Readiness and Catalytic Spillovers**

Dual-fuel engines for LNG, methanol, and ammonia are commercially available. Wind-assisted propulsion systems are in commercial service. Air lubrication systems reduce fuel consumption in deployed installations. The fuel transition pathway is the most clearly defined of any hard-to-abate sector, more so than steel, cement, or aviation. The investment decisions made for new builds ordered in 2025–2035 determine the fleet's carbon profile in 2045–2060: the critical juncture of India's net-zero trajectory. Acting now is categorically more cost-effective than retrofitting or retiring assets later.

Maritime's catalytic spillovers are concrete: scale effects from maritime hydrogen demand reduce production costs for industrial users of the same molecules (steel, fertilisers); MRV infrastructure developed for GFI compliance transfers directly to the CCTS; demonstration of viable decarbonisation strengthens India's climate credibility in diplomatic and financial market terms. Maritime sits at the tip of India's transitional sphere: the most mature point from which momentum builds across harder sectors.

### **ANCHOR 3: MAXIMUM AMPLIFICATION — END-TO-END CARBON ACCOUNTING**

Shipping offers one of the most robust foundations for end-to-end carbon accounting among global sectors: every ship is a uniquely identified registered asset, every bunker delivery is commercially metered, and every voyage records origin, destination, cargo, and distance. While full well-to-wake carbon accounting is still evolving under the IMO's emerging fuel lifecycle frameworks, the institutional architecture for fuel consumption monitoring, voyage reporting, and emissions verification is already well established. This infrastructure for maritime carbon compliance constitutes a national asset that can be leveraged across India's CCTS and NDC reporting architecture.

### **The Template Value**

The GFI framework's well-to-wake lifecycle accounting, covering upstream production through to combustion, is the most rigorous supply chain carbon methodology in any regulated global sector. The institutional infrastructure being built for compliance: fuel certification bodies, carbon registries, port-level data systems, verification protocols, constitutes a national capability directly deployable in the CCTS and NDC reporting architecture. India's investment in maritime carbon accounting is not a compliance cost; it is the construction of a cross-economy institutional asset that accelerates the maturity of the broader domestic carbon market.

### **ANCHOR 4: TRADE COMPETITIVENESS, REPUTATIONAL RISK, AND PUBLIC HEALTH**

Beyond strategic energy security and the net-zero pathway, maritime decarbonisation is compelled by three converging pressures: the trade and market access consequences of carbon regulations now taking effect, the reputational imperatives of India's global positioning, and the domestic public health dividends of cleaner port-city air.

### **Trade Competitiveness and Market Access Risk**

The EU ETS extension to shipping (January 2024) and FuelEU Maritime (2025) have converted the decarbonisation agenda from a future compliance consideration into a present commercial cost. Indian-flag vessels on EU-trading routes now carry carbon price exposure; Indian exporters using foreign-flag vessels face Scope 3 shipping emissions embedded in their EU ETS compliance costs. The EU CBAM, fully operational from 2026, creates further linkage: steel, aluminium, cement,

fertiliser, and hydrogen exports to the EU must account for production and logistics emissions, including shipping. While these regulations are still developing in scope and enforcement intensity, the direction of travel is unambiguous: access to the most lucrative global markets will increasingly be conditioned on demonstrable low-carbon supply chains that include low-carbon shipping. India's export competitiveness in the EU, its second-largest trading partner, depends in part on the ability to offer verifiably green shipping services. Acting now to build green bunkering infrastructure, MRV capability, and a credible domestic carbon framework positions India ahead of the compliance curve rather than in reactive catch-up when the standards bite harder.

### **Reputational Risk and Diplomatic Capital**

India has built significant diplomatic capital as a responsible climate actor: the Panchamrit commitments, the International Solar Alliance, CDRI co-founding, and constructive engagement at MEPC have positioned India as a multilateral leader rather than a reluctant follower. This positioning is an asset: in climate negotiations, in attracting green finance, in securing preferential terms on capacity-building programmes, and in the diplomatic influence that shapes the rules at MEPC and UNFCCC. A failure to act domestically on maritime decarbonisation risks eroding that capital: it exposes India to the accusation of advocating CBDR-RC principles at IMO while not deploying its own policy tools in a sector where it has clear sovereign leverage. A Maritime Decarbonisation Policy reinforces India's narrative as a Vishwa Guru in climate governance: a country that leads by example, not merely by advocacy.

### **Domestic Air Quality and Public Health in Port Cities**

Shipping emissions are not only a climate problem; they are a public health emergency in port cities. A vessel burning heavy fuel oil at berth emits SO<sub>x</sub>, NO<sub>x</sub>, black carbon, and fine particulate matter (PM<sub>2.5</sub>) at concentrations that materially degrade urban air quality. Studies of major port cities worldwide link vessel emissions to elevated rates of respiratory disease, cardiovascular illness, and premature mortality in surrounding populations. India's major port cities, namely Mumbai, Chennai, Kolkata, Visakhapatnam, Kochi, and JNPT-Navi Mumbai, are among the most densely populated urban centres on the coast; the populations living downwind of port operations bear a disproportionate health burden. MARPOL Annex VI's SO<sub>x</sub> ECA provisions have reduced sulphur emissions at sea, but berth-side emissions remain largely unaddressed in India's domestic framework. Shore power deployment, JIT arrival to reduce anchoring time, and stricter berth-side emission standards directly convert maritime decarbonisation investment into measurable public health benefits: reducing hospital admissions, improving quality of life in port communities, and alleviating pressure on India's urban health infrastructure. This co-benefit case makes maritime decarbonisation a health ministry and urban development issue, not only a shipping and climate policy matter.

### **First-Mover Pricing Power in the Indian Ocean Region**

Singapore, Rotterdam, and Fujairah are positioning as green bunkering hubs, but no Indian Ocean port has yet secured an equivalent first-mover advantage. India's geography, astride the busiest East-West and India-Africa shipping corridors, with multiple deep-draught ports and renewable energy at competitive cost, creates a structurally advantaged position for green bunkering hub

development. The first regional hub to achieve scale in green ammonia or methanol bunkering will establish the supply chain relationships, certification infrastructure, and commercial contracts that subsequent entrants must compete against. Critically, as the first mover in the region, India will be positioned to set market prices for green bunker fuels before competition from other Indian Ocean ports develops, capturing a pricing premium and margin that later entrants will not be able to replicate. The window is open: Gulf ports are investing heavily and could close the advantage within this decade. A Maritime Decarbonisation Policy that provides regulatory certainty, infrastructure incentives, and demand anchors for green fuel producers, combined with India's Green Hydrogen Mission supply pipeline, is the instrument that converts geographic advantage into durable market leadership and pricing power.

## **CONCLUSION: THE CASE FOR A MARITIME DECARBONISATION POLICY**

The preceding sections have traced the full arc: from Stockholm 1972 and UNCLOS through the Montreal Protocol's technology transition precedent, the UNFCCC climate architecture, the Basel-HKC ship recycling nexus, the London Protocol's CCS provisions, the UN Global Compact's corporate sustainability framework, the SDGs, and the ILO's just transition imperative; through India's legislative evolution from the Water and Air Acts to the EPA, NAPCC, Green Hydrogen Mission, and Panchamrit; to the complete maritime regulatory architecture comprising SOLAS, STCW, MARPOL's six Annexes including the IMO 2020 global sulphur cap, black carbon, the AFS Convention, HKC, the EEDI/EEEXI/CII progression, the full alternative fuels spectrum, technical and operational efficiency measures, Harit Sagar, green corridors, the Clydebank Declaration, the Poseidon Principles, and the emerging IMO Net-Zero Framework.

The conclusion that emerges from this landscape is both inevitable and urgent.

## **Four Grounds for a Standalone Maritime Decarbonisation Policy**

- The regulatory clock is ticking: At MEPC 83, IMO Member States reached agreement in principle on the mid-term GHG reduction measures, including the proposed Goal-based Fuel Intensity (GFI) standard and an associated economic measure under the emerging IMO Net-Zero Framework. Once formally adopted through MARPOL Annex VI amendments, these measures are expected to significantly influence Indian-flag vessels and vessels calling at Indian ports, potentially from around 2028. India therefore cannot afford to defer engagement; the strategic choice is between proactive policy design and reactive compliance under frameworks shaped by others.
- The opportunity window is time-bounded: Singapore, Rotterdam, and Fujairah are already positioning as green bunkering hubs. The EU ETS and FuelEU Maritime are creating commercial urgency for alternative fuel investment. Green corridors are being established. The window within which India can secure a competitive position as the green bunkering hub for the Indian Ocean region is open, but not indefinitely.
- No existing instrument is sufficient: MIV 2030 provides the infrastructure platform but not the decarbonisation regulatory framework. The EPA provides enabling authority but not sector-specific standards. The CCTS covers industrial emitters but not vessels. MARPOL implementation through DGS addresses flag state compliance but not the supply chain, finance, HKC implementation, or skills dimensions. A Maritime Decarbonisation Policy is the integrating instrument that fills these gaps and creates the coherent regulatory signal investors, shipowners, port developers, and fuel producers need.

- The strategic anchors are compelling and time-sensitive: Energy security, lead-sector catalysis, and the carbon accounting template, together with the HKC commercial opportunity at Alang, the Harit Sagar green port transformation, the green corridor potential, and India's 250,000-strong seafarer community's just transition, constitute a national strategic case for maritime decarbonisation that transcends the sector's emissions share.

### **THE POLICY IMPERATIVE**

A Maritime Decarbonisation Policy is the instrument through which India: converts its renewable advantage into a green marine fuel export position; implements HKC compliantly and captures the global ship recycling premium; deploys Harit Sagar's green port framework with regulatory force; accelerates net-zero by leading with the most transition-ready sector; builds carbon accounting infrastructure that strengthens the CCTS; and discharges IMO obligations in ways that reflect CBDR-RC and serve India's development interests. It is not a compliance document; it is a national strategic instrument.

## PART II: Executive Summary

India's maritime sector is entering a decisive decade of transformation. As the country expands port capacity, strengthens shipbuilding, modernises inland waterways and positions itself as a global logistics and manufacturing hub, the global maritime landscape is simultaneously being reshaped by net-zero commitments, lifecycle emissions standards, sustainable finance and rapidly evolving regulatory frameworks.

The National Maritime Decarbonisation Policy Framework (NMDPF) responds to this moment by establishing the integrated national architecture within which India's maritime decarbonisation transition will be planned, financed, governed and measured. It aligns industrial growth, infrastructure development, technology innovation, green finance and human capital under a common decarbonisation logic, providing the policy spine that connects India's existing maritime programmes into a coherent long-term strategy.

At the heart of the NMDPF are eight interconnected policy pillars that collectively define India's long-term transition pathway.

**Pillar 1 - Green Shipbuilding and Retrofits** establishes a comprehensive pathway for transforming India's vessel ecosystem through performance-linked incentives, national green certification standards, retrofit financing, innovation clusters, zero-emission coastal shipping, and digital MRV systems. By combining industrial policy with lifecycle emissions standards and future-fuel readiness, the pillar aims to position India as a competitive global hub for low-carbon shipbuilding while accelerating modernization of the domestic fleet.

**Pillar 2 - Green Ports** advances the transition of Indian ports into low-carbon, digitally enabled and climate-resilient logistics hubs through large-scale electrification, renewable energy adoption, shore power infrastructure, smart environmental monitoring, sustainable infrastructure standards and green corridor initiatives. The pillar extends beyond port boundaries by incorporating value chain emissions, coastal ecosystem protection and international partnerships, creating an integrated model for sustainable port development.

**Pillar 3 - Green Ship Recycling** reinforces India's leadership in responsible end-of-life vessel management by strengthening compliance with international conventions, digital governance, worker safety, environmental protection and circular economy principles. Through a national recycling portal, green steel pathways, innovation programmes and modern compliance frameworks, the pillar positions ship recycling as both a strategic industrial sector and a critical contributor to resource efficiency and maritime decarbonisation.

**Pillar 4 - Green Finance** establishes the enabling financial architecture required to scale maritime decarbonisation by introducing a dedicated maritime green finance taxonomy, ESG reporting frameworks, digital MRV systems and innovative financing instruments. By aligning domestic financial mechanisms with international sustainability standards while mobilising blended finance, green bonds, concessional lending and multilateral partnerships, the pillar seeks to unlock long-term investment across ships, ports, alternative fuels and circular economy infrastructure.

**Pillar 5 - Green Skills and Capacity Building** develops the human capital required for India's maritime transition through a National Green Maritime Skill Mission integrating competency

standards, specialised certification pathways, simulation-based training and international collaboration. By creating a future-ready workforce equipped for alternative fuels, digital systems, sustainable port operations and green technologies, the pillar ensures that maritime decarbonisation becomes an inclusive transition generating high-quality employment and global talent leadership.

**Pillar 6 – Alternative Fuels** Alternative Fuels accelerates the transition towards low- and zero-emission maritime energy systems through biofuel blending mandates, green hydrogen, ammonia, methanol and electrification pathways, supported by bunkering infrastructure, Green Fuel Development Zones, demand aggregation mechanisms, green shipping corridors and long-term investment in next-generation fuels. By strengthening domestic production capabilities and enabling future fuel ecosystems, the pillar seeks to establish India as a leading producer, supplier and consumer of sustainable maritime fuels.

**Pillar 7 – Green Technology** Green Technology positions innovation as the primary enabler of maritime decarbonisation by promoting advanced propulsion systems, AI-enabled operations, digital twins, onboard carbon capture, smart ports, renewable energy integration and frontier technologies. Through coordinated research, certification frameworks and technology parks, the pillar seeks to accelerate domestic innovation while strengthening India's long-term technological competitiveness.

**Pillar 8 – Pollution Prevention/ Waste Management** complements decarbonisation by strengthening waste management, oil spill preparedness, water quality monitoring, noise control and marine ecosystem protection. By embedding circular economy principles and international environmental standards across maritime operations, the pillar ensures that India's maritime growth remains environmentally responsible, resilient and globally aligned.

Supporting these pillars is a comprehensive governance framework that defines institutional responsibilities, implementation mechanisms, monitoring systems, financing linkages, and inter-ministerial coordination processes required for effective execution. The framework adopts a phased approach with measurable outcomes, enabling adaptive implementation while maintaining long-term strategic direction.

Recognising the global nature of maritime decarbonisation, the framework also places significant emphasis on international cooperation. It identifies opportunities for collaboration on green shipping corridors, sustainable finance, technology transfer, research partnerships, harmonised standards, capacity building, and multilateral engagement.

The National Maritime Decarbonisation Policy Framework adopts a whole-of-government and whole-of-sector approach to maritime transition. By integrating infrastructure development, industrial policy, climate action, innovation, finance and social inclusion within a single strategic architecture, it provides a clear roadmap for building a competitive, resilient and low-carbon maritime ecosystem while positioning India as a global leader in sustainable maritime development.

## PART III: Policy Framework Pillars

### Pillar 1: Green Shipbuilding and Retrofits

#### **SECTION 1: GLOBAL CONTEXT & INDIA'S POSITION**

The global shipbuilding industry is undergoing a major transition driven by tightening decarbonisation regulations, fuel transition requirements, and growing demand for low and zero-emission vessels. Alternative fuel vessels operating on LNG, methanol, ammonia, hydrogen and hybrid-electric propulsion systems are moving from pilot deployment to commercial scale, while demand for retrofits is increasing for energy-efficiency systems, onboard carbon capture, shore power integration and digital fuel optimisation technologies. The IMO's Revised GHG Strategy, FuelEU Maritime regulations, EU ETS requirements and sustainability-linked financing frameworks are accelerating investment in green shipbuilding and retrofitting globally.

China, the Republic of Korea and Japan continue to dominate global shipbuilding output, together accounting for over 90% of global orderbook tonnage. China has integrated green shipbuilding within large-scale industrial manufacturing ecosystems and alternative fuel technology programmes. The Republic of Korea has positioned green shipbuilding as a strategic national industry through investments in ammonia-fuelled vessels, hydrogen propulsion systems and low-carbon ship technologies. Japan has focused on fuel-flexible vessel designs and integrated fuel-transition roadmaps linking shipping, ports and industrial decarbonisation. Singapore and Norway have emerged as leaders in green retrofits, maritime innovation, digital MRV systems and green corridor deployment through targeted public-private investment models.

India's shipbuilding sector remains a strategic pillar of the country's maritime industrial ambitions, with policy support increasingly focused on capacity expansion, technological modernisation, and green vessel development. In this context, the Shipbuilding Financial Assistance Scheme (SBFAS), extended until 31 March 2036 with a corpus of ₹24,736 crore and incorporating support through the Shipbreaking Credit Note Scheme, together with the proposed Shipbuilding Development Scheme (SbDS) with a budgetary outlay of ₹19,989 crore, provides the financial backbone for expanding domestic shipbuilding capacity to 4.5 million Gross Tonnage annually, supporting mega shipbuilding clusters, infrastructure expansion, ship design and technology development, and risk coverage mechanisms. Maritime India Vision 2030 and Amrit Kaal Vision 2047 further identify shipbuilding and maritime manufacturing as strategic sectors for long-term growth and competitiveness.

India has also initiated early-stage green maritime transition measures. The Green Tug Transition Programme (GTTP) has been launched to support cleaner propulsion systems for harbour tugs, while the Inland Waterways Authority of India (IWAI) has initiated deployment of electric vessels and hydrogen-fuel feasibility projects for inland waterways. Shipyards and maritime technology firms are increasingly exploring hybrid-electric systems, methanol-ready vessels, shore power integration and digital fuel optimisation technologies. The Directorate General of Maritime Administration (DGMA), Maritime Development Fund (MDF) and Sagarmala Finance Corporation Limited (SMFCL) together provide the institutional foundation for scaling green shipbuilding and retrofit financing frameworks.

## **SECTION 2: POLICY MEASURES**

### **1.1 Definition**

A Green Ship means a ship that integrates advanced technologies, low- or zero-emission energy systems, and operational best practices to reduce emissions, fuel consumption, and environmental pollution, while complying with applicable national and international regulatory standards and contributing towards India's maritime decarbonisation goals. Green Ships shall be classified as Energy Efficient, Low Emission, or Zero Emission based on verified lifecycle emissions performance and technology integration, and shall include both newbuilds and retrofitted vessels meeting prescribed certification criteria.

### **1.2 Fleet Modernisation and Green Shipbuilding**

1.2.1 The Shipbuilding Financial Assistance Scheme (SBFAS) shall be supplemented with a Green Ship Incentive Layer linked to the National Green Ship Certification Framework, Green Compliance Index (GCI), verified lifecycle emissions reduction, and prescribed domestic value addition requirements.

1.2.2 In the near to medium term, vessels integrating transition technologies including dual-fuel flexibility, methanol-ready or LNG-ready architecture, wind-assisted propulsion, waste heat recovery systems, hybrid-electric propulsion, air lubrication systems, digital fuel optimisation systems, and other notified low-emission technologies shall be eligible for enhanced assistance under Shipbuilding Financial Assistance Scheme (SBFAS) based on verified lifecycle emissions reduction and Green Ship Certification tier classification.

1.2.3 In the long term, priority support shall be provided for vessels achieving certified net-zero lifecycle emissions through full electrification, green hydrogen, ammonia propulsion, fuel-cell systems, or equivalent zero-emission propulsion systems, with support of up to 50% of incremental green technology cost over conventional vessel baselines.

1.2.4 Green shipbuilding incentives shall be disbursed only upon compliance with notified Green Ship Design Standards, Green Ship Certification tier requirements, MRV reporting obligations, and verification of domestic value addition.

1.2.5 The Directorate General of Maritime Administration (DGMA), in coordination with the National Green Maritime Coordination Cell (NGMCC), the central coordination body for implementation of the National Maritime Decarbonisation Policy, shall notify Green Ship Design Standards covering fuel readiness, lifecycle emissions accounting, energy efficiency, onboard digital monitoring, future-fuel-ready design provisions, and retrofit compatibility.

### **1.3 Green Ship Certification and Procurement**

1.3.1 A National Green Ship Certification Framework shall be notified under the Merchant Shipping Act, 2025, with tiered certification standards covering high-efficiency vessels, future-fuel-ready vessels, and zero-emission-ready vessels aligned to IMO GHG Fuel Intensity (GFI) thresholds and alternative fuel compatibility requirements.

1.3.2 Mandatory basic compliance under the Green Ship Certification Framework shall apply to all Indian-flagged ships in alignment with applicable IMO decarbonisation and emissions compliance requirements, while advanced compliance standards shall be progressively mandated for coastal and inland waterway newbuilds in accordance with evolving global green shipping standards.

1.3.3 Green Ship Certification shall be progressively integrated into the vessel registration framework from 2030 onwards and linked to eligibility for Shipbuilding Financial Assistance Scheme (SBFAS) support, Green Compliance Index (GCI)-based incentives, and access to concessional finance.

1.3.4 A Government ship procurement, including vessels for the Indian Coast Guard, port authorities, public sector shipping companies, inland waterways, and research institutions, shall progressively prioritise procurement of green-certified vessels.

#### **1.4 Green Retrofitting and Retrofit Finance**

1.4.1 A dedicated subsidy, linked to verified emission reduction outcomes, shall be introduced to support retrofitting of existing vessels with alternative fuel systems, hybrid propulsion, onboard carbon capture, energy-saving devices, hull efficiency technologies, waste heat recovery, digital fuel optimisation, and other notified low-emission technologies, subject to techno-economic feasibility based on vessel age, residual asset life, structural suitability, retrofit complexity, and expected emissions reduction.

1.4.2 Financial risk-sharing mechanisms for green retrofitting shall be operationalised through government-backed loan guarantees, concessional financing, insurance premium subsidies, blended finance mechanisms, public-private partnership frameworks, and green bonds linked to verified emissions performance.

1.4.4 Sagarmala Finance Corporation Limited (SMFCL) and the Maritime Development Fund (MDF) shall establish dedicated green retrofit financing windows aligned with National Green Maritime Coordination Cell (NGMCC)-certified eligibility criteria and MRV verification frameworks.

#### **1.5 Green Innovation and Industrial Ecosystems**

1.5. A Green Innovation Fund financed through the Maritime Development Fund (MDF) shall support pilot deployment, localisation, and commercialisation of green propulsion technologies, hybrid-electric systems, methanol-ready vessel systems, onboard carbon capture technologies, battery-electric propulsion systems, digital emissions monitoring systems, and other maritime decarbonisation technologies.

1.5.2 Green Shipbuilding Clusters shall be designated in Andhra Pradesh, Odisha, Gujarat, Maharashtra, and Tamil Nadu as integrated low-carbon maritime manufacturing and innovation hubs supporting green vessel construction, retrofit engineering, marine battery integration, alternative fuel systems, propulsion technologies, and digital maritime systems.

#### **1.6 Zero Emission Coastal and Inland Shipping**

1.6.1 Selected coastal and inland waterway routes shall be designated as Zero Emission Zones (ZEZs) based on the corridor selection framework identified under the India Green Corridors Pre-Feasibility Study and Consortium Incubation Workshop (CIW), considering fuel availability, port readiness, infrastructure, vessel suitability, and techno-economic feasibility. Initial implementation shall prioritise the first wave of shortlisted inland and coastal corridors, with progressive transition towards zero- and low-emission vessel operations, particularly for inland passenger ferries, harbour craft, coastal cargo vessels, and other short-sea shipping segments.

1.6.2 The Green Tug Transition Programme (GTTP) shall be expanded to accelerate the transition of conventional tug operations towards zero- and low-emission propulsion systems through targeted financial support, green procurement mandates, supporting charging and bunkering infrastructure at ports, and phased adoption of cleaner tug technologies including electric, hybrid-electric, hydrogen, methanol, and other notified alternative fuel systems.

## **1.7 Regulation, MRV and Shipyard Decarbonisation**

1.7.1 A national Monitoring, Reporting and Verification (MRV) framework shall be operationalised through NLP-Marine for monitoring lifecycle emissions, GHG Fuel Intensity (GFI), fuel transition progress, energy efficiency performance, retrofit outcomes, and environmental performance of notified maritime assets.

1.7.2 Green Compliance Index (GCI)-linked reporting requirements shall be mandatory for notified categories of vessels, shipyards, ports, and retrofit projects.

1.7.3 Green Shipyard Decarbonisation Standards, including a yard-specific Green Compliance Assessment (GCA) framework, shall be notified to monitor and progressively reduce emissions from shipbuilding and ship repair operations through renewable energy adoption, energy-efficient manufacturing, low-carbon fabrication practices, electrification of yard equipment, resource efficiency measures, and lifecycle carbon accounting.

## **1.8 International Collaboration**

1.8.1 Strategic international partnerships shall be strengthened with leading green maritime nations, the IMO, classification societies, maritime technology providers, and multilateral institutions to facilitate technology transfer, technical cooperation, regulatory harmonisation, capacity building, alternative fuel safety standards, digital MRV systems, and access to maritime decarbonisation finance in alignment with global decarbonisation pathways<sup>1</sup>.

1.8.2 International collaborations shall support pilot and demonstration projects, joint R&D programmes, knowledge exchange, and domestic capability development in green maritime technologies, including alternative fuels, hybrid and battery-electric propulsion systems, green

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<sup>1</sup> India and Singapore are collaborating on a Green and Digital Shipping Corridor to promote low-emission shipping and maritime digitalisation. Under the India–Denmark Green Strategic Partnership, the India Green Shipping Corridors Pre-Feasibility Study was undertaken to identify viable green corridor opportunities for India. Through the IMO GreenVoyage2050 Programme, technical cooperation is being strengthened to support maritime decarbonisation through capacity building, pilot projects, and adoption of low- and zero-emission shipping solutions.

shipbuilding, and other low- and zero-emission maritime solutions, while supporting implementation of IMO decarbonisation measures.

## **1.9 Governance**

1.9.1 This pillar shall be implemented under Working Group 1, led by the Directorate General of Maritime Administration. DGMA shall be responsible for notifying the Green Ship Certification Framework and Green Ship Design Standards under the Merchant Shipping Act 2025, administering GCI-linked compliance and reporting requirements for vessels and shipyards, and overseeing the restructured Shipbuilding Financial Assistance Scheme (SBFAS) performance-linked framework. For the detailed governance framework and implementation architecture under the National Maritime Decarbonisation Policy, refer to Part IV: Policy Governance.

1.9.2 The Ministry of Heavy Industries and DPIIT shall be responsible for designating Green Shipbuilding Clusters and coordinating domestic manufacturing capability development in green maritime technologies. Sagarmala Finance Corporation Limited and the Maritime Development Fund shall be responsible for operationalising dedicated green retrofit and newbuild financing windows aligned with NGMCC-certified eligibility criteria.

1.9.3 The Working Group shall coordinate with the Indian National Shipowners Association, Indian Register of Shipping, and Cochin Shipyard Limited on implementation. The Working Group shall coordinate directly with its sectoral stakeholders and report on a continuous basis to the National Green Maritime Coordination Cell (NGMCC) administered by National Centre of Excellence in Green Port and Shipping (NCoEGPS), which shall consolidate pillar-level progress into biannual reporting to the Secretary MoPSW and annual reporting to Inter-Ministerial Taskforce on Maritime Decarbonisation (IMTMD).

## **SECTION 3: TARGETS**

### **Short-Term (0–6 Months)**

1. Initiate the process for the development of Green Ship Design Standards and Green Ship Certification Framework, GCI-linked incentives, and green retrofit financing mechanisms through Shipbuilding Financial Assistance Scheme (SBFAS), Sagarmala Finance Corporation Limited (SMFCL), and the Maritime Development Fund (MDF).
2. Initiate development of Zero Emission Zones (ZEZs), including route-level techno-economic feasibility assessments, fuel availability planning, supporting bunkering and charging infrastructure frameworks, and national MRV reporting architecture through NLP-Marine.
3. Identify Green Shipbuilding Clusters and initiate international partnerships for green propulsion technologies, lifecycle assessment methodologies, digital MRV systems, and maritime decarbonisation financing.

### **Medium-Term (6 Months–2 Years)**

4. Notify Green ship design standards, Operationalise the Green Ship Certification Framework, national MRV reporting systems, green retrofit financing windows, and GCI-linked reporting requirements for notified maritime assets.
5. Promote alternative fuel penetration in coastal and inland waterway fleets through phased implementation of Zero Emission Zones (ZEEs), Green Tug Transition Programme (GTTP), technically feasible retrofit initiatives, and supporting alternative fuel infrastructure.
6. Initiate Green Shipbuilding Clusters in identified coastal maritime states and plan/execute pilot projects for green propulsion systems, onboard carbon capture technologies, and low-emission vessel operations.
7. Promote renewable electricity utilisation in notified shipyards and operationalise green shipyard decarbonisation standards.
8. Prioritise green-certified vessels for at least 30% of government ship procurement, wherever technically and operationally feasible.

### **Long-Term (2–5 Years)**

9. Mandate advanced Green Ship Certification compliance for all coastal and inland waterway newbuilds and operationalise role-based Green Compliance Index (GCI) reporting across notified maritime sectors.
10. Strive to achieve 30% clean fuel adoption across the Indian coastal and inland fleet through scale-up of green vessel deployment, technically viable retrofit programmes, fleet modernisation, and alternative fuel infrastructure.
11. Strive to achieve 50% renewable electricity utilisation in notified shipyards and operationalise integrated low-carbon shipbuilding and green maritime manufacturing ecosystems.
12. Position India among the leading global green shipbuilding and green retrofit destinations through integrated green shipbuilding, green fuel infrastructure, digital MRV systems, and maritime decarbonisation financing frameworks.

## **Pillar 2: Green Ports**

### **SECTION 1: GLOBAL CONTEXT & INDIA'S POSITION**

India's port sector has undergone significant transformation over the past decade, driven by increasing cargo volumes, terminal mechanisation, infrastructure expansion, and growing emphasis on environmental sustainability. With 14 Major Ports and over 200 Non-Major Ports administered by State Maritime Boards, ports play a critical role in supporting India's trade, energy security, industrial development, and logistics connectivity. As port operations continue to expand, environmental considerations associated with energy consumption, equipment operations, vessel activities, dredging, waste generation, and coastal ecosystem impacts have gained increasing prominence.

The sustainability agenda within Indian ports has been guided by a series of national policy and institutional initiatives. Maritime India Vision 2030 introduced sustainability as a key pillar of port modernisation, while the Maritime Amrit Kaal Vision 2047 further reinforced the role of ports in supporting India's long-term decarbonisation and green growth ambitions. At the operational level, the Harit Sagar Guidelines have provided a structured framework for environmental management, resource efficiency, pollution prevention, renewable energy adoption, and ecosystem protection across ports. More recently, the Green Port Performance Index (GPPI) has established a standardised mechanism for assessing and benchmarking environmental performance across Indian ports.

**Renewable energy** deployment has emerged as one of the most visible sustainability achievements across Indian ports. Several major ports have undertaken significant investments in solar and wind energy infrastructure to reduce dependence on conventional grid electricity and lower operational emissions. Ports such as New Mangalore Port Authority, V.O. Chidambaranar Port Authority, Visakhapatnam Port Authority, Jawaharlal Nehru Port Authority, Paradip Port Authority, Cochin Port Authority, Mumbai Port Authority, and Deendayal Port Authority have implemented renewable energy projects ranging from rooftop solar systems to utility-scale solar and wind installations. In several cases, renewable energy contributes a substantial proportion of internal electricity consumption, demonstrating growing commitment towards clean energy adoption.

Alongside renewable energy deployment, ports have increasingly focused on **electrification** of equipment and infrastructure. Electrification initiatives include the replacement of diesel-powered cargo handling equipment with electric alternatives, deployment of electric rubber-tyred gantry cranes, electric yard equipment, electrified conveyor systems, and adoption of electric vehicles within port premises. Several ports have also initiated early-stage deployment of Shore Power (Onshore Power Supply) infrastructure to enable vessels to connect to grid electricity while at berth, reducing emissions associated with onboard auxiliary engines. The Green Tug Transition Programme (GTTP) has further accelerated efforts to transition harbour craft and tug operations towards cleaner propulsion technologies.

**Energy efficiency** improvements have become an integral component of port sustainability programmes. Indian ports have undertaken initiatives such as LED lighting retrofits, automated energy management systems, smart metering, energy audits, terminal automation, operational optimisation, and building efficiency upgrades. These measures have contributed to reductions in electricity consumption, operational costs, and emissions intensity while improving overall resource efficiency.

**Environmental management practices** have also expanded significantly across major and non-major ports. Many ports operate wastewater treatment and recycling facilities, rainwater harvesting systems, dust suppression mechanisms, environmental monitoring programmes, and solid waste management systems. Green belt development, mangrove conservation, afforestation initiatives, biodiversity enhancement programmes, and beneficial reuse of dredged material are increasingly being integrated into port environmental management strategies. Regular monitoring of air quality, harbour water quality, noise levels, and environmental compliance indicators has become common practice across major ports.

**Carbon accounting and sustainability reporting practices** are gradually emerging within the sector. Several ports have initiated monitoring of fuel consumption, electricity usage, and greenhouse gas emissions as part of environmental management and sustainability reporting activities. While individual ports have made progress in emissions monitoring, a nationally harmonised framework for carbon accounting, emissions reporting, baseline development, and performance benchmarking has yet to be established.

### **International Benchmarking**

Globally, leading ports have increasingly adopted comprehensive decarbonisation strategies that extend beyond environmental compliance and focus on measurable emissions reduction, energy transition, digitalisation, and climate resilience. Ports such as Rotterdam, Antwerp-Bruges, Hamburg, Singapore, Los Angeles, and Long Beach have established integrated sustainability frameworks supported by carbon accounting systems, renewable energy infrastructure, alternative fuel ecosystems, and advanced monitoring platforms.

A common feature across leading international ports is the adoption of emissions accounting frameworks, enabling systematic measurement and management of direct, indirect, and value-chain emissions. Shore Power Supply systems have been progressively deployed at select leading ports like Port of Rotterdam and Los Angeles to reduce vessel emissions at berth, while electrification of cargo handling equipment, port vehicles, and terminal operations has become increasingly widespread. Several ports have also invested in large-scale renewable energy projects, battery energy storage systems, and smart energy management platforms to support low-carbon operations.

International ports are increasingly adopting Green Corridor initiatives, Just-in-Time arrival systems, and digital platforms to optimise vessel-port interactions and reduce operational emissions. Sustainability reporting, digital Monitoring, Reporting and Verification (MRV) systems, and climate resilience planning have become integral components of port management frameworks.

Indian ports have made notable progress in renewable energy deployment, equipment electrification, environmental monitoring, and sustainability initiatives. Building on these efforts, further advancement in emissions management, reporting system, digitisation and clean energy infrastructure can support the continued transition towards sustainable and low carbon port operations.

## **SECTION 2: POLICY MEASURES**

### **2.1 Definition**

A Green Port is a port facility that systematically reduces its greenhouse gas emissions, air pollutant discharges, and environmental impacts across all port-owned and port-controlled operations through the integration of renewable energy systems, electrification of cargo handling equipment and harbour craft, shore power infrastructure, sustainable waste and water management, and real-time environmental monitoring. A Green Port further supports the broader maritime energy transition by providing infrastructure for the production, storage, bunkering, and supply of

alternative maritime fuels to calling vessels, and by enabling vessels to reduce their own emissions during port stays.

## **2.2 Port Operations and Equipment – Scope 1**

2.2.1 The electrification of cargo handling equipment, harbour craft, and port vehicles shall be mandated through a phased implementation programme, with compliance timelines scaled to port size and operational category. Renewable energy integration, smart energy management, waste management, and air quality monitoring shall be required across all major and non-major ports. Environmental performance shall be assessed and publicly reported annually against the Green Port Performance Index (GPPI)

2.2.2 Ports, shipyards, and maritime industrial facilities shall progressively integrate solar, wind, battery storage, and smart grid systems to reduce dependence on fossil fuels. In alignment with the Harit Sagar Green Port Guidelines and Maritime India Vision 2030, all major ports shall endeavour to achieve a renewable energy share exceeding 60% by 2030 and 90% by 2047. All new port construction and major retrofits shall comply with LEED, IGBC, or GRIHA green building standards, with green procurement standards applied to all major equipment and infrastructure tenders.

2.2.3 Hybrid or low-emission technologies for dredgers, harbour craft, and port vehicles shall be mandated through a phased implementation programme. Mandatory real-time IoT-based environmental monitoring shall be instituted at all major ports, covering emissions from port machinery, cargo handling equipment, and harbour craft. Environmental performance data shall feed into the national MRV framework and form the basis for mandatory periodic auditing and public sustainability reporting.

## **2.3 Port Energy and Infrastructure – Scope 2**

2.3.1 The development of Shore Power Supply infrastructure shall be progressively undertaken across major and non-major ports to reduce emissions from vessels at berth. For smaller harbour craft, ferries and patrol vessels, shore power connections shall be prioritised. For larger commercial vessels including container ships, bulk carriers and tankers, Shore Power Supply infrastructure shall be developed in a phased manner subject to standardised technical requirements, grid capacity assessments, renewable electricity integration, and incentive mechanisms for adoption.

2.3.2 Ports shall progressively increase the share of renewable energy in port operations through deployment of solar, wind, and other suitable clean energy technologies, supported by renewable electricity procurement, battery energy storage systems, and smart energy management solutions. Progressive expansion of renewable energy shall be pursued by 2030 with ports achieving 90% renewable energy consumption by 2047 in alignment with the Harit Sagar Green Port Guidelines.

2.3.3 Energy efficiency measures shall be integrated across port terminals, buildings, lighting systems, and operational infrastructure through adoption of energy-efficient technologies, smart grid solutions, and continuous energy performance improvement programmes.

## **2.4 Vessels, Value Chain and Coastal Environment – Scope 3**

2.4.1 A voluntary framework for tracking and disclosing Scope 3 emissions associated with vessel calls, hinterland transportation, and port-linked logistics operations shall be developed to support comprehensive emissions visibility across the maritime value chain. Major ports shall be encouraged to progressively integrate Scope 3 emissions data into their annual sustainability disclosures, in alignment with evolving international reporting standards and the National Green Port Index methodology.

2.4.2 Green Corridor initiatives, Just-in-Time arrival systems, digital port call optimisation measures, and other collaborative vessel-port efficiency programmes shall be promoted to reduce emissions associated with vessel movements, waiting times, and port interface activities.

2.4.3 Ports shall establish and maintain adequate waste reception facilities, pollution prevention infrastructure, and environmental management systems in accordance with applicable national regulations and international conventions to minimise adverse impacts on the marine environment.

2.4.4 Biodiversity conservation, coastal ecosystem protection, mangrove restoration, and nature-based solutions shall be integrated into port planning, development, and operational activities to strengthen environmental sustainability and ecological resilience.

2.4.5 Climate risk assessment, adaptation planning, and resilience measures shall be incorporated into port development and operational frameworks to address risks associated with sea level rise, extreme weather events, coastal erosion, flooding, and other climate-related impacts.

## **2.5 Technology and Digitalisation**

2.5.1 Digital platforms and smart port technologies shall be promoted to support emissions monitoring, environmental compliance, operational efficiency, and sustainability reporting across major and non-major ports.

2.5.2 Carbon accounting tools, digital dashboards, IoT-enabled monitoring systems, and other data-driven solutions shall be deployed to support performance benchmarking, regulatory compliance, and informed decision-making.

2.5.3 The Maritime Single Window (MSW) shall be progressively strengthened to achieve full integration across all major and non-major ports in alignment with IMO FAL convention requirements. The Integrated Berth and Terminal management system (IBTMS) shall be implemented across major ports to support real time berth scheduling, vessel traffic management and port call optimization.

## **2.6 Research and Innovation**

2.6.1 Research, development, and pilot projects for emerging port decarbonisation technologies shall be promoted through collaboration between ports, research institutions, industry, and technology providers, with financial support for technology validation and scale-up across energy efficiency, renewable energy integration, low-emission equipment, digital systems, and climate-resilient port infrastructure.

## **2.7 International Cooperation and Maritime Diplomacy**

2.7.1 India shall actively engage with the IMO, including MEPC processes, and international maritime forums to shape and align with evolving global port sustainability standards. Strategic partnerships with international port authorities, technology providers, and multilateral organisations shall be promoted to facilitate technology transfer, joint research, and adoption of global best practices in green port development and maritime decarbonisation.

2.7.2 India shall further pursue sister port partnerships between major Indian ports and leading international green ports to facilitate knowledge exchange, technology transfer and benchmarking of sustainability practices. India's participation in key international maritime forums and events, including dedicated India Pavilions, shall be strengthened to showcase green port initiatives and attract global partnerships. Engagement with International Labour Organization (ILO) shall be maintained to ensure that the green port transitions is inclusive and supports the protection of port workers' rights and livelihoods.

## **2.8 Governance**

2.8.1 This pillar shall be implemented under Working Group 3, led by the Indian Ports Association in coordination with the Major Port Authorities. The Indian Ports Association shall be responsible for coordinating the adoption of the Green Port Performance Index across all major ports, overseeing compliance with Harit Sagar Green Port Guidelines, and facilitating the Annual Port Sustainability Forum. Major Port Authorities shall be responsible for operationalising electrification timelines, renewable energy targets, OPS infrastructure, and the National Green Port Digital Platform within their respective jurisdictions. For the detailed governance framework and implementation architecture under the National Maritime Decarbonisation Policy, refer to Part IV: Policy Governance.

2.8.2 MoPSW through State Maritime Boards shall be responsible for coordinating GPPI reporting and Green Port Certification requirements for non-major ports above prescribed throughput thresholds. The Ministry of Power and State Distribution Companies shall be responsible for grid capacity augmentation and tariff harmonisation required for shore power implementation. National Centre of Excellence in Green Port and Shipping (NCoEGPS) shall provide technical secretariat support and maintain the national repository of port sustainability performance data.

2.8.3 The Working Group shall comprise the Indian Ports Association, Major Port Authorities, State Maritime Boards, National Centre of Excellence in Green Port and Shipping (NCoEGPS), Inland Waterways Authority of India, Ministry of Power, State Distribution Company (DISCOM), and port operators. The Working Group shall coordinate directly with its sectoral stakeholders and report on a continuous basis to the National Green Maritime Coordination Cell (NGMCC) administered by National Centre of Excellence in Green Port and Shipping (NCoEGPS), which shall consolidate pillar-level progress into biannual reporting to the Secretary MoPSW and annual reporting to Inter-Ministerial Taskforce on Maritime Decarbonisation (IMTMD).

## **SECTION 3 TARGETS**

### **Short-Term (0–6 Months)**

1. Establish the National Port Sustainability Council under MoPSW with a dedicated Green Ports Working Group; notify phased electrification timelines for cargo handling equipment,

port vehicles, and harbour craft across all major ports, with compliance schedules scaled to port size and operational category.

2. Strengthen the Green Port Performance Index (GPPI) framework by integrating ISO 14001 and ISO 50001 compliance credited inputs, introduce tiered Green Port Certification levels linked to composite GPPI score thresholds, and mandate third-party verification of port-submitted data from the first assessment cycle.
3. Issue renewable energy adoption targets for all major ports and notify green procurement standards for port equipment and infrastructure tenders; formally extend the Green Tug Transition Programme to dredgers, pilot vessels, mooring boats, and other port-controlled harbour craft with phased transition schedules and associated financial incentives.
4. Commence procurement and development of the National Green Port Digital Platform as the single interface for Scope 1 and Scope 2 emissions reporting, GPPI score computation, third-party audit workflows, and port sustainability reporting across major and non-major ports.

### **Medium-Term (6 Months–2 Years)**

5. Strive to achieve a minimum 50% renewable energy share in port operations at all major ports; operationalise battery energy storage systems and smart energy management platforms; and expand renewable energy adoption to non-major ports.
6. Operationalise the National Green Port Digital Platform with mandatory emissions reporting, third-party audit workflows, and integration with the Maritime Single Window; publish port-wise GPPI scores annually.
7. Notify phased Shore Power Supply installation timelines for all 14 major ports and establish the shore power financing framework in coordination with the Ministry of Power and state DISCOMs and promote installation of Shore Power Supply at Non major ports
8. Operationalise Just-in-Time arrival systems at all major ports and notify the Green Maritime Corridor framework with designated priority domestic routes.

### **Long-Term (2–5 Years)**

9. Maximize renewable-powered operations at all major ports through accelerated renewable energy deployment; complete electrification of cargo handling equipment; and achieve universal Shore Power Supply coverage across all major port terminal categories.
10. Extend mandatory GPPI reporting and Green Port Certification to all non-major ports above prescribed throughput thresholds under the Indian Ports Act 2025; mandate Green Port Certification as a condition for eligibility under central green finance and incentive schemes.

## [Pillar 3: Green Ship Recycling](#)

### **SECTION 1: GLOBAL CONTEXT & INDIA'S POSITION**

The global ship recycling market, valued at \$9.1 billion in 2025, is projected to reach \$13 billion by 2030 at a CAGR of 7.4%, driven by an ageing global fleet, tightening emissions regulations accelerating end-of-life decisions, and growing demand for recycled steel.<sup>2</sup> Bulk carriers, container

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<sup>2</sup> BCC Research, *Global Ship Recycling Market*, August 2025

ships, and oil tankers constitute the dominant vessel categories entering the recycling pipeline. Asia accounts for the major share of global recycling activity, with the South/West Asian cluster India, Bangladesh, and Pakistan processing the largest volumes by DWT (Dead Weight Tonnage).<sup>3</sup>

India ranks among the top two ship recycling nations globally by deadweight tonnage processed, maintaining a stable throughput of 3–4 million DWT annually through market cycles between 2019 and 2026. Bangladesh is the aggregate volume leader but has demonstrated pronounced cyclicity across market cycles, reflecting vulnerability to steel price fluctuations and demand shocks. Turkey holds large number of HKC (Honk Kong Convention) compliant facilities globally but processes comparatively modest volumes. It competes primarily on proximity to European markets rather than scale. India's recycling performance has been consistent across this period. This reflects structural yard capacity and regulatory stability rather than opportunistic market entry. It is a foundation on which a green premium positioning can be credibly built.<sup>4</sup>

Ship recycling in India is concentrated almost entirely at Alang, Bhavnagar (Gujarat), which has 150 plots, 128 operational, and 115 HKC-compliant yards. Two minor facilities exist in Kerala and West Bengal but remain outside the compliance framework. The list of global HKC-compliant ship recycling facilities is dominated by Turkey and Bangladesh. The 115 yards in India have received HKC SOC (Statement of Compliance) from recognised organisations and the authorization process is underway.<sup>4</sup>

India has built a domestic regulatory framework aligned with international standards. The Ship Breaking Code (2013) was the first step. The Recycling of Ships Act (2019) and Ship Recycling Rules (2021) followed. The Ship Recycling Regulation (2026) is the most recent addition, timed to align with the Hong Kong Convention entering into force on 26 June 2025<sup>3</sup>.<sup>3</sup> Financial instruments are also in place. The Ferrous Scrap Development Fund (FSDF) has deployed ₹104.41 crore toward worker welfare and environmental upgradation at Alang. The Ship Recycling Credit Note, under the Shipbuilding Financial Assistance Scheme (SBFA), carries an allocation of ₹4,001 crore. It incentivises compliant recycling by offering ship owners a credit note equivalent to 40% of scrap value, redeemable against new shipbuilding in Indian yards.<sup>5</sup>

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## **SECTION 2: POLICY MEASURES**

### **3.1 Definition**

Green ship recycling in India refers to the process of dismantling end-of-life ships in compliance with the Recycling of Ships Act, 2019, the Hong Kong International Convention, and other international/domestic standards. It prioritizes worker safety, environmental protection, and resource recovery, supported by a framework of certification, hazardous material control, and regulatory oversight.

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<sup>3</sup> Clarksons Research, Demolition Location Data, 2019–2026

<sup>4</sup> IMO, List of Authorized Ship Recycling Facilities under the Hong Kong Convention, 2025

<sup>5</sup> Ministry of Ports, Shipping & Waterways — FSDF & SBFA Scheme Documentation, 2026

### **3.2 Compliance Framework and International Standards**

3.2.1 All ship recycling facilities operating in India shall achieve and maintain compliance with the provisions of the Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships (HKC) and the Recycling of Ships Act, 2019 and the Recycling of Ships Regulations, 2026.

3.2.2 Ship recycling facilities shall be categorised under a national compliance framework comprising:

- (a) HKC (Hong Kong Convention) -Compliant Facilities;
- (b) EUSRR (European Union Ship Recycling Regulation) -Compliant Facilities; and
- (c) Transition Facilities undertaking compliance upgradation.

3.2.3 The Directorate General of Maritime Administration (DGMA), in coordination with State Maritime Boards as competent authorities, shall develop yard-specific compliance roadmaps for all transition facilities by 2028.

3.2.4 Technical handholding, capacity-building support and compliance advisory services shall be facilitated through recognised industry associations, training institutions and accredited technical partners to accelerate compliance adoption.

3.2.5 Financial incentives under notified schemes shall be linked to demonstrated progress towards HKC and EUSRR compliance.

### **3.3 National Ship Recycling Digital Platform**

3.3.1 A National Ship Recycling Portal shall be established under the Directorate General of Maritime Administration (DGMA) as the single digital window for implementation of the Hong Kong Convention, the Recycling of Ships Act, 2019 and the Recycling of Ships Regulations, 2026.

3.3.2 The Portal shall enable end-to-end digital governance of ship recycling activities through real-time monitoring, transparent compliance management, auditability and stakeholder integration, and shall connect the DGMA, State Maritime Boards as competent authorities, Recognised Organisations, ship recycling facilities and authorised service providers.

3.3.3 The Portal shall provide digital workflows for ship recycling facility registration and licensing, Ready for Recycling Certificate management, Ship Recycling Plan submission and approval, Inventory of Hazardous Materials (IHM) submission and verification, inspection and audit management, compliance tracking, and incident and non-conformity reporting.

3.3.4 The Portal shall maintain a national registry of ship recycling facilities and associated records, including Hong Kong Convention (HKC) and EU Ship Recycling Regulation (EUSRR) compliance status, ISO certifications, worker training and competency records, safety performance indicators, environmental monitoring data and other regulatory information as may be notified.

3.3.5 The Portal shall serve as the national repository for Inventory of Hazardous Materials (IHM) records and shall enable electronic capture, preparation, submission, verification, storage and retrieval of hazardous material inventories through a class-neutral and interoperable digital architecture.

3.3.6 The Portal shall serve as the national repository for ship recycling data and progressively incorporate modules for greenhouse gas accounting, green steel traceability, circular economy reporting, Ferrous Scrap Development Fund (FSDF) project monitoring, IMO-GISIS integration and dashboard-based monitoring of sectoral sustainability and compliance performance.

### **3.4 Foundational Standards for Sustainable Ship Recycling**

3.4.1 Ship recycling facilities shall progressively adopt a foundational standards framework to strengthen operational quality, environmental management, worker safety and responsible recycling practices, thereby supporting readiness for compliance with the Hong Kong Convention (HKC) and the EU Ship Recycling Regulation (EUSRR). The foundational standards framework shall comprise:

- (a) ISO 30000 – Ship Recycling Management Systems;
- (b) ISO 9001 – Quality Management Systems;
- (c) ISO 14001 – Environmental Management Systems; and
- (d) ISO 45001 – Occupational Health and Safety Management Systems.
- (e) ISO 50001 – Energy Management Systems

3.4.2 Ship recycling facilities shall establish systems for monitoring and reporting workplace incidents, near misses, emergency preparedness, worker training, medical support facilities, sanitation infrastructure and other worker welfare measures in accordance with applicable standards and regulatory requirements.

3.4.3 Ship recycling facilities shall implement environmental management and compliance systems, including monitoring and control of runoff, wastewater discharge, emissions, hazardous waste handling and other environmental aspects, in accordance with applicable regulatory requirements and recognised industry standards.

3.4.4 Ship recycling facilities shall progressively adopt resource-efficient and environmentally responsible operational practices, including renewable energy utilisation, energy consumption monitoring, alternative cutting technologies and other measures that reduce occupational hazards, emissions and environmental impacts.

### **3.5 Capacity Building, Research and Innovation**

3.5.1 A National Ship Recycling Institution shall be established in Alang as a centre of excellence for training, research, innovation and technical support to strengthen India's ship recycling ecosystem and facilitate the adoption of global best practices.

3.5.2 The Institution shall develop and deliver accredited capacity-building programmes covering worker safety, hazardous material management, environmental compliance, sustainable recycling practices, implementation of the Hong Kong Convention (HKC), and adoption of the foundational standards prescribed under this Policy.

3.5.3 Research, development and pilot deployment of advanced ship recycling technologies shall be promoted to improve worker safety, operational efficiency, material recovery, resource utilisation and environmental performance across ship recycling facilities.

5.3.4 Innovation programmes shall support the development and adoption of emerging technologies including alternative cutting methods, automation, digital inspection and monitoring systems, material traceability solutions, renewable energy integration, energy-efficient equipment and other technologies that enhance the sustainability and competitiveness of the sector.

3.5.5 The National Ship Recycling Institution shall facilitate collaboration between industry, academia, technology providers, classification societies, financial institutions and government agencies to accelerate innovation, knowledge transfer and dissemination of best practices across the ship recycling value chain.

3.3.6 A framework for mapping and integrating the informal secondary materials market associated with ship recycling shall be developed. Given that a significant share of non-steel materials recovered from end-of-life vessels including fittings, equipment, furnishings and consumables currently enters circulation through informal trade channels, a structured traceability and reporting mechanism shall be established to capture the full material recovery footprint of the sector, support circular economy accounting, and progressively bring informal market participants within the regulatory and welfare framework.

### **3.6 Green Steel, Circular Economy and Sustainable Finance**

3.6.1 A Green Steel Pathway for the ship recycling sector shall be established to promote the traceability, certification and utilisation of recycled ship steel within domestic manufacturing, infrastructure and maritime value chains, thereby supporting India's circular economy and decarbonisation objectives.

3.6.2 The Bureau of Indian Standards (BIS), in coordination with relevant ministries and industry stakeholders, shall develop standards and certification mechanisms for recycled ship steel, including guidance on material quality, traceability and suitable end-use applications for structural and non-structural purposes.

3.6.3 The Bureau of Energy Efficiency (BEE), in coordination with the Directorate General of Maritime Administration (DGMA), steel industry stakeholders and relevant government agencies, shall develop methodologies for measuring and certifying the energy efficiency, carbon footprint and resource efficiency of recycled ship steel across the value chain, from vessel recycling through processing and end-use applications.

3.6.4 A national greenhouse gas accounting framework shall be developed for ship recycling facilities and recycled ship steel, based on internationally recognised methodologies, to enable measurement, reporting and verification of emissions, resource efficiency and environmental performance across the recycling value chain.

3.6.5 The Ferrous Scrap Development Fund (FSDF) shall be operationalised to support environmental upgrades, compliance improvements, green steel initiatives, digitalisation, technology adoption, worker welfare and circular economy projects. Financial incentives and

market-based instruments shall be explored and notified to reward facilities demonstrating superior compliance, environmental performance, material recovery and emissions reduction outcomes. The Ship Recycling Credit Note, introduced under the Shipbuilding Financial Assistance Scheme (SBFA), shall continue to be operationalised as a demand-side instrument linking compliant ship recycling with new shipbuilding in Indian yards.

### **3.7 Governance**

3.7.1 This pillar shall be implemented under Working Group 5, led by the Directorate General of Maritime Administration in coordination with the Ministry of Environment, Forest and Climate Change. DGMA shall be responsible for administering the Recycling of Ships Act 2019 and the Recycling of Ships Regulations 2026, maintaining the Document of Authorisation to conduct Ship Recycling (DASR) which are issued by State Maritime Boards, operationalising the National Ship Recycling Portal, and overseeing yard-level compliance with HKC and EUSRR standards. MoEFCC shall be responsible for environmental clearance processes, in coordination with the State Pollution Control Board on discharge standards applicable to ship recycling facilities, and alignment of the national GHG accounting framework for ship recycling with India's NDC reporting obligations. For the detailed governance framework and implementation architecture under the National Maritime Decarbonisation Policy, refer to Part IV: Policy Governance.

3.7.2 The State Maritime Boards shall be responsible for state-level coordination of yard compliance roadmaps, worker welfare programmes, and environmental monitoring at Alang and other recycling clusters within the country. They will also issue the Document of Authorisation to conduct Ship Recycling. The Bureau of Indian Standards shall be responsible for notifying recycled ship steel standards and certification mechanisms. The Bureau of Energy Efficiency shall be responsible for developing carbon footprint certification methodology for recycled ship steel across the value chain. The Ferrous Scrap Development Fund shall be administered jointly by DGMA and the Ministry of Steel to finance environmental upgrades, compliance improvements, green steel initiatives, digitalisation, technology adoption, worker welfare and circular economy projects. 3.7.3 The Working Group shall comprise DGMA, MoEFCC, the State Maritime Boards, the Ship Recycling Industry Association, the Ministry of Steel, Indian Register of Shipping, HKC compliance bodies, and academic and technical institutions. The Working Group shall coordinate directly with its sectoral stakeholders and report on a continuous basis to the National Green Maritime Coordination Cell (NGMCC) administered by National Centre of Excellence in Green Port and Shipping (NCoEGPS), which shall consolidate pillar-level progress into biannual reporting to the Secretary MoPSW and annual reporting to Inter-Ministerial Taskforce on Maritime Decarbonisation (IMTMD).

## **SECTION 3: TARGETS**

### **Short-Term (0–6 Months)**

1. Classify all licensed ship recycling facilities under HKC-compliant, EUSRR-compliant and Transition categories and publish yard-specific compliance roadmaps for Transition Facilities.
2. Commence the procurement and development of the National Ship Recycling Portal and establish national registry of ship recycling facilities with HKC/EUSRR compliance status and initiate development of digital Inventory of Hazardous Materials (IHM) management systems.

3. Initiate technical guidance and capacity building support for ISO standards compliance (ISO 30000, ISO 9001, ISO 14001, ISO 45001, ISO 50001) as mandated under the First Schedule of the Ship Recycling Regulations 2026.
4. Activate framework for FSDF utilization for worker welfare and environmental upgradation, worker safety certification programmes and welfare-linked insurance schemes at Ship recycling facilities.
5. Initiate HKC compliance support programme for all Transition Facilities, including technical assistance, gap assessments and targeted capacity building to accelerate upgrade to full HKC-compliant status.

#### **Medium-Term (6 Months–2 Years)**

6. Operationalise the National Ship Recycling Portal as single digital window integrating DGMA, state maritime boards as competent authorities and Recognised Organisations, with modules for IHM verification, compliance tracking, environmental monitoring, safety performance and FSDF project monitoring.
7. Establish the National Ship Recycling Institution at Alang with accredited training modules for worker safety and all four ISO standards fully operational.
8. Notify BIS standards for recycled ship steel and BEE carbon footprint certification methodology and develop national GHG accounting framework based on ISO 14067 and GHG Protocol.
9. Initiate bilateral end-of-life ship supply agreements with key vessel-owning nations.
10. Achieve 100% HKC compliance across all operational ship recycling facilities by the end of the medium-term horizon, completing the upgrade of all Transition Facilities in accordance with yard-specific compliance roadmaps with formal IMO HKC authorisation for all yards.
11. Initiate EUSRR compliance readiness programme for facilities seeking European-flagged vessel recycling contracts, including gap assessments against EU Ship Recycling Regulation requirements and implementation roadmaps for eligible yards.

#### **Long-Term (2–5 Years)**

12. Attain EUSRR compliance as the established standard for facilities engaged in European-flagged vessel recycling.
13. Integrate carbon intensity metrics and lifecycle MRV across all licensed yards through the Portal, operationalise BIS-certified green steel supply chain, and scale FSDF R&D support for advanced yard technologies.
14. Publish yard-wise sustainability performance via reports through the Portal and establish India as the globally preferred green ship recycling destination.

## Pillar 4: Green Finance

### **SECTION 1: GLOBAL CONTEXT & INDIA'S POSITION**

Green finance is increasingly a structural driver of maritime decarbonisation globally, moving beyond voluntary commitment toward a fundamental reshaping of how shipping assets are financed. The Poseidon Principles, a framework committing signatory financial institutions to align

their ship finance portfolios with the IMO's long-term decarbonisation goals, currently counts 29 signatory banks representing approximately \$185 billion in investments, over half of the total global ship finance portfolio. Borrowers under green and sustainability-linked loans are required to commit capital to projects meeting defined environmental criteria, with regular reporting and strict compliance monitoring. The direction is unambiguous: access to international ship finance is progressively contingent on demonstrable environmental performance, and institutions that cannot meet green finance criteria will face increasing difficulty accessing competitive capital.

India's maritime sector has received a significant capital commitment through a Cabinet-approved allocation of ₹69,725 crore across four flagship schemes, as summarised below:

| Scheme                                                 | Allocation                | Key Components                                                                             |
|--------------------------------------------------------|---------------------------|--------------------------------------------------------------------------------------------|
| <b>Shipbuilding Financial Assistance Scheme (SFAS)</b> | <b>INR 24,736 crore</b>   | Cost differential support; Shipbreaking Credit Note; National Shipbuilding Mission         |
| <b>Maritime Development Fund (MDF)</b>                 | <b>INR 25,000 crore</b>   | Maritime Investment Fund (INR 20,000 cr) + Interest Incentivisation Fund (INR 5,000 cr)    |
| <b>Shipbuilding Development Scheme (SbDS)</b>          | <b>INR 19,989 crore</b>   | Greenfield clusters; brownfield expansion to 4.5M GT; India Ship Technology Centre         |
| <b>Legal, Policy and Process Reforms</b>               | <b>Structural enabler</b> | Demand aggregation; infrastructure status for ships; flagging reforms; GST rationalisation |
| <b>Total Cabinet Allocation</b>                        | <b>INR 69,725 crore</b>   |                                                                                            |

However, none of these allocations are currently green-labelled, green-conditioned, or subject to environmental performance criteria. India's broader green finance landscape, while growing, remains concentrated in renewable energy, existing green bond issuances by SBI, Bank of Baroda and Union Bank have not extended to maritime applications, and no maritime-specific green finance taxonomy currently exists. The sovereign green bond framework, while under development, does not yet include the shipping sector. Discussions with the Asian Infrastructure Investment Bank (AIIB) on maritime green finance are ongoing.

## SECTION 2: POLICY MEASURES

### 4.1 Definition

A structured and verifiable financial mechanism, including green bonds, loans, public-private partnerships, and ESG investments, dedicated to the funding of environmentally sustainable maritime projects. This includes green ship construction, repair and retrofitting, port electrification, clean fuel infrastructure, energy-efficient terminal equipment, and circular economy-driven ship recycling including green steel production.

## **4.2 Maritime Green Finance Taxonomy**

4.2.1 A maritime-specific green finance taxonomy shall be developed, building upon India's draft Climate Finance Taxonomy Framework, to provide a standardised classification of green, transitional and brown maritime investments across shipbuilding, ship recycling, ports, inland waterways and alternate fuels infrastructure.

4.2.2 The taxonomy shall define eligible green activities, environmental criteria and performance thresholds for each sub-sector, and shall serve as the foundational reference for green bond issuances, sustainability-linked loans, ESG reporting and second-party assurance.

4.2.3 The taxonomy shall be aligned with the International Capital Market Association (ICMA) Green Bond Principles, International Finance Corporation (IFC) Performance Standards, EU Taxonomy, proposed GFI Tier 1/2 criteria and the IMO Net-Zero Framework and shall be periodically reviewed to reflect evolving international standards.

## **4.3 ESG Reporting & Digital Infrastructure**

4.3.1 A maritime sector ESG reporting framework shall be established, with standardised templates for each sub-sector defining KPIs for carbon emissions, energy efficiency, worker safety and environmental compliance, mapped to the taxonomy under clause 4.2.

4.3.2 Digital MRV platforms and ESG reporting tools shall be developed and integrated with existing port management systems and the National Ship Recycling Portal, enabling real-time performance tracking and transparent disclosure.

4.3.3 The ESG reporting framework shall align with mandatory disclosure requirements under the Companies Act and SEBI listing obligations, benchmarked against GRI, TCFD and IMO data collection systems.

4.3.4 ESG reporting performance shall be linked to eligibility and preferential access to green financial instruments, incentive schemes and compliance cost reductions.

## **4.4 Green Finance Mobilisation**

4.4.1 The Maritime Development Fund (MDF), comprising the Maritime Investment Fund (INR 20,000 crore) and Interest Incentivisation Fund (INR 5,000 crore), shall be examined for introduction of green conditionality criteria to direct a defined proportion of its corpus toward taxonomy-aligned maritime projects.

4.4.2 Sagarmala Finance Corporation Limited (SMFCL) shall assess the feasibility of establishing a dedicated green financing vertical with bespoke financial products and instruments for projects meeting the Maritime Green Finance Taxonomy criteria

4.4.3 The Shipbuilding Financial Assistance Scheme and Shipbuilding Development Scheme shall progressively incorporate green eligibility criteria prioritising alternate fuel-ready vessels, energy-efficient shipbuilding and low-carbon shipyard infrastructure.

4.4.4 Viability Gap Funding, blended finance, de-risking instruments and venture capital support for maritime innovation shall be mapped under the taxonomy, with preferential interest rates under the Interest Incentivisation Fund for taxonomy-aligned projects and PPP modalities for green maritime infrastructure.

#### **4.5 Green Finance Instruments**

4.5.1 The following instruments shall be developed and notified in consultation with RBI, SEBI and Ministry of Finance:

(a) Green Maritime Bonds — structured in accordance with India's Draft Sovereign Green Bond Framework and ICMA Green Bond Principles, with mandatory use-of-proceeds reporting and second-party assurance ;

(b) Concessional Import and Export Finance — for clean maritime technologies, alternate fuel systems and green-certified vessels;

(c) Maritime Climate Credits — tradeable instruments recognising verified emissions reductions, aligned with emerging IMO market-based measures.

4.5.2 Shore power infrastructure financing shall be structured through Power Finance Corporation in partnership with the Indian Ports Association for major ports and SMFCL for non-major ports.

#### **4.6 International Cooperation & Green Finance Diplomacy**

4.6.1 India shall engage with the Green Climate Fund, Global Environment Facility and Asian Infrastructure Investment Bank (AIIB) to mobilise concessional and co-financing arrangements for green maritime infrastructure and alternate fuels development.

4.6.2 Bilateral green finance partnerships shall be pursued with the EU, Japan and Norway, leveraging their green maritime finance frameworks and technology transfer mechanisms.

4.6.3 Research and innovation partnerships with international institutions, classification societies and technology providers shall be developed to build India-specific green finance methodologies and carbon accounting tools, consistent with India's Common but Differentiated Responsibilities and Respective Capabilities (CBDR-RC) positions.

#### **4.7 Carbon Markets & Market-Based Mechanisms**

4.7.1 The development of maritime carbon market mechanisms shall be explored as a long-term incentive instrument, including the feasibility of carbon credit advance purchase agreements, in consultation with MoEFCC and TERI and with reference to Article 6 of the Paris Agreement.

4.7.2 India's engagement with IMO market-based measures shall be guided by its Common but Differentiated Responsibilities and Respective Capabilities (CBDR-RC) principles and Greenhouse Gas Fuel Intensity (GFI) Tier 1/2 positions. Carbon market mechanisms shall be treated as supplementary instruments and shall not substitute for direct public investment or green conditionality embedded in existing schemes.

#### **4.8 Governance**

4.8.1 This pillar shall be implemented under Working Group 6, led by Sagarmala Finance Corporation Limited in coordination with the Ministry of Finance. SMFCL shall be responsible for operationalising the dedicated green maritime finance vertical, administering the Maritime Development Fund green conditionality criteria, and facilitating access to taxonomy-aligned financing instruments for ports, shipyards, shipping companies, and fuel infrastructure developers. The Ministry of Finance, through the Department of Economic Affairs, shall be responsible for maritime sector inclusion under India's sovereign green bond framework, coordination with RBI and SEBI on green maritime bond and sustainability-linked loan standards, and alignment of maritime green finance instruments with India's broader Climate Finance Taxonomy Framework. For the detailed governance framework and implementation architecture under the National Maritime Decarbonisation Policy, refer to Part IV: Policy Governance.

4.8. Priority sector lending guidelines for green maritime projects shall be developed in consultation with RBI. Green bond issuance standards and ESG disclosure requirements for listed maritime entities shall be developed in consultation with SEBI. The maritime carbon market framework shall be developed in coordination with MoEFCC, consistent with India's domestic carbon market architecture and Article 6 engagement at the UNFCCC. Financing pathways for green hydrogen and ammonia as maritime fuels shall be developed in alignment with MNRE, with reference to bunkering demand signals through IMDA.

4.8.3 The Working Group shall comprise Sagarmala Finance Corporation Limited (SMFCL), Ministry of Finance, RBI, SEBI, Asian Development Bank, World Bank, Green Climate Fund, New Development Bank, European Investment Bank, International Renewable Energy Agency (IRENA), green bond issuers, and maritime lenders. The Working Group shall coordinate directly with its sectoral stakeholders and report on a continuous basis to the National Green Maritime Coordination Cell (NGMCC) administered by National Centre of Excellence in Green Port and Shipping (NCoEGPS), which shall consolidate pillar-level progress into biannual reporting to the Secretary MoPSW and annual reporting to Inter-Ministerial Taskforce on Maritime Decarbonisation (IMTMD).

### **SECTION 3: TARGETS**

#### **Short-Term (0–6 Months)**

1. Constitute a technical working group comprising RBI, SEBI, Ministry of Finance, Department of Economic Affairs and MoPSW and initiate development of the maritime-specific green finance taxonomy building on India's draft Climate Finance Taxonomy Framework.
2. Aim to commission feasibility assessments for green conditionality criteria under the Maritime Development Fund (MDF) and a dedicated green vertical within Sagarmala Finance Corporation Limited (SMFCL).
3. Initiate the development of the maritime sector ESG reporting framework aligned with Companies Act and SEBI disclosure requirements.
4. Commence background discussions with AIIB, Green Climate Fund, EU, Japan and Norway on co-financing arrangements.
5. Engage with the Department of Economic Affairs to include maritime infrastructure as an eligible category under India's Sovereign Green Bond Framework
6. Commission a feasibility study for India's first green maritime bond issuance by a major port authority, with reference to the Sovereign Green Bond Framework. The study will serve as proof of concept for the Maritime Green Finance Taxonomy and for institutional green bond issuances in the maritime domain.

#### **Medium-Term (6 Months–2 Years)**

7. Notify the maritime green finance taxonomy and operationalise the ESG reporting framework with digital MRV platforms integrated into port management systems and the National Ship Recycling Portal.
8. Develop and freeze the maritime sector ESG reporting framework including standardised templates, KPI definitions and baseline capture methodology
9. Notify green conditionality criteria for the MDF and issue SMFCL green vertical scheme guidelines (if approved), enabling the first tranche of taxonomy-aligned green maritime project financing.
10. Facilitate India's first green maritime bond issuance under the notified taxonomy and operationalise concessional finance structures for clean maritime technologies.
11. Promote bilateral green finance partnerships with EU, Japan and Norway and secure co-financing commitments from AIIB (Asian Infrastructure Investment Bank) and Green Climate Fund for priority green maritime infrastructure projects.

#### **Long-Term (2–5 Years)**

12. India's green maritime finance architecture shall be fully operational across all sub-sectors, with taxonomy-aligned capital flows, mandatory ESG reporting, and green-conditioned public schemes applied across the full ₹69,725 crore maritime scheme architecture. Maritime sector inclusion under India's sovereign green bond framework shall be achieved, and a maritime carbon market framework aligned with IMO market-based measures and Article 6 of the Paris Agreement shall be operationalised, positioning Indian maritime entities to access global sustainability-linked finance on competitive terms.

## Pillar 5: Green Skill

### **SECTION 1: GLOBAL CONTEXT & INDIA'S POSITION**

The global maritime sector is entering a major workforce transition as decarbonisation shifts from voluntary adoption to operational compliance. The transition towards ammonia, methanol, hydrogen, LNG, biofuels, battery-electric vessels, shore power, digital MRV systems and smart port technologies is creating new green maritime occupations across shipping, ports, shipbuilding, ship repair, inland waterways and associated maritime services. The Maritime Just Transition Task Force estimates that nearly 450,000 seafarers may require additional training by 2030, increasing to around 800,000 by the mid-2030s<sup>6</sup>, to support operation of zero and near-zero emission vessels. Workforce transition is therefore becoming a core requirement for maritime decarbonisation.

Leading maritime nations have already integrated green skill development into their maritime transition strategies. Singapore has established the Maritime Energy Training Facility for alternative fuel and maritime decarbonisation training supported by digital certification systems. Norway has linked workforce development with green ferries and green corridor pilots, while Denmark has integrated maritime training within bilateral green shipping cooperation frameworks. Japan and the Republic of Korea have aligned green skill development with shipbuilding and alternative fuel technology roadmaps. At the international level, IMO and the Maritime Just Transition Task Force have launched fuel-specific training frameworks for ammonia, methanol and hydrogen-fuelled vessels. These models demonstrate that green maritime transition requires role-specific competency standards, simulation-based training infrastructure and institutionalised certification systems.

India has a strong foundation to position itself as a global green maritime talent hub. India is among the world's largest suppliers of seafarers, with nearly 3.23 lakh<sup>7</sup> active Indian seafarers employed globally. The country has an established maritime education ecosystem through the Directorate General of Shipping, Indian Maritime University, DGMA-approved maritime training institutes, port training systems and shipyard training capacity. MoPSW has also initiated regional maritime skill development through the Maritime Skill Development Centre in Guwahati and the Centre of Excellence for Inland Water Transport in Dibrugarh.

However, India's maritime skilling framework remains primarily aligned to conventional vessel operations and STCW compliance. Maritime decarbonisation now requires competency streams in alternative fuel operations, hydrogen and ammonia safety systems, methanol and LNG operations, battery-electric propulsion, green bunkering, emissions monitoring, digital MRV systems, sustainable port operations and green retrofitting. These capabilities remain fragmented and are not yet organised under a unified national green maritime competency framework aligned with the ongoing comprehensive revision of the STCW Convention and emerging IMO guidance.

### **SECTION 2: POLICY MEASURES**

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<sup>6</sup> Maritime Just Transition Task Force - <https://www.ics-shipping.org/press-release/training-seafarers-for-a-decarbonized-future/>

<sup>7</sup> Ministry of Ports, Shipping and Waterways - [https://x.com/shipmin\\_india/status/2065759779705045341](https://x.com/shipmin_india/status/2065759779705045341)

## **5.1 Definition**

Green Skills refers to the technical, operational, digital, environmental, and safety competencies required to support sustainable, low-carbon, and environmentally compliant maritime operations across shipping, ports, inland waterways, shipbuilding, ship repair, recycling, logistics, and associated maritime activities. These include competencies relating to alternative fuels, emissions reduction technologies, MRV systems, energy efficiency, digital maritime systems, sustainable port operations, green retrofitting, pollution prevention, and environmental compliance.

## **5.2 Green Maritime Skill Mission**

5.2.1 A Green Maritime Skill Mission (GMSM) shall be launched as an inter-ministerial initiative led by the Ministry of Ports, Shipping and Waterways (MoPSW) in coordination with the Ministry of Skill Development and Entrepreneurship (MSDE), the Directorate General of Maritime Administration (DGMA), the Indian Maritime University (IMU), the Inland Waterways Authority of India (IWAI), and the Skill Council for Green Jobs (SCGJ). The Mission shall establish India as a global hub for green maritime talent by 2030 through a unified framework for green maritime job roles, competency standards, training programmes, and certification pathways.

## **5.3 Curriculum Development and Certification**

5.3.1 Green shipping competencies shall be mandatorily integrated into all DGMA-approved pre-sea and post-sea maritime training curricula. Training programmes shall cover alternative and low-carbon fuels, energy efficiency and emissions reduction, digital maritime technologies, shore power systems, sustainable port operations, green shipbuilding, retrofit technologies, and environmental compliance requirements.

5.3.2 Training standards and certification frameworks shall be aligned with relevant IMO instruments, including the Generic Interim Guidelines on Training for Seafarers on Ships Using Alternative Fuels and New Technologies (STCW.7/Circ.25), the Maritime Just Transition Task Force (MJTTF) Baseline Training Frameworks, the ongoing comprehensive revision of the Standards of Training, Certification and Watchkeeping for Seafarers (STCW) Convention, and other internationally recognised standards.

5.3.3 Role-specific certification pathways shall be developed for seafarers, bunkering personnel, port operators, shipyard personnel, retrofit specialists, emergency responders, environmental compliance officers, and maritime digital systems operators.

## **5.4 Green Maritime Training Centres**

5.4.1 A national network of Green Maritime Training and Simulation Centres shall be established at designated maritime universities, DGMA-approved institutes, ports, and shipyard facilities, operationalising a three-tier architecture comprising awareness programmes, vocational and technical skilling, and advanced specialised certification. Simulation-based training facilities for alternative fuel systems, voyage optimisation, MRV systems, and emergency response shall be deployed at designated national maritime training hubs. Training quality and faculty standards across the network shall be maintained under a national accreditation framework notified by DGMA.

5.4.2 Specialised training infrastructure and programmes shall be developed for alternative fuel handling and bunkering, hydrogen and ammonia safety, LNG and low-flashpoint fuel operations, marine battery and energy storage systems, smart port technologies, and emissions monitoring, covering seafarers, port operators, and personnel across inland waterways, coastal shipping, and green corridor operations.

5.4.3 The Indian Ocean Centre of Excellence for Sustainable Maritime Transport (IOCE-SMarT) shall be operationalised as a regional centre of excellence for green maritime capacity building, applied research, technology demonstration, and international knowledge exchange. IOCE-SMarT shall support curriculum development, faculty training, simulation-based learning, industry partnerships, and technical cooperation with global institutions, including the IMO's Maritime Technology Cooperation Centres (MTCC) network, to strengthen green maritime capabilities across India and the wider Indian Ocean region.

## **5.5 Green Talent Fund**

5.5.1 A Green Talent Fund shall be established under the Maritime Development Fund to finance scholarships, fellowships, apprenticeships, specialised training programmes, and research initiatives in green shipping and maritime decarbonisation, covering advanced study in green propulsion systems, alternative fuel technologies, sustainable maritime infrastructure, and digital maritime systems. Companies investing in certified green workforce development programmes shall be eligible for salary co-funding support and applicable fiscal incentives.

5.5.2 The Green Talent Fund shall be supported through allocations under the Maritime Development Fund, IMU-led research and curriculum development initiatives, national skill development programmes, and industry co-funding mechanisms.

## **5.6 Workforce Transition and International Collaboration**

5.6.1 Reskilling and upskilling programmes shall be developed for maritime professionals transitioning to alternative fuel operations, green retrofit projects, MRV systems, digital maritime technologies, battery-electric and hybrid propulsion, shore power systems, and sustainable port operations. Recognition of Prior Learning mechanisms and accelerated certification pathways shall be developed to facilitate transition into emerging green maritime occupations.

5.6.2 Strategic international collaborations for technology transfer, joint research, capacity building, and specialised certification shall be formalised through bilateral maritime cooperation agreements with leading maritime nations. Partnerships with the IMO, classification societies, and global maritime academies shall be institutionalised to support specialised green shipping certifications, faculty exchange programmes, and international recognition of Indian maritime qualifications.

## **5.7 Governance**

5.7.1 This pillar shall be implemented under Working Group 7, led by the Indian Maritime University in coordination with the Ministry of Skill Development and Entrepreneurship (MSDE). IMU shall be responsible for developing and maintaining the National Green Maritime Skills Framework, integrating green competency modules into DGMA-approved pre-sea and post-sea curricula, overseeing the national network of Green Maritime Training and Simulation Centres, and

administering the IMU- National Centre of Excellence in Green Port and Shipping (NCoEGPS) Research Consortium. MSDE shall be responsible for aligning green maritime occupational standards with the National Skills Qualifications Framework, coordinating the Skill Council for Green Jobs, and integrating maritime green skills pathways into national skilling programmes and Recognition of Prior Learning mechanisms. For the detailed governance framework and implementation architecture under the National Maritime Decarbonisation Policy, refer to Part IV: Policy Governance.

5.7.2 DGMA shall be responsible for notifying the national accreditation framework for Green Maritime Training Centres, approving role-specific certification pathways for seafarers, bunkering personnel, and port operators, and ensuring alignment of training standards with applicable IMO instruments and the STCW Convention as revised. The Maritime Development Fund shall be responsible for operationalising the Green Talent Fund, including scholarship, fellowship, and apprenticeship disbursement mechanisms and industry co-funding arrangements.

5.7.3 The Working Group shall comprise the Indian Maritime University, Ministry of Skill Development and Entrepreneurship (MSDE), DGMA-approved maritime academies, the Skill Council for Green Jobs, IWAI training centres, port training centres, and classification societies. The Working Group shall coordinate directly with its sectoral stakeholders and report on a continuous basis to the National Green Maritime Coordination Cell (NGMCC) administered by National Centre of Excellence in Green Port and Shipping (NCoEGPS), which shall consolidate pillar-level progress into biannual reporting to the Secretary MoPSW and annual reporting to Inter-Ministerial Taskforce on Maritime Decarbonisation (IMTMD).

## **SECTION 3: TARGETS**

### **Short-Term (0–6 Months)**

1. Initiate development of the Green Maritime Skill Mission (GMSM) and the National Green Maritime Skills Framework.
2. Initiate integration of green fuel handling, MRV systems, digital maritime technologies, and sustainable port operations modules into DGMA-approved maritime training curricula and initiate development of national certification pathways for alternative fuel handling, green retrofit operations, emissions monitoring systems, and digital maritime systems.
3. Identify designated Green Maritime Training and Simulation Centres at maritime universities, ports, shipyards, and IWAI training hubs and establish the Green Talent Fund framework under the Maritime Development Fund with support from IMU-led research initiatives and national skill development programmes.
4. Designate the Indian Maritime University, Mumbai as the first Green Maritime Training and Simulation Centre pilot, delivering training and simulation-based assessment across green fuel handling, MRV reporting systems, and alternative fuel safety as an initial proof of concept.

### **Medium-Term (6 Months–2 Years)**

5. Operationalise specialised certification programmes for ammonia, methanol, hydrogen, LNG, battery-electric propulsion, shore power operations, and green bunkering across all DGMA-approved pre-sea and post-sea training programmes.
6. Operationalise the national network of Green Maritime Training and Simulation Centres, including dedicated programmes for inland waterways, coastal shipping, green corridor operations, and battery-electric vessel systems.
7. Operationalise the Green Talent Fund for scholarships, apprenticeships, workforce transition initiatives, and Recognition of Prior Learning mechanisms for maritime professionals transitioning to green maritime operations.
8. Formalise international cooperation partnerships with IMO, classification societies, and leading maritime nations for specialised certification, faculty exchange, and trainer development.

### **Long-Term (2–5 Years)**

9. Achieve nationally recognised and internationally aligned green maritime competency and certification systems across shipping, ports, inland waterways, shipbuilding, ship repair, and recycling sectors.
10. Operationalise Centres of Excellence for green shipping technologies, alternative fuels, and sustainable maritime operations, positioned as regional hubs for green maritime training and research.
11. Institutionalise long-term international partnerships for joint certification, maritime research, and green maritime technology capability development.

## Pillar 6: Alternate Fuels

### **SECTION 1: GLOBAL CONTEXT & INDIA'S POSITION**

India's maritime sector is in the early stages of an alternate fuel transition. Policy frameworks under the National Green Hydrogen Mission, Harit Sagar Green Port Guidelines, and Maritime India Vision 2030 are translating into port infrastructure investment and pilot activity.

#### **Biofuels**

Biofuels present the most immediately deployable pathway for Indian shipping. They can be blended with existing marine gas oil and marine diesel oil supply chains without dedicated port infrastructure or vessel modification. Key developments:

- I. Biofuel blends are being supplied through conventional fuel chains at major Indian ports, with no dedicated infrastructure required at the blending stage.
- II. India has established a sustainability certification requirement for marine biofuels through MS Notice No. 14 of 2023, which mandates that no biofuels shall be supplied to ships in blended or unblended form without certification under a recognised international sustainability scheme, including the International Sustainability and Carbon Certification (ISCC) or the Roundtable on Sustainable Biomaterials (RSB) or equivalent. A Proof of Sustainability document must accompany the Bunker Delivery Note for all biofuel supply transactions. A comprehensive national certification framework aligned with international

regulatory requirements including FuelEU Maritime and the IMO GHG Fuel Intensity standard remains to be notified to support verified compliance reporting at scale.

- III. The Harit Sagar Green Port Guidelines and India's fuel transition roadmap position biofuels as the first commercially deployable marine bunkering option for domestic coastal vessels.

Globally, second-generation biofuels including hydrotreated vegetable oil are seeing accelerating uptake, driven by FuelEU Maritime's 2% renewable fuel blending mandate in force from 2025.

## **Methanol**

Methanol is the most commercially advanced alternate fuel pathway in India. Key developments:

- I. India's first shore-to-ship methanol bunkering trial was completed at Deendayal Port (Kandla) on 2 April 2026, in collaboration with Stolt Tankers, JM Baxi, Aegis Vopak, and Indian Oil Corporation, with on-site verification by DNV. The port was rated Level 6 on the IAPH Port Readiness Level scale for methanol bunkering. Kandla already has compatible infrastructure from its existing grey methanol cargo handling operations.
- II. Deendayal Port is targeting availability of approximately 500 KTPA of RFNBO-compliant e-methanol by 2028-29 to support deep-sea dual-fuel vessels on the Asia-Europe trade corridor.
- III. V.O. Chidambaranar Port (Tuticorin) has received Rs. 35 crore in MNRE funding for methanol bunkering and refuelling infrastructure, with a 2x750 m<sup>3</sup> storage facility under development targeting commercial operations by FY 2026-27.
- IV. Mumbai Port has issued an Expression of Interest for methanol bunkering infrastructure.
- V. Cochin Shipyard Limited signed a contract with CMA CGM in February 2026 for the construction of six 1,700 TEU LNG dual-fuel feeder container vessels, marking India's entry into alternative fuel vessel construction for a major international operator.
- VI. India has notified a national green methanol production standard.

Globally, methanol dual-fuel vessel orders grew 164% year-on-year in 2023. Maersk's operational methanol containership fleet has established methanol as the first commercially deployed green alternative fuel at scale in deep-sea shipping.

## **LNG**

India has well-developed domestic LNG supply infrastructure through a network of regasification terminals and gas pipelines. Marine-specific bunkering infrastructure is at an earlier stage:

- I. The Harit Sagar Green Port Guidelines mandate at least one LNG bunkering station at each major port by 2030.
- II. Adani Ports and Special Economic Zone Limited and Bharat Petroleum Corporation Limited (BPCL) signed an MoU in October 2025 to develop India's first ship-to-ship LNG bunkering facility at Vizhinjam Port in Kerala, positioned on the East-West global shipping corridor. The facility has not yet moved to construction as of mid-2026.
- III. JNPA signed an MoU with the Port of Marseille Fos in February 2026 to promote LNG, hydrogen, and green shipping collaboration between India and Europe.

Globally, LNG remains the only alternative marine fuel at commercial scale, accounting for approximately 6.1% of total reported marine fuel consumption in 2023.

### **Green Ammonia**

Green ammonia has strong production-side momentum in India, with maritime bunkering on a post-2030 horizon:

- I. The Government of India approved a dedicated green hydrogen and ammonia handling jetty at Paradip Port in February 2026 at Rs. 797.17 crore, with 4 MTPA annual handling capacity, to be implemented on a build-operate-transfer basis. Construction is yet to commence.
- II. Deendayal Port has a 3.5 MMTPA green ammonia-compatible jetty and has allocated 3,400 acres to developers, with a production target of 7 MMTPA by 2030.
- III. V.O. Chidambaranar Port has allocated 501 acres for green hydrogen and ammonia development, with a 2 MMTPA production target by 2030.
- IV. Reliance Industries has announced a USD 3 billion green ammonia supply agreement with South Korea's Samsung C&T under a 15-year contract.
- V. A green ammonia export corridor between VOC Port, Rotterdam, and Singapore has the potential to support approximately 11 MTPA of aggregated import demand by 2030.

Port-level standards, bunkering workforce training, and regulatory frameworks for marine ammonia handling are under development with reference to emerging international standards.

Globally, ammonia-fuelled two-stroke engines entered commercial service in 2026, with the technology expected to become commercially significant for deep-sea shipping by 2035 to 2040.

### **Green Hydrogen**

Green hydrogen for maritime propulsion is positioned on a 2035 horizon, consistent with Harit Sagar targets:

- I. Deendayal Port has commissioned a 1 MW electrolyser-based green hydrogen plant, with a Rs. 2,775 crore power infrastructure proposal approved for CTU connectivity and a 300 MLD desalination plant study underway to support hydrogen production at scale.
- II. V.O. Chidambaranar Port completed a 10 Nm<sup>3</sup> per hour green hydrogen demonstration plant in March 2025 at a cost of Rs. 3.8 crore, with 501 acres allocated for wider green hydrogen development.
- III. Paradip Port has a dedicated hydrogen terminal in the pipeline through PPP with an estimated investment of Rs. 700 crore, with completion targeted by 2027. Land allocation by the state government is under discussion.
- IV. WAI's hydrogen-powered ferry prototype is the most advanced domestic maritime hydrogen application currently in evidence.

Globally, hydrogen fuel cell vessel orders are accelerating. The technology is establishing a commercial position in short-sea and ferry operations, with deep-sea application expected post-2040.

### **Battery-Electric and Hybrid**

Battery-electric propulsion is advancing in India's harbour craft and inland waterway segments:

- I. The Green Tug Transition Programme targets deployment of at least 30% green tugs at all major ports by 2030, with full transition by 2036. As of July 2025, Deendayal Port Authority has completed both the tender float and contract award. VOCPA, JNPA, PPA, NMPA, and VPA have issued Notices Inviting Tender. KPL is planning green tug procurement after its current diesel tug contract expires in August 2027.
- II. 100 green tugs are in the procurement pipeline across all major ports at an investment of approximately Rs. 12,000 crore.
- III. Hybrid propulsion is being deployed on select inland waterway vessels and ferries under the Harit Nauka Guidelines framework.
- IV. As of 2023-24, renewable energy accounted for 15.48% of total electricity consumption across Indian major ports. Mumbai Port Authority and Deendayal Port Authority have already achieved the 60% renewable energy target, with DPA at 69.41% and Mumbai Port at 87.22%. Nine major ports are on track to meet the 60% target by 2030.

Globally, battery-electric propulsion is suited to short-range, low-power applications at current technology levels. Autonomous and AI-enabled electric vessel operations are progressing from pilot to commercial deployment in Norway, Japan, and Singapore.

## **SECTION 2- POLICY MEASURES**

### **6.1. Definition**

Alternative maritime fuels are any energy source, fuel, or propulsion system used in maritime operations that measurably reduces greenhouse gas emissions or air pollutant emissions compared to conventional fossil marine fuels, assessed on a well-to-wake lifecycle basis. This includes biofuels, methanol, liquefied natural gas, green hydrogen, green ammonia, synthetic e-fuels, and electricity, as well as emerging advanced energy systems including nuclear propulsion, where they demonstrate verifiable environmental benefit.

### **6.2 Fuels Ready for Immediate Deployment**

6.2.1 Mandatory blending of sustainable biofuels shall be introduced for domestic coastal vessels using marine gas oil or marine diesel oil, commencing in 2027 and increasing progressively in line with demonstrated domestic supply availability. The blending mandate applies to domestic coastal operations and is distinct from the IMO GHG Fuel Intensity (GFI) framework adopted at MEPC 83, which governs international voyages of vessels above 5,000 GT. India shall align its domestic maritime fuel standards with the GFI framework, with implementing regulations notified by 2028. Where certified sustainable biofuel is demonstrably unavailable at a bunkering location, the competent authority may grant temporary compliance relief for the affected route or port, subject to annual review and withdrawal once adequate supply is established.

6.2.2 All biofuels supplied to ships in blended or unblended form shall be certified under a recognised international sustainability scheme, including the International Sustainability and Carbon Certification (ISCC) or the Roundtable on Sustainable Biomaterials (RSB) or equivalent, in accordance with MS Notice No. 14 of 2023. A Proof of Sustainability document shall accompany the

Bunker Delivery Note for all biofuel supply transactions. Where certified sustainable biofuel is demonstrably unavailable at a bunkering location, the competent authority may grant temporary compliance relief for the affected route or port, subject to annual review and withdrawal once adequate supply is established. Non-compliance with blending mandates shall attract penalties as prescribed by the competent authority.

6.2.3 Financial incentives shall be introduced to accelerate domestic production of low and zero-GHG maritime fuels, for establishment of green hydrogen, green ammonia, green methanol, and sustainable biofuel production plants, Production-Linked Incentives for incremental production, and a 10-year corporate tax holiday for new qualifying fuel producers. Subsidies shall be structured on a well-to-wake GHG intensity basis, with higher incentive levels for fuels achieving greater emissions reductions, ensuring that the framework remains open to all qualifying alternative fuel pathways. A dedicated green maritime fuel financing window shall be established under the Maritime Development Fund to provide concessional loans and credit enhancement for early-stage fuel production projects, with sustainability-linked loan frameworks promoted through RBI priority sector lending guidelines.

6.2.4 The electrification of small domestic vessels, including inland ferries, river craft, and short-sea coastal vessels, shall be promoted through financial incentives for vessel construction and retrofitting, and through the development of shore-based electric charging infrastructure at inland waterway terminals and non-major ports. This measure shall be implemented in coordination with the Harit Nauka Guidelines, the Inland Waterways Authority of India, and relevant state governments, with a target of 100% electric propulsion for newly built government-operated inland passenger vessels by 2030.

### **6.3 Infrastructure Build-Out and Transition Fuels**

6.3.1 Building on the designation of Deendayal Port Authority (Kandla), Paradip Port Authority, and V.O. Chidambaranar Port Authority (Tuticorin) as Green Hydrogen Hubs under the National Green Hydrogen Mission, green bunkering infrastructure shall be scaled up and extended to all 14 major ports through a PPP model, with the Government providing up to 20% capital cost support through Viability Gap Funding, with provision for an additional 20% from in cases where project viability requires enhanced support. Infrastructure development shall be sequenced by fuel readiness, prioritising sustainable biofuels, green methanol, and green ammonia, followed by hydrogen. LNG bunkering infrastructure shall be supported as a transitional bridging fuel at ports where dedicated green fuel infrastructure is not yet operational, subject to a regulatory sunset aligned with India's 2035 emissions milestones. Green Fuel Development Zones shall be established within designated port premises for integrated green fuel production, storage, and refuelling operations, with viability gap funding and green bond issuance standards notified through SEBI to mobilise private capital for zone development.

6.3.2 A national demand aggregation mechanism shall be established, bringing together Indian shipping companies, fuel producers, and port operators to form buyer alliances, aggregate offtake commitments, and provide long-term demand certainty for green fuel producers. Carbon Credit Advance Purchase Agreements shall be made available through the mechanism to provide

producers with additional revenue certainty. This mechanism shall be coordinated through the Indian Maritime Decarbonisation Alliance (IMDA).

6.3.3 Green Maritime Corridors shall be designated on key domestic and international trade routes, providing dedicated infrastructure and preferential port tariffs for vessels operating on alternative fuels. Priority routes shall include India-Singapore, India-UAE, and India-Rotterdam, with initial domestic corridors on short-sea and feeder routes such as Chennai-Andaman and Visakhapatnam-Haldia, expanding progressively to full international trade corridors by 2035. Vessels operating on alternative fuels within designated green corridors shall be eligible for reduced port dues, priority berthing, and fuel subsidies. Newly constructed vessels of 500 GT and above operating under the Indian registry on designated green corridors shall be required to be dual-fuel or alternative-fuel capable, supported by financing mechanisms under the Green Shipping Fund and SBFAP incentives.

#### **6.4 Deep Transition and Long-Term Fuel Pathways**

6.4.1 Dedicated R&D investments shall be made in domestic electrolyser manufacturing, ammonia synthesis technologies, and advanced biofuel production to reduce India's dependence on imported green fuel technologies. Collaboration with the National Green Hydrogen Mission, National Biofuels Policy, MNRE, and the IMO Net-Zero Framework shall be formalised for coordinated action. A National Green Maritime Technology Research Fund shall be established under the Maritime Development Fund with dedicated allocations for e-fuel pilot development, ammonia propulsion R&D, and hydrogen maritime safety research, with risk-sharing mechanisms available for early-stage technology trials.

6.4.2 Synthetic e-fuels, including e-methanol and e-ammonia produced through electrolysis using renewable electricity, shall be recognised as a priority long-term maritime fuel pathway. The Government shall support domestic R&D in e-fuel production, promote pilot projects integrating renewable energy with e-fuel synthesis, and engage with IMO and bilateral partners on well-to-wake certification standards for e-fuels.

6.4.3 Nuclear propulsion for maritime applications shall be assessed as a long-horizon energy pathway. The Government shall study the feasibility of nuclear-powered commercial vessels and floating nuclear power support for port energy needs, in coordination with the Atomic Energy Regulatory Board (AERB) and Nuclear Power Corporation of India Limited (NPCIL), and in alignment with emerging IMO- International Atomic Energy Agency (IAEA) safety recommendations and the anticipated revision of the Nuclear Ship Safety Code. India shall engage in international research programmes and maintain regulatory readiness for nuclear-powered maritime assets as the technology and its global safety framework mature.

#### **6.5 Capacity Building**

6.5.1 A National Alternative Fuels Maritime Training Programme shall be established under the Directorate General of Maritime Administration (DGMA), covering safe handling, storage, transfer, and emergency response for all alternative maritime fuels including methanol, LNG, ammonia, hydrogen, and biofuels. Training shall be mandatory for all port personnel, vessel officers, and bunkering operatives at ports where alternative fuel operations are underway or planned. Alternative fuel competencies shall be integrated into all DGMA-approved maritime academy

curricula, aligned with IMO model courses on low-flashpoint fuels and the International Code of Safety for Ships Using Gases or Other Low-flashpoint Fuels (IGF) Code.

6.5.2 Green Port Training Centres with dedicated alternative fuel simulation and safety infrastructure shall be established at Deendayal Port, V.O. Chidambaranar Port, and Paradip Port, leveraging their designation as Green Hydrogen Hubs. A Green Talent Fund shall provide scholarships, fellowships, and industry apprenticeships for specialised training in alternative fuel systems, ammonia and hydrogen safety engineering, and maritime energy transition management.

## **6.6 International Cooperation**

6.6.1 Strategic bilateral partnerships for alternative fuel technology transfer, joint R&D, and green maritime corridor development shall be formalised with Norway, Singapore, Japan, Republic of Korea, Denmark, the Netherlands, and the United Arab Emirates, prioritising electrolyser technology, ammonia fuel engine development, hydrogen safety standards, and e-fuel certification frameworks. India shall actively participate in and seek to shape the development of the IMO Net-Zero Framework, GFI implementing regulations, and safety codes for low-flashpoint maritime fuels, ensuring that international standards reflect the operational realities and developmental priorities of major fuel-producing nations.

6.6.2 The India-Denmark Green Strategic Partnership pre-feasibility study on the Rotterdam-India-Singapore Green Shipping Corridor, expected in late 2026, shall be used as the basis for converting India's corridor ambitions into operationally specific project commitments with defined vessel targets, bunkering volumes, and fuel certification requirements. India shall engage with the Green Shipping Challenge and the Clydebank Declaration corridor framework to position Indian ports as preferred bunkering and fuel export hubs on key international trade routes.

## **6.7 Governance**

6.7.1 This pillar shall be implemented under Working Group 2, led by the Directorate General of Maritime Administration in coordination with the Ministry of New and Renewable Energy and the Ministry of Petroleum and Natural Gas. DGMA shall be responsible for notifying fuel safety standards, GFI implementing regulations, marine biofuel bunkering standards aligned to IMO guidelines and applicable DGMA circulars, and dual-fuel operational requirements under the Merchant Shipping Act 2025. MNRE shall be responsible for coordinating green hydrogen and ammonia production targets under the National Green Hydrogen Mission and ensuring alignment between hub-level production commitments and maritime bunkering demand signals through IMDA. MoPNG shall be responsible for LNG bunkering infrastructure policy, the regulatory framework for transitional fuel supply at major ports, and coordination with domestic fuel producers on biofuel supply chain development. For the detailed governance framework and implementation architecture under the National Maritime Decarbonisation Policy, refer to Part IV: Policy Governance.

6.7.2 Deendayal Port Authority, Paradip Port Authority, and V.O. Chidambaranar Port Authority shall be responsible for operationalising Green Fuel Development Zones, scaling bunkering infrastructure at the three designated Green Hydrogen Hubs, and serving as the primary demand anchors for the national demand aggregation mechanism. The Indian Maritime Decarbonisation Alliance shall be

responsible for coordinating buyer alliances, aggregating offtake commitments, and managing Carbon Credit Advance Purchase Agreement frameworks across the sector.

6.7.3 The Working Group shall comprise DGMA, MNRE, MoPNG, the Indian Maritime Decarbonisation Alliance, the National Green Hydrogen Mission Authority, Deendayal Port Authority, Paradip Port Authority, V.O. Chidambaranar Port Authority, Indian Oil Corporation, and domestic fuel producers. The Working Group shall coordinate directly with its sectoral stakeholders and report on a continuous basis to the National Green Maritime Coordination Cell (NGMCC) administered by National Centre of Excellence in Green Port and Shipping (NCoEGPS), which shall consolidate pillar-level progress into biannual reporting to the Secretary MoPSW and annual reporting to Inter-Ministerial Taskforce on Maritime Decarbonisation (IMTMD).

## **SECTION 3. TARGETS**

### **Short-Term (0–6 Months)**

1. Initiate the process of development of the national marine biofuel certification standard .
2. Initiate the national framework for Green Fuel Development Zones at designated major ports, in formal coordination with the Ministry of New and Renewable Energy and other relevant ministries to anchor maritime sector decarbonisation within national green fuel supply planning, with VGF eligibility criteria and application procedures defined.
3. Constitute the Indian Maritime Decarbonisation Alliance (IMDA) and operationalise the national demand aggregation mechanism for green fuel offtake.

### **Medium-Term (6 Months–2 Years)**

4. Operationalise commercial methanol bunkering at Kandla and V.O. Chidambaranar Port, and issue Expressions of Interest for methanol bunkering infrastructure at a minimum of three additional major ports.
5. Deliberate to designate the Kandla-Tuticorin route as India's first operational Green Maritime Corridor, with preferential tariff and priority berthing frameworks notified.

### **Long-Term (2–5 Years)**

6. Strive to achieve 10% of total energy consumed by Indian-registered shipping from zero or near-zero GHG fuels, with green fuel bunkering infrastructure .
7. Green Maritime Corridors extended to India-Singapore, India-UAE, and India-Rotterdam, with dual-fuel requirements in force for eligible vessels on designated corridors and India recognised as a Clydebank Declaration corridor partner.

## **Pillar 7: Green technology**

## **SECTION 1: GLOBAL CONTEXT & INDIA'S POSITION**

India's maritime sector is in active transition. Policy commitments under Maritime India Vision 2030 and the Maritime Amrit Kaal Vision 2047 have begun translating into on-ground technology deployment across ports, vessels, and digital infrastructure. The following captures what is deployed or actively underway as of mid-2026.

### **Port Energy and Electrification**

Renewable energy adoption is the most visible area of progress across India's 14 major ports. Key deployments include:

- I. Deendayal Port (Kandla): 20 MW solar and wind capacity, 1 MW electrolyser-based green hydrogen plant commissioned, 3,400 acres allocated for green hydrogen and ammonia development, 3.5 MTPA green ammonia-compatible jetty built.
- II. Visakhapatnam Port: 10 MW solar installation operational since 2023.
- III. Cochin Port: 1.5 MW floating solar system, 100 kWp and 150 kWp grid-connected rooftop solar plants, nine solar prosumers operational as of 2024.
- IV. V.O. Chidambaranar Port (Tuticorin): 9 MW solar and wind mix under implementation, pilot green hydrogen plant commissioned April 2025, green methanol bunkering facility under development.
- V. Paradip Port: 10 MW solar plant under commissioning, government-approved green hydrogen and ammonia jetty under PPP with 4 MTPA annual handling capacity.
- VI. JNPA: 4.10 MW combined rooftop and ground-mounted solar capacity.
- VII. Haldia Port: 2 MW solar PV plant operational since 2025.

Port equipment electrification is progressing under Harit Sagar Green Port Guidelines, with electric rubber-tyred gantry cranes, automated guided vehicles, LED lighting systems, and electric yard tractors being deployed at major container terminals. Shore power (cold ironing) infrastructure is at an early stage, with deployment currently covering port craft operations and progressing toward EXIM vessel berths. Grid capacity augmentation remains the primary constraint.

### **Vessel Technology**

The Green Tug Transition Programme (GTTP), launched October 2024, is India's most advanced vessel-level decarbonisation initiative. Phase 1 covers four pilot ports, Deendayal, JNPA, Paradip, and V.O. Chidambaranar, with two green tugs to be procured or chartered at each. Work orders have been placed at all four ports. India's first all-electric tug, being built by Atreya Shipyard for Deendayal Port with Kongsberg permanent magnet propulsion and energy storage systems, is expected to be delivered by late 2026. The programme targets 50 green tugs across all major ports by 2030 and full fleet transition by 2047.

The following vessel-level technologies are in pilot or early adoption, primarily through private sector and classification society-led initiatives rather than regulated mandates:

- I. Air lubrication systems: reducing hull drag by injecting a carpet of air bubbles under the vessel hull, being trialled on select bulk carriers and tankers calling Indian ports.
- II. Hull coating improvements: advanced low-friction and biofouling-resistant coatings being adopted on newbuilds and during dry-dock cycles, with documented fuel savings of 3 to 8%.

- III. Wind-assisted propulsion: at evaluation stage for Indian-registry vessels, while globally rotor sails and suction sails are delivering verified fuel savings of up to 25% and have entered commercial scale deployment.
- IV. Waste heat recovery systems: being specified in select newbuild designs at Indian shipyards, particularly for larger coastal and offshore supply vessels.
- V. Hybrid propulsion: deployed on select inland waterway vessels and ferries under the Harit Nauka Guidelines framework.

Cochin Shipyard has been an active site for hydrogen fuel cell vessel development and is among the few Indian shipbuilders publicly engaged in zero-emission vessel design. Commercial deployment of hydrogen-propelled vessels remains limited domestically, though globally Japanese shipyards received orders for twelve hydrogen fuel cell vessels by April 2025.

### **International Technology Landscape:**

The pace of green maritime technology commercialisation globally has accelerated considerably since 2023. Technologies that were experimental three to five years ago are now entering commercial deployment at scale:

- I. Wind-assisted propulsion (rotor sails, suction sails, rigid wing sails) is delivering third-party verified fuel savings of 10 to 25% and is now specified in new vessel orders across bulk, tanker, and RoRo segments. The global market was estimated at USD 7.7 billion in 2025.
- II. Ammonia-fuelled two-stroke engines entered commercial service in 2026, with MAN Energy Solutions and Wärtsilä leading engine supply.
- III. Methanol dual-fuel vessels are now in commercial operation globally, led by Maersk's methanol-powered containership fleet.
- IV. Onboard carbon capture systems have completed initial sea trials on commercial vessels in Europe and Japan, with regulatory guidance from IMO.
- V. Autonomous vessel operations under human oversight are progressing to commercial deployment, with the first fully crewless short-sea cargo operations expected by 2027 in regulated corridors in Northern Europe.
- VI. Advanced hull materials, including fibre-reinforced polymer composites and titanium alloy components, are being adopted in naval and specialist vessel construction to reduce structural weight and improve lifecycle efficiency.
- VII. Biofouling management is seeing a significant shift toward non-toxic, silicon-based and enzyme-active hull coatings that eliminate the need for biocidal antifouling paints, with regulatory pressure from IMO's biofouling guidelines accelerating adoption.

## **SECTION 2- POLICY MEASURES**

### **7.1. Definition**

Any system, equipment, process, material, or digital solution deployed across vessels, ports, or shipyards that measurably reduces greenhouse gas emissions, improves energy efficiency, or minimises environmental impact. Green Technology encompasses commercially available solutions

as well as emerging innovations that demonstrate verifiable environmental benefit on a well-to-wake basis.

## **7.2. Green technologies in shipbuilding and repair**

The following technologies shall be promoted, incentivised, and progressively mandated across India's shipbuilding and repair sector:

- 7.2.1 Hybrid-electric and battery-electric propulsion systems for coastal, inland, and harbour vessels.
- 7.2.2 Green hydrogen and ammonia fuel cell propulsion systems for zero-emission newbuilds.
- 7.2.3 Wind-assisted propulsion systems including rotor sails, suction sails, and rigid wing sails, delivering verified fuel savings of 10 to 25% on applicable vessel types and routes.
- 7.2.4 Air lubrication systems reducing hull drag through sub-hull micro-bubble injection, with documented fuel savings of 5 to 10%.
- 7.2.5 Waste heat recovery systems capturing exhaust and jacket water heat for onboard power generation.
- 7.2.6 Advanced low-friction and biofouling-resistant hull coatings eliminating reliance on biocidal antifouling paints, with fuel efficiency improvements of 3 to 8%.
- 7.2.7 Onboard Carbon Capture and Storage (OCCS) systems for larger vessels where fuel switching is not immediately viable, subject to IMO regulatory guidance expected at MEPC 84.
- 7.2.8 Lightweight structural materials including fibre-reinforced polymer composites, reducing vessel weight and improving lifecycle energy efficiency.
- 7.2.9 AI-driven fuel optimisation and voyage management systems for real-time route, speed, and trim optimisation.
- 7.2.10 Dual-fuel and multi-fuel engine platforms providing operational flexibility across conventional and alternative fuel pathways.

## **7.3. Alternative fuels related technologies**

The following technologies shall support India's alternative fuel production, storage, distribution, and bunkering infrastructure:

- 7.3.1 Electrolyser systems for domestic green hydrogen production, including alkaline, PEM, and solid oxide technologies.
- 7.3.2 Ammonia synthesis and cracking technologies enabling ammonia as both a hydrogen carrier and a direct marine fuel.
- 7.3.3 Green methanol production systems integrated with renewable energy and biomass feedstocks.
- 7.3.4 Cryogenic storage and handling systems for liquefied hydrogen and ammonia at port and vessel level.
- 7.3.5 Advanced biofuel production technologies including second-generation cellulosic biofuels and hydrotreated vegetable oils suitable for direct blending without vessel modification.

- 7.3.6 Bunkering metering and quality assurance systems ensuring accurate GHG intensity measurement at the point of fuel delivery, aligned with IMO GFI reporting requirements.
- 7.3.7 Fuel cell systems for auxiliary power generation on vessels operating in port, reducing hotelling emissions.
- 7.3.8 Green Fuel Development Zone infrastructure integrating production, storage, and multi-fuel dispensing within designated port premises.

#### **7.4 Green technologies in ports**

The following technologies shall be deployed across India's major and non-major ports:

- 7.4.1 Shore power Supply system's providing clean grid or renewable electricity to vessels at berth, eliminating auxiliary engine emissions during port stays.
- 7.4.2 Port-scale renewable energy systems including rooftop solar, ground-mounted solar, wind turbines, and floating solar installations.
- 7.4.3 Battery-based Energy Storage Systems balancing renewable generation and peak port load.
- 7.4.4 Electric and hybrid cargo handling equipment including rubber-tyred gantry cranes, rail-mounted gantry cranes, automated guided vehicles, and electric yard tractors.
- 7.4.5 IoT-based real-time emissions monitoring systems across port machinery, vessels at berth, and bunkering operations.
- 7.4.6 Digital twin platforms for port energy management, infrastructure planning, and emissions performance simulation.
- 7.4.7 Just-in-Time arrival coordination systems reducing vessel waiting time, auxiliary engine idling, and anchorage emissions.
- 7.4.8 Smart stormwater and oil-water separation systems for pollution containment within port premises.
- 7.4.9 Eco-dredging equipment including electrified or hybrid low-emission dredgers with silt containment systems.
- 7.4.10 Green building materials including recycled steel, fly ash bricks, and green-certified cement for port infrastructure construction and retrofit.

#### **7.5 Green ship recycling technologies**

The following technologies shall be adopted across India's ship recycling sector, anchored at Alang and other recycling clusters:

- 7.5.1 Automated and semi-automated cutting and dismantling systems reducing worker exposure to hazardous materials and improving operational efficiency.
- 7.5.2 Hazardous material containment and removal systems for asbestos, Polychlorinated biphenyls (PCBs), heavy metals, and other substances identified in the Inventory of Hazardous Materials.
- 7.5.3 Material recovery and sorting technologies maximising steel and non-ferrous metal recovery rates, supporting circular economy principles.
- 7.5.4 Soil and groundwater remediation systems for contaminated intertidal and shoreline zones.

- 7.5.5 Digital yard management platforms enabling real-time tracking of hazardous material flows, waste streams, and compliance documentation aligned with Hong Kong Convention (HKC) and EU Ship Recycling Regulation (EUSRR) requirements.
- 7.5.6 Renewable energy systems for yard operations including solar installations and battery storage, reducing fossil fuel dependence in cutting and processing operations.

## **7.6 Emerging and Futuristic Technologies**

India's green maritime technology strategy shall extend beyond currently available solutions to position India as an active participant in the development, testing, and commercialisation of frontier maritime technologies. The following areas represent the global technology horizon and India's strategic research agenda:

- 7.6.1 Next-generation hull protection through enzyme-active, silicon-based, and biomimetic coatings, eliminating biocidal antifouling paints and reducing lifetime vessel fuel consumption.
- 7.6.2 Onboard Carbon Capture and Storage systems for large vessels on long international voyages where fuel switching is not viable within the 2030 to 2040 window, with Carbon Capture and Utilisation pathways converting captured CO<sub>2</sub> into synthetic fuels or construction materials.
- 7.6.3 Autonomous and AI-enabled vessel operations, including AI-based collision avoidance, remote monitoring systems, and regulatory frameworks for autonomous vessel certification.
- 7.6.4 Advanced operational optimisation through AI-based voyage management, predictive maintenance, fleet-level carbon management software, and port call optimisation platforms.
- 7.6.5 Material recovery and circular economy technologies for ship recycling, including AI-based material sorting, robotic dismantling systems, and blockchain-enabled traceability of recovered materials into downstream supply chains.
- 7.6.6 Structural lightweighting through fibre-reinforced polymer composites and advanced high-strength materials, leveraging India's existing capabilities in automotive and aerospace manufacturing.
- 7.6.7 Ocean-based carbon removal technologies including enhanced ocean alkalinity and blue carbon ecosystem restoration, supported through international research partnerships and pilot programmes.

## **7.7 Governance**

7.7.1 This pillar shall be implemented under Working Group 4, led by the Directorate General of Maritime Administration in coordination with the Department of Science and Technology. DGMA shall be responsible for notifying the Green Technology Compliance Framework, administering technology certification and standardisation processes for vessels and shipyards, and overseeing the operationalisation of Maritime Green Technology Parks. DST shall be responsible for coordinating research and innovation funding, managing technology readiness assessments for emerging maritime technologies, and facilitating linkages between maritime technology development and India's broader industrial research ecosystem. For the detailed governance

framework and implementation architecture under the National Maritime Decarbonisation Policy, refer to Part IV: Policy Governance.

7.7.2 Indian Government recognised Class Societies shall be responsible for classification and technical verification of green maritime technologies deployed on Indian-flag vessels, providing assurance services for Onboard Carbon Capture and Storage pilots, and contributing to IMO technical working group processes on emerging technology standards. NCoEGPS shall be responsible for maintaining the national repository of green maritime technology data, coordinating the Innovation Forums, and providing technical secretariat support to the Working Group. The Maritime Development Fund shall be responsible for operationalising the National Green Maritime Technology Research Fund and disbursing risk-sharing mechanisms for early-stage technology trials.

7.7.3 The Working Group shall comprise DGMA, DST, Indian Register of Shipping, NCoEGPS, Indian Maritime University, technology providers, classification societies, academic institutions, and DPIIT. The Working Group shall coordinate directly with its sectoral stakeholders and report on a continuous basis to the National Green Maritime Coordination Cell (NGMCC) administered by National Centre of Excellence in Green Port and Shipping (NCoEGPS), which shall consolidate pillar-level progress into biannual reporting to the Secretary MoPSW and annual reporting to Inter-Ministerial Taskforce on Maritime Decarbonisation (IMTMD).

## **SECTION 3- TARGETS**

### **Next 2 Years (2026 to 2028)**

1. A national Green Maritime Technology Research Fund shall be established under the Maritime Development Fund with dedicated allocations for onboard carbon capture, advanced hull coatings, autonomous vessel readiness, and AI-based optimisation systems.
2. At least one Onboard Carbon Capture and Storage pilot shall be initiated on an Indian-flag commercial vessel in partnership with a classification society and a technology provider.
3. Aim to designate one Indian-flag vessel for a full-voyage digital twin trial in partnership with a classification society, generating verified performance and emissions data for the national MRV framework.

## Pillar 8: Pollution Prevention

### **SECTION 1: GLOBAL CONTEXT & INDIA'S POSITION**

Maritime activities generate multiple categories of pollution that pose direct risks to coastal and marine environments. Ships and ports are sources of solid and liquid waste, oily water discharges, sewage, chemical effluents, air emissions, noise and accidental spills, each requiring systematic management and regulatory oversight. Globally, the IMO's MARPOL convention and its six annexes provide the primary international framework governing pollution from ships, covering oil, noxious

liquids, sewage, garbage and harmful substance. The London protocol further regulates the dumping of wastes at sea. Leading maritime nations have progressively strengthened port reception infrastructure, discharge monitoring, spill response capability and noise management frameworks in alignment with these obligations.

India is a signatory to MARPOL and has ratified key annexes governing oil, sewage, garbage, and air emissions from ships. At the domestic level, the Environmental Protection Act, 1986, Solid Waste Management Rules, 2016 and Plastic Waste Management Rules, 2016 provide the regulatory basis for waste handling and discharge compliance applicable to port operations. The National Oil Spill Disaster Contingency Plan (NOS-DCP), administered by the Indian Coast Guard, governs spill preparedness and response at the national level. Several major ports have established waste reception facilities, harbour water quality monitoring programmes, and oil spill response equipment in compliance with CPCB and SPCB requirements. The Swachh Sagar platform has further strengthened waste reception reporting at the vessel - port interface.

However, implementation remains uneven across the sector. Waste reception facility capacity and utilisation vary significantly between major and non-major ports. Port discharge compliance, harbour water quality monitoring noise management, and hazardous waste handling practices are not uniformly implemented or reported. As India's maritime sector expands, a dedicated pollution prevention framework addressing solid and liquid waste, port discharges, noise, and spill response is essential to meet international obligations and protect India's coastal and marine environment.

## **SECTION 2: POLICY MEASURES**

### **8.1 Definition**

Pollution prevention in the maritime context refers to the systematic management and mitigation of solid and liquid waste, noise, accidental spills, and discharges arising from shipping and port operations to safeguard marine ecosystems, coastal environments, and human health, in accordance with applicable national regulations and international conventions including MARPOL and the London Protocol.

### **8.2 Waste Management and Port Discharges**

8.2.1 Ports shall strengthen and maintain adequate waste reception facilities for ship-generated solid and liquid waste in compliance with MARPOL requirements, with waste volumes reported annually through the Swachh Sagar platform. Coverage and reporting compliance shall be progressively extended to all non-major ports above prescribed throughput thresholds

8.2.2 Compliance with applicable discharge standards for sewage, oily water, chemical effluents, and stormwater runoff shall be enforced across all major and non-major ports. Harbour water quality monitoring systems shall be established at all major ports and integrated with CPCB and SPCB reporting frameworks to enable continuous compliance tracking.

8.2.3 All major ports shall maintain documented hazardous waste management plans covering the handling, storage, and disposal of hazardous materials arising from maritime operations, with annual compliance reporting to CPCB and SPCB

8.2.4 The 5R approach — Refuse, Reduce, Reuse, Repurpose, and Recycle — as prescribed under the Harit Sagar Green Port Guidelines shall be adopted across all major ports for the management of ship-generated and port-operational solid waste, with waste segregation, treatment, and circular utilisation targets notified by the Government

8.2.5 Port authorities shall implement cargo spillage prevention and containment protocols for dry bulk, liquid bulk, and hazardous cargo handling operations, including dust suppression systems for coal, ore, and grain terminals, secondary containment for liquid bulk transfer points, and stormwater runoff treatment systems for cargo handling areas, in compliance with applicable CPCB and SPCB standards.

### **8.3 Oil Spill Prevention and Response**

8.3.1 The existing National Oil Spill Disaster Contingency Plan (NOSDCP), administered by the Indian Coast Guard as the Central Coordinating Authority, shall be strengthened through integration with the national maritime MRV framework and the Green Port Digital Platform, enabling real-time pollution incident data to feed into the national environmental monitoring system.

### **8.4 Noise Pollution**

8.4.1 Noise monitoring systems shall be operationalised at all major ports in accordance with the Noise Pollution (Regulation and Control) Rules 2000, with compliance data submitted to CPCB and relevant State Pollution Control Boards and integrated into port sustainability reporting under the Green Port Performance Index. DGMA shall, in coordination with MoEFCC, develop maritime-specific noise standards for port operations and vessel underwater radiated noise, aligned with IMO guidelines on underwater noise from commercial shipping and emerging international requirements, to protect marine ecosystems and coastal communities from cumulative noise impacts.

### **8.5 Research and Financial Support**

8.5.1 Research and development of advanced waste treatment systems, noise reduction technologies, and spill response solutions shall be supported through the Maritime Development Fund (MDF). Strategic partnerships between shipping companies, port authorities, and environmental agencies shall be facilitated for research, testing, and training in maritime pollution control, including joint task forces for rapid response to oil spills and marine debris incidents.

8.5.2 Financial support mechanisms including grants and low-interest loans shall be made available to port operators and shipowners to facilitate adoption of pollution control technologies, waste management systems, and compliance infrastructure, with priority support extended to small port operators and non-major ports.

### **8.6 International Cooperation**

8.6.1 India shall actively engage with the IMO and relevant MEPC processes to contribute to and align with evolving global pollution prevention standards under MARPOL and associated instruments and, shall pursue bilateral and multilateral cooperation frameworks for technology transfer, capacity building, and harmonised implementation of international pollution prevention obligations. India shall benchmark its port discharge standards, waste reception facility utilisation rates, and harbour water quality monitoring frameworks against leading maritime jurisdictions including Singapore, Rotterdam, and the Port of Antwerp, with findings incorporated into the biannual Green Port Performance review.

### **SECTION 3: TARGETS**

#### **Next 2 Years (2026-2028)**

1. All major ports shall continue to implement existing discharge, waste management, and cargo spillage prevention obligations under applicable CPCB, SPCB, and MARPOL frameworks, with progressive extension of compliance requirements to non-major ports above prescribed throughput thresholds.
2. Port pollution prevention practices shall be benchmarked against leading international port jurisdictions and aligned with evolving IMO MEPC standards under MARPOL and associated instruments.
3. India shall strengthen implementation of its obligations under the London Protocol and relevant MARPOL Annexes, with active participation in IMO pollution prevention processes to contribute to and adopt emerging international standards.

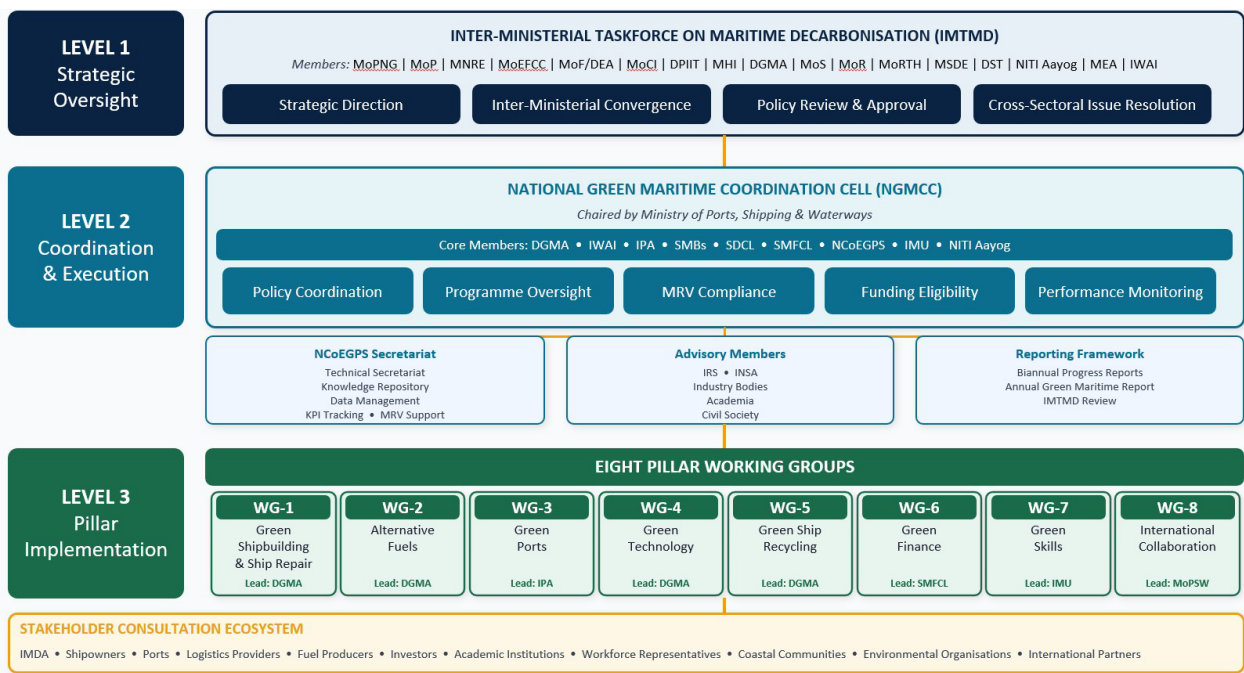
# PART-IV: Policy Governance

## 6.1 Overview

6.1.1 The National Maritime Decarbonisation Policy shall be governed through a three-level institutional framework comprising an apex inter-ministerial body, a central coordination and execution cell, and eight pillar-specific working groups. This framework shall ensure that policy implementation is coordinated across ministries, grounded in verified performance data, and accountable to defined reporting obligations at each level.

6.1.2 The National Green Maritime Coordination Cell (NGMCC), housed within the Ministry of Ports, Shipping and Waterways, shall serve as the central operating platform responsible for the coordinated execution of all eight pillars of the NMDP. The NGMCC shall be formally notified through a Government of India Resolution under the Allocation of Business Rules of MoPSW, conferring on it the status of a permanent statutory authority with binding directive powers over certification eligibility, MRV compliance, and access to central maritime funding schemes.

6.1.3 The proposed organisational flow is as indicated below:



## 6.2 Level 1- Apex Policy Governance

6.2.1 The first level of the governance framework shall comprise an Inter-Ministerial Taskforce on Maritime Decarbonisation (IMTMD), constituted as the apex body responsible for high-level policy direction, inter-ministerial convergence, and resolution of cross-ministry issues that cannot be addressed at the coordination level. The IMTMD shall be chaired by the Secretary, Ministry of Ports, Shipping and Waterways, and shall meet annually to review NMDP implementation progress and issue strategic guidance.

6.2.2 The IMTMD shall comprise the following ministries and bodies:

- i. Ministry of Petroleum and Natural Gas
- ii. Ministry of Power
- iii. Ministry of New and Renewable Energy
- iv. Ministry of Environment, Forest and Climate Change
- v. Ministry of Finance / Department of Economic Affairs
- vi. Ministry of Commerce and Industry
- vii. Department for Promotion of Industry and Internal Trade
- viii. Ministry of Heavy Industries
- ix. Directorate General of Maritime Administration
- x. Ministry of Steel
- xi. Ministry of Railways
- xii. Ministry of Road Transport and Highways
- xiii. Ministry of Skill Development and Entrepreneurship
- xiv. Department of Science and Technology
- xv. NITI Aayog
- xvi. Ministry of External Affairs
- xvii. Inland Waterways Authority of India

6.2.3 The Chair may co-opt any additional Ministry, Department, Regulatory Body, Public Sector Undertaking, Technical Institution, or Domain Expert as deemed necessary for specific agenda items or on a standing basis

### **6.3 Level 2- Coordination and Execution**

6.3.1 The second level of the governance framework shall comprise the National Green Maritime Coordination Cell (NGMCC), which shall oversee the execution and coordination of all eight pillars of the NMDP. The NGMCC shall be housed within the Ministry of Ports, Shipping and Waterways and shall function as the central operational platform for implementation oversight, MRV compliance, finance integration, technology standardisation, and just transition safeguards across all pillars.

6.3.2 The permanent institutional membership of the NGMCC shall be as follows:

- i. Ministry of Ports, Shipping and Waterways (MoPSW) - Chair
- ii. Directorate General of Maritime Administration (DGMA)- Primary Regulatory Authority
- iii. Inland Waterways Authority of India (IWAI)- Inland Waterway Implementation
- iv. Indian Ports Association (IPA)- Major Port Coordination
- v. State Maritime Boards (SMB)- Non-Major Port and Coastal State Interface
- vi. Sagarmala Development Company Limited (SDCL)- Port Infrastructure Programme
- vii. Sagarmala Finance Corporation Limited (SMFCL)- Green Maritime Finance Window

- viii. National Centre of Excellence in Green Ports and Shipping (NCoEGPS)- Permanent Secretariat
- ix. Indian Maritime University (IMU)- Maritime Education and Research
- x. NITI Aayog- Observer

6.3.3 The following bodies shall serve as rotational advisory members of the NGMCC, participating in a supporting and enabling capacity across relevant pillar working groups:

- i. Indian Register of Shipping (IRS)
- ii. Indian National Shipowners Association (INSA)
- iii. Ship Recycling Industry Representatives
- iv. Technical Institutions and Academic Experts
- v. Civil Society and Workforce Observers
- vi. OEM and Logistics Industry Representatives

6.3.4 The NGMCC shall operate through the following accountability and reporting framework. A Biannual Implementation and Emissions Progress Report shall be submitted to the Secretary, MoPSW every six months. An Annual Green Maritime Report shall be published for public disclosure on an annual basis. An NMDP Implementation Review shall be submitted to the IMTMD annually. Pillar Working Group progress updates shall be submitted on a continuous basis to the NGMCC Secretariat, which shall be administered by NCoEGPS.

#### **6.4 Level 3 – Pillar Working Groups**

6.4.1 The third level of the governance framework shall comprise eight dedicated Pillar Working Groups. Each Working Group shall coordinate directly with its sectoral stakeholders and report on a continuous basis to the NGMCC Secretariat administered by NCoEGPS. The composition of each Working Group shall be as follows:

##### **6.4.2 Working Group 1: Green Shipbuilding and Ship Repair**

The Working Group shall be led by the Directorate General of Maritime Administration (DGMA)

Key Responsibilities:

- I. DGMA- Green Ship Certification Framework in-line with IMO Framework, Green Ship Design Standards, Shipbuilding Financial Assistance Scheme (SBFAS) performance-linked framework, GCI-linked compliance and MRV reporting
- II. Ministry of Heavy Industries and DPIIT- Green Shipbuilding Cluster designation, domestic manufacturing capability in green maritime technologies
- III. Sagarmala Finance Corporation Limited (SMFCL) and Maritime Development Fund (MDF)- Green retrofit and newbuild financing windows, NGMCC-certified eligibility criteria

Working Group Members shall include: Indian National Shipowners Association, Indian Register of Shipping, Cochin Shipyard Limited, Ministry of Heavy Industries, Department for Promotion of Industry and Internal Trade (DPIIT), Indian shipbuilding industry representatives

#### 6.4.3 Working Group 2: Alternative Fuels

The Working Group shall be led by the Directorate General of Maritime Administration in coordination with the Ministry of New and Renewable Energy and the Ministry of Petroleum and Natural Gas.

Key Responsibilities:

- I. DGMA- Fuel safety standards, GFI implementing regulations, support for national marine biofuel certification standard, dual-fuel certification requirements under the Merchant Shipping Act 2025
- II. MNRE- Green hydrogen and ammonia production targets under the National Green Hydrogen Mission, alignment of hub-level production commitments with maritime bunkering demand
- III. MoPNG- LNG bunkering infrastructure policy, regulatory framework for transitional fuel supply at major ports, coordination with domestic biofuel supply chains
- IV. Deendayal Port Authority, Paradip Port Authority, and V.O. Chidambaranar Port Authority — Operationalisation of Green Fuel Development Zones, bunkering infrastructure at designated Green Hydrogen Hubs, demand anchoring for the national demand aggregation mechanism
- V. IMDA- Coordination of buyer alliances, aggregation of offtake commitments, Carbon Credit Advance Purchase Agreement frameworks

Working Group Members shall include: Indian Maritime Decarbonisation Alliance, National Green Hydrogen Mission Authority, Deendayal Port Authority, Paradip Port Authority, V.O. Chidambaranar Port Authority, Indian Oil Corporation, and domestic fuel producers.

#### 6.4.4 Working Group 3: Green Ports

The Working Group shall be led by the Indian Ports Association in coordination with the Major Port Authorities.

Key Responsibilities:

- I. Indian Ports Association- Coordination of GPPI adoption across all major ports, oversight of Harit Sagar Green Port Guidelines compliance, facilitation of the Annual Port Sustainability Forum
- II. Major Port Authorities- Operationalisation of electrification timelines, renewable energy targets, OPS infrastructure, and the National Green Port Digital Platform within respective port jurisdictions
- III. National Port Sustainability Council- Institutional oversight of the green ports agenda, inter-agency coordination, and Green Ports Working Group governance
- IV. State Maritime Boards- Extension of GPPI reporting and Green Port Certification to non-major ports above prescribed throughput thresholds
- V. Ministry of Power and State DISCOMs- Grid capacity augmentation and tariff harmonisation required for shore power implementation across major ports
- VI. NCoEGPS- Technical secretariat support, national repository of port sustainability performance data

Working Group Members shall include: State Maritime Boards, NCoEGPS, Inland Waterways Authority of India, Ministry of Power, State Distribution Companies, and port operators.

#### 6.4.5 Working Group 4: Green Technology

The Working Group shall be led by the Directorate General of Maritime Administration in coordination with the Department of Science and Technology.

Key Responsibilities:

- I. DGMA- Green Technology Compliance Framework, technology certification and standardisation for vessels and shipyards, operationalisation of Maritime Green Technology Parks
- II. DST- Research and innovation funding coordination, technology readiness assessments for emerging maritime technologies, linkages with India's broader industrial research ecosystem
- III. Indian Register of Shipping- Classification and technical verification of green maritime technologies on Indian-flag vessels, assurance services for OCCS pilots, contribution to IMO technical working group processes on emerging technology standards
- IV. NCoEGPS- National repository of green maritime technology data, coordination of Innovation Forums, technical secretariat support to the Working Group
- V. MDF- Operationalisation of the National Green Maritime Technology Research Fund, disbursement of risk-sharing mechanisms for early-stage technology trials

Working Group Members shall include: Indian Register of Shipping, NCoEGPS, Indian Maritime University, technology providers, classification societies, academic institutions, and DPIIT.

#### 6.4.6 Working Group 5: Green Ship Recycling

The Working Group shall be led by the Directorate General of Maritime Administration in coordination with the Ministry of Environment, Forest and Climate Change.

Key Responsibilities:

- I. DGMA- Administration of the Recycling of Ships Act 2019 and Recycling of Ships Regulations 2026, operationalisation of the National Ship Recycling Portal, oversight of HKC and EUSRR yard-level compliance
- II. MoEFCC- Environmental clearance processes, coordination with CPCB on discharge and emissions standards for ship recycling facilities, alignment of national GHG accounting framework with India's NDC reporting obligations
- III. State Maritime Board- State-level coordination of yard compliance roadmaps, worker welfare programmes, environmental monitoring at ship recycling clusters, and issuance and maintenance of DASR
- IV. Bureau of Indian Standards- Notification of recycled ship steel standards and certification mechanisms
- V. Bureau of Energy Efficiency- Development of carbon footprint certification methodology for recycled ship steel across the value chain

- VI. FSDF- Joint administration with Ministry of Steel to finance yard infrastructure upgradation, environmental compliance, and green steel initiatives

Working Group Members shall include: Ship Recycling Industry Association, State Maritime Board, Ministry of Steel, Indian Register of Shipping, Bureau of Indian Standards, Bureau of Energy Efficiency, and HKC compliance bodies.

#### 6.4.7 Working Group 6: Green Finance

The Working Group shall be led by Sagarmala Finance Corporation Limited in coordination with the Ministry of Finance.

Key Responsibilities:

- I. SMFCL- Operationalisation of the dedicated green maritime finance vertical, administration of MDF green conditionality criteria, facilitation of taxonomy-aligned financing instruments for ports, shipyards, shipping companies, and fuel infrastructure developers
- II. Ministry of Finance- Maritime sector inclusion under India's sovereign green bond framework, coordination with RBI and SEBI on green maritime bond and sustainability-linked loan standards, alignment with India's Climate Finance Taxonomy Framework
- III. RBI- Priority sector lending guidelines for green maritime projects
- IV. SEBI- Green bond issuance standards and ESG disclosure requirements for listed maritime entities
- V. MoEFCC- Coordination of the maritime carbon market framework with India's domestic carbon market architecture and Article 6 engagement at UNFCCC
- VI. MNRE- Alignment of green hydrogen and ammonia financing pathways with maritime bunkering demand signals through Indian Maritime Decarbonisation Alliance (IMDA)

Working Group Members shall include: Reserve Bank of India, SEBI, Asian Development Bank, World Bank, Green Climate Fund, New Development Bank, European Investment Bank, IRENA, green bond issuers, and maritime lenders.

#### 6.4.8 Working Group 7: Green Skills

The Working Group shall be led by the Indian Maritime University in coordination with the Ministry of Skill Development and Entrepreneurship.

Key Responsibilities:

- I. IMU- Development and maintenance of the National Green Maritime Skills Framework, integration of green competency modules into DGMA-approved curricula, oversight of the national network of Green Maritime Training and Simulation Centres, administration of the IMU-NCoEGPS Research Consortium
- II. MSDE- Alignment of green maritime occupational standards with the National Skills Qualifications Framework, coordination of the Skill Council for Green Jobs, integration of maritime green skills pathways into national skilling programmes and Recognition of Prior Learning mechanisms

- III. DGMA- Notification of the national accreditation framework for Green Maritime Training Centres, approval of role-specific certification pathways for seafarers, bunkering personnel, and port operators, alignment of training standards with applicable IMO instruments and the STCW Convention as revised
- IV. MDF- Operationalisation of the Green Talent Fund, including scholarship, fellowship, and apprenticeship disbursement mechanisms and industry co-funding arrangements

Working Group Members shall include: DGMA-approved maritime academies, Skill Council for Green Jobs, IWAI training centres, port training centres, and classification societies.

#### 6.4.9 Working Group 8: International Collaboration

The Working Group shall be led by the Ministry of Ports, Shipping and Waterways in coordination with the Ministry of External Affairs.

Key Responsibilities:

1. MoPSW- Coordination of India's Green Shipping Challenge commitments, Clydebank Declaration corridor framework engagement, and positioning of Indian ports as preferred bunkering and fuel export hubs on key international trade routes
2. MEA- Management of bilateral maritime cooperation agreements with Norway, Singapore, Japan, Republic of Korea, Denmark, the Netherlands, and the United Arab Emirates, and coordination of green maritime diplomacy through bilateral and multilateral channels
3. IMO National Focal Point- Representation of India's positions at IMO MEPC on the Net-Zero Framework, GFI implementing regulations, and safety codes for low-flashpoint maritime fuels
4. Indian Maritime Decarbonisation Alliance (IMDA)- Coordination of international demand aggregation partnerships and engagement with Zero Emission Maritime Buyers Alliance (ZEMBA) and equivalent global buyer alliances

Working Group Members shall include: IMO National Focal Point, Indian Maritime Decarbonisation Alliance, bilateral partner missions, Green Shipping Challenge Secretariat, Clydebank Declaration partners, and multilateral development banks.

### **6.5 Stakeholder Consultation Framework**

6.5.1 Periodic stakeholder consultations shall be conducted to ensure that NMDP implementation remains grounded in industry realities, coastal community needs, and emerging technological developments. Consultations shall be coordinated through the Indian Maritime Decarbonisation Alliance and the NCoEGPS secretariat, with below suggested engagement mechanisms:

- i. Shipowners and shipping companies can engage through INSA representation on the NGMCC Advisory and through Working Group 1 and Working Group 2 consultations.
- ii. Port operators and logistics providers shall engage through IPA representation on the NGMCC, Working Group 3 consultations, and the Annual Port Sustainability Forum.
- iii. Financial institutions and investors shall engage through the SMFCL-led Green Maritime Finance Working Group 6.

- iv. Technology developers and service providers shall engage through Working Group 4 and NCoEGPS-led Innovation Forums.
- v. The ship recycling industry shall engage through Working Group 5 and in coordination with the State Maritime Board.
- vi. Academic and research institutions shall engage through the IMU-NCoEGPS Research Consortium and Working Group 7.
- vii. Coastal communities and local authorities shall engage through the Just Transition Safeguards mechanism within the NGMCC and in coordination with the Ministry of Fisheries, Animal Husbandry and Dairying.
- viii. Environmental organisations shall engage through MoEFCC coordination and through Working Group 5 and Working Group 3 consultations.
- ix. International partners shall engage through Working Group 8, the IMO National Focal Point, and MEA bilateral channels.

## **6.6 Monitoring, Evaluation and Review**

6.6.1 The implementation of the NMDP shall be monitored through Key Performance Indicators drawn from MRV datasets maintained on NLP-Marine and other designated data sources. The NGMCC shall be responsible for maintaining performance datasets used for funding and compliance decisions. Indicators shall cover maritime GHG emissions and carbon intensity, renewable energy utilisation at major ports, alternative fuel adoption, number of certified green vessels and ports, Green Port Performance Index scores, green maritime investment mobilised, and maritime workforce training outcomes.

6.6.2 The NMDP shall be reviewed at least once every five years to incorporate emerging technologies, international regulatory developments, industry feedback, and evolving national climate objectives. The first review shall be completed by 2031.

## **PART V: International Cooperation and Diplomacy**

### **1. International Cooperation as a Strategic Imperative**

India's maritime decarbonisation agenda cannot be pursued in isolation. The sector operates within a globally integrated regulatory, financial, and technological ecosystem, one that is undergoing rapid and irreversible transformation. Three imperatives make international cooperation a structural necessity rather than a diplomatic preference.

The first is regulatory alignment. The IMO's revised GHG Strategy, the entry into force of the Hong Kong Convention, the EU's Fit for 55 package, and the emerging Net-Zero Framework under MARPOL Annex VI are collectively reshaping the terms on which ships access international trade routes, ports admit vessels, and capital flows to maritime projects. India's fleet, ports, and recycling yards operate within this system. The ability to influence, anticipate, and align with these frameworks rather than react to them determines whether India's maritime sector remains competitive or faces progressive market exclusion.

The second is technology access. The green maritime transition is technology-intensive, and the frontier technologies like ammonia-fuelled engines, onboard carbon capture, wind-assisted propulsion, hydrogen fuel systems, digital MRV platforms, are being developed and commercialised primarily in Norway, Denmark, Japan, South Korea, the Netherlands, and Singapore. India does not currently have domestic commercial capability across these technology clusters. Structured bilateral and multilateral partnerships are the fastest and most cost-effective pathway to technology transfer, joint R&D, and domestic capability development.

The third is financing. The scale of investment required for India's green maritime transition cannot be met through domestic public finance alone. Accessing international green finance flows, multilateral concessional capital, and sustainability-linked private finance requires India to demonstrate alignment with international green finance standards and build structured relationships with the multilateral institutions and international financial partners who are increasingly the gatekeepers of climate-aligned capital.

Taken together, these imperatives mean that international cooperation is not a supplementary activity, but it is a core enabler of the NMDPF's implementation across every pillar.

### **2. Global Maritime Decarbonisation Landscape — Technology and Regulatory Context**

#### **2.1 Green Technology**

The pace of green maritime technology commercialisation has accelerated considerably since 2023. Technologies that were experimental three to five years ago are entering commercial deployment at scale, creating both an opportunity and an urgency for India to engage with the global technology ecosystem now rather than after standards and supply chains have consolidated without Indian participation.

- Wind-assisted propulsion including rotor sails, suction sails, and rigid wing sails, is delivering third-party verified fuel savings of 10–25% and is now specified in new vessel orders across bulk carrier, tanker, and RoRo segments. The global market was estimated at USD 7.7 billion in 2025.
- Ammonia-fuelled two-stroke engines entered commercial service in 2026, with MAN Energy Solutions and Wärtsilä leading engine supply globally.
- Methanol dual-fuel vessels are now in commercial operation, led by large containership operators, establishing methanol as a near-term transition fuel with growing bunkering infrastructure.
- Onboard carbon capture systems have completed initial sea trials on commercial vessels in Europe and Japan, with IMO regulatory guidance expected at MEPC 84 in 2026 — a development that will significantly affect compliance pathway choices for the global fleet.
- Autonomous vessel operations under human oversight are progressing toward commercial deployment, with the first crewless short-sea cargo operations expected by 2027 in regulated corridors in Northern Europe, signalling a medium-term transformation in crew requirements and vessel design.

## **2.2 Regulations**

### *2.2.1 International Maritime Organisation (IMO):*

- The IMO Net-Zero Framework under MARPOL Annex VI encompassing the GFI-based fuel standard and an economic instrument with Tier 1 and Tier 2 compliance levels is the defining global regulatory development of the current period.
- Operational efficiency and design standards remain in effect, including the Energy Efficiency Existing Ship Index (EEXI) and the Carbon Intensity Indicator (CII), which grade vessels based on their annual operational performance
- Data collection systems (DCS) - Requires vessels to monitor and report data on fuel consumption, voyage details and emissions.

### *2.2.2 European Mandates*

- The EU Emissions Trading System (EU ETS)- Shipping companies must surrender emissions allowances for voyages within the EU and a portion of international voyages
- FuelEU Maritime - Imposes strict limits on the yearly average greenhouse gas intensity of the energy used onboard a ship, with reduction targets spanning every five years through 2050
- Monitoring, Reporting and Verification (EU MRV): Requires vessels to monitor and report fuel consumption, emissions and other voyage data on EU-related voyages.

### *2.2.3 Other Global Mandates*

- The Clydebank Declaration, signed by a growing coalition of nations committed to establishing green shipping corridors, and the Green Shipping Challenge launched at COP27, are creating a diplomatic architecture for corridor development that India must actively engage with.
- The Sustainable Fuel Certification Scheme and the IMO's LCA standards for marine fuels are establishing the certification infrastructure that will determine which fuels qualify as green

in international trade, a standard-setting process in which India has a direct interest as both a fuel-producing and fuel-consuming nation.

India's international cooperation agenda must be calibrated to this landscape, not merely tracking global developments but actively shaping the standards, corridors, and financial frameworks that will govern the sector for the next two decades.

### **3. India's Current International Engagement Landscape**

India's international maritime cooperation portfolio spans bilateral partnerships, multilateral forum participation, corridor development frameworks, and programme-level engagements. While several of these are at varying stages of operationalisation, together they constitute a foundation on which the NMDPF's diplomatic agenda can be systematically built.

#### **3.1 Bilateral Engagements**

*3.1.1 Norway* — India's most substantive bilateral maritime relationship on decarbonisation. Engagement is anchored in the India-Norway bilateral Green Maritime Cooperation framework under the Green Voyage 2050 programme. Areas of active collaboration include alternative fuel safety standards, green propulsion systems, wind-assisted propulsion technology, and maritime decarbonisation financing. Norway's Green Shipping Programme is one of the most advanced national green shipping ecosystems globally and provides a policy and technology reference model for several NMDPF pillars.

*3.1.2 Denmark* — The India-Denmark Green Strategic Partnership includes a dedicated Centre of Excellence on green maritime cooperation. A pre-feasibility study on the Rotterdam-India-Singapore Green Shipping Corridor, being developed under this partnership, is expected in late 2026 and will form the basis for converting India's corridor ambitions into operationally specific project commitments with defined vessel targets, bunkering volumes and fuel certification requirements. Bilateral cooperation also extends to green skills, with faculty exchange and specialised certification programmes under development through Danish Maritime Authority mechanisms.

*3.1.3 Japan* — India and Japan maintain broad maritime and clean energy cooperation through bilateral economic and infrastructure partnerships. Japan's global leadership in ammonia fuel technologies, advanced shipbuilding and low-carbon industrial systems presents significant opportunities for future technology transfer and joint research supporting India's maritime decarbonisation agenda. Collaboration currently remains primarily technology- and industry-oriented rather than a dedicated bilateral green shipping programme..

*3.1.4 Netherlands* — India cooperates with the Netherlands on sustainable ports, logistics and circular economy initiatives through government and port-to-port engagement. Rotterdam's experience in alternative fuel bunkering, digital ports and industrial circularity provides valuable reference models for India's port decarbonisation and green corridor development.

*3.1.5 Singapore* — India and Singapore signed a Memorandum of Understanding on Maritime Digitalisation and Decarbonisation, establishing a formal framework for collaboration on maritime

innovation, digital systems, decarbonisation initiatives and the development of a green and digital shipping corridor. The partnership leverages Singapore's position as the world's largest bunkering hub and India's growing role as a major cargo and potential green fuel hub on Asia-Pacific trade routes.

### **3.2 Multilateral Forum Engagements**

*3.2.1 International Maritime Organization (IMO)* — India participates actively in MEPC processes, including the development of the IMO Net-Zero Framework, GFI implementing regulations, the Sustainable Fuel Certification Scheme, IMO LCA standards for marine fuels, and safety codes for low-flashpoint fuels. India's engagement is calibrated to ensure that international standards reflect the operational realities and developmental priorities of major fuel-producing and fuel-consuming nations, consistent with the CBDR-RC principle.

*3.2.2 IMO — GloLitter Partnerships Project* — India has been designated as a Lead Partner Country under the GloLitter Partnerships Project, a joint IMO-FAO initiative helping developing countries tackle marine plastic litter from shipping and fisheries. India has published a dedicated National Action Plan under this programme, making it one of the most advanced developing-country participants in the global marine litter governance architecture.

*3.2.3 International Maritime Organization – GreenVoyage2050* - India actively engages with IMO capacity-building programmes supporting National Action Plans, green fuel readiness, port decarbonisation and implementation of the IMO GHG Strategy.

*3.2.4 International Organization for Standardization (ISO)* - India participates in ISO technical committees relevant to maritime environmental management, sustainable procurement and greenhouse gas accounting, supporting harmonisation with international standards.

*3.2.5 Hong Kong International Convention (HKC)* - Following the entry into force of the HKC, India's ship recycling framework is increasingly integrated with the global convention architecture, making engagement through IMO implementation processes a key component of its international cooperation strategy.

## **4. India's Position in Global Maritime Governance**

### **4.1 India's Overarching Posture**

India approaches global maritime governance as a constructive and active participant engaging substantively in the development of international frameworks while ensuring that the pace, design, and burden-sharing of the global maritime transition reflects the developmental realities of major emerging economies. This posture is anchored in the principle of Common But Differentiated Responsibilities and Respective Capabilities (CBDR-RC), which India has consistently articulated across climate and environmental negotiations and which applies with equal force to the maritime sector.

India is not a passive recipient of internationally determined standards. As the world's largest democracy, a top-five global maritime nation by multiple metrics, and an emerging hub for shipbuilding, ship recycling, alternative fuel production, and port infrastructure, India has both the standing and the strategic interest to shape the international frameworks within which it will

operate for the next five decades. The NMDPF positions international engagement not merely as alignment with external requirements but as an active exercise of India's maritime diplomacy.

#### **4.2 IMO Engagement — Key Processes and India's Positions**

The IMO's revised GHG Strategy (2023) establishes indicative checkpoints of 20% emissions reduction by 2030 and 70% by 2040, with net-zero by or around 2050. The implementing instrument, the Net-Zero Framework under MARPOL Annex VI encompasses a GHG Fuel Intensity standard and an economic instrument with Tier 1 and Tier 2 compliance levels.

India's engagement on the Net-Zero Framework is calibrated to three priorities.

1. Ensuring that the GFI trajectory and compliance timelines reflect the infrastructure readiness and fuel availability constraints of developing and emerging economies, not only the decarbonisation ambitions of advanced maritime nations.
2. Ensuring that the economic instrument particularly the Tier 2 levy and the reward mechanism for zero and near-zero emission fuels does not disproportionately burden developing-country flag states and shipowners without corresponding technology transfer and financing support.
3. Ensuring that alternative fuel safety standards, certification frameworks, and LCA methodologies under development at IMO reflect the production realities of nations like India that are positioning as upstream green fuel producers particularly for green hydrogen, green ammonia, and green methanol.

India actively participates in MEPC processes and shall seek to formalise its positions through the inter-ministerial coordination architecture established under the NMDPF, ensuring that India's MEPC delegation reflects a unified national view across Ministry of Ports, Shipping and Waterways (MoPSW), Ministry of External Affairs (MEA), Ministry of Environment, Forest and Climate Change (MoEFCC) and the Ministry of Finance

#### **5. Strategic Priorities for India's Maritime Diplomacy**

India's international cooperation agenda is organised around 7 key pillars of NMDPF, each cutting across multiple goals and requiring coordinated diplomatic, institutional, and technical engagement.

##### **5.1 Green Ships and Retrofitting**

India's international cooperation agenda under this pillar shall focus on technology access, standards harmonisation, and shipping-side enablers for green corridor development. Green shipping corridors are addressed substantively under Green Fuels; references here are limited to vessel-side obligations and retrofit requirements.

###### **5.1.1 Industry and Institutional Partnerships**

- India shall engage with Denmark, the Maersk Mc-Kinney Møller Centre and the Global Centre for Maritime Decarbonisation to accelerate hydrogen and methanol technology pathways for Indian-flagged and Indian-built vessels.
- India shall partner with classification societies and accredited testing laboratories to standardise Life-Cycle Emissions Reporting (LCER) frameworks applicable to Indian fleet segments.

- India shall participate in IMO's pilot for fuel lifecycle GHG validation under the GHG Fuel Standard (GFS) by 2027.
- India shall collaborate with Norway to access expertise on vessel retrofitting, energy efficiency technologies, and wind-assisted propulsion systems.
- India shall engage technology leaders in advanced engine technologies, onboard carbon capture and storage, advanced energy storage systems, and air lubrication systems to facilitate technology transfer and co-development with Indian shipyards.

#### **5.1.2 Multilateral Engagement**

- India shall participate in Green Voyage 2050 (Phase 2) with focus on propulsion innovation and operational efficiency measures applicable to the Indian fleet.
- India shall align its vessel emission standards and retrofit guidelines with evolving IMO Tier III technical and operational measures, and shall engage actively in MEPC processes to safeguard its interests as a major flag and port state.

#### **5.1.3 Green Shipping Corridors**

- India shall progress its participation in green shipping corridors including IMEC, the Rotterdam–India–Singapore route, the India–Singapore corridor, and the India–UAE corridor. Vessel readiness, retrofit requirements, and flag state obligations under these corridors shall be taken forward through bilateral engagement with corridor partner nations and relevant classification societies.

### **5.2 Green Ports**

India's port sustainability agenda has a significant international cooperation dimension that extends beyond technology transfer into diplomatic positioning, knowledge exchange, and brand building.

#### **5.2.1 Sister-Port Partnerships**

- India shall establish formal bilateral sister-port arrangements between Indian major ports and leading international green ports as a structured mechanism for benchmarking, best practice exchange, and joint pilot deployments.
- Priority partner ports shall include Rotterdam, PSA Singapore, the Port of Oslo, Yokohama, and Busan, reflecting the geographic spread of India's bilateral maritime partnerships and the technology clusters most relevant to India's port decarbonisation agenda.

#### **5.2.2 Multilateral Platform Engagement**

- India shall engage with the European Green Ports Initiative and the Asian Smart Ports Network as the two most substantive multilateral port sustainability platforms to benchmark Indian port performance and access global best practice.
- Engagement shall specifically target clean energy and electrification, alternative fuels and zero-emission technologies, digital and smart port systems, and R&D collaboration on emerging port decarbonisation technologies.

- India shall seek to position Indian ports as active contributors within the global green ports ecosystem, moving beyond technology recipient status to co-develop standards and share implementation learnings from one of the world's largest port development programmes.

### **5.3 Green Ship Recycling**

India's international cooperation under this pillar shall focus on regulatory alignment, bilateral partnerships, and knowledge exchange to position Indian ship recycling yards as globally preferred, environmentally sound facilities.

#### **5.3.1 *Regulatory Alignment and Compliance***

- India shall engage with IMO and flag state administrations to progress formal HKC authorisation for eligible Indian yards and ensure India's ship recycling regulatory framework remains aligned with evolving international standards.
- India shall engage with the European Commission and relevant EU member state authorities to understand EUSRR requirements and facilitate compliance readiness for Indian yards seeking to recycle European-flagged vessels.

#### **5.3.2 *Bilateral and Multilateral Partnerships***

- India shall establish partnerships with Japan, and South Korea to access expertise in environmentally sound recycling practices, yard infrastructure upgradation, worker safety systems, and hazardous material management.
- India shall participate actively in international ship recycling forums to contribute India's experience as the world's largest ship recycling nation and shape global standards in a manner consistent with India's development interests.

#### **5.3.3 *Knowledge Exchange and Technical Cooperation***

- India shall explore potential knowledge exchange and technical support under the Safe and Environmentally Sound Recycling of Ships (SENSREC) programme, a collaboration between the Government of Norway and IMO to support developing countries in implementing the Hong Kong Convention

### **5.4 Green Finance**

India's green maritime transition requires international capital at a scale that domestic public finance cannot provide alone. The strategic priority is to build the institutional relationships, taxonomy alignments, and project pipelines that make India's maritime sector eligible for and attractive to international green finance flows. Three tracks of international financial engagement shall be pursued simultaneously.

#### **5.4.1 *Multilateral Concessional Finance***

- India shall deepen the engagement with the Green Climate Fund, Global Environment Facility, and AIIB to develop co-financing arrangements for green maritime infrastructure, with a focus on alternate fuels infrastructure, port electrification, and digital MRV systems.

#### **5.4.2 Sustainability-linked Private Finance**

- Engagement with Poseidon Principles signatory banks, representing approximately USD 185 billion in global ship finance, to ensure that Indian maritime entities and financial institutions are positioned to access and participate in sustainability-linked ship finance arrangements.

#### **5.4.3 Green Bond Market Development**

- Leveraging partnerships with Standard Chartered, Lloyd's Register, Climate Fund Managers, and APM Terminals to structure India's first green maritime bond issuances and develop the second-party assurance infrastructure required for international credibility.

#### **5.4.4 Maritime ESG Taxonomy**

- The taxonomy shall be aligned with the EU Taxonomy, ICMA Green Bond Principles, and IFC Performance Standards ensuring that Indian maritime entities accessing international capital markets can demonstrate alignment with globally recognised green finance standards.

### **5.5 Green Skills**

India's green maritime skills agenda has a direct international dimension — both in terms of accessing global green maritime expertise and in positioning India as a preferred hub for green maritime training and certification.

- Partnerships with BIMCO, EMSA, and IMA-accredited training institutions shall be institutionalised to support international recognition of Indian maritime qualifications, alignment of India's green skills curriculum with globally recognised certification frameworks, and access to specialised training in alternative fuel handling, MRV systems, and green port operations.
- Mutual recognition agreements with IMO, leading classification societies, and global maritime academies shall be pursued to ensure that Indian seafarers and maritime professionals trained in India's green skills ecosystem are recognised and employable internationally.
- Bilateral green skills cooperation with Denmark and Japan, covering faculty exchange, joint curriculum development, and specialised certification programmes, shall be formalised through existing bilateral maritime cooperation frameworks.
- Training exchange programmes between India's Maritime Energy Training Facility and leading international cruise operators including Viking and Royal Caribbean shall be operationalised as part of the inland and coastal waterway green transition agenda.
- India's longer-term aspiration shall be to become a net exporter of green maritime training — developing India-origin certification programmes, training methodologies, and green maritime education products deployable across Indian Ocean Region states and developing maritime nations.

### **5.6 Green Fuels and Bunkering**

India's geographic positioning at the intersection of East–West and Middle East–Asia trade routes creates a structural opportunity to emerge as a regional hub for alternative marine fuels. Realising this opportunity requires coordinated international engagement across fuel certification, corridor

development, bilateral partnerships, and multilateral standard-setting moving from corridor aspiration to operationally specific bunkering commitments.

#### **5.6.1 Multilateral and Bilateral Engagement**

- India shall deepen engagement under the India–Denmark Green Strategic Partnership, including through the Maersk Mc-Kinney Møller Centre, to accelerate methanol and hydrogen fuel pathways and progress the Rotterdam–India–Singapore corridor pre-feasibility study expected in late 2026.
- India shall engage with the UAE on upstream green hydrogen and green ammonia production particularly from Abu Dhabi as a natural supply relationship with India's bunkering infrastructure development along the India–Middle East–Europe route.
- India shall seek to accede to the Clydebank Declaration, formally committing to green shipping corridor development, and shall engage with the Green Shipping Challenge to position Indian ports as preferred bunkering and fuel export hubs on key international trade routes.
- India shall engage with EU Fit for 55 processes and the International Fuel Certification Framework under MEPC to monitor regulatory developments that affect market access for Indian-bunkered vessels on European trade routes, and align domestic standards accordingly.

#### **5.6.2 Green Shipping Corridors**

India shall progress four priority corridor commitments, with bunkering infrastructure, fuel certification, and financing dimensions coordinated across corridor partner nations:

- Rotterdam–India–Singapore: The most strategically significant corridor, traversing the Europe–Middle East–Asia route. Developed under the India–Denmark Green Strategic Partnership; pre-feasibility study expected late 2026. India's role is as a mid-route bunkering and fuel certification hub, with Kochi and JNPA as primary Indian port nodes.
- India–Singapore: Anchored in high-volume bilateral trade and Singapore's position as the world's largest bunkering hub; focus on co-developing certification and supply chain architecture for South Asia–Southeast Asia trade.
- India–UAE: Aligned with IMEC and the India–UAE bilateral relationship; positions Indian west coast ports as green bunkering waypoints on the India–Middle East–Europe route, with upstream fuel supply linkages to Abu Dhabi.
- IMEC Green Infrastructure Backbone: India's corridor diplomacy shall be coordinated with IMEC infrastructure planning to ensure green bunkering, shore power, and alternative fuels investments are sequenced with IMEC port development timelines.

#### **5.6.3 DNV–IMO Alternative Fuels Study: Strategic Implications for India's Bunkering Diplomacy**

The *Study on Potential Demand and Pricing of Alternative Marine Fuels in India* (DNV, 2026), conducted in partnership with DG Shipping and MoPSW, provides the analytical foundation for India's green fuels diplomacy. Four findings are directly relevant to India's international engagement:

- Credible near-term bunkering demand lies with cargo-calling vessels, not passing traffic — India's corridor and bunkering diplomacy must therefore be anchored in ports with strong origin-destination cargo volumes, particularly Mundra, JNPA, Chennai, and Tuticorin.

- Container shipping is the most predictable early adopter segment, given its concentration among large operators with decarbonisation commitments and predictable route patterns — bilateral engagement with major container shipping nations and operators should be prioritised accordingly.
- Delivered fuel cost competitiveness is the primary determinant of bunkering decisions — meaning India's international engagement must extend beyond infrastructure commitments to active work on port charge rationalisation, GST treatment of marine fuels, and fiscal support mechanisms that close the cost gap with competing hubs.
- India's opportunity lies in clustered multi-port bunkering hubs rather than isolated pilots — a hub-and-spoke architecture across Kandla/Deendayal, JNPA, Kochi, Tuticorin, and Paradip is more credible and scalable, and should form the basis of India's bunkering offer to corridor partners.

The study proposes a phased approach — *Establish (2026–2030), Scale (2030–2035), and Position (2035–2047)* — that India shall use as the reference framework for sequencing its international bunkering commitments and corridor operationalisation timelines.

## **5.7 Green Technology**

India's most immediate international cooperation need is access to frontier green maritime technologies not yet domestically available at commercial scale. The strategic priority is to convert aspirational bilateral partnerships into structured technology transfer arrangements with defined deliverables, timelines, and domestic capability development components.

### **5.7.1 Priority Technology Clusters**

- India shall pursue international partnerships for advanced engine technologies for alternative fuels like ammonia, methanol, and hydrogen with MAN Energy Solutions, Wärtsilä, and leading Japanese and Korean OEMs as primary counterparts.
- India shall engage European and Japanese technology developers on onboard carbon capture and storage systems, where commercial deployment-ready technology exists and Indian shipyards and operators require structured access.
- India shall partner with Norwegian and Danish developers on wind-assisted propulsion systems, where leading intellectual property and installation experience is concentrated, to enable pilot deployments on Indian-flagged vessels.
- India shall engage European and East Asian OEMs on advanced energy storage systems and air lubrication systems for integration into Indian newbuild and retrofit programmes.
- India shall engage Singapore, Norway, and Denmark the most advanced deployment environments on digital MRV platforms and autonomous vessel systems, with a focus on regulatory alignment and technology piloting at Indian ports.

### **5.7.2 Partnership Framework**

- Partnerships with Norway, Denmark, Japan, Republic of Korea, the Netherlands, Singapore, and the UAE shall be the primary vehicles for technology transfer under this pillar.
- Each partnership shall be structured around a defined technology cluster, a joint R&D programme, a pilot deployment commitment in India, and a domestic capability development

pathway progressing from technology import to joint manufacturing and eventually to export-ready Indian green maritime technology products.

## **5.8 Pollution Prevention**

India's international cooperation under this pillar shall focus on aligning domestic pollution prevention frameworks with global conventions, advancing India's leadership in IMO-led environmental programmes, and building bilateral and multilateral partnerships for marine pollution abatement across noise, litter, biofouling, ballast water, and air emissions.

### **5.8.1 IMO Programme Engagement**

- India shall deepen its engagement under the GloLitter Partnerships Programme a joint IMO–FAO initiative to reduce plastic litter and other solid waste from ships and fisheries as a priority commitment under this pillar, progressing from awareness and capacity building to measurable port waste reception facility improvements and crew training at scale.
- India shall engage with IMO's GloFouling Partnerships Programme to address biofouling as both a pollution and biosecurity risk, aligning India's anti-fouling management frameworks with the IMO Biofouling Guidelines and contributing to the development of a mandatory instrument currently under consideration at MEPC.
- India shall engage with GloNoise under IMO's relevant programmes to address underwater radiated noise and biofouling as co-benefits of the green shipping transition.

### **5.8.2 Convention Alignment and Bilateral Engagement**

- India shall strengthen implementation of MARPOL Annexes across all six pollution categories oil, noxious liquid substances, harmful substances in packaged form, sewage, garbage, and air emissions and shall engage bilaterally with port state control regimes to ensure Indian-flagged vessels and Indian ports meet or exceed prevailing international standards.
- India shall engage with key partner nations on port waste reception facility standards, ship-generated waste management protocols, and circular economy linkages between ship recycling and broader marine waste reduction objectives.
- India shall align its Ballast Water Management implementation with the IMO BWM Convention, engaging with type-approval authorities and bilateral partners to accelerate onboard treatment system adoption across the Indian-flagged fleet and ensure Indian ports have adequate reception and monitoring capacity.

### **5.8.3 Regional Cooperation**

- India shall engage with SACEP (South Asia Co-operative Environment Programme) and the Regional Seas Programme to advance coordinated pollution prevention action across the Indian Ocean region, positioning India as the lead maritime nation in driving regional adoption of IMO pollution prevention standards.
- India shall pursue bilateral cooperation agreements with Indian Ocean rim states on marine litter, underwater noise, and air emissions from shipping, building on India's existing maritime diplomacy partnerships to extend pollution prevention commitments beyond flag state obligations into regional environmental leadership.

### **5.9 Indian Ocean Centre of Excellence — IOCE Smart**

The Indian Ocean Centre of Excellence for Smart and Sustainable Shipping is a significant institutional vehicle for regional maritime leadership. Proposed to be anchored at the Indian Maritime University with NGMCC oversight, IOCE Smart shall serve as the knowledge, policy, and capacity building hub for Indian Ocean Region states navigating the green maritime transition.

A DGMA-led assessment and stakeholder engagement process is underway, with MEA coordination to ensure that the Centre's mandate aligns with India's broader Indian Ocean diplomacy objectives. The NMDPF

designates operationalisation of IOCE Smart as a near-term institutional priority, with a target of formal establishment within the short-term horizon.

IOC Smart's programme mandate shall cover policy advisory support for Indian Ocean littoral states, green maritime technology demonstration and transfer, alternative fuels safety and certification training, MRV system capacity building, and annual Indian Ocean Green Maritime Forum convening — positioning India as the regional reference point for sustainable shipping governance.

## **6. Institutional Architecture for Maritime Diplomacy**

### **6.1 Coordination Structure**

Effective international cooperation requires a dedicated institutional architecture that connects India's maritime technical expertise with its diplomatic capabilities. Currently, maritime international engagement is distributed across MoPSW, DGMA, MEA, and MoEFCC without a unified coordination mechanism. The NMDPF establishes a structured architecture to address this gap.

The **NGMCC International Cooperation Working Group** shall function as the nodal coordination mechanism for all maritime diplomacy activities under the NMDPF. Its mandate covers bilateral partnership development and monitoring, multilateral forum preparation and follow-up, corridor governance oversight, IMO delegation coordination, and international cooperation target tracking. The Working Group shall include representation from MoPSW, DGMA, MEA, MoEFCC, SMFCL, IRS, and relevant industry associations.

The **Inter Ministerial Taskforce on Maritime Decarbonisation (IMTMD)** shall ensure that India's international maritime positions are coordinated across ministries — particularly MEA, Ministry of Finance, MoEFCC, and Ministry of External Affairs before IMO MEPC sessions, bilateral negotiations, and multilateral forum engagements.

**MEA coordination** shall be institutionalised through a dedicated maritime diplomacy desk within MEA's economic diplomacy division, ensuring that maritime cooperation agenda items are incorporated into bilateral summit processes, trade agreement negotiations, and multilateral climate forum engagements.

### **6.2 Annual Maritime Diplomacy Calendar – \*Indicative**

India's international maritime engagement shall be structured around a defined annual calendar of diplomatic events, forum participations, and bilateral review meetings. The calendar shall include:

| Month            | Event                                                      | Type                | Lead           | Partners                                                              | Notes                                               |
|------------------|------------------------------------------------------------|---------------------|----------------|-----------------------------------------------------------------------|-----------------------------------------------------|
| <b>January</b>   | IOCE Smart Governing Board Meeting (Q1)                    | Institutional       | MoPSW          | IMU, MEA                                                              | Quarterly once operationalised (Proposed)           |
| <b>March</b>     | MEPC Session (Spring) — preparation, position finalisation | Multilateral        | DGS / NGMCC WG | MEA, MoEFCC, MoF                                                      | Pre-session inter-ministerial coordination required |
|                  | Singapore Maritime Week                                    | International Event | MoPSW          | SMFCL, IRS                                                            | India Maritime Pavilion; annual                     |
| <b>April</b>     | MEPC Session (Spring) — post-session debrief               | Multilateral        | DGS / NGMCC WG | MEA, MoEFCC                                                           | Coordinated through NGMCC Working Group             |
|                  | IOCE Smart Governing Board Meeting (Q2)                    | Institutional       | MoPSW          | IMU, MEA                                                              | Quarterly once operationalised (Proposed)           |
| <b>May</b>       | Nor-Shipping (biennial, Oslo)                              | International Event | MoPSW          | SMFCL, IRS                                                            | India Maritime Pavilion; odd years                  |
| <b>June</b>      | GloLitter NAP Annual Review                                | Programme Review    | DGS            | IMO, FAO                                                              | Annual review of India's National Action Plan       |
| <b>July</b>      | IOCE Smart Governing Board Meeting (Q3)                    | Institutional       | MoPSW          | IMU, MEA                                                              | Quarterly once operationalised                      |
| <b>September</b> | Annual National Green Shipping Dialogue                    | National Convening  | MoPSW / NGMCC  | Bilateral partners, multilateral institutions, corridor co-developers | International segment to be incorporated            |

|                 |                                                            |                     |                  |                                                                  |                                                              |
|-----------------|------------------------------------------------------------|---------------------|------------------|------------------------------------------------------------------|--------------------------------------------------------------|
| <b>October</b>  | MEPC Session (Autumn) — preparation, position finalisation | Multilateral        | DGS / NGMCC WG   | MEA, MoEFCC, MoF                                                 | Pre-session inter-ministerial coordination required          |
| <b>November</b> | MEPC Session (Autumn) — post-session debrief               | Multilateral        | DGS / NGMCC WG   | MEA, MoEFCC                                                      | Coordinated through NGMCC Working Group                      |
|                 | Europort (biennial, Rotterdam)                             | International Event | MoPSW            | SMFCL, IRS                                                       | India Maritime Pavilion; odd years                           |
| <b>December</b> | Bilateral Review Meetings                                  | Bilateral           | MoPSW / NGMCC WG | Norway, Denmark, Japan, South Korea, Singapore, UAE, Netherlands | Annual review: technology transfer, corridors, green finance |
| <b>December</b> | IOCE Smart Governing Board Meeting (Q4) + Annual Report    | Institutional       | MoPSW            | IMU, MEA                                                         | Annual public report on IOR capacity building outcomes       |

## Annex 1: Abbreviations and Key Terms

|                       |                                                                                                                |
|-----------------------|----------------------------------------------------------------------------------------------------------------|
| AFS Convention        | International Convention on the Control of Harmful Anti-fouling Systems on Ships (2001/2008).                  |
| ALS                   | Air Lubrication System — micro-bubbles under hull to reduce frictional resistance; 5–10% fuel saving.          |
| Basel Convention      | Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (1989).            |
| BWMC                  | Ballast Water Management Convention (2004/2017) — controls invasive species via ballast water treatment.       |
| CBAM                  | Carbon Border Adjustment Mechanism — EU carbon price on imports from countries without equivalent pricing.     |
| CBDR-RC               | Common But Differentiated Responsibilities and Respective Capabilities — UNFCCC equity principle.              |
| CCTS                  | Carbon Credit Trading Scheme — India's domestic carbon market under the EC Amendment Act 2022.                 |
| CII                   | Carbon Intensity Indicator — annual A–E operational GHG intensity rating for ships above 5,000 GT.             |
| Clydebank Declaration | COP 26 government commitment to establish green shipping corridors; 30+ signatory states.                      |
| CRZ                   | Coastal Regulation Zone — Indian regulatory framework governing coastal land use and development.              |
| DASR                  | Document of Authorisation to conduct Ship Recycling                                                            |
| DWT                   | Dead weight tonnage                                                                                            |
| EEDI                  | Energy Efficiency Design Index — mandatory CO <sub>2</sub> performance standard for new ships (in force 2013). |
| EEXI                  | Energy Efficiency Existing Ship Index — one-time technical standard for existing ships (in force 2023).        |
| EPA                   | Environment (Protection) Act, 1986 — India's principal umbrella environmental legislation.                     |
| EUSRR                 | European Union Ship Recycling Regulation                                                                       |
| EU ETS                | EU Emissions Trading Scheme — extended to maritime from January 2024.                                          |

|                        |                                                                                                                                          |
|------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| FuelEU Maritime        | EU regulation setting lifecycle GHG intensity limits for marine fuels at EU ports (from 2025).                                           |
| GFI                    | Goal-based Fuel Intensity — IMO lifecycle GHG intensity standard for marine fuels (~2028 entry).                                         |
| GHG                    | Greenhouse Gas — CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O and others; shipping contributes approximately 2.9% of global GHG. |
| Green Hydrogen Mission | India's National Green Hydrogen Mission (2023) targeting 5 MMTPA production by 2030.                                                     |
| Harit Sagar            | India's Green Port Guidelines (2023) — framework for port decarbonisation and green bunkering.                                           |
| HKC                    | Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships (2009/2025).                                |
| ICMA                   | International Capital Market Association                                                                                                 |
| IHM                    | Inventory of Hazardous Materials — mandatory ship document under the HKC listing hazardous content.                                      |
| IGF Code               | International Code of Safety for Ships using Gases or other Low-flashpoint Fuels (in force 2017).                                        |
| ILO                    | International Labour Organisation — UN agency establishing labour standards including for seafarers.                                     |
| IMO                    | International Maritime Organisation — UN specialised agency for maritime safety and environment.                                         |
| IRS                    | Indian Register of Shipping — India's national classification society; authorised IMO surveyor.                                          |
| JIT Arrival            | Just-in-Time Arrival — speed reduction to reach berth precisely when available, eliminating idle burn.                                   |
| London Protocol        | 1996 Protocol to London Convention — governs ocean dumping; 2006 amendment covers marine CCS.                                            |
| MAKV                   | Mission Amrit Kaal Vishwa Guru — India's 2047 centenary vision of Viksit Bharat.                                                         |
| MARPOL                 | International Convention for the Prevention of Pollution from Ships (73/78).                                                             |
| MIV 2030               | Maritime India Vision 2030 — India's strategic framework for maritime sector development.                                                |
| MLC 2006               | Maritime Labour Convention — international minimum standards for seafarers' working conditions.                                          |

|                     |                                                                                                             |
|---------------------|-------------------------------------------------------------------------------------------------------------|
| MRV                 | Measurement, Reporting and Verification — architecture for tracking and confirming GHG emissions.           |
| NAPCC               | National Action Plan on Climate Change (2008) — India's eight national climate missions.                    |
| NDC                 | Nationally Determined Contribution — national climate action plan under the Paris Agreement.                |
| Poseidon Principles | Ship finance framework aligning bank lending portfolios with IMO GHG strategy trajectory (2019).            |
| SDGs                | Sustainable Development Goals — 17 goals of the UN 2030 Agenda (adopted 2015).                              |
| Sea Cargo Charter   | Cargo owner and charterer commitment to disclose climate alignment of chartered shipping (2020).            |
| SEEMP               | Ship Energy Efficiency Management Plan — operational efficiency document required for all ships.            |
| SIGHT               | Strategic Interventions for Green Hydrogen Transition — production-linked incentive under Green H2 Mission. |
| SMFCL               | Sagarmala Finance Corporation Limited                                                                       |
| SOLAS               | International Convention for the Safety of Life at Sea (current version 1974).                              |
| STCW                | International Convention on Standards of Training, Certification and Watchkeeping for Seafarers.            |
| UNCLOS              | UN Convention on the Law of the Sea (1982/1994) — foundational legal architecture for ocean governance.     |
| UNFCCC              | United Nations Framework Convention on Climate Change (1992/1994).                                          |
| WAPS                | Wind-Assisted Propulsion Systems — Flettner rotors, rigid wing sails, kite sails; 5–30% fuel saving.        |
| WHR                 | Waste Heat Recovery — recovering exhaust heat to generate auxiliary power; 3–10% fuel saving.               |
| WtW / WtT / TtW     | Well-to-Wake / Well-to-Tank / Tank-to-Wake — lifecycle GHG accounting boundary definitions.                 |