INTERNATIONAL MARITIME ORGANIZATION

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SUB-COMMITTEE ON SHIP DESIGN AND CONSTRUCTION
12th session
Agenda item 8

SDC 12/8/4
14 November 2025
Original: ENGLISH
Pre-session public release: ☒

EXPERIENCE-BUILDING PHASE FOR THE REDUCTION OF UNDERWATER RADIATED NOISE FROM SHIPPING

Proposal for a regional approach to underwater radiated noise management and extension of the experience-building phase

Submitted by Japan and ICS

SUMMARY

Executive summary:	This document proposes a regional and temporal approach to URN management whereby coastal States establish protected areas based on scientific assessments. This approach considers URN's unique characteristics, varying impacts on marine species, and compatibility of measures to reduce URN with GHG reduction. This document also proposes extending the Experience-Building Phase to allow sufficient data accumulation and validation of co-beneficial technologies.
Strategic direction, if applicable:	1
Output:	1.16
Action to be taken:	Paragraph 34
Related documents:	SDC 8/14/3; SDC 9/5/4, SDC 9/INF.10, SDC 9/INF.11; SDC 10/5/3, SDC 10/5/4 and MEPC 82/17/Add.1

Introduction

1 This document is submitted in accordance with paragraph 6.12.5 of the *Organization and method of work of the Maritime Safety Committee and the Marine Environment Protection Committee and their subsidiary bodie*s (MSC-MEPC.1/Circ.5/Rev.6) and provides a comprehensive proposal for a framework for URN management.

2 In July 2023, MEPC 80 approved the *Revised guidelines for the reduction of underwater radiated noise from shipping to address adverse impacts on marine life* (MEPC.1/Circ.906) (Revised URN Guidelines). The Guidelines recommend that shipowners, ship operators, shipbuilders, designers, suppliers and manufacturers implement URN reduction approaches during the design phase, construction phase and operational phase based on URN management planning.

3 MEPC 82 established a three-year Experience-Building Phase (EBP) from 2024 to 2026, to enhance the effectiveness of the Revised URN Guidelines (MEPC.1/Circ.906/Rev.1). During this period, Member States are requested to gather experience in areas including URN baselining, management planning, design and operational approaches, and compatibility between energy efficiency and URN reduction. This document is submitted as a contribution to the EBP, proposing a framework for URN management based on a regional approach.

4 It is considered essential that careful consideration be given to ensure that such measures do not impede compliance with already agreed GHG reduction related measures. Furthermore, considering the unique characteristics of URN regional and temporal (e.g. seasonal and diurnal) differences in marine biodiversity, a flexible framework that enables regional implementation is necessary.

5 This document proposes a framework whereby coastal States could establish protected areas based on potential internationally agreed principles, taking into account the unique characteristics of URN, location and time dependent marine biodiversity. Subsequently, companies could implement appropriate URN reduction measures into their ships in accordance with URN management plans.

Discussion

Unique characteristics of underwater radiated noise

6 For effective implementation of URN reduction measures, it is necessary first to consider the characteristics of URN, as having several unique characteristics that distinguish it from other forms of marine pollution such as water pollution and air pollution.

7 URN has two key characteristics distinguishing it from other pollutants. First, it attenuates over distances. As demonstrated in documents SDC 9/INF.10 (Japan) and SDC 10/5/4 (Japan), URN from ships attenuates significantly within a few kilometres from the source and beyond a certain distance the received level becomes dominated by ambient noise. Second, URN does not accumulate; once a ship passes by, the noise disappears without residual effects. These characteristics, fundamentally different from greenhouse gas emissions which diffuse widely and persist, mean that URN impacts in a specific area depend primarily on immediate shipping traffic conditions.

8 These characteristics suggest that, for effective biodiversity protection, it is more appropriate to establish URN management focused on areas where species requiring protection are located, rather than setting global targets for total URN emissions. In addition, protected species may not always be in a specific region because of their seasonal migration. Regional and temporal consideration will be an effective measure to harmonize co-existence of maritime traffic and marine species.

Varying impacts of URN on different marine species

9 The impacts of URN vary significantly depending on the species of marine life exposed to the noise. Different species have different auditory characteristics and varying sensitivity to different frequencies and sound pressure levels.

10 As referenced in past studies and NOAA's Marine Mammal Acoustic Technical Guidance, different species have different sensitivities: baleen whales are sensitive to low frequencies below 1 kHz, while small odontocetes, such as dolphins and porpoises, are sensitive to high frequencies from several kHz to over 100 kHz. Fish also exhibit various sensitivities across different frequency bands, but mostly low frequency range below several kHz.

11 Types of impacts also vary by species and circumstances, including masking of communication signals, disruption of reproductive behaviour, displacement from habitat, and in extreme cases, physical injury. The severity of impacts depends not only on noise levels but also on frequency components, exposure duration and the behavioural context of exposed animals.

12 Considering these differences, to achieve the fundamental objective of biodiversity protection, it is necessary to identify species requiring protection in each area and establish regulated areas and timing according to their distribution. A globally uniform approach would be inefficient and potentially ineffective as such an approach could potentially lead to incentivizing measures which do not match region- and time-specific biodiversity needs.

URN reduction options and compatibility with GHG reduction

13 URN reduction measures can be broadly classified into two types: design-based measures (e.g. propeller modifications) and operational measures (e.g. speed reduction).

14 Design-based URN reduction measures are potentially effective in cases where ships cannot adjust their operational profiles, such as when protected areas comprise a large portion of a ship's route. As demonstrated in documents SDC 8/14/3 (Japan) and SDC 9/INF.11 (Japan), it should be noted that such measures often involve fuel efficiency trade-offs. For example, expanding propeller blade area can reduce URN but may significantly increase fuel consumption. Demonstrating such trade-off, document SDC 8/14/3 showed that a 17 dB URN reduction could result in approximately 21% GHG emission increase.

15 Operational URN reduction measures may be effective when ships are required to travel through highly biodiverse areas, such as when protection areas occupy a portion of their route. As demonstrated in documents SDC 9/5/4 (Japan) and SDC 9/INF.11, operational measures, particularly speed reduction in limited areas, have the potential of achieving both URN reduction and GHG reduction simultaneously at slow down area while minimizing adverse effects to the effects of shipping.

16 Furthermore, document SDC 9/INF.11 demonstrated that when maintaining constant voyage time, establishing smaller areas for intentional speed reduction results in lower GHG emissions compared to design changes or speed reduction over wide areas. This finding reinforces the importance of carefully defining protected areas based on actual biodiversity protection needs.

17 Considering these factors, the most effective URN reduction measures compatible with GHG reduction are to define truly needed protection areas while applying speed reduction to protect biodiversity.

Framework for establishing protection areas

18 Based on the above discussion, the most appropriate management approach for URN is:

.1 coastal States establish URN sensitive areas and time or season as necessary, in accordance with guidelines to be developed by the Organization, taking into account the characteristics and distribution of species requiring protection and anticipated shipping traffic; and

.2 companies develop URN management plans for individual ships based on their operational characteristics.

This section discusses the establishment of URN sensitive areas.

19 The establishment of URN sensitive areas require three types of assessments of:

.1 noise levels from ships in the area (e.g. creation of "noise maps");

.2 the distribution of species requiring protection; and

.3 URN risk using both maps (e.g. creation of "sensitivity maps").

20 Assessment of noise levels in an area can be conducted by calculating noise levels for each passing vessel using estimated baseline noise levels and propagation characteristics, then summing them to generate a noise map. By overlaying this noise map with the distribution map of species requiring protection, a sensitivity map can be created to identify sea areas where URN reduction measures are most needed.

21 This approach is technically straightforward and feasible. Various simplified methods have been proposed for estimating ships' baseline noise levels using AIS-obtainable parameters, as contained in document SDC 10/5/3 (Japan). Estimation methods using shaft speed or main engine horsepower, as proposed in documents SDC 9/5/4 and SDC 10/5/3, provide practical means for both prediction and management.

22 This approach requires consideration of regional and temporal characteristics, such as environmental condition data including ambient noise levels and underwater sound propagation characteristics (water depth, bathymetry, water temperature distribution, etc.), and information on the distribution of species requiring protection. Seasonal and weather-related variations can also be appropriately considered.

23 As discussed in document SDC 10/5/4, ambient noise levels vary significantly by region and season. When ambient noise levels in a specific area during a specific season are equal to, or higher than, URN from ships, their impact on marine life becomes limited. Therefore, ambient noise levels should be considered when establishing areas where URN reduction approaches are required.

Ships' URN management plans

24 URN management plans on board ships should include information on baseline URN at the design and construction stage, as the relationship between ship speed (or power) and underwater noise levels. As proposed in documents SDC 9/5/4 and SDC 10/5/3, using shaft speed or main engine output as management parameters provides practical means for URN management throughout all stages from design to operation.

25 Under this framework, coastal States would collect necessary background data, conduct environmental impact assessments based on internationally consistent methods, and establish acceptable values (e.g. noise intensity limits according to distance from protected areas) when deemed necessary. Ships equipped with URN management plans, when navigating in coastal States' URN sensitive areas, would select appropriate main engine speed and ship course based on the URN management plan to ensure that URN emitted from the ship satisfies acceptable values.

Proposals

26 Based on the above discussion, the co-sponsors propose that the Organization examine methods to develop a framework for URN management based on a regional and temporal approach, and support its implementation. URN has unique characteristics of attenuating over short distances and not accumulating in the marine environment, which are fundamentally different from

GHG emissions that diffuse over wide areas and accumulate. Therefore, rather than total emission regulations similar to GHG regulations, truly effective measures and frameworks that fully consider the characteristics of URN are necessary.

27 The approach proposed in this document provides an effective framework that is suitable for the characteristics of URN for the following reasons:

.1 since the impacts of URN are limited to the vicinity of the source, management focused on areas where species requiring protection are distributed are most effective;

.2 by considering regional and temporal characteristics such as ambient noise levels, distribution of marine life, and shipping traffic conditions, appropriate measures can be implemented in areas where protection is truly needed;

.3 by allowing operational measures, compatibility with GHG reduction targets becomes possible; and

.4 this approach is technically feasible.

28 In contrast, global total emission regulations or uniform numerical standards for individual ships do not consider the localized characteristics of URN and may cause the following problems:

.1 causing contradictions with GHG reduction measures, resulting in outcomes contrary to the overall objective of environmental protection;

.2 while effects may be limited in sea areas with high ambient noise levels, protection may be insufficient in quiet sea areas; and

.3 imposing unnecessary regulations even in sea areas with low protection needs, resulting in excessive burden on international shipping.

Need for extension of the Experience-Building Phase

29 It is proposed to extend the current EBP (2024-2026). Currently, international shipping is in the process of implementing efforts to maximize energy efficiency in ship design, and encourage fuel transition for GHG reduction, and introducing URN regulations hastily under these circumstances would lead to increased GHG emissions.

30 After the approval of the Revised URN Guidelines, reports of newbuilding cases intended for underwater noise reduction and underwater noise measurement results remain limited, and it cannot be concluded that sufficient experience has been accumulated regarding the many proposed measures.

31 Furthermore, the technical difficulty of measuring underwater noise itself is also a contributing factor to insufficient experience accumulation. As reported in documents SDC 9/INF.10 and SDC 9/5/4, URN measurement in actual sea conditions involves many technical challenges, including constraints of weather and sea conditions, difficulty in installing and recovering measurement equipment, masking effects from ambient noise, and complexity of sound propagation characteristics. The uncertainty of absolute values from direct measurement reaches several decibels or more, which is equal to or greater than the noise reduction achieved by reduction measures. Therefore, for practical URN management, it is essential to establish simplified methodologies for estimating noise levels from ships' design data and operational parameters.

32 Considering these factors, it is proposed to extend the EBP and continue information collection and methodology examination, especially regarding the following matters, as well as remaining issues described in document MEPC 82/17/Add.1, annex 8 (Action plan for the reduction of underwater noise from commercial shipping):

.1 collection of verification results on actual ships for technologies and operational methods with co-benefits for GHG reduction and URN reduction;

.2 methodologies for assessing ship noise levels and creating noise maps using simplified approaches accessible to countries with various levels of resources;

.3 methodologies for establishing URN managed areas and time based on sensitivity mapping considering ambient noise levels, distribution of protected species, and shipping traffic conditions;

.4 contents and format of URN management plans onboard ships; and

.5 comparative data and quantitative assessment of the impact on GHG emissions of design-based measures and operational measures.

33 The co-sponsors consider it appropriate to conduct further examination of the framework for URN management as necessary after these experiences and knowledge have been sufficiently accumulated. Hasty establishment of target values of URN or introduction of total emission regulations without considering the characteristics of URN may not only result in ineffective measures and unintended adverse environmental impacts (such as increased GHG emissions) but also impose unnecessary burdens on international shipping.

Action requested of the Sub-Committee

34 The Sub-Committee is invited to consider the proposals contained in paragraphs 26 to 33 and take action, as appropriate, particularly regarding:

.1 IMO's role in developing and supporting implementation of a framework for URN management based on a regional and temporal approach that considers the unique characteristics of URN;

.2 the necessity and justification for extending the EBP; and

.3 information to be collected with priority and methodologies to be examined during the extension period.