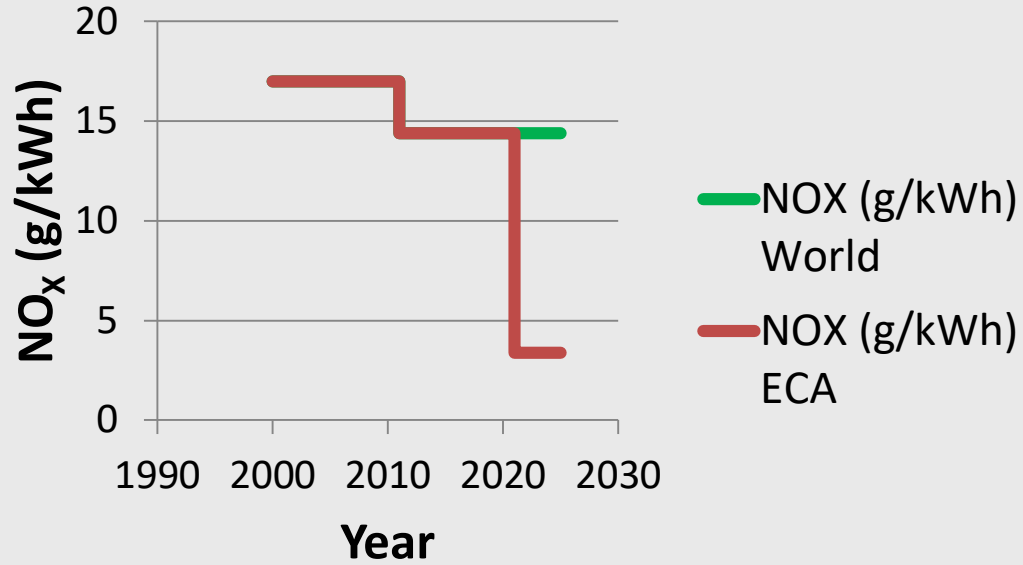


**Legal aspects, technology,
enforcement involving abatement
measures**

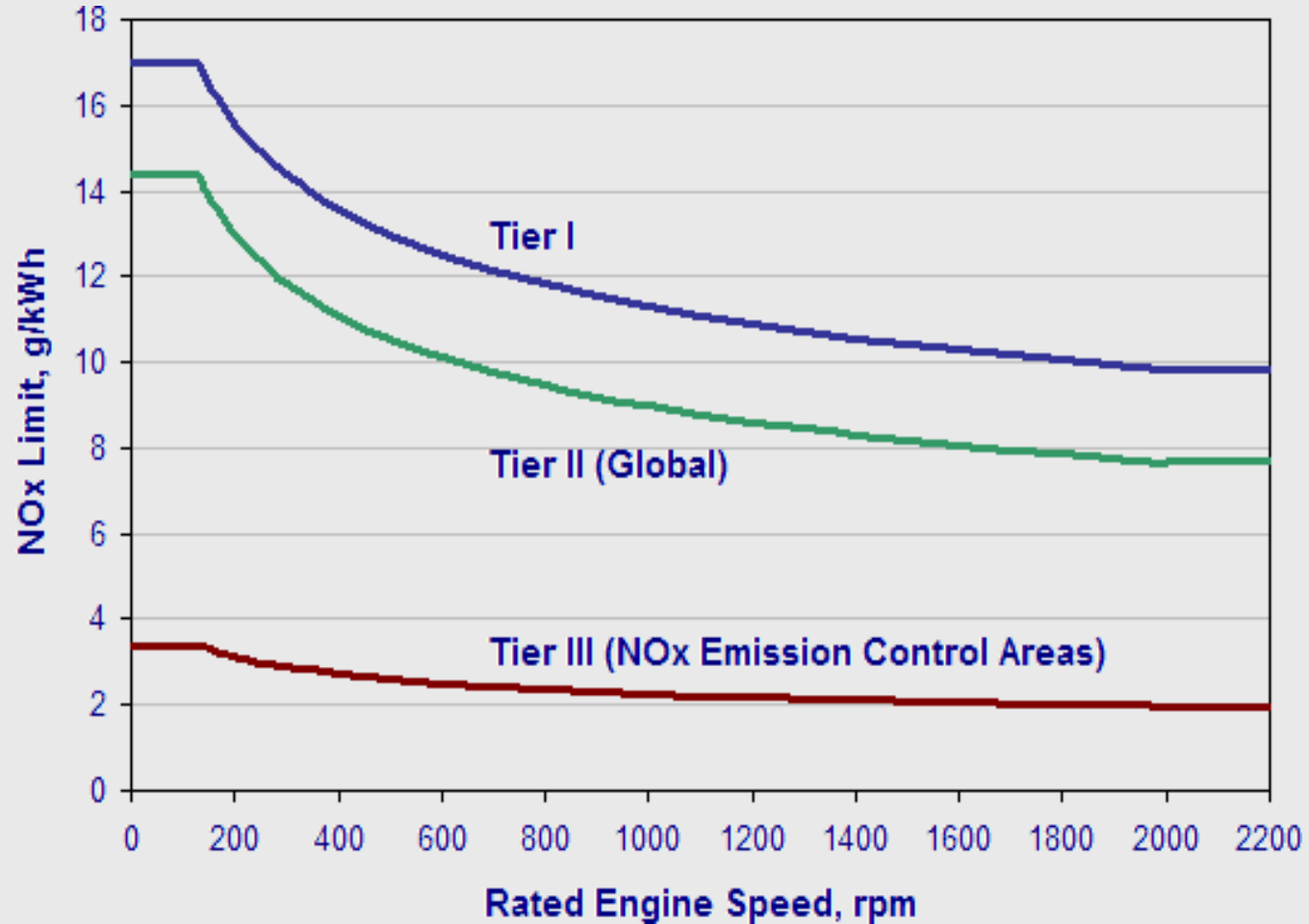
**Erik Fridell, IVL Swedish
Environmental Research Institute,
Sweden**

Regulations, nitrogen oxides



Tier II from 2012, global

Tier III in NO_x-ECAs: (Northern Europe 2021; North America 2016)



How to comply with Tier III?

- Aftertreatment: Selective Catalytic Reduction
- Engine technology: EGR
- Other fuels: LNG, methanol, ..

THE SCIPPER PROJECT

Shipping Contributions to Inland Pollution Push for the Enforcement of Regulations

Monitoring and enforcement of mainly NOX and SOX. Improved modelling of contribution from shipping to air pollution

WP5 Results synthesis and recommendations

- Gaps in regulations
- Compliance monitoring
- Scenarios for future emissions and impact



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement Nr.814893



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Some identified gaps, related to NOX:

- NECA geographical scopes are possibly not enough to accomplish the technology demand from the industry that would be needed to have efficient NOX-regulations.
- Control procedures to discover SCR deactivation are missing.
- Regulation on ammonia slip over time after SCRs are lacking.
- SCR functioning in port areas and other close to shore locations are not well covered by the regulation.
- Knowledge of NOX sensor performance over time.
- Regulatory prescribed approaches to the use of remote sensing technology for NOX emissions is lacking.
- Sufficient monitoring procedures at the use of NOX abatement equipment for Tier III are lacking.



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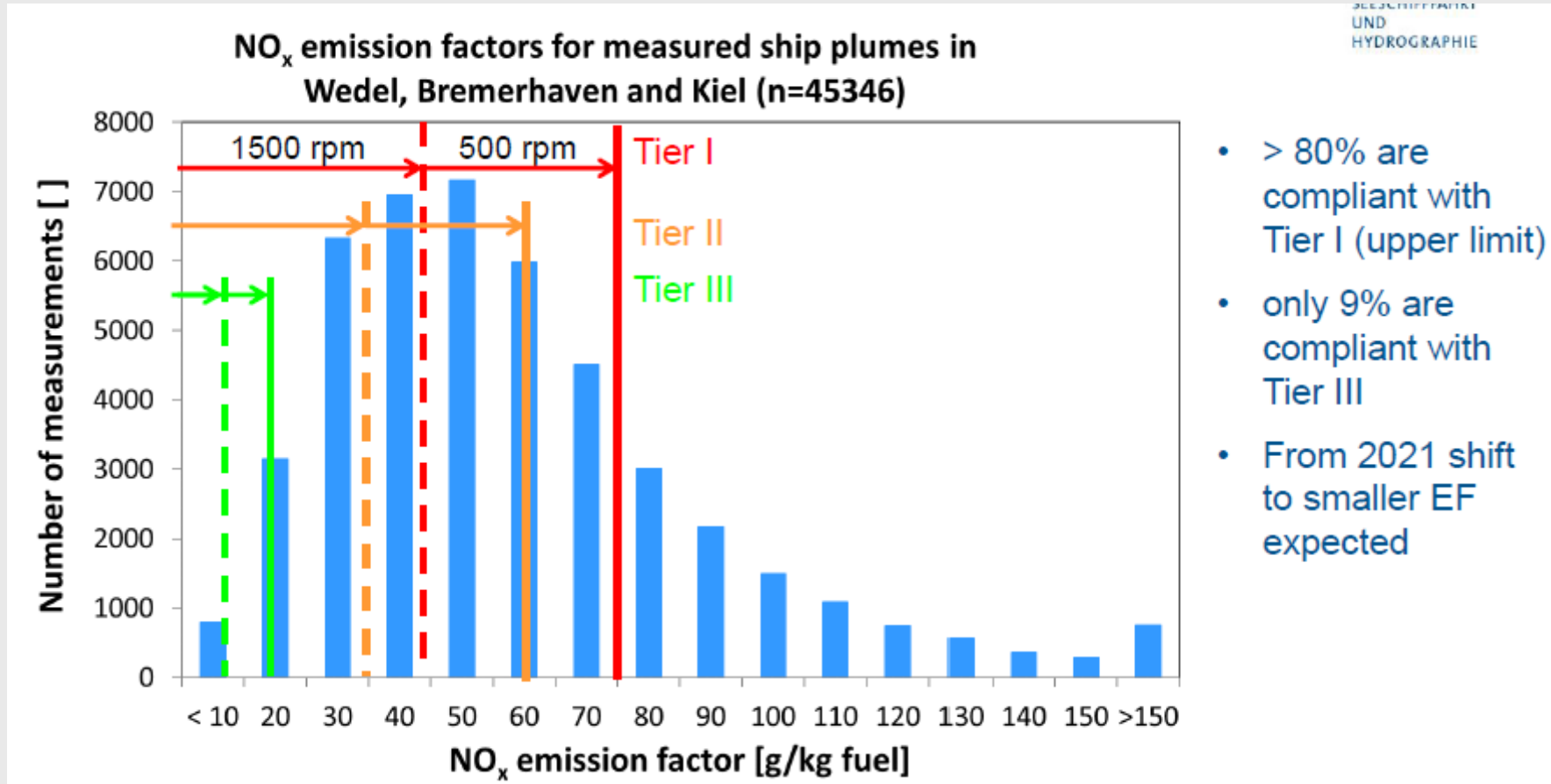
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CSHIPP

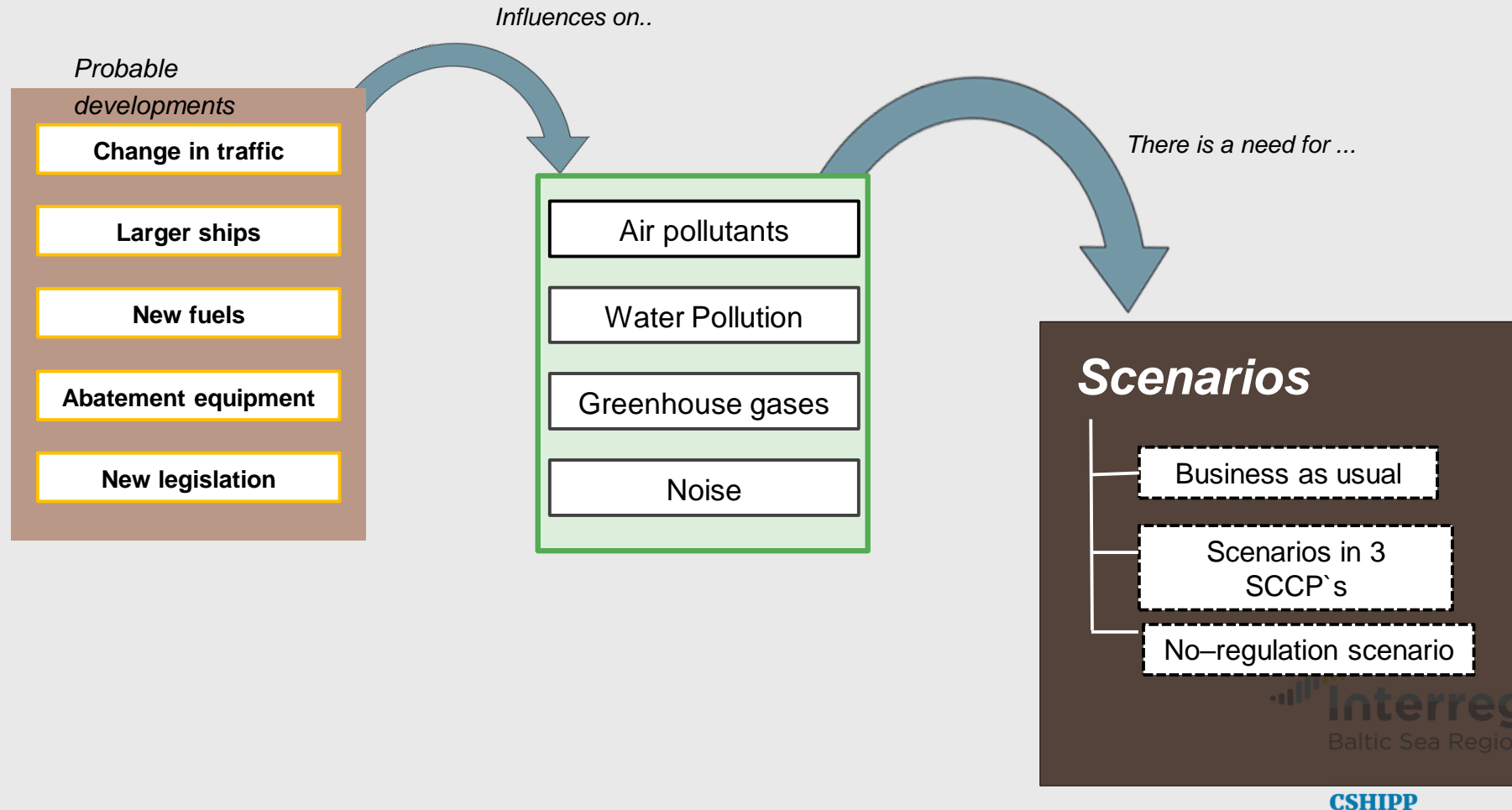
Example of monitoring results (Weigelt et al.)



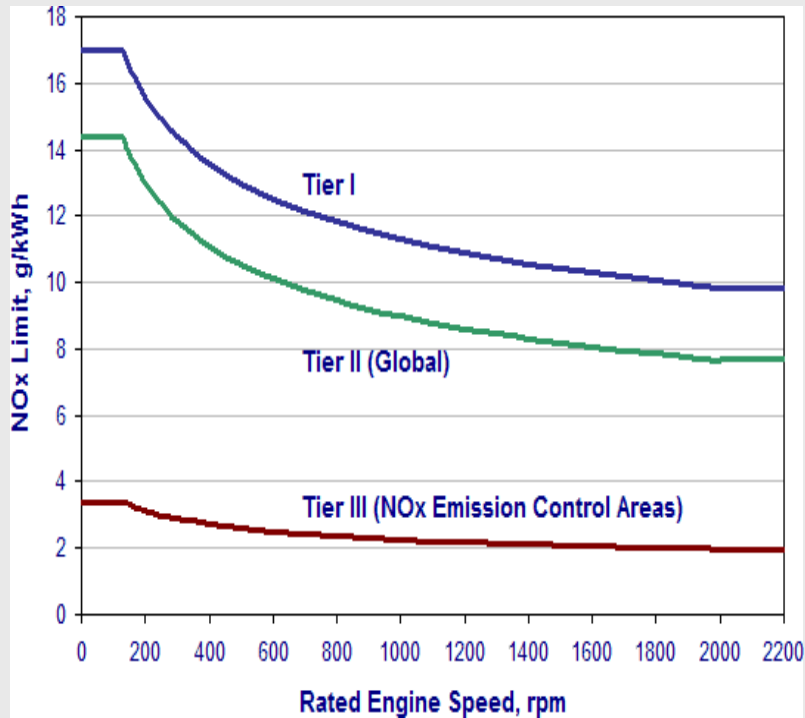
What will the future look like?



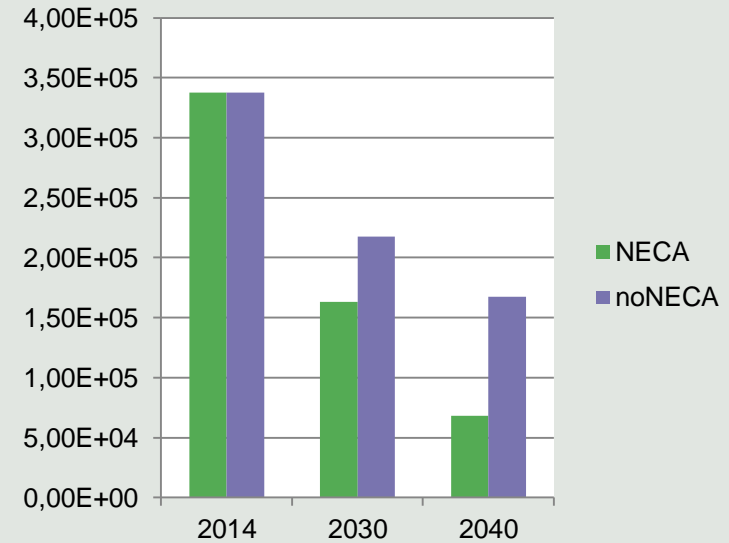
Shipping in the Baltic is expected to keep on increasing in the future. At the same time the ships will likely become more fuel efficient and a number of regulations on emissions to air and water will be enforced. A number of factors will influence the environmental performance.



What if there is no NO_x regulation in the Baltic Sea?

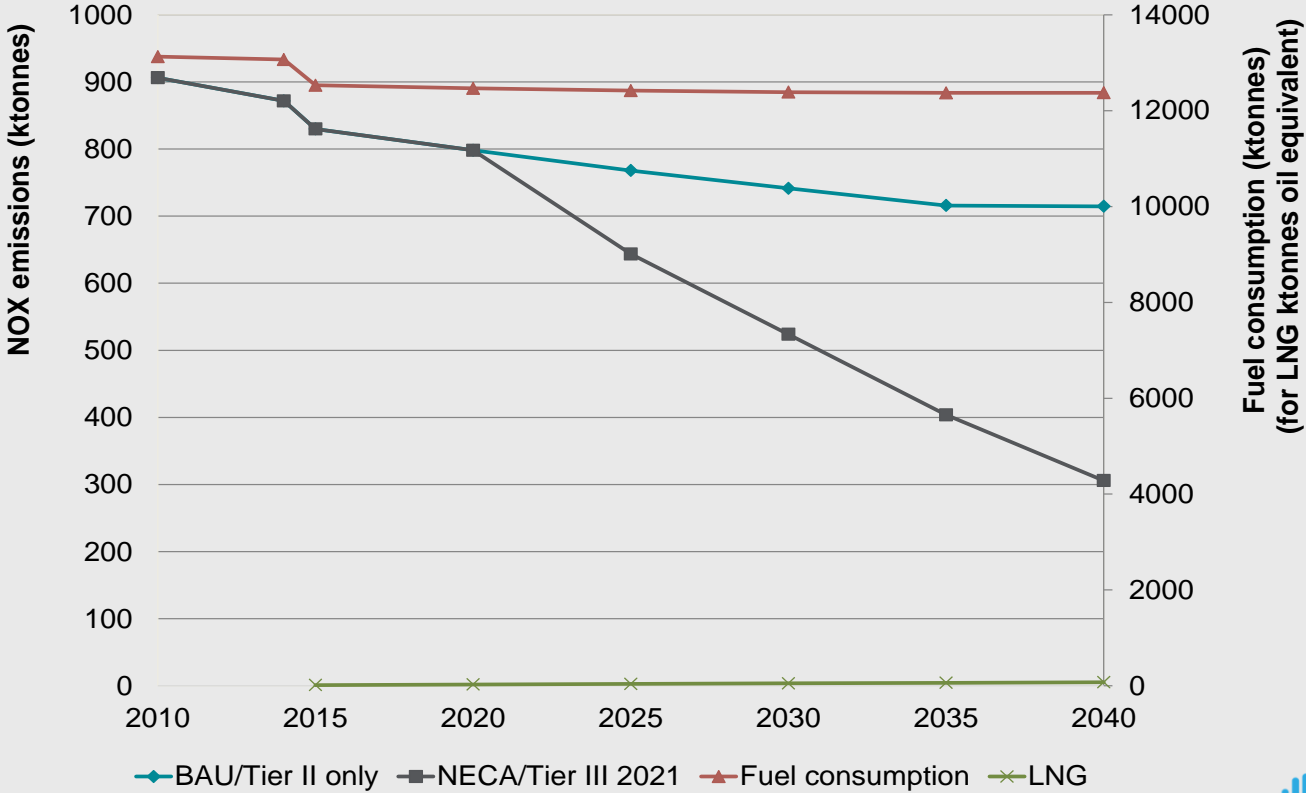


NO_x emissions in tonnes



The Baltic Sea will become a nitrogen emission control area (NECA). From 2021 new ships will have to follow the more stringent NO_x regulation Tier III. As old ships are replaced by new ones the emissions will gradually go down. The bar graph shows this expected development and what it would look like without the NECA.

Fuel consumption and NO_x emissions in Baltic and North Seas. With NECA in BS and NS effective 2021.



Scenarios related to SSP`s

- Scenarios developed for climate research have been investigated and the emissions from shipping in the Baltic Sea have been calculated. The three scenarios studied are “sustainability (SSP1)”, “middle of the road (SSP2)” and “fragmentation (SSP3)”.
- These scenarios imply different development in shipping regarding volumes, types of fuel use and the introduction of environmental policies and the use of abatement methods. The emissions of CO₂, NO_x and sewage are shown with large differences between these three different futures.

Different futures (2040) relative to 2014 (*fractions*)

