Supplementary S1. Coding System for PCI Framework

For the purpose of distinction and data management, following specific codes were developed for PCIs:

1. Principle of coherence is denoted as PC-N, where; PC = Principle of coherence, N = Serial number of principle i.e., 1 to 3.
2. Criteria against the principle of coherence 1 (PC-1) are coded as CN-EN^{e}, where; C = Criterion, N = Serial number of criterion, E = Criteria category for PC-1, N^{e} = Serial number of criteria category for PC-1.
3. Criteria against the principle of coherence 2 (PC-2) are coded as CN-SN^{s}, where; C = Criterion, N = Serial number of criterion, S = Criteria category for PC-2, N^{s} = Serial number of criteria category for PC-2.
4. Criteria against the principle of coherence 3 (PC-3) are coded as CN-GN^{g}, where; C = Criterion, N = Serial number of criterion, G = Criteria category for PC-3, N^{g} = Serial number of criteria category for PC-3.
5. Indicators for criteria against the principle of coherence 1 (PC-1) are coded as CN-EN^{e}.Y, where; C = Criterion, N = Serial number of criterion, E = Criteria category for PC-1, N^{e} = Serial number of criteria category for PC-1, and Y = Serial number of indicator.
6. Indicators for criteria against the principle of coherence 2 (PC-2) are coded as CN-SN^{s}.Y, where; C = Criterion, N = Serial number of criterion, S = Criteria category for PC-2, N^{s} = Serial number of criteria category for PC-2, and Y = Serial number of indicator.
7. Indicators for criteria against the principle of coherence 3 (PC-3) are coded as CN-GN^{g}.Y, where; C = Criterion, N = Serial number of criterion, G = Criteria category for PC-3, N^{g} = Serial number of criteria category for PC-3, and Y = Serial number of indicator.

Supplementary S2. Criteria, Indicators and Keywords

Table S1. Composite Indicators for Criterion 1.

Code	Indicator	Scope-Wise Keywords
C1-E1.1	Measures exist to prevent and control greenhouse gas emissions	Greenhouse Gas; GHGs; Climate Change; Mitigation; Low Sulphur; Fuel; Alternative fuel; Vessel speed reduction; Shore side electricity; LNG; Bio fuel; energy efficiency
C1.E1.2	Measures exist for low carbon future (e.g., alternate fuel for maritime vessels, harnessing onshore and offshore renewable etc.)	Bio-fuel; Hydrogen; Ammonia; LNG; renewable; alternate energy
C1-E1.3	Measures exist for climate adaptation and resilience strategies for any climate-related incidence of ship (e.g., capacity building, resilient infrastructure, early warning system etc.)	Adaptation; resilience; Climate change; capacity building; resilient infrastructure; early warning system; climate strategy; climate action
C1-E1.4	Measures exist to prevent and control air pollution from non-greenhouse gas emissions	Particulate matter; Aerosol; Dust; Methyl mercury; Air borne Particles; Toxic pollutant; Air pollutant
C1-E1.5	Measures exist for safe disposal and management of ballast water	Salt water; Effluents; Convention; Ballast water; Ballast Water Management Convention; Ballast Water Management Plan; Invasive species; Sediments
C1-E1.6	Measures exist to control and mitigate water pollution	Water Pollution; Sewage; Chemical Spills; Oil Spills; Lubricant; Effluents from Ships; Acid mine Drainage; Plastic Pollution

C1-E1.7	Measures exist for solid waste management (prevent marine debris)	Waste Disposal; Garbage; Waste from Dredging; Dredging Waste; Mining Waste; Waste from Shipyards; Ballast Tank Sediments; Plastic; Marine Debris
C1-E1.8	Measures exist to control and mitigate oil and chemical spills at sea	Spill; Oil spill; Chemical Spill; Weathering; containing spilled Oil; Oil Exposure; Spill Response; Oil Spill Incident; Crude Oil, Heavy Fuel Oil, Lubricating Oil, Light Fuel oil, Non Petroleum oil; Cargo and Bunker Oil; Kerosene, Naphtha; Storage Tanks, Sorbents, Aquatic Environment; Marine Environment; Viscosity; Biodegradation; Training; Exercise; Emulsification; Fresh Water; Evaporation; Oxidation; Dispersion; Booms; Skimmers; Contingency Plan; Hydrophobic; Bio-augmentation
C1-E1.9	Measures exist for environmental sound handling and management of hazardous waste	Contaminated Materials; Toxic Waste; Poison; Industrial Waste; Hazardous Waste; Waste Transportation; Transportation of Waste; Heavy Metals; Persistent Organic Pollutants;
C1-E1.10	Measures exist to control and manage noise pollution	Noise Pollution; Marine Construction Noise; Drilling; Sonar Sound; Seismic Air Gun; Under Water Noise; Intermittent Noise; Acoustic Habitat; Natural Sounds; Propeller Cavitations Noise; Heavy Vessel Traffic Noise; Port Construction; under water construction; Anthropogenic Sound; Shipping Transportation Noise; Acoustic Environment; Artificial Sound; Dredging Operations; Sea bed Exploration; Electrical and Engine Machinery Noise

Table S2. Composite Indicators for Criterion 2.

Code	Indicator	Scope-Wise Keywords
C2-E2.1	Provisions for maritime spatial planning for safe navigation in key biodiversity areas and hotspots (e.g., ship routes to avoid vessel strikes with animals)	Ship Strike; Strike Threat; Cargo Operations; Animal Strikes; Accidents; Vessels Strikes to Endangered; Spatial Planning; Biodiversity areas; Movement of Vessels; Marine Roads; Conservation; Lethal Vessel strike; Navigation Practices; Navigational Safety; Conventional Vessel Operation

Table S3. Composite Indicators for Criterion 3.

Code	Indicator	Scope-Wise Keywords
C3-S1.1	Policies support social justice and provides equal opportunities irrespective of gender	Discrimination; equal opportunities; gender balance; rights; gender right;
C3-S1.2	Measures exist to protect and create livelihood opportunities for coastal communities	opportunities; Job Opportunities; awareness; gender equality; livelihood; livelihood outcomes; community; community training; coastal communities; vulnerability of coastal communities; infrastructure; coastal infrastructure; coastal resilience; food security; financial resources; natural resource; income; wages; labor cost; livelihood strategies; technical training; health safety
C3-S1.3	Measures exist to protect labor rights including safety of workers through safe manning practices	safe work practices; Safe Manning; Health; Safety; Worker right; labor right; Worker Protection; green job
C3-S1.4	Provisions to improve working conditions	Occupational Health; workplace safety; Wages; discrimination; no Harassment; work hours; ergonomic
C3-S1.5	Provisions for capacity building of workers	Capacity Development; Capacity building; Employee; Training; on job training; professional exposure; human resource capacity building

Table S4. Composite Indicators for Criterion 4.

Code	Indicator	Scope-Wise Keywords
C4-S2.1	Policies have provision to ensure economic diversification (e.g., enabling environment for private investments)	Economic Strategy; Jobs; Recruitment; Market Expansion; Profitable Multi Formality
C4-S2.2	Measures exist to develop maritime sectors on blue economy norms	Marine Technology; Living and non- living Resources; Coastal Development; Blue Carbon; Food Security

Table S5. Composite Indicators for Criterion 5.

Code	Indicator	Scope-Wise Keywords
C5-G1.1	Policy and legal instruments are up to date and adequate to address sustainability aspects of shipping sector	Emissions; transportation activities; incentives; tax; sea freight; jobs; mitigation; pollution; waste emissions; equal opportunities; biological diversity; justice; right; employment; vessels; labour market; human capital; social capital; infrastructure; macroeconomic environment; social equity
C5-G1.2	Policy and legal instruments are adequately aligned with international obligations for multilateral maritime and environmental agreements	Treaty; agreement; protocol; convention; multilateral; bilateral; requirement; obligation
C5-G1.3	Institutional mandate and mechanism are described clearly for implementation of the document	Department; coordination; implementation; progress; capacity; research; development; training; engagement; responsibility; stakeholder; procedure; method; rule; regulation; law; compliance; project; fund; budget; finance
C5-G1.4	Direction exists regarding coordination need among various institutions	Role; responsibility; institution; participation; consultation; leadership; coordination; cooperation; committee

Table S6. Composite Indicators for Criterion 6.

Code	Indicator	Scope-Wise Keywords
C6-G2.1	Measures exist for Capacity building of Line govt departments to address all environmental requirements for Shipping Sector	Capacity building; capacity; actor; stakeholder; authority; training; employee; department
C6-G2.2	Measures exist to build capacity of Civil society and academia to meet all environmental requirements of maritime sectoral economies	Civil society; Capacity building; capacity; actor; stakeholder; training; employee; department; academia; NGO
C6-G2.3	Measures exist to develop capacity of Private sector stakeholders to meet all environmental requirements of maritime sectoral economies	Private sector; Capacity building; capacity; actor; stakeholder; training; employee; department; academia; labor union; trade union; ship owner; seafarer
C6-G2.4	Mechanisms for stakeholder engagement exist at local, provincial, federal and international levels	Participation; engagement; NGO; civil society; think tank; labor union; trade union; academia; institution; Private sector

Table S7. Composite Indicators for Criterion 7.

Code	Indicator	Scope-Wise Keywords
C7-G3.1	Measures exist to monitor compliance with the policy, legal and institutional arrangement	Compliance; Enforcement; implementation; Monitor; audit; report; review; objective; target
C7-G3.2	Mechanism exist to review and update the policy and legal instruments on periodic basis	review; periodic; term; law; rule; legal; agreement act; obligation; policy; statues

Supplementary S3. PCI Based Scoring Matrix for Sectoral Governance of Shipping Sector

Table S8. PCI Based Scoring Matrix For Coherence Analysis of Shipping Sector Governance Framework.

Objective	Principles	Criteria	Indicators	Federal												National Standard	Provincial				International			Total Values Counted	Sum of Values	Index
				NMP 2002	MSO 2001	MMP 2019	PMSA Act 1994	MSMR 2021	PMS CHDSS Rules 2009	PEPA 1997	NEP 2005	FICCP 2013	NCCP 2021	NSDS 2017	NMCDP	NHWM 2022	NEQS Regulation 2000	BEPA 2012	SEPA 2014	BHS 2020	SHS 2014	UNCLOS 1982	MARPOL 73/78	BC 1992			
An inclusive and coherent policy framework for environmental sustainability in maritime sectoral economies	Ensure Environmental Protection	Maritime Pollution Control and Climate Response	Measures exist to prevent and control greenhouse gas emissions	2	1	0	2	NA	NA	2	3	3	3	0	NA	NA	3	1	1	NA	NA	3	5	NA	14	29	2.07
			Measures exist to prevent and control air pollution from non-greenhouse gas emissions	3	1	0	3	NA	NA	3	3	3	3	1	NA	NA	3	3	3	NA	NA	3	5	NA	14	37	2.64

Measures exist for low carbon future (e.g., alternate fuel for maritime vessels, harnessing onshore and offshore renewables etc.)	1	1	0	3	NA	NA	1	3	3	3	1	NA	NA	NA	2	2	NA	NA	1	4	NA	13	25	1.92
Measures exist for climate adaptation and resilience strategies for any climate related incidence of ship (e.g., capacity building, resilient infrastructure, early warning system etc.)	1	1	0	3	NA	NA	0	2	4	4	0	4	NA	NA	0	0	NA	NA	1	2	NA	14	22	1.57
Measures exist for safe disposal and management of ballast water	2	3	3	3	NA	NA	3	0	2	3	0	NA	NA	0	0	0	NA	NA	1	5	NA	14	25	1.79
Measures exist to control and mitigate water pollution	3	4	0	3	NA	NA	3	3	1	3	2	4	NA	4	4	1	NA	NA	2	5	NA	15	42	2.80
Measures exist for solid waste management (prevent marine debris)	3	5	5	3	NA	NA	3	2	3	1	4	4	NA	0	2	1	NA	NA	3	5	NA	15	44	2.93

		Measures exist to control and mitigate oil and chemical spills at sea	4	5	5	3	NA	NA	3	3	0	1	2	5	1	0	2	1	2	2	3	5	5	19	52	2.74
		Measures exist for environmental sound handling and management of hazardous waste	3	4	0	3	3	5	3	3	4	4	3	4	4	0	3	3	3	3	3	4	5	21	67	3.19
		Measures exist to control and manage noise pollution	3	3	4	3	NA	NA	3	3	NA	2	1	NA	NA	4	5	5	NA	NA	0	2	NA	13	38	2.92
	Ecosystem Conservation	Provisions for maritime spatial planning for safe navigation in key biodiversity areas and hotspots (e.g.,ship routes to avoid vessel strikes with animals)	1	1	0	0	1	NA	0	0	0	0	0	NA	NA	NA	0	0	NA	NA	4	3	NA	14	10	0.71
Socio-economic Well-being	Social Well-being	Policies support social justice and provides equal opportunities irrespective of gender	0	0	2	0	0	NA	NA	3	3	2	3	0	0	NA	0	0	0	0	3	NA	NA	16	16	1.00
		Measures exist to protect and create livelihood opportunities for coastal communities	0	0	2	0	0	NA	NA	3	2	4	2	0	0	NA	0	0	0	0	3	NA	NA	16	16	1.00
		Measures exist to protect labor rights including safety of workers through safe manning practices	0	4	5	0	4	NA	NA	0	0	0	0	4	0	NA	0	0	0	0	2	2	0	18	21	1.17
		Provisions to improve working conditions	0	2	2	0	3	NA	NA	2	1	0	0	0	0	NA	1	0	2	0	2	4	3	18	22	1.22

		Provisions for capacity building of workers	3	4	5	0	5	NA	NA	3	1	2	2	0	2	NA	0	0	3	3	2	4	0	18	39	2.17
	Sustained Economic Growth	Policies have provision to ensure economic diversification through local enterprenurship and fair trade (e.g., enabling environment for private investements)	0	2	5	0	0	NA	NA	3	0	2	2	0	0	NA	0	0	0	0	2	NA	0	17	16	0.94
		Measures exist to develop maritime sectors on blue economy norms	3	1	2	4	0	NA	0	2	2	3	2	0	0	NA	0	0	0	0	2	3	0	19	24	1.26
Vibrant Governance of Sectoral Policies and Law	Basic Response Mechanism	Policy and legal instruments are up to date and adequate to adress sustainability aspects of shipping sector	1	2	2	2	5	2	2	2	3	4	3	3	3	2	3	3	2	2	4	4	4	21	58	2.76
		Policy and legal instruments are adequately aligned with international obligations for multilateral maritime and environmental agreements	4	4	3	4	5	2	2	2	3	2	3	4	2	2	3	2	1	1	NA	NA	NA	18	49	2.72
		Institutional mandate and mechanism are described clearly for implementation of the document	4	2	2	3	3	2	1	3	3	2	2	4	3	1	3	2	1	1	5	5	5	21	57	2.71

	Direction exists regarding coordination need among various institutions	3	2	1	4	2	2	NA	1	3	3	3	3	3	NA	NA	3	1	1	5	5	5	18	50	2.78
Actor's Capacity	Measures exist for Capacity building of Line govt departments to adress all environmental requirements for Shipping Sector	4	2	3	3	3	2	3	2	3	2	2	4	2	NA	3	2	1	1	3	3	3	20	51	2.55
	Measures exist to build capacity of Civil society and academia to meet all environmental requirements of maritime sectoral economies	4	2	2	3	3	1	5	1	2	3	2	4	1	NA	3	3	1	1	5	5	5	20	56	2.80
	Measures exist to develop capacity of Private sector stakeholders to meet all environmental requirements of maritime sectoral economies	3	2	3	2	2	1	5	3	2	2	2	2	3	NA	3	2	1	1	3	4	3	20	49	2.45
	Mechanisms for stakeholder engagement exist at local, provincial, federal and international levels	3	1	1	2	1	1	1	3	3	3	2	3	2	NA	2	1	2	2	4	4	3	20	44	2.20
Performance System	Measures exist to monitor compliance with the policy, legal and institutional arrangement	3	3	4	2	2	2	3	3	3	3	3	4	3	4	3	3	3	3	3	4	4	21	65	3.10

	Mehanism exist to review and update the policy and legal instruments on periodic basis	3	3	3	2	3	2	3	4	3	3	3	4	3	4	1	2	3	3	5	4	5	21	66	3.14
		2.3	2.3	2.3	2.1	2.4	2.0	2.3	2.3	2.2	2.4	1.8	2.7	1.7	2.1	1.7	1.4	1.4	1.3	2.9	4.0	3.1			