INTERNATIONAL MARITIME ORGANIZATION

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| MARINE ENVIRONMENT PROTECTION COMMITTEE<br>85th session<br>Agenda item 9 | MEPC 85/9/2<br>28 August 2026<br>Original: ENGLISH<br>Pre-session public release: ☒ |

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

## The emerging URN measurement problem – A proposed way forward

**Submitted by ICS, BIMCO, IPTA and RINA**


**SUMMARY**

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| *Executive summary:* | The *Revised guidelines for the reduction of underwater radiated noise from shipping to address adverse impacts on marine life* (MEPC.1/Circ.906/Rev.1) identify direct measurement as the preferred method for establishing a ship's underwater radiated noise (URN) baseline and supporting quiet ship class notations. However, the existing measurement regime, based primarily on dedicated sea trials, presents a significant barrier to wider uptake by ships in service due to its high cost, operational disruption and limited availability of specialist resources. As one potential solution, this document proposes the development of a network of autonomous URN measurement facilities located at the approaches to major shipping pinch points and supported by the emerging ISO "Measurement of Opportunity" standard. Such facilities would enable ships to obtain baseline measurements during normal operations, reducing costs and avoiding dedicated trials. Preliminary estimates suggest that a small network of strategically located facilities could provide measurement opportunities for a substantial proportion of the world fleet at a fraction of current costs. Nevertheless, supplementary or alternative proposals for economically viable and technically feasible solutions would also be welcomed by the co-sponsors of this document. |
| *Strategic direction, if applicable:* | 1 |
| *Output:* | 1.16 |
| *Action to be taken:* | Paragraph 36 |
| *Related documents:* | SDC 12/8, SDC 12/INF.3, SDC 12/INF.4 and SDC 12/INF.5 |


### Introduction

1 In October 2023, the *Revised guidelines for the reduction of underwater radiated noise from shipping to address adverse impacts on marine life* (MEPC.1/Circ.906/Rev.1) (Revised URN Guidelines) came into effect and are within an experience-building phase (EBP). Although originally of three years' duration, MEPC 84 agreed in principle to a two-year

extension (to the end of 2028), but subject to the Secretary-General's review of the workload implications, which will be confirmed at MEPC 85.

2 Key features of the EBP include:

.1 determination of a ship's underwater radiated noise (URN) baseline; and

.2 reduction of a ship's URN, either through a noise management plan, or by adoption of a class society quiet ship class notation.

3 Appendix 3 of the Revised URN Guidelines provides a typical template for URN planning and confirms the preferred method of determining a baseline is via URN measurement. Similarly, for purposes of attaining a quiet ship notation, baselining by URN measurement is also normally required by the classification societies.

4 At MEPC 84, the Committee invited interested Member States and international organizations to submit further proposals and comments to MEPC 85 on the most appropriate way forward. In response, the co-sponsors have made this proposal as a positive contribution and as a possible solution to the emerging URN measurement problem.

**The emerging problem**

5 URN measurement using autonomous measuring facilities has been available in a few locations (e.g. Vancouver and the St. Lawrence Estuary in Canada and Genoa in Italy). Otherwise, the most common way to achieve a ship URN baseline measurement is through dedicated sea trials. Such trials typically involve the selection of an appropriate sea area and then mobilization of technicians and equipment to the site where a leased workboat is utilized to deploy the hydrophones. Advice from shipowners and class societies indicates a typical cost per trial of around $30,000 to $50,000.

6 However, the actual cost for ships in service will be higher owing to the consequential cost of diverting the ships and loss of revenue for the duration of the redeployment and sea trials. For this, a guide may be taken from typical day rates, e.g. around $10,000 per day for a handy-sized bulk carrier, and up to $200,000 per day for a Very Large Crude Carrier (VLCC).

7 Hence, assuming the redeployment and trials typically take about a day, the total sea trial cost per ship is estimated to be in the range of $40,000 to $250,000. For a world fleet of about 100,000 ships the total cost of URN baselining every ship therefore amounts to around $4 billion to $25 billion (N.B.: this is the cost for one set of measurements). A ship's URN emissions may change with time, for example propeller damage may increase the emissions, or the adoption of energy efficiency measures might reduce the emissions. Therefore, ideally ships in service would be measured regularly, and therefore the cumulative costs would be even higher.

8 There is also the question of resources. The co-sponsors estimate the existing global resources to achieve such measurements (e.g. qualified technicians and measuring equipment) are consistent with an annual total of around 50 such trials per year. Achieving 100,000 such trials would require unprecedented scaling up.

9 Hence, a problem is emerging, whereby to achieve significant further uptake of the Revised URN Guidelines, utilizing the preferred baselining methodology will incur an inappropriately high cost and the resources to achieve the required scale and rate of measurements do not at this time exist.

**A potential solution**

10 Autonomous measuring facilities such as those that have been located at Boundary Pass off Vancouver, Canada, in the St. Lawrence Estuary, Canada and off Genoa, Italy are well-proven and can provide convenient access to URN measurement at reasonable cost, particularly where such facilities are located close to a ship's route.

11 To date, such facilities have not been built or operated to a common standard and therefore, the measurement accuracy has varied. Hence, it has not been appropriate to determine URN trends for a particular ship using measurements over a period of time from two different facilities, as might be required by a ship operating on irregular routes.

12 However, ISO have recently initiated the development of a "Measurement of opportunity Standard". This is expected to develop requirements for such facilities and thereby provide the basis for convenient, consistent and accurate baseline measurement.

13 If located at the approaches to key geographical pinch points, a network of such autonomous facilities could facilitate measurement of the majority of the world fleet.

**Development of the ISO standard**

14 From start to finish, the development of an ISO standard normally takes about three years and passes through the following phases:

.1 Proposal

.2 Preparatory

.3 Committee

.4 Enquiry

.5 Approval

.6 Publication

15 A coordinator has recently been appointed and its development is currently within the proposal phase.

16 Development of such a standard is considered by the co-sponsors as feasible because there are several years' experience of operating such facilities. There are also existing ISO standards for dedicated URN sea trials and at least part of these standards could be adapted for the autonomous facilities.

17 To achieve the widest possible acceptance of the new standard it will be important for it to provide:

.1 sufficiently rigorous construction and operational criteria to satisfy the requirements of the class societies, i.e. for purposes of assignment of quiet ship class notations; and

.2 repeatable accuracy across the network, such that ships on irregular routes may establish trends in their URN emissions using more than one facility.

**Autonomous facilities – CAPEX, OPEX and schedule duration**

18 As the ISO standard is currently being developed, no facilities have yet been built to that standard, and therefore no accurate cost estimates exist.

19 However, guidance may be taken from the existing facilities, and the co-sponsors are grateful for the information below that was supplied by the owners/operators:

**Table 1: Estimated costs and durations**

| Facility | Approx. CAPEX local currency | Approx. CAPEX $ | Approx annual OPEX local currency | Approx annual OPEX $ | Approximate duration from sanction to installation |
|---|---|---|---|---|---|
| Boundary Pass, Vancouver, Canada | CAD 5,960,000 | $4,187,436 | CAD 2,350,000 | $1,651,087 | Not stated |
| St. Lawrence Estuary, Canada | CAD 500,000 | $351,295 | CAD 400,000 | $281,036 | Not stated |
| Genoa, Italy | €140,000 | $158,820 | €120,000 | $136,131 | 6 months |

20 The co-sponsors extend their sincere thanks to the following organizations for providing the above cost information:

.1 Transport Canada

.2 Institut des Sciences de la Mer de Rimouski (ISMER)

.3 Université du Québec à Rimouski (UQAR)

.4 Quiet-Oceans

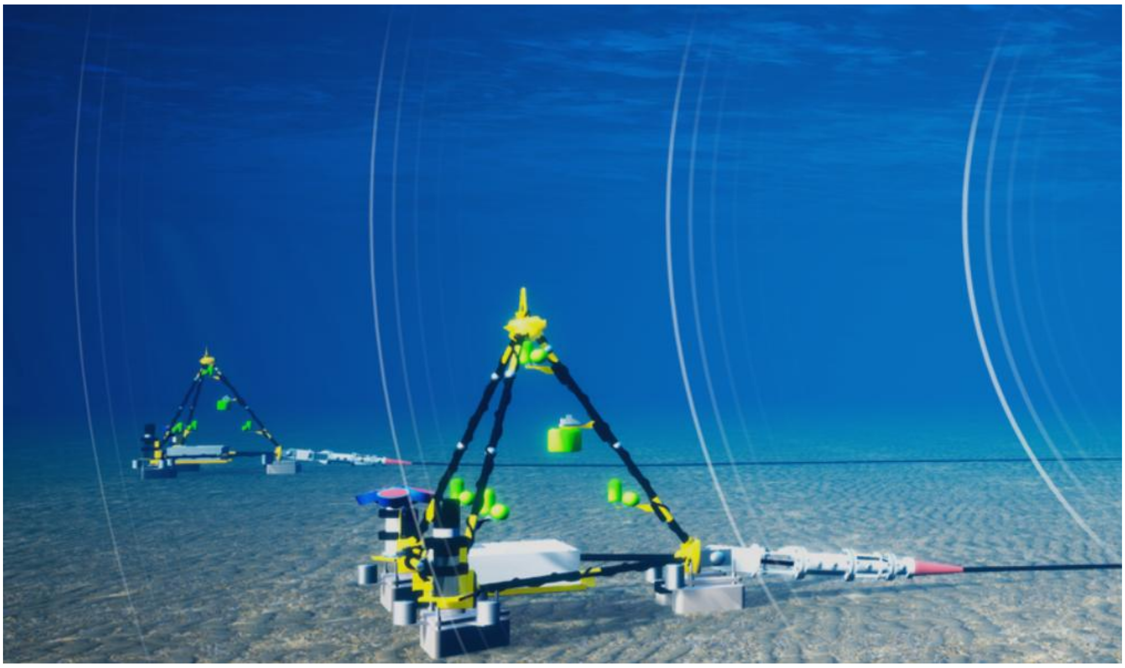

**Figure 1: The JASCO boundary pass listening station**

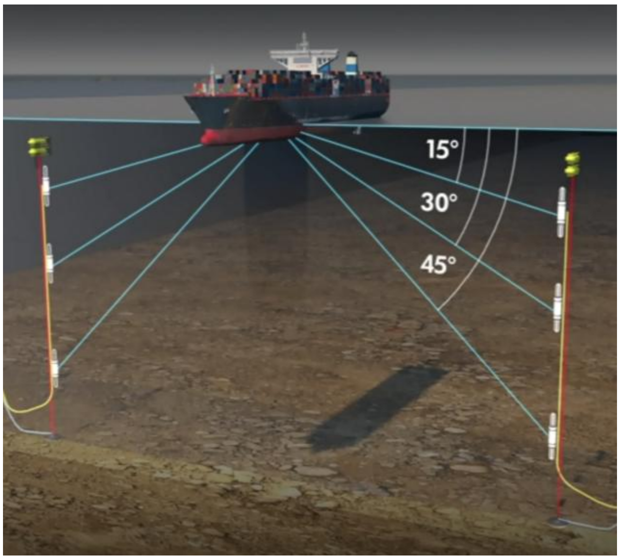


**Figure 2: Geometry of the St. Lawrence Estuary MARS listening station**

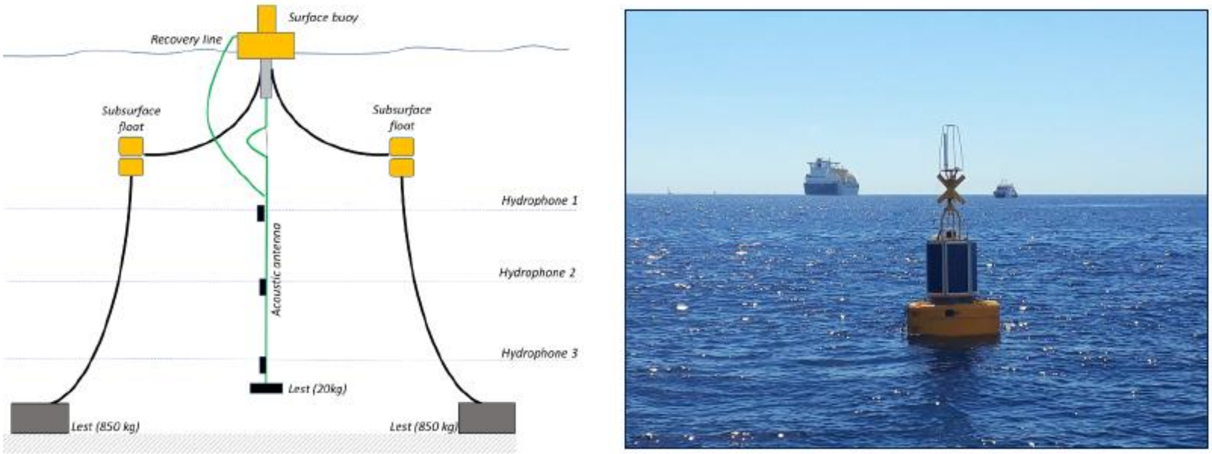


**Figure 3: Quiet-Oceans smart URN buoy located at Genoa**

21 The relatively high cost of the Boundary Pass, Vancouver facility is dominated by the provision of subsea cabling, which is not a feature of the other two facilities. Therefore, the costs associated with the Boundary Pass, Vancouver facility can be considered an outlier and are discounted.

22 Based upon the St. Lawrence and Genoa facilities, a ballpark estimate for procuring one such facility is in the range:

CAPEX = $159,000 to $351,000

OPEX = $136,000 to $281,000 per annum

23 Schedule duration for procurement = Approximately six months

**Cost of data checking and reporting**

24 Once each baseline set of URN data has been collected, it is important to manually check it for inconsistencies or outliers, and if found satisfactory to produce a detailed report.

For the Genoa facility, the cost chargeable to each ship for such a report amounts to about $4,424.

**Possible locations**

25 To minimize cost and operational impact, it would be beneficial to locate the measurement facilities at the approaches to geographical pinch points. Final selection would of course depend upon such factors as water depth, bottom topography and level of ambient URN. However, table 2 proposes several candidates. In such a way a handful of locations could provide URN measurements for a high proportion of the world fleet, given the high amount of ship traffic.

**Table 2: Key pinch points for world shipping**

| Location | Approximate Number of ship passes per year | References | Per cent of world trade | References |
|---|---|---|---|---|
| Approaches to Suez Canal | 12,758 | (Suez Canal Authority, 2025) | 16% | (Financial Times, 2026) |
| Approaches to Panama Canal | 13,404 | (Canal de Panama, 2026) | 7% | |
| Gibraltar Straits | 60,000 | Gibraltar port authority website | 18% | |
| Malacca Straits | 94,000 | (World Economic Forum, 2024) | 30% | |
| Strait of Hormuz (peacetime) | 52,000 | (Oxford University, 2026) | 8% | |
| Taiwan Strait | 62,400 | (UK Office for National Statistics, 2024) | 21% | |
| English Channel | 67,600 | (UK Office for National Statistics, 2024) | 16% | |
| **Total** | **362,162** | | **116%** | |

26 It is important to note that a number of ships will never pass such pinch points, for example, ships that operate on short sea routes. Therefore, although such a network could substantially increase the availability of low-cost URN measurement, it cannot in itself provide universal coverage.

**Overall cost and schedule**

27 In summary, the above ballpark estimates indicate that a network of say five autonomous facilities could cover the majority of ships that trade on international routes and could be implemented at a total cost of approximately:

CAPEX = $0.8 million to $1.8 million

OPEX = $0.7 million to $1.4 million per annum

28 Spread over a world fleet of 100,000 ships, the proportioned CAPEX and OPEX per ship would be very low, at under $20 per ship CAPEX and under $15, OPEX per ship, per year. Leaving the dominating cost per ship as the $4,424 for manually checking and reporting

the URN data. This is in comparison to the $40,000 to $250,000 per ship for a dedicated sea trial.

29 Including the necessary time for development of the ISO standard and procuring, constructing and installing the facilities, such a network could be established within a time frame of about 4 years.

**Economies of scale**

30 Substantially increasing the number of ships that undertake dedicated sea trials could yield economies of scale. However, the same could be said for the proposed network of autonomous measuring facilities, particularly with respect to the process of checking and reporting the data. Therefore, for purposes of this high-level comparative study, economies of scale have not been considered.

**Impact on environmental incentive schemes**

31 Documents SDC 12/8 (Belgium), SDC 12/INF.3 (ICS et al.), SDC 12/INF.4 (ICS et al.) and SDC 12/INF.5 (ICS et al.) summarize the outcome of three case studies for ships that have undertaken URN baseline measurements. The documents concluded that in the two cases where the URN measurement cost was less than $15,500 then it is likely that the adoption of a URN management plan or a quiet ship class notation could yield an overall cash benefit from the discounts awarded by existing environmental incentive schemes[*]. Therefore, accessibility to low-cost measurement can also unlock economic drivers for URN reduction through such incentive schemes.

**Future URN measurement concepts**

32 Other measurement technologies are under development and might provide alternative or supplementary options for URN measurement for ships in service. For example, onboard measurement of URN (Bruliard, 2024) and measurement by aerial drones (Steven Lloyd et al, 2016). The co-sponsors would welcome further proposals for economically viable and technically feasible measurement solutions based on such novel technologies.

**URN prediction**

33 Methodologies for predicting a ship's URN already exist, for example, using a combination of finite element, computational fluid dynamics, and boundary element methods (Akula Chaturvedi, 2020). The cost of producing a model capable of predicting a ship's URN emissions from all major sources, (e.g. propeller, machinery, appendages and hull) is of the order of €100,000 and normally full-scale sea trial results would also be required for purposes of calibration. There is also the question of changes to the emitted URN due to in-service changes, for example due to cavitation erosion of the propeller blades, increases in hull surface roughness, or the adoption of energy efficiency measures. Predictive methods may not reveal such changes, whereas periodic measurements would. Therefore, predictive methods are regarded by Sponsors as less suitable for a ship in-service. However, it might be appropriate at the newbuild stage for a shipyard building to a standard design, as the costs could be spread over multiple ships. The model could also be of benefit in assessing the impact of minor variations in design.

* For example, The International Association of Ports and Harbours (IAPH) – Environmental Ship Index (ESI), Green Marine, Green Award, the PIAQUO Noise Ship Index (NSI) and the Vancouver Port Authority Echo programme.

**Conclusion**

34 The following is concluded:

.1 We cannot manage what cannot be measured. A practical system of URN baseline measurement for the world fleet is an essential prerequisite.

.2 The existing regime for URN baseline measurement is too costly and there are inadequate resources to provide the required number and frequency of measurements. Dedicated sea trials are also too disruptive for the normal operation of ships.

.3 Predictive methods exist, but are relatively high cost and are less well suited to the baselining of ships in service.

.4 If appropriately located, a limited network of autonomous facilities could provide greater accessibility at much lower cost and with minimal disruption to shipping services, thereby substantially increasing the uptake of the Revised URN Guidelines and the class society quiet ship class notations.

.5 Access to low-cost URN measurement can also unlock economic drivers for URN reduction through environmental incentive schemes.

.6 To ensure consistent accuracy of measurements, an essential prerequisite is the establishment of an international standard. The development of ISO's measurement of opportunity standard can provide this.

.7 Although such a network could substantially increase the availability of low-cost URN measurement, it cannot in itself provide universal coverage. Therefore, alternative low cost, accessible methods will still need to be developed, e.g. for ships that regularly sail on short sea routes.

**Proposal**

35 The co-sponsors propose that the Committee:

.1 acknowledge the importance of economically viable and readily accessible URN baseline measurement to:

.1 the further uptake of the Revised URN Guidelines, and

.2 the environmental incentive schemes and their potential for driving URN reduction;

.2 invite further submissions with proposed approaches to URN measurements that are economically viable, technically feasible, and implementable;

.3 include within the terms of reference for the URN Working Group (if established at MEPC 85 or SDC 13), the following item:

*"Advise on the practical and economically feasible options for URN baselining of ships. Include consideration of the necessary timelines for establishing such options."*

**Action requested of the Committee**

36 The Committee is invited to note the information provided in this document, consider the proposal in paragraph 35 and take action as appropriate.

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## ANNEX

## REFERENCES

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