

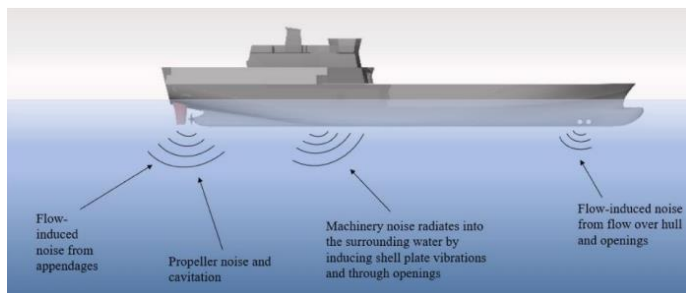
REVISED IMO GUIDELINES FOR THE REDUCTION OF UNDERWATER RADIATED NOISE

Recognizing the adverse impact of under water radiated noise for marine life, the Marine Environment Protection Committee of the IMO (MEPC) approved on its 66th session in 2014, the “Guidelines for the reduction of underwater noise from commercial shipping to address adverse impacts on marine life”. After a comprehensive review process, which had been conducted in the recent years by the IMO sub-committee on Ship Design and Construction (SDC), MEPC approved the “Revised guidelines for the reduction of underwater radiated noise from shipping to address adverse impacts on marine life” (Revised Guidelines) at its 80th session in July 2023. The Revised Guidelines were officially published at the 22nd August 2023 (IMO 2023). To provide a short and comprehensive overview on the subject of Underwater Radiated Noise (URN) from shipping and the recently published Revised Guidelines, the VDR has issued this paper as support and guidance for shipping companies.

Due to the IMO's greenhouse gas (GHG) reduction targets and the binding instruments implemented, such as the Carbon Intensity Indicator (CII) or the Energy Efficiency Design Index (EEDI), ship owners are currently concentrating on meeting these binding requirements through the implementation of appropriate fuel efficiency measures. While choosing the best fuel efficiency measures for their vessels, shipowners should be aware that many of these are also very effective for the reduction of URN. Therefore, if considered at an early stage, and by careful consideration of the adopted GHG reduction measures, it is likely that significant URN reductions can also be achieved with no additional cost.

URN – sources and impact

URN noise from ships is caused by various different sources.

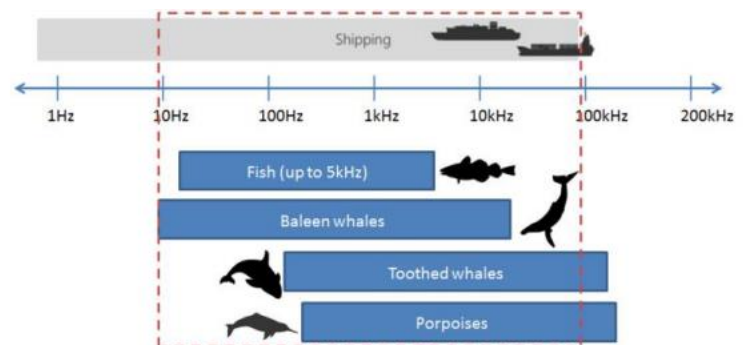


Source: Smith & Rigby, 2022

The main sources are (Vard, 2023):

- Flow Noise – by making way through the water, different kind of waves are created that are a source for URN. Flow noise can be considered as low intense noise.
- Machinery Noise – created by the operation of different kind of ships equipment (e.g. engines, compressors etc.), which travels through the ships hull into the sea. Such noise can be reduced by different kind of measures, like e.g. encapsulation of machinery or usage of respective bearings.
- Propeller Noise – arises mainly from cavitation and usually reduces with the reduction of the ships speed/RPM. Propeller Noise caused by cavitation can be considered as the main source of URN.

The largest adverse impact of URN from shipping comes from the frequency of noise generated, which overlaps with the frequency that many marine animals use to communicate.



Source: IMO 2018

The URN from shipping is therefore hampering the acoustic communication of these marine species, leading e.g., to a loss of orientation.

The Revised Guidelines

The revised guidelines aim to reduce URN from shipping by providing guidance to stakeholders on possible approaches to reducing URN and establishing corresponding programs.

The Revised Guidelines apply to new and existing vessels and are of non-mandatory nature. When published by the IMO in August 2023, a three-year experience building phase (EBP) started, which will be used to collect data to evaluate the effectiveness

of the guideline, incl. the level of voluntary uptake by shipping companies. The EBP will be monitored by the IMO sub-committee SDC, which will be responsible to evaluate the data collected and to prepare proposals for a further subsequent revision. Such proposal may, depending on the determined effectiveness of the guideline, also include a mandatory instrument for the reduction of URN.

Implementation of the revised Guidelines – actions to be taken by ship owners

Shipowners who which to voluntarily implement the Revised Guidelines will need to:

1. conduct a baselining of the URN level for their vessels. As possible options, the guidelines recommend to conduct real underwater measurements of the actual URN (e.g. by using hydrophones), but also allows model tests or numerical prediction. The baselining should reflect the ship’s normal operating conditions and speed.
2. after the baselining, define noise reduction targets. The Revised Guidelines do not require a specified noise reduction target, and ship owners are free to define their own. When setting the URN reduction target, it is advisable to consider:
 - noise reduction strategy may be progressive
 - local sound propagation conditions, and sensitivity of local marine life
3. choose operational measures (e.g. hull propeller cleaning, speed reduction etc.) and/or technical measures (e.g. propeller optimization, ships/engine design etc.), to achieve the defined noise reduction target. The interrelationship between energy efficiency measures and URN measures should be carefully considered.

Shipowner are advised to seek support from classification societies, for conducting the baselining and setting the noise reduction targets. Also, when choosing the relevant measures to achieve the set targets, classification societies may be of assistance. Different classification societies have already invented so called “silent class notations” and shipowners may also want to consider to obtain such notation for their vessels.

Classification Society	Name	Year
DNV	SILENT (5 class notations)	2018
Bureau Veritas SA	NR614 Underwater NR614 Underwater	2017
Lloyd's Register	ShipRight (3 class notations)	2018
ABS	Underwater noise (2 class notations)	2018
CCS	Guidelines for ship URN	2018
RINA	RINA DOLPHIN (2 class notations)	2019
Korean Register	Guidances for Underwater Radiated Noise (2 class notations)	2021

Overview of classification society “Quiet Class” notations (EMSA, 2021)

The Noise Management Plan

The core requirement of the Revised Guidelines for shipowners is to develop a ship specific Noise Management Plan (NMP). The intention for the NMP is be a flexible tool that allows a customized approach.

The plan shall include:

- A statement of the objectives of the plan
- Details of the approach taken
- Details of how the ship owner will monitor and evaluate the success of his or her actions

The plan may further include:

- Details of how a ship’s noise signature will be baselined
- Targets for URN reduction (e.g. Noise reduction relative to the baseline measurement).

For the development of an NMP, support may be available from shipyards, flag administrations, classification societies and equipment manufacture.

For new vessels, it is advisable to develop the NMP at an early stage.

Interrelation between energy efficiency measures and URN measures

When considering the implementation of URN reduction measures, the potential interrelation between energy efficiency measures needs to be considered. E.g., while slow steaming usually has a positive effect on fuel consumptions and the reduction of URN, this may not be the case for vessels operating with variable-pitch propellers.

However, it should be noted that the vast majority of energy efficiency measures will also have a positive effect on the reduction of URN, as indicated by the examples in the table below.

Measure	Energy Efficiency (change in %)	URN (change in %)
Selection of Anti-Fouling Paint	Up to 5 %	< 5 dB
Underwater Hull Cleaning	Up to 5 %	< 5 dB
Air bubbler system	3 to 6 %	> 10 dB
Propeller Optimization	Up to 5 %	< 5 dB
Wind Assisted Propulsion (Flettner Rotors)	7 to 11 %	5 to 10 dB
Cold Ironing	100% in port	5 to 10 dB
Slow Steaming/EPL	Approximately proportional to square of speed reduction.	< 5 dB

Examples for the interrelation between energy efficiency measures and URN measures (Vard, 2023)

Recommendation to consider the voluntary implementation of the Revised Guideline

The German Ship Owners' Association recommends shipping companies to consider the voluntary implementation of the Revised guidelines for the reduction of underwater radiated noise from shipping to address adverse impacts on marine life.

Shipowners are required to implement GHG reduction/ Energy Efficiency measures, to meet mandatory standards.

By carefully considering the GHG reduction/energy efficiency measures taken, URN reductions can be achieved at no additional cost. After the necessary baselining, the requirements of the revised guidelines can be met by just setting appropriate objectives and documenting the measures taken in the NMP.

It must be noted that only a wide uptake of the Revised Guideline will show the shipping industries commitment to the reduction of URN. Only such a wide uptake within the EBP can prove the effectiveness of the Revised Guidelines and may therefore also help, to prevent even more stringent mandatory regulations to be implemented by the IMO in future.

Literature

EMSA (2021), Sounds: Status of Underwater Noise from Shipping, Study on Inventory of existing policy, research and impacts of continuous underwater noise in Europe

IMO (2023), MEPC.1-Circ.906 – Revised Guidelines for the Reduction of Underwater Radiated Noise for Shipping to Address Adverse Effects of Marine Life

IMO (2018), MEPC 7 /IN .2, "Scientific support for underwater noise effects on marine species and the importance of mitigation," August 2018

Smith, Rigby (2022), "Underwater radiated noise from marine ships: A review of noise reduction methods and technology," J. Ocn. Eng., vol. 266, doi: 10.1016/j.oceaneng.2022.112863

Vard (2023), ship energy efficiency and underwater radiated noise, Report 545-000-01, Rev 1

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