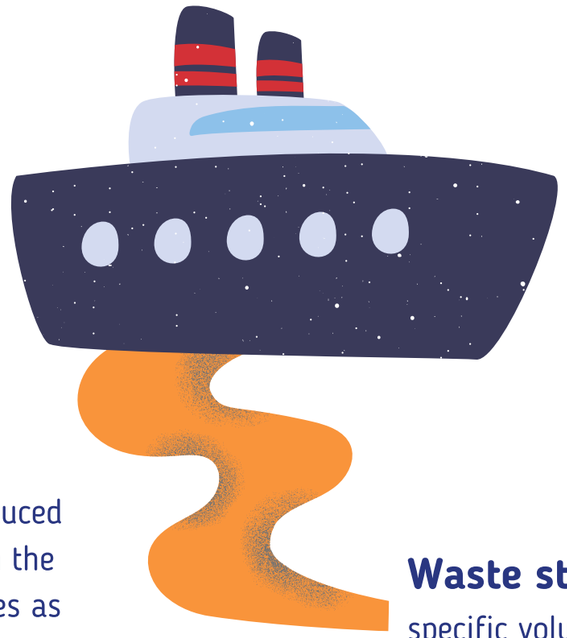
Knowledge gaps & research directions in clean shipping

Air pollutants:

update and development of new emission factors of air pollutants.

Emission abatement technologies:

impacts of open and closed-loop scrubbers on marine environment, effects of nitrogen oxide emission abatement technologies on emissions of other pollutants.



Description of ships in traffic models:

a continuous update of the description of ships in traffic models in terms of fuel type, use of engines in different modes and the use of abatement measures.

Health impacts:

assessments of health effects from nitrogen dioxide, primary particulate matter, secondary pollutants such as ozone and ultrafine particles.

Underwater noise:

improvements in noise source modelling, technical and operational measures for reducing underwater noise, noise propagation modelling, regular monitoring of underwater noise.

Oceanic modelling:

a description of physical effects of induced mixing in ship lanes, improvements in the description of biogeochemical processes as well as the determination of synergistic effects such as toxicity of different contaminants and acidification.

Waste streams:

specific volumes, concentrations of nutrients and contaminants in the different waste streams (e.g. grey water, black water, food waste) and their discharge patterns.

Compliance monitoring:

uncertainties involved in measurement technologies, standardisation and validation of measurements, improvements in sensor sensitivity and accuracy.

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