

# Synergies between noise reduction and decarbonisation

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Rev 1

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Shaping the Future of Shipping





- Background
- Synergies between efficiency and reduction of Underwater Radiated Noise (URN)
- Things to avoid
- Assessment of impact



# Global noise levels

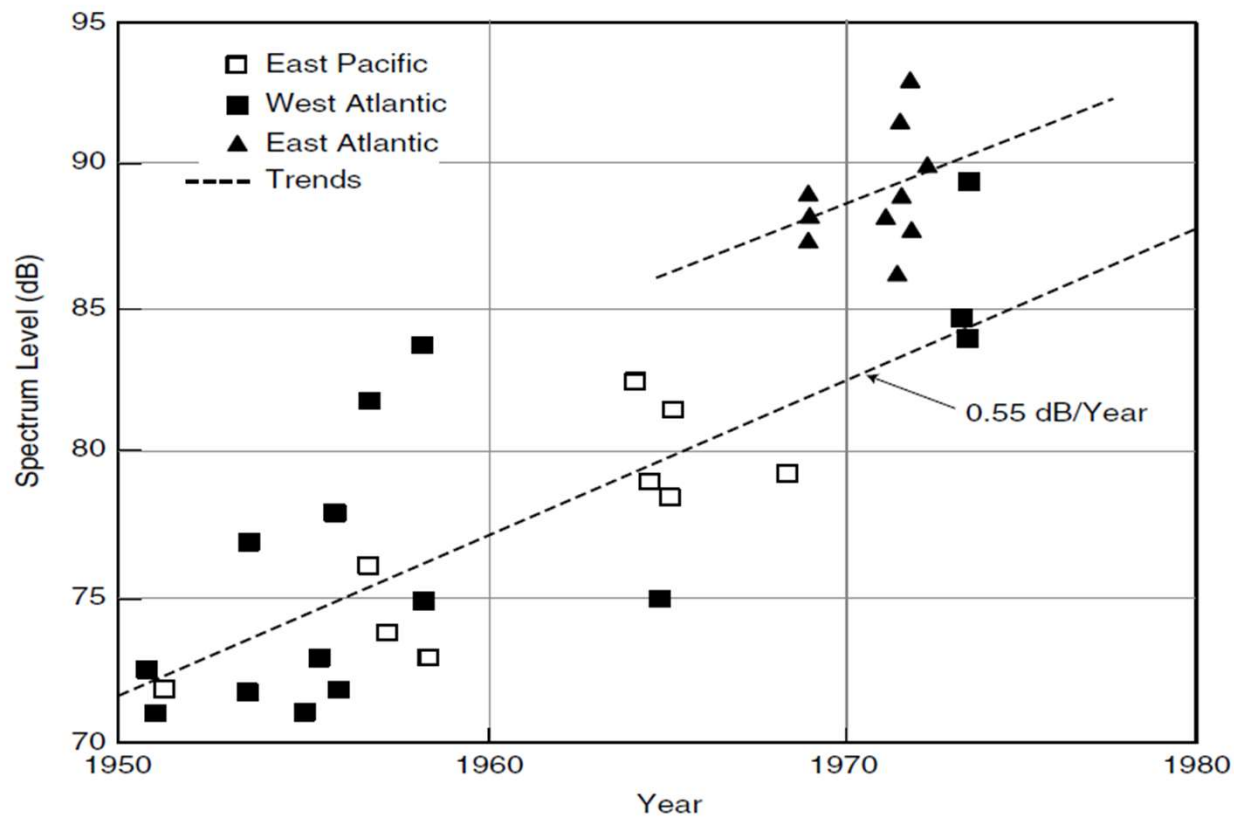


FIGURE 2-7 Long-term trend for low-frequency ambient levels for period 1958–1975. SOURCE: Ross, 1993, courtesy of Acoustics Bulletin.



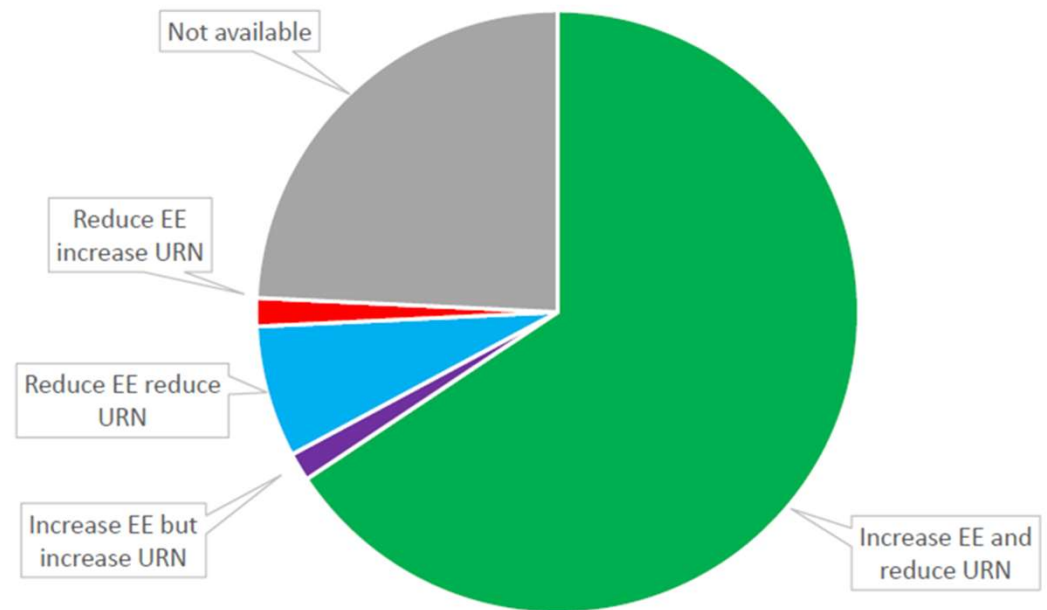
Okeanos Foundation for the Sea:

*“we call for initial global action that will reduce the contributions of shipping to ambient noise energy in the 10-300 Hz band by 3dB in 10 years and by 10dB in 30 years relative to current levels.”*

# Synergies between Energy Efficiency (EE) and URN



- The majority of efficiency measures are also known to reduce URN
- For about two thirds of the measures there is clear synergy and co-benefit
- In effect energy efficiency is noise reduction.
- With a little care in selection of energy efficiency measures, a welcome by-product with little additional effort will be noise reduction.





Some examples:

	Impact on energy efficiency	Reduction in URN	
		dB	Frequencies
<b>Hull cleaning</b>	< 5%	< 5	All
<b>Bulbous bow</b>	3 to 5%	< 5	All
<b>Flow straightening, e.g. propeller boss cap fins</b>	3 to 7%	5 to 10	< 1000 Hz
<b>Propeller maintenance</b>	2 to 5%	< 5	All
<b>Contra rotating propellers</b>	< 6%	5 to 10	40 to 300 Hz
<b>Air lubrication</b>	4 to 12%	< 10	20 to 80 Hz
<b>Wind assisted propulsion</b>	< 13%	5 to 10	All

For comparison, please remember the Okeanos foundation target of 3dB reduction (10 to 300 Hz) in 10 years.



- Optimisation of the propeller blade area ratio.
- Slow running of vessels with controllable pitch propellers.
- Ultrasonic anti-fouling systems





To counteract the increase due to growth in trade and also achieve the target 3db reduction:

**Requires a 4.8 dB reduction in average URN from individual ships**

Density of ship traffic goes up 50%  
**Ambient URN increases 1.8 dB**

**Reduces 3 db (Okeanos target)**

$$L_n = L_s - 95 + 10 \log \delta + 10 \log \frac{1}{\alpha_T H}$$

Ambient noise in dB (points to  $L_n$ )  
 Average sound source level per ship (points to  $L_s$ )  
 Density of ship traffic (points to  $\delta$ )  
 Attenuation factor (points to  $\alpha_T$ )  
 Water depth (points to  $H$ )

The term  $10 \log \delta$  is circled in blue, and the term  $10 \log \frac{1}{\alpha_T H}$  is circled in blue. A red arrow points from the text "Density of ship traffic goes up 50% Ambient URN increases 1.8 dB" to the circled  $10 \log \delta$  term. Another red arrow points from the text "Requires a 4.8 dB reduction in average URN from individual ships" to the  $L_s$  term. A third red arrow points from the text "Reduces 3 db (Okeanos target)" to the  $L_n$  term.





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- Industry can and should take ownership of the URN problem and its solution.
- The mandatory greenhouse gas regulations are driving ship owners towards increasing energy efficiency.
- Due to the strong synergies, and with clear guidance to ship owners, the energy efficiency measures can provide the heavy-lift of URN reduction.

Thank You



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Thank you for your attention  
I am happy to take questions

