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## WORK PROGRAMME OF THE COMMITTEE AND SUBSIDIARY BODIES

### Development of a legally binding framework for the control and management of ships' biofouling to minimize the transfer of invasive aquatic species

Submitted by Canada, Fiji, Finland, France, Mexico, Norway, Peru and Republic of Korea

#### SUMMARY

*Executive summary:* This document proposes a new output to develop a legally binding framework for the control and management of ships' biofouling to minimize the transfer of invasive aquatic species.

*Strategic direction, if applicable:* 2, 3, 4 and 7

*Output:* Not applicable

*Action to be taken:* Paragraph 37

*Related documents:* Resolutions A.1173(33), A.1174(33) and MEPC.378(80)

#### Introduction

1 This document is submitted in accordance with the provisions of the *Organization and method of work of the Maritime Safety Committee and the Marine Environment Protection Committee and their subsidiary bodies* (MSC-MEPC.1/Circ.5/Rev.5) on the submission of proposals for new outputs. In this document, the co-sponsors propose a new output to develop a legally binding framework for the control and management of ships' biofouling to minimize the transfer of invasive aquatic species.

#### IMO objectives

2 Developing legally binding requirements for shipping on an issue where there is a clear link between a global problem and global shipping falls within the core of the purpose of the Organization as defined in Article 1 of the IMO Convention. The spread of invasive aquatic species through ships' biofouling is such an issue.

3 The new output proposed in this document is in line with the mission statement of the Strategic Plan (resolution A.1173(33)). The co-sponsors find it appropriate to quote the first line of the vision statement: "IMO will uphold its leadership role as the global regulator of shipping...". It should be clear that, in a case where a significant environmental problem is caused by shipping, IMO should not be too late in responding adequately to defend regulatory leadership.

4 The proposed output contributes to the implementation of several of the strategic directions of IMO. Addressing biofouling through mandatory requirements falls within the scope of SD 4 "Continue to engage in ocean governance", and SD 2 "Integrate new, emerging and advancing technologies in the regulatory framework.". Further, SD 7 "Ensure the regulatory effectiveness of international shipping", which points towards the role of IMO as a global regulator, is relevant. Because of the potential for reduced GHG emissions by minimizing biofouling on ships, SD 3 "Respond to climate change and reduce greenhouse gas emissions from international shipping" is also relevant.

### **Need for mandatory requirements for the control and management of ships' biofouling**

5 The Global Assessment Report on Biodiversity and Ecosystem Services by the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) concluded that the rate of global change in nature during the past 50 years is unprecedented in human history.<sup>1</sup> The direct drivers of change in nature with the largest global impacts have been: changes in land and sea use, direct exploitation of organisms, climate change, pollution and invasion of alien species.

6 The role of ships' biofouling as a vector for invasive species is well-documented and was brought to the attention of IMO in 2006. The work initiated by MEPC resulted in Biofouling Guidelines, which were adopted by MEPC in 2011. Recently the effects have been documented by the GESAMP WG 44 in the report "Marine Biofouling: Non-Indigenous Species and Management Across Sectors", which provides an overview of existing knowledge on marine biofouling.<sup>2</sup>

7 An assessment by SINTEF Ocean and NIVA in Norway published in October 2024 identified a list of invasive aquatic species (IAS) which through their global spread through fouling of ships have been documented with significant negative impacts.<sup>3</sup> To identify invasive non-indigenous species (NIS), the study used as a starting point the World Register of Introduced Marine Species.<sup>4</sup> The study then performed a series of filtering steps to produce a final list of 82 species classified as invasive and that likely have been transported by ship hulls. Invasive brackish species associated with ship hulls have been filtered out, and microorganisms are absent. Therefore, the number 82 is likely a vastly underestimated number of NIS and represents only those most high-profile cases which are well documented and classified today. The vast majority of biological invasion research focuses on macro-organisms. Relatively little attention has been given to the invasive potential of microorganisms in scientific literature. As stated in the report, "it should be further noted that non-indigenous bacteria and viruses are underrepresented in invasion ecology studies, which limits the ability to quantify their impacts".

8 With basis in the 82 identified species, the study conducted a literature review to assess the extent of damage related to the spread of invasive species using different global and regional databases, including "Global Invasive Species Database" (GBIF and GISD);

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<sup>1</sup> IPBES (2019). Summary for policymakers of the global assessment report on biodiversity and ecosystem services. Available from: <https://doi.org/10.5281/zenodo.3553579>

<sup>2</sup> GESAMP (IMO/FAO/UNESCO-IOC/UNIDO/WMO/IAEA/UN/UNEP/ISA/UNDP Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection) (2024). *Marine Biofouling: Non-Indigenous Species and Management Across Sectors*. Rep. Stud. GESAMP No.114, 147 p.

<sup>3</sup> SINTEF Ocean and NIVA (2024). *Spread of invasive species via biofouling of marine vessels: A brief assessment*. Report No.2024:01208. Commissioned by the Norwegian Ministry of Climate and Environment. Available from: <https://sintef.brage.unit.no/sintef-xmlui/handle/11250/3161720>

<sup>4</sup> <https://www.marinespecies.org/introduced>

"National Estuarine and Marine Exotic Species Info. System" (NEMESIS); and European Network on Invasive Alien Species (NOBANIS). The associated impact was assigned to three categories: 1) ecological, 2) economical, and 3) (human) health and safety, aligned with the GESAMP WG44. The species were grouped according to their phylum and the distribution. The results show that worldwide ship-fouling associated invasive species are dominated by Annelids (polychaete worms), Arthropods (shrimp, crabs, barnacles) and Molluscs (snails and bivalves). Bryozoans and Cnidarians (corals, hydroids and jellyfish) are the next most common taxa. Considering economic and health and safety impacts (category 2 and 3), the study found more documented impacts in category 2 across all the investigated species, including economic losses to shipping, aquaculture, fisheries, tourism, infrastructure and amenity values.

9 Actions to manage the spread and impacts of non-indigenous species is an important part of States' obligations under the Convention on Biological Diversity. The Kunming-Montreal Global Biodiversity Framework, adopted in 2022, has further set the specific target to "Eliminate, minimize, reduce and/or mitigate the impacts of invasive alien species on biodiversity and ecosystem services by identifying and managing pathways of the introduction of alien species, preventing the introduction and establishment of priority invasive alien species, reducing the rates of introduction and establishment of other known or potential invasive alien species by at least 50% by 2030, and eradicating or controlling invasive alien species, especially in priority sites, such as islands".<sup>5</sup>

10 In July 2023, the Committee adopted resolution MEPC.378(80) on the *2023 Guidelines for the control and management of ships' biofouling to minimize the transfer of invasive aquatic species* (hereafter the 2023 Biofouling Guidelines). These Guidelines are an important first step towards harmonizing biofouling management globally, which is currently characterized by a fragmented regulatory landscape with different national requirements and guidelines.<sup>6</sup>

11 It is considered that the effectiveness of the 2023 Biofouling Guidelines will be relatively limited while voluntary. The Correspondence Group on Review of the Biofouling Guidelines had received as part of its terms of reference instructions to develop recommendations on how to facilitate an increase in uptake and effectiveness of the Guidelines (PPR 7/22, paragraph 7.12.3). One of the proposals the Group identified in its report to PPR 10 was that regulatory incentives should be considered to ensure full global implementation and uptake of the Guidelines, and that a process for making the Guidelines legally binding should be considered (PPR 10/5/1, paragraph 50.1).

12 SINTEF Ocean and NIVA have assessed whether the measures set out in resolution MEPC.378(80) can be effective in preventing the further spread of marine invasive species if the Guidelines are made binding. In their report it is concluded that mandatory requirements around cleaning approaches, cleaning frequency, cleaning location, capture, and proper handling and disposal of cleaning waste, and planning and recording of cleaning operations, can have a strong effect on the spread of invasive biofouling species by ships. It is further noted that inappropriate cleaning practices can have unintended and opposing effects on anti-fouling coating (AFC) performance. SINTEF Ocean and NIVA also state that it is necessary to develop effective and low-risk niche area cleaning technologies to fully realize the biosecurity benefits of in-water cleaning.

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<sup>5</sup> See target 6 in section H. Global targets for 2030, in: CBD/COP/DEC/15/4, Decision adopted by the Conference of the Parties to the Convention on Biological Diversity, 15/4. Kunming-Montreal Global Biodiversity Framework.

<sup>6</sup> GEF-UNDP-IMO GloFouling Partnerships Project and GIA for Marine Biosafety (2022). *Compilation and Comparative Analysis of Existing and Emerging Regulations, Standards and Practices Related to Ships' Biofouling Management*. Available from: [https://www.glofouling.imo.org/\\_files/ugd/34a7be\\_eb2788b4a15241d2ab0c11c48ace1850.pdf](https://www.glofouling.imo.org/_files/ugd/34a7be_eb2788b4a15241d2ab0c11c48ace1850.pdf)

13 MARPOL Annex VI, regulation 28 on operational carbon intensity (the CII regulation), and the forthcoming regulations on greenhouse gases (GHG) in order to respond to the 2023 IMO GHG Strategy, are expected to result in more cleaning events globally and could lead to a higher risk of spreading invasive species if biofouling management is not regulated. The projected increase in ship traffic in the coming decades also highlights the importance of managing biosecurity risks in an equitable manner globally. Mandatory requirements will ensure a global level playing field for international shipping, and will also provide regulatory certainty for technology providers, setting a clear path towards environmentally sound cleaning.

### **Analysis of the issue**

14 Through experiences with implementing the 2011 and 2023 Biofouling Guidelines, the industry already has demonstrated that control and management of ships' biofouling is possible. Potential short-term challenges such as the availability of cleaning providers in ports can be mitigated by establishing a clear regulatory process and timeline for new requirements.

### **Analysis of implications**

15 New requirements for the control and management of ships' biofouling may lead to additional cost to the maritime industry related to inspection and cleaning events but will also lead to cost savings due to increased efficiency and reduced fuel consumption. For example, it has been estimated that a bulk carrier operating in an equatorial region may realize a net saving of \$6.5 million over five years using a proactive cleaning strategy (hull and propeller) compared to a no cleaning strategy.<sup>7</sup>

16 It is expected the legislative and administrative burdens of the new output for maritime administrations will be comparable to other issues which are brought into a legally binding framework. This depends, however, on the comprehensiveness of the legally binding regime and is therefore difficult to precisely identify in advance. It should be noted that Member States who have the intention to apply the 2023 Biofouling Guidelines, as called for in resolution MEPC.378(80), will most likely already face a legislative and administrative burden.

17 Global requirements are expected to reduce the administrative burden for shipowners and cleaning service providers that today are facing many different requirements in different geographies.

18 The GEF-UNDP-IMO GloFouling Partnerships Project is already supporting developing countries with actions to implement the 2023 Biofouling Guidelines. A completed checklist for identifying administrative requirements and burdens is set out in annex 1 to this document.

19 When introducing mandatory requirements for biofouling management, other environmental impacts such as the release of hazardous substances and microplastics may also need to be addressed as appropriate.

### **Benefits**

20 Introducing mandatory requirements for the control and management of ships' biofouling is expected to contribute substantially to limit the introduction of invasive species globally.

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<sup>7</sup> Glofouling (2022) *Analysing the impact of marine biofouling on the energy efficiency of ships and the GHG abatement potential of biofouling management measures*. This estimate is based on a fuel price of \$572.50 per metric ton.

21 Another benefit is that the new output is expected to guide coating and cleaning technology providers towards improved compatibility between cleaning technologies and coating, reducing the release of harmful substances.

22 Further, the new output is expected to reduce fuel consumption and emissions from international shipping,<sup>8</sup> contributing to meeting the ambitions and indicative checkpoints in the 2023 IMO GHG Strategy.

23 If a legally binding framework on biofouling is not established, the patchwork of different national and local biofouling requirements can be expected to increase. This will make it difficult for international shipping to operate effectively and to be certain that the operation is in compliance with varying local or national requirements with varying documentation requirements. The benefits of a global level playing field for international shipping and maritime technology and service providers are unquestioned.

### Industry standards

24 The proposed output can build on the existing IMO 2023 Biofouling Guidelines and the forthcoming IMO Guidance on in-water cleaning of ships' biofouling. There are also several industry standards and national regulations and guidelines that the proposed output could build on, as relevant. For an overview of existing standards and guidelines, see the Compilation and Comparative Analysis of Existing and Emerging Regulations, Standards and Practices Related to Ships' Biofouling Management by the GEF-UNDP-IMO GloFouling Partnerships Project.<sup>9</sup> Additional standards and guidelines are also shared with the Committee and its Sub-Committees through various documents (e.g. PPR 12/5/Rev.1 from the Correspondence Group on Development of Guidance on Matters Relating to In-water Cleaning, PPR 11/INF.8 from ISO, PPR 11/5/2 from ICS and BIMCO, PPR 10/5 from ICES, PPR 9/INF.6 from Belgium, PPR 7/INF.7 from Australia and the Kingdom of the Netherlands and MEPC 67/19 from New Zealand).

### Output

25 The co-sponsors propose that the following output be established: "development of a legally binding framework for the control and management of ships' biofouling to minimize the transfer of invasive aquatic species." The proposed output is suggested to be in the work programme for the biennia 2026-2027 and 2028-2029.

26 Developing a legally binding framework on unregulated issues is in general a comprehensive task. Building on experience from other issues the co-sponsors suggest that two biennia would be needed in order to complete the task. For ship recycling it was agreed at Assembly 24 in 2005 to develop legally binding requirements and the Hong Kong Convention was adopted in 2009. For ballast water management, the work on legally binding requirements took six years leading to the adoption of the Ballast Water Management Convention in 2004. In both examples the Committee had guidelines on the matter, which provided a good basis for the development of legally binding requirements. Similarly, the 2023 Biofouling Guidelines and the draft IMO guidance on in-water cleaning of ships' biofouling provide a good basis for the proposed new output.

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<sup>8</sup> GEF-UNDP-IMO GloFouling Partnerships Project and GIA for Marine Biosafety (2022). Analysing the Impact of Marine Biofouling on the Energy Efficiency of Ships and the GHG Abatement Potential of Biofouling Management Measures. Available from:  
[https://www.glofouling.imo.org/\\_files/ugd/34a7be\\_02bd986766d44728b85228c3ec9b95ee.pdf](https://www.glofouling.imo.org/_files/ugd/34a7be_02bd986766d44728b85228c3ec9b95ee.pdf)

<sup>9</sup> GEF-UNDP-IMO GloFouling Partnerships Project and GIA for Marine Biosafety (2022). Compilation and Comparative Analysis of Existing and Emerging Regulations, Standards and Practices Related to Ships' Biofouling Management. Available from:  
[https://www.glofouling.imo.org/\\_files/ugd/34a7be\\_eb2788b4a15241d2ab0c11c48ace1850.pdf](https://www.glofouling.imo.org/_files/ugd/34a7be_eb2788b4a15241d2ab0c11c48ace1850.pdf)

27 Deliverable for biennium 2026-2027: The co-sponsors suggest that the first brief outline of a legally binding framework on biofouling be developed by 2027. This would include consideration of the type of legal framework which should be developed, identification of what elements should be addressed in legally binding terms, and what elements should be addressed in guidelines which requirements are referring to. Draft requirements can be expected to be in development but would need further consideration.

28 Deliverable for biennium 2028-2029: A draft legal framework is suggested to be finalized in this biennium and should be ready for a decision by the Committee on the process leading to adoption.

29 The co-sponsors suggest that the Committee instruct the PPR Sub-Committee to develop the draft legal framework. MEPC will have policy steering as the work progresses through consideration of the reports of the Sub-Committee. From the co-sponsors' point of view, a role for other Sub-Committees is not identified at this stage, but the Committee may consider such needs as work is progressing. For example, when port State control guidelines are to be developed the Sub-Committee on Implementation of IMO Instruments will need to be consulted.

30 The table below illustrates the available meetings if the programme of meetings will be held as planned. At the years with two MEPC meetings, it is normal that only one meeting considers the report of the PPR Sub-Committee. It is up to the PPR Sub-Committee to decide how to organize the work during the meetings and in between the meetings (e.g. establish correspondence groups or request holding intersessional meetings). The Sub-Committee may request policy guidance from the Committee as work is progressing.

**Table 1: Relevant meetings in the process of developing mandatory requirements on biofouling**

<b>Biennium 2026-2027</b>			
<b>Year</b>	<b>Meeting</b>	<b>Meeting</b>	<b>Meeting</b>
2026	PPR 13 (Jan/Feb)		
		MEPC 84 (spring)	
		MEPC 85 (autumn)	
2027	PPR 14 (Jan/Feb)		
		MEPC 86 (summer)	
			Assembly 35
<b>Biennium 2028-2029</b>			
<b>Year</b>	<b>Meeting</b>	<b>Meeting</b>	<b>Meeting</b>
2028	PPR 15 (Jan/Feb)		
		MEPC 87 (spring)	
		MEPC 88 (autumn)	
2029	PPR 16 (Jan/Feb)		
		MEPC 89 (summer)	
			Assembly 36

31 It should be noted that, building upon experience from the various mandatory frameworks at IMO, work will be needed also in later biennia. The co-sponsors do not see the need to define further details for later biennia at this stage and consider that it will be subject to regular updates of the Strategic Plan for the Organization.

32 The co-sponsors propose the following terms of reference for the PPR Sub-Committee regarding the proposed output:

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"Taking into account the 2023 Biofouling Guidelines (resolution MEPC.378(80)), [the Guidance on in-water cleaning of ships], and relevant technical and scientific information related to the control and management of ships' biofouling to minimize the transfer of invasive aquatic species, the PPR Sub-Committee is instructed to:

- .1 develop a legally binding framework on the control and management of ships' biofouling to minimize the transfer of invasive aquatic species, and in the framework:
  - .1 consider appropriate provisions for testing, verification, surveys, certification, inspections, documentation, record-keeping, and enforcement as appropriate;
  - .2 consider and develop draft guidelines needed by the legally binding framework;
  - .3 take into account international law such as UNCLOS and other international agreements;
  - .4 take into account and address as appropriate potential release of hazardous materials and microplastics; and
  - .5 take into account implications for reduction of air pollution, greenhouse gas emissions and under water radiated noise, if any;
- .2 by MEPC 86 provide an assessment and recommendation of the form of the legally binding framework, e.g. a free-standing legal instrument or as an amendment to an existing legal instrument; and
- .3 by MEPC 89 provide a finalized draft legal framework and recommendations to the Committee on the way forward."

### **Human element**

33 A completed checklist for considering human element issues by IMO bodies (A 33/Res.1174) is set out in annex 2 to this document.

### **Urgency**

34 Developing legal requirements for the control and management of ships' biofouling is urgently needed to meet the global target set in the Kunming-Montreal Global Biodiversity Framework, preventing further introduction of invasive alien species through ship movements. Ship's biofouling is an important vector for the introduction of invasive species globally, and the risk of further spread remains high without a global mandatory framework as noted in paragraphs 11 and 12 in this document.

35 Noting the timeline from initiating a process until a possible mandatory framework may enter into force, IMO should commence work as soon as possible in line with the plan and timeline set out in paragraphs 25 to 31 in this document.

36 The co-sponsors would emphasize that even in the case of rapid development of a legally binding framework on biofouling it will take some time until such a framework will be in force and work effectively to minimize the problem of spreading invasive aquatic species. IMO should not wait any longer to initiate the appropriate global measure on such an important issue.

**Action requested of the Committee**

37 The Committee is invited to consider the proposal for an output to develop a legally binding framework on biofouling as outlined in paragraphs 25 to 32, take into account the proposed organization of the work and take action as appropriate.

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**ANNEX 1**

**CHECKLIST FOR IDENTIFYING ADMINISTRATIVE REQUIREMENTS**

This checklist should be used when preparing the analysis of implications required in submissions of proposals for inclusion of outputs. For the purpose of this analysis, the term "administrative requirement" is defined, in accordance with resolution A.1043(27), as an obligation, arising from a mandatory IMO instrument, to provide or retain information or data.

**Instructions:**

(A) If the answer to any of the questions below is **YES**, the Member State proposing an output should provide supporting details on whether the requirements are likely to involve start-up and/or ongoing costs. The Member State should also give a brief description of the requirement and, if possible, provide recommendations for further work, e.g. would it be possible to combine the activity with an existing requirement.

(B) If the proposal for the output does not contain such an activity, answer **NR** (Not required).

(C) For any administrative requirement, full consideration should be given to electronic means of fulfilling the requirement in order to alleviate administrative burdens.

<p>1 Notification and reporting? Reporting certain events before or after the event has taken place, e.g. notification of voyage, statistical reporting for IMO Members.</p>	<p>NR</p>	<p>Yes <input type="checkbox"/> Start-up <input checked="" type="checkbox"/> <b>Ongoing</b></p>
<p>Description of administrative requirement(s) and method of fulfilling it: (if the answer is yes)</p> <p><b>It is foreseen that the Organization could establish a new module for in-water cleaning in the GISIS database. It is foreseen that each Party could potentially report to the new GISIS module on the availability and location of cleaning providers in ports and ports' availability of environmentally safe disposal of collected biofouling waste.</b></p>		
<p>2 Record-keeping? Keeping statutory documents up to date, e.g. records of accidents, records of cargo, records of inspections, records of education.</p>	<p>NR</p>	<p>Yes <input type="checkbox"/> Start-up <input checked="" type="checkbox"/> <b>Ongoing</b></p>
<p>Description of administrative requirement(s) and method of fulfilling it: (if the answer is yes)</p> <p><b>It is foreseen that each ship will have to maintain a biofouling record book, and that ports may need to keep a record of permits issued to cleaning providers as well as a record of accidental release of biofouling and waste in port waters.</b></p>		
<p>3 Publication and documentation? Producing documents for third parties, e.g. warning signs, registration displays, publication of results of testing.</p>	<p>NR</p>	<p>Yes <input type="checkbox"/> Start-up <input checked="" type="checkbox"/> <b>Ongoing</b></p>
<p>Description of administrative requirement(s) and method of fulfilling it: (if the answer is yes)</p> <p><b>It is foreseen that the Parties could report test certificates for AFC providers and cleaning providers to the new GISIS module on in-water cleaning.</b></p>		

4 Permits or applications? Applying for and maintaining permission to operate, e.g. certificates, classification society costs.	NR	Yes <input type="checkbox"/> Start-up <input checked="" type="checkbox"/> <b>Ongoing</b>
Description of administrative requirement(s) and method of fulfilling it: (if the answer is yes)  <b>It is foreseen that the new output will include in-water cleaning permits and/or approvals, as well as permits and/or approvals related to independent inspection providers. These approvals will involve classification society costs.</b>		
5 Other identified requirements?	NR	Yes <input type="checkbox"/> Start-up <input type="checkbox"/> Ongoing
Description of administrative requirement(s) and method of fulfilling it: (if the answer is yes)		

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ANNEX 2

CHECKLIST FOR CONSIDERING AND ADDRESSING THE HUMAN ELEMENT

	1 Question	2 Yes/ No	3 IMO references	4 Considerations	5 Instructions
<b>Workload</b>			<p><i>Other relevant references may be added</i></p> <p><i>Strike out references that are not relevant</i></p>	<p><i>If answer to question is "yes" identify considerations. If answer is "no" make proper justification</i></p>	<p><i>Identify how human element considerations should be addressed in the output</i></p>
1	<b>Does the "output" affect workload?</b>	Yes			
1.1	<b>On board, especially in the already intensive phases of the voyage and port operations to:</b>		<p><del><i>Revised guidelines for the operational implementation of the International Safety Management (ISM) Code by Companies (MSC-MEPC.7/Circ.8)</i></del></p> <p><del><i>Guidelines on fatigue (MSC.1/Circ.1598)</i></del></p> <p><del><i>Principles of minimum safe manning (resolution A.1047(27))</i></del></p> <p><del><i>Guidelines for the investigation of accidents where fatigue may have been an issue (MSC/Circ.621)</i></del></p>		
1.1.1	Operations including navigation, cargo and engineering	No			

	1 Question	2 Yes/ No	3 IMO references	4 Considerations	5 Instructions
1.1.2	Maintenance of the ship's structure and its equipment	Yes		Maintenance will be required if a ship has installed an in-water cleaning system.	A maintenance manual will be required.
1.1.3	Onboard administration in support of the ship's management systems	No			
1.1.4	Onboard administration related to regulation involving flag States, classification societies, port State and other bodies such as charterers and port authorities	Yes		Keep biofouling record book.	An instruction will be required, as outlined in the 2023 Biofouling Guidelines
1.1.5	Increased workload or time pressure on personnel if involved in implementation of changes prior to the implementation date	No			
1.2	<b>Ashore, in a manner that would affect the ships operation to:</b>				
1.2.1	Companies' administration	Yes	PPR 12/5/Rev.1	There will be additional administration related to permits for cleaning in ports.	An instruction will be required, as recommended in the draft IMO guidance for in-water cleaning.
1.2.2	Flag State, port State and classification societies administration such that certification and other processes are compromised or delayed	No			

	1 Question	2 Yes/ No	3 IMO references	4 Considerations	5 Instructions
<b>Decision-making</b>			<i>Other relevant references may be added</i>  <i>Strike out references that are not relevant</i>	<i>If answer to question is "yes" identify considerations. If answer is "no" make proper justification</i>	<i>Identify how human element considerations should be addressed in the output</i>
2	<b>Does the "output" impact decision-making on board the ship?</b>	No			
2.1	By confusion with existing requirements and regulations				
2.2	By changing responsibilities as laid out in the ISM Code				
2.3	By creating complexity in its implementation and/or in the safety management systems				
2.4	By requiring increased mental effort, such as the need to find, transform and analyse data or result in the need to make judgements based on incomplete information				
2.5	By limiting the time available to establish situational awareness, decide, communicate (possibly across time zones) or check				
2.6	By increasing reliance on judgement and administrative controls to manage major risks such as oil spills and collisions				

	1 Question	2 Yes/ No	3 IMO references	4 Considerations	5 Instructions
<b>Living and Working Environment</b>			<p><i>Other relevant references may be added</i></p> <p><i>Strike out references that are not relevant</i></p>	<p><i>If answer to question is "yes" identify considerations. If answer is "no" make proper justification</i></p>	<p><i>Identify how human element considerations should be addressed in the output</i></p>
<b>3</b>	<b>Does the "output" affect the living and working environment?</b>	No	<p><i>Guidelines on the basic elements of a shipboard occupational health and safety programme (MSC-MEPC.2/Circ.3)</i></p> <p><i>Guidelines on fatigue (MSC.1/Circ.1598)</i></p>		
<b>3.1</b>	By interfering with existing arrangements for abandonment, fire-fighting and other emergency plans or procedures				
<b>3.2</b>	By introducing new materials that could create an explosion, fire, environmental or occupational health risk				
<b>3.3</b>	By introducing new high energy sources such as high-voltage, high-pressure fluids				
<b>3.4</b>	By affecting access or egress and causing lack of ventilation in working spaces				
<b>3.5</b>	By affecting the habitability of accommodation spaces due to noise, vibration, temperatures, dust and other contaminants				

	1 Question	2 Yes/ No	3 IMO references	4 Considerations	5 Instructions
	<b>Operation and Maintenance</b>		<p><i>Other relevant references may be added</i></p> <p><i>Strike out references that are not relevant</i></p>	<p><i>If answer to question is "yes" identify considerations. If answer is "no" make proper justification</i></p>	<p><i>Identify how human element considerations should be addressed in the output</i></p>
4	Does the "output" affect the operation and maintenance of the ship, its structure or systems and equipment?	Yes	<p><del>Revised guidelines for the operational implementation of the International Safety Management (ISM) Code by companies (MSC-MEPC.7/Circ.8)</del></p> <p><del>Guidelines for bridge equipment and systems, their arrangement and integration (BES) (SN.1/Circ.288)</del></p> <p><del>Principles of minimum safe manning (resolution A.1047(27))</del></p> <p><del>Issues to be considered when introducing new technology on board ships (MSC/Circ.1091)</del></p> <p><del>Guideline on software quality assurance and human-centred design for e-navigation (MSC.1/Circ.1512)</del></p> <p><del>Guidelines for the standardization of user interface design for navigation equipment (MSC.1/Circ.1609)</del></p>		

	1 Question	2 Yes/ No	3 IMO references	4 Considerations	5 Instructions
4.1	By introducing equipment that the user may find difficult to operate or maintain or may be unreliable	Yes	PPR 12/5/Rev.1	The output will affect the operations of the ship if a ship has installed an in-water cleaning system and if it requires involvement from crew, or if in-water cleaning operated from shore requires involvement from crew.	A ship-specific cleaning plan and equipment operation manual will be required, as outlined in document PPR 12/5/Rev.1.
4.2	By introducing new and/or novel technology, or technology that changes the role of the person	No			
4.3	By introducing requirements for new competencies and roles	No			
4.4	By overloading existing infrastructure such as power generation and ventilation systems	No			
4.5	By poor integration with existing systems and controls	No			
4.6	By introducing new and unfamiliar operations/procedures	No			
4.7	By introducing new and unfamiliar operating interfaces	No			
4.8	By introducing risks to the ship during any modifications required prior to the implementation date of the output	No			



	1 Question	2 Yes/ No	3 IMO references	4 Considerations	5 Instructions
<b>Measures to address the human element</b>			<p><i>Other relevant references may be added</i></p> <p><i>Strike out references that are not relevant</i></p>	<p><i>If answer to question is "yes" identify considerations. If answer is "no" make proper justification</i></p>	<p><i>Identify how human element considerations should be addressed in the output</i></p>
5	Does the "output" require changes to:	Yes	<p><del>Shipboard technical operating and maintenance manuals (MSC.1/Circ.1253)</del></p> <p><del>Revised guidelines for the operational implementation of the International Safety Management (ISM) Code by companies (MSC-MEPC.7/Circ.8)</del></p>		
5.1	Training	Yes		<p>The output will require training if a ship has installed an in-water cleaning system and if it requires involvement from crew, or if in-water cleaning operated from shore requires involvement from crew.</p>	<p>A training plan will be required, as outlined in document PPR 12/5/Rev.1.</p>
5.2	Practical skill development and competences	Yes		See above	See above
5.3	Operating, management and/or maintenance procedures	Yes		See section 4	See section 4
5.4	Information/manuals for operation and maintenance			See section 4	See section 4
5.5	Spares outfit	Yes		<p>Spares may be relevant if a ship has installed an in-water cleaning system.</p>	<p>An operations and maintenance manual will be required.</p>

	<b>1 Question</b>	<b>2 Yes/ No</b>	<b>3 IMO references</b>	<b>4 Considerations</b>	<b>5 Instructions</b>
<b>5.6</b>	Occupational safety requirements including guarding and PPE	No			
<b>5.7</b>	Shore support	Yes		Shore support will always be required during cleaning in port.	See above