SUSTAINABLE WATERWAY TRANSPORT, CLEAN AIR

CLINSH main policy recommendations

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SUSTAINABLE WATERWAY TRANSPORT, CLEAN AIR

CLINSH partners

- The Netherlands
- Belgium
- Germany
- United Kingdom

Budget: € 8,5 mio

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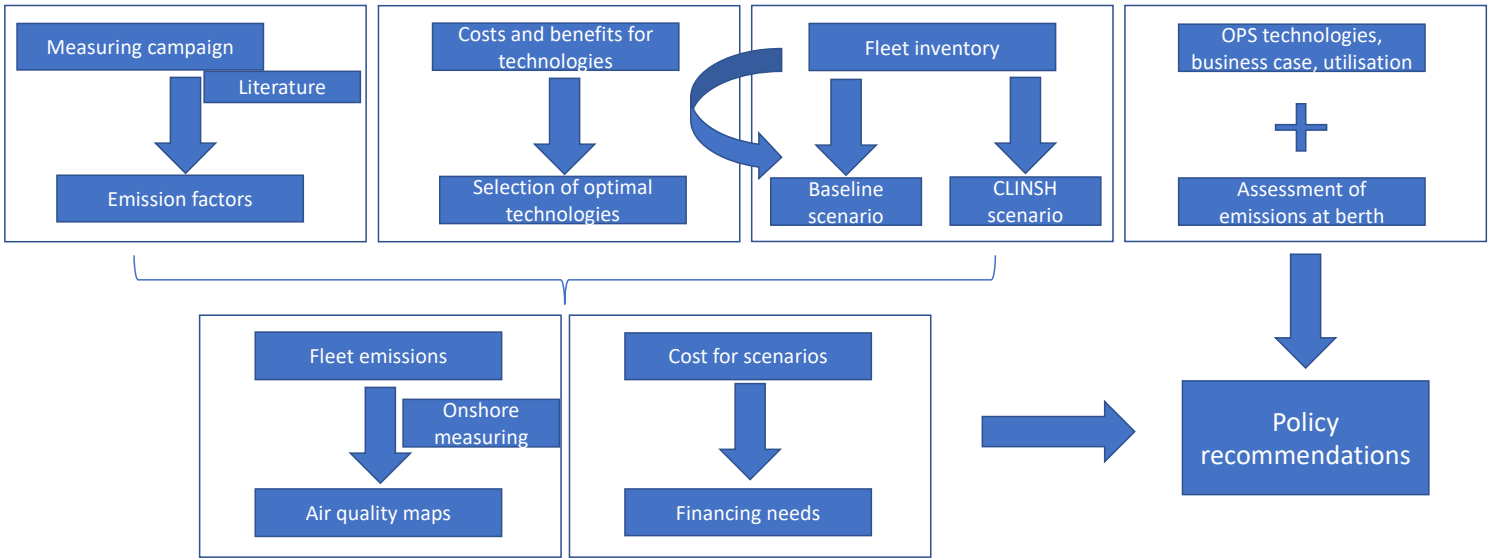
Main activities of the CLINSH project



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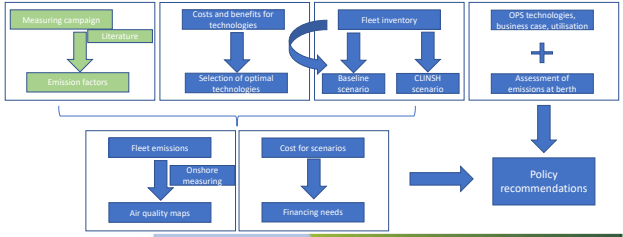
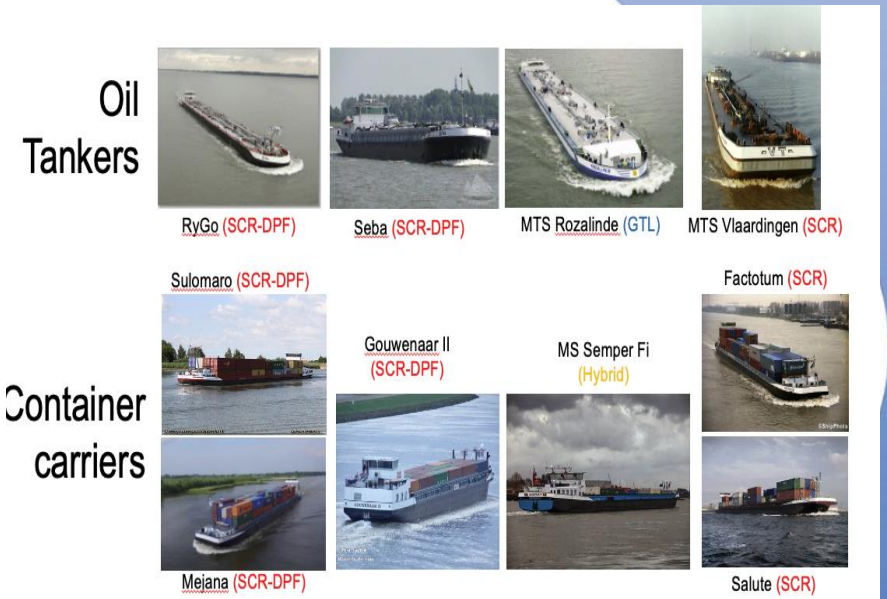


Emissions monitoring

43 vessels monitored in CLINSH fleet



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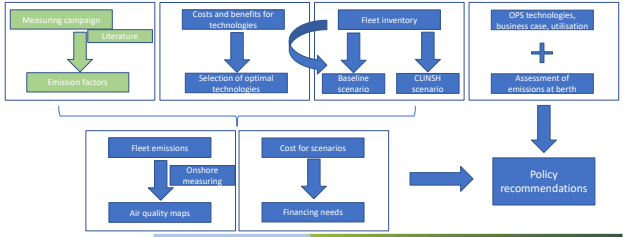

Emission factors and reductions relative to CCNR2

Emission factors derived from CLINSH measuring campaign (c) and literature (l)

	NOx emission factor (g/kWh)	NOx emission relative to CCNR2	PM emission factor (g/kWh)	PM emission relative to CCNR2
CCNR0 diesel	10.59 [c]	205%	0.406 [l]	308%
CCNR1 diesel	8.31 [c]	161%	0.132 [l]	100%
CCNR2 diesel	5.16 [c]	100%	0.132 [l]	100%
CCNR2 GTL	4.55 [c]	88%	0.091 [l]	70%
CCNR2 FWE	4.14 [c]	80%	0.066 [l]	50%
CCNR1 SCR-DPF [a)]	2.07 [c]	40%	0.013 [l]	10%
LNG	1.80 [l]	35%	0.013 [l] [b)]	10%
Stage V diesel	1.80 [l]	35%	0.013 [l] [b)]	10%
Euro VI diesel	0.40 [c]	8%	0.010 [l]	8%

a) Compared to CCNR1 the NOx emissions are 25%, or a 75% reduction.

b) The emission limit for stage V is 0.015, the value of 0.013 is based on a 90% reduction as compared to CCNR2.

More in afternoon session on Emission factors, emission scenario's, air quality results

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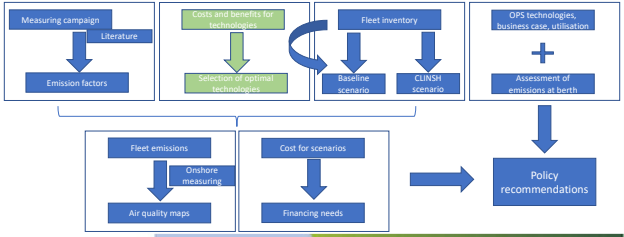
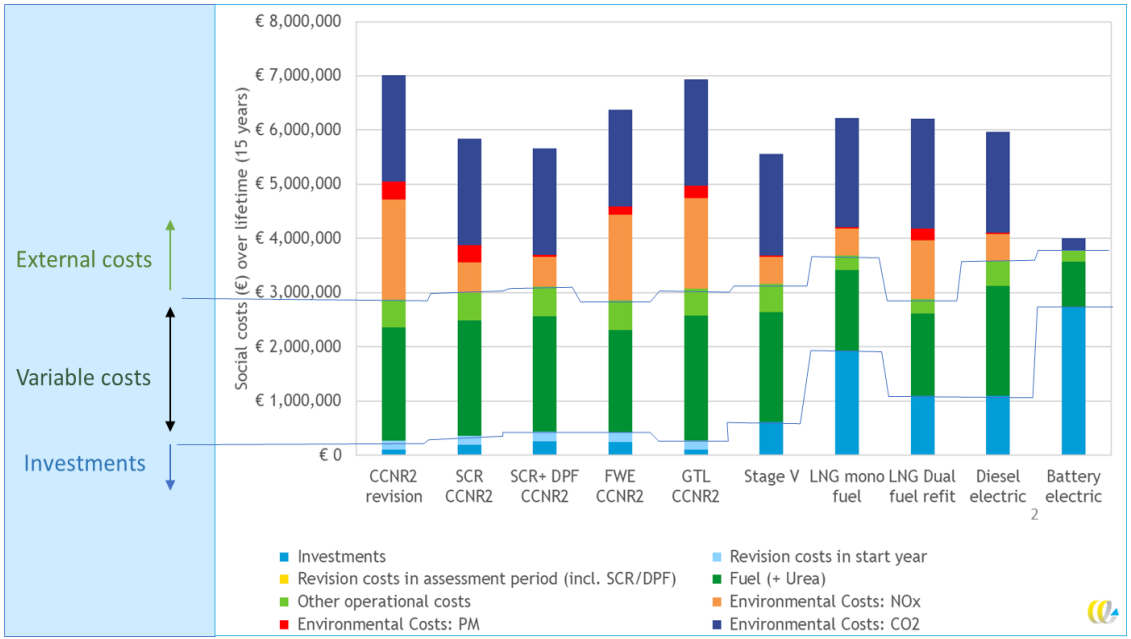


Costs of emissions reduction options

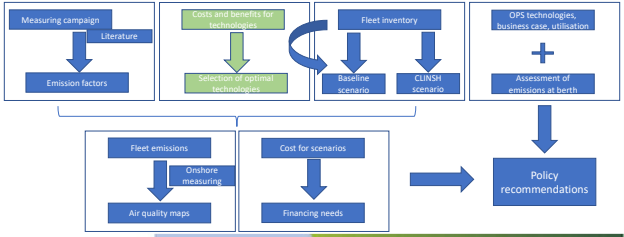
Example *110 m dry cargo vessel*



CLINSH performed a cost analysis along two lines:

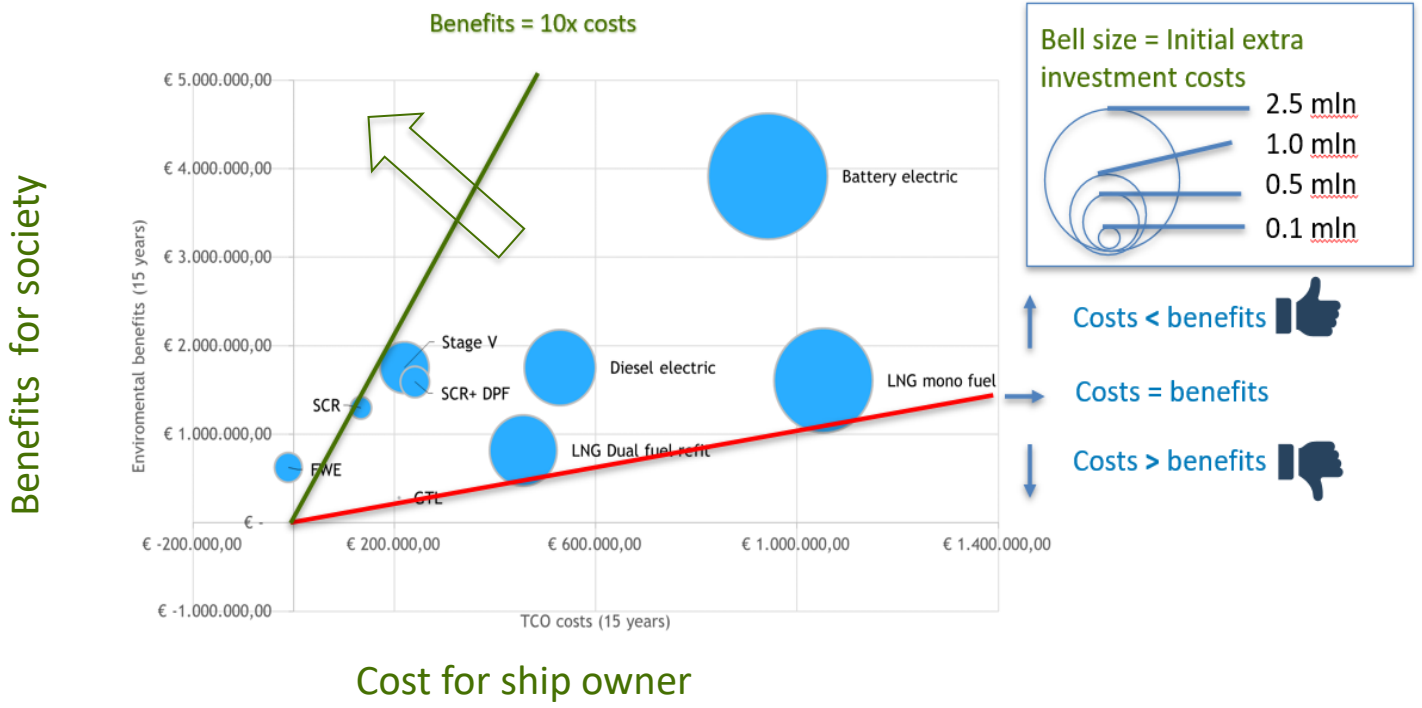
- the **total costs of ownership** of vessels with the various technologies, and the
- **social costs and benefits** of operating such vessels (emissions translated to money).

- for **18 vessel categories** and for **low, medium and high fuel consumption** vessels



Societal vs ship owner cost

Example *CCNR2 110m dry cargo vessel*



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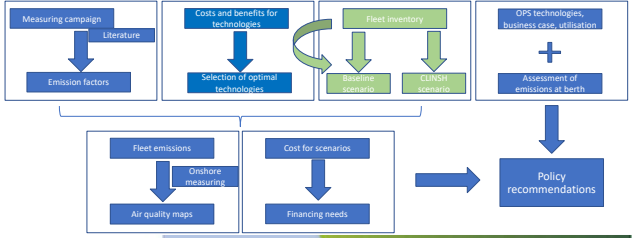
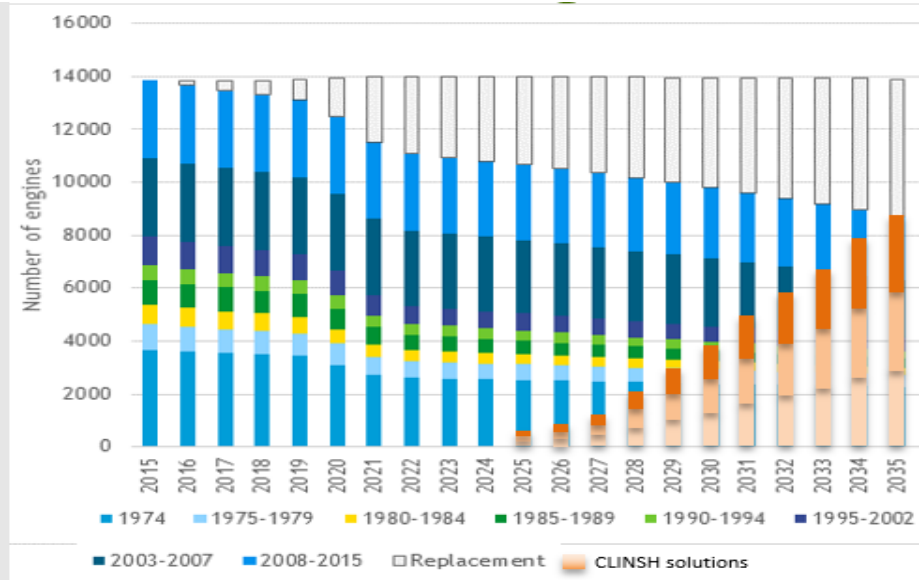


CLINSH scenario vs Baseline scenario

Acceleration of Stage V and reduction options



Baseline scenario: No new policies assumed; scheduled engine renewal only (Stage V).

CLINSH scenario: New policies assumed that lead to accelerated (additional) adoption of reduction options, distribution according to Social Cost Benefit Analysis

ZE technologies have on purpose been **omitted** from the scenarios. These technologies will play an important role in the long term, but their role is expected to be limited until 2035 because of range limitations end/or cost. CLINSH focuses on the application of air quality abatement technologies until ZE technologies are mature and widely available.

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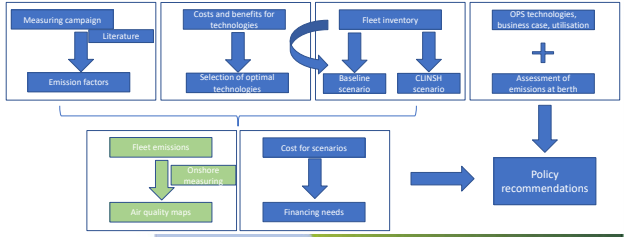
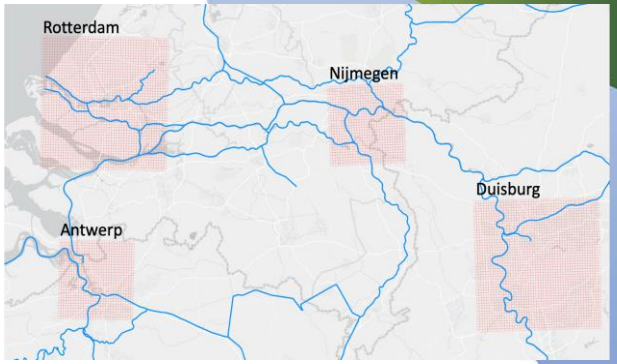


Reductions in CLINSH scenario

Whereas the Baseline scenario leads to NOx and PM emission reductions in the order of 20%, the CLINSH scenario reduces these emissions **in the order of 80%.**



	Rotterdam		Nijmegen		Antwerp		Duisburg	
[kilotons / year]	NOx	PM_{10}	NOx	PM_{10}	NOx	PM_{10}	NOx	PM_{10}
Baseline 2020	2.68	0.098	1.32	0.041	0.97	0.034	2.05	0.063
Baseline 2035	2.06 -23%	0.074 -23%	0.97 -27%	0.028 -32%	0.75 -23%	0.027 -22%	1.59 -22%	0.046 -27%
CLINSH 2035	0.72 -73%	0.032 -65%	0.28 -79%	0.004 -89%	0.27 -72%	0.013 -61%	0.45 -78%	0.010 -84%

Annual emissions from IWT in the model regions for the Baseline 2020/2035 and CLINSH 2035 scenario.

More in afternoon session on Emission factors, emission scenario's, air quality results

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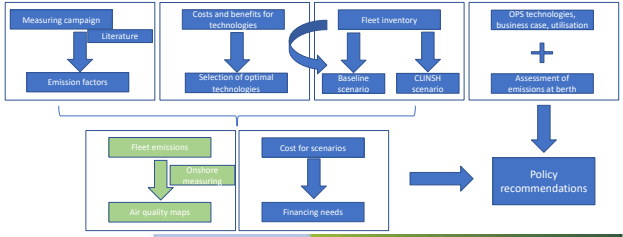
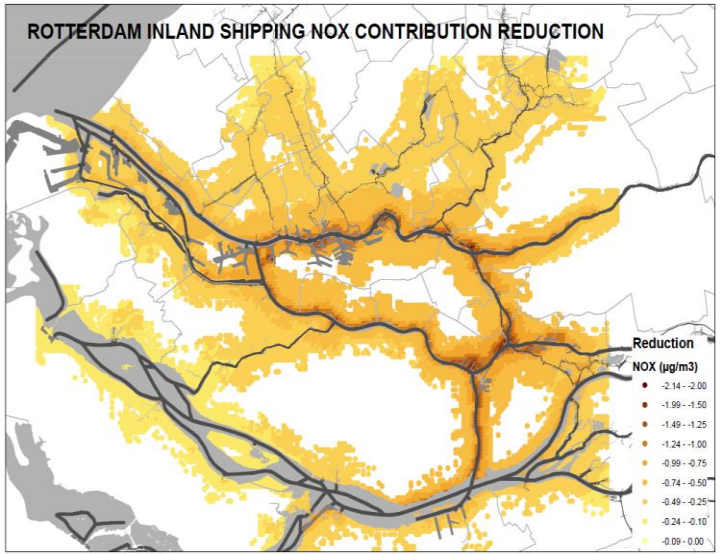


Air quality impact in CLINSH scenario



CLINSH developed a method to identify the inland shipping contribution to urban air quality for different emission scenarios in the cities of Antwerp, Rotterdam, Nijmegen and the greater Duisburg area.

Scenario	Max. contribution µg/m³	Average contribution µg/m³	Reduction vs. average Baseline 2020
Baseline 2020	3.0	1.2	-
Baseline 2035	2.6	1.0	16%
CLINSH 2035	1.3	0.4	66%

NOx reduction potential of the CLINSH scenario in Rotterdam region.

Realizing the CLINSH scenario would significantly improve air quality.

More in afternoon session on Emission factors, emission scenario's, air quality results

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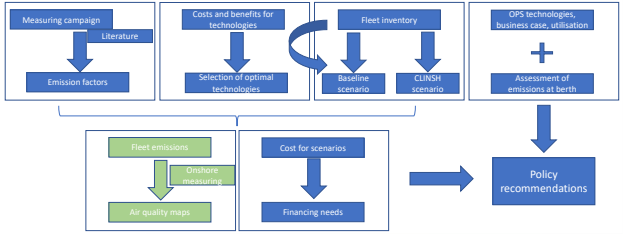
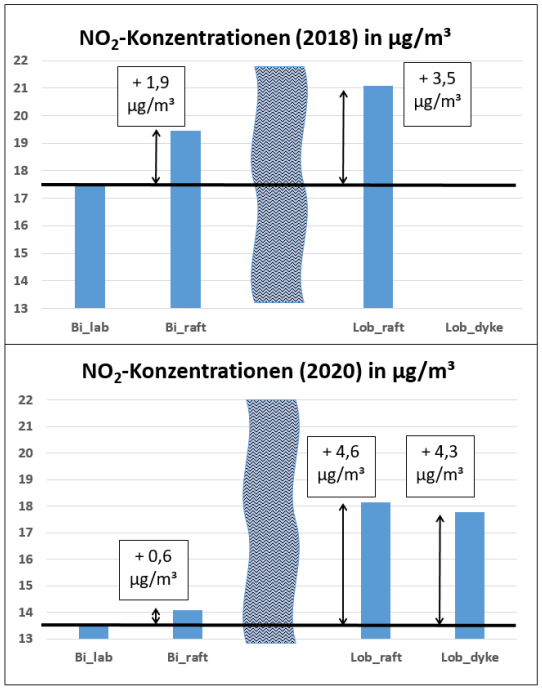


Air quality measurements on shore



- Measurements by LANUV in the ports of Neuss/Düsseldorf and Duisburg as well as on the Rhine show that the pollution of NOx and PM_{10} caused by inland navigation is **not as extensive** as assumed at the beginning of the project.
- The annual average increase in pollution caused by about 110,000 passing vessels at the German-Dutch border near Bimmen/Lobith in 2018 + 2020 is **1 (left bank) to 5 µg/m³** (right bank) for NO_2.
- Same range as the modelling results presented on previous slide.
- For perspective: EU Air Quality Directive sets a 40 µg/m³ annual average limit.

More in afternoon session on Onshore measurements

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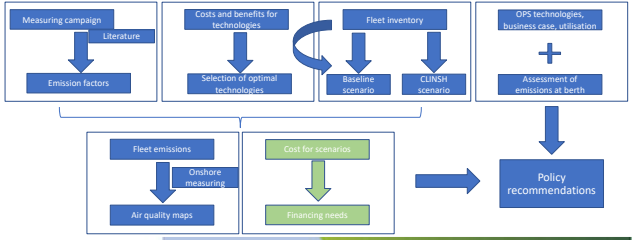

Costs of the scenarios: benefits for society

	Total social costs Baseline scenario 2020- 2035	Total social costs CLINSH scenario in 2020-2035	Difference
Number of vessels involved, West-Europe*	6,572	6,572	
Social costs with 15 years lifetime (mio €)	€ 26,139	€ 21,280	**€ -4,859**
TCO (Total costs of ownership) with 15 years lifetime (mio €)	€ 10,751	€ 11,512	**€ 761**
CO2 costs with 15 years lifetime (mio €)	€ 8,074	€ 7,867	€ -207
NOx costs with 15 years lifetime (mio €)	€ 6,051	€ 1,788	€ -4,263
PM costs with 15 years lifetime (mio €)	€ 1,264	€ 112	€ -1,151
Initial investment costs (mio €)	€ 1,123	€ 2,393	**€ 1,270**
Diesel consumed over 15 years (mio litres)	14,662	14,286	-376
TCO increase per litre of diesel (€ per litre)	€ 0.733	€ 0.806	€ 0.053

More in afternoon session on Fleet scenarios and financial instruments

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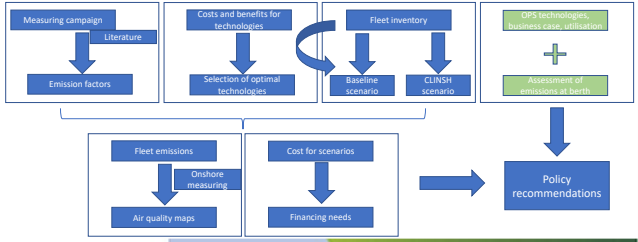

Onshore Power Supply to vessels at berth

- Demonstration of OPS on public and private quays in Ghent and Nijmegen

Objectives of actions:

- Assess environmental and economic benefits of onshore power supply (OPS) for use of inland vessels
- Develop guidance for the provision of OPS
- Demonstrate how OPS can improve air quality and aid compliance with emission limits

More in afternoon session on Onshore Power Supply

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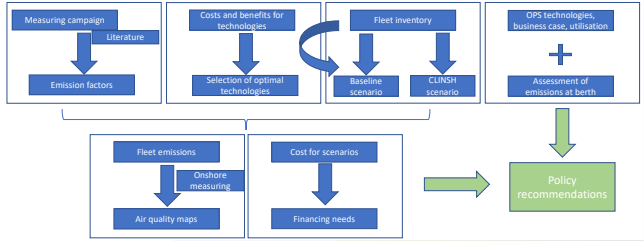
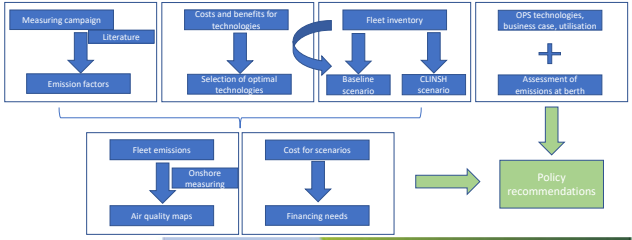


Policy recommendations

- CLINSH calls for **investment in readily available emission reduction measures**, until zero-emission technologies are mature, like Stage V engines and effective after-treatment like SCR-DPF, that improve air quality (mainly NOx and PM emissions).
  - The social benefits are considerably larger than the added Total Cost of Ownership.

- Effective policy intervention on EU and national levels is needed through **investment support to ship owners.**
  - Create a **Greening Fund and/or differentiated tax schemes** that support low and zero emission technologies to enable ship owners to opt for better solutions.
  - The widespread adoption of Stage V (equivalent, including marinized Euro VI) engines and optimised after-treatment systems could be stimulated by applying the **Stage V (equivalent) emission standard to the existing fleet in 2035.** → *Only if combined with initial investment support*.
  - Budget for the fund or grant schemes could be raised by **allocating revenue from the taxation of IWT fuels** that is proposed in the Energy Tax Directive.



Policy recommendations (cont.)

- Aligned with financial support for engine renewal and emission reduction techniques until 2035 could be the implementation of **low emission zones in ports**.
  - Investigate the **feasibility and impact** of such zoning.
  - Use **emissions labelling** as the basis for local regulation of IWT vessels, e.g. new Dutch scheme.

- **Invest in OPS** where air quality and/or noise concerns are most pressing and where the cost effectiveness of euros spent to reduce emissions is the highest.
  - Develop **funding mechanisms and tax exemptions** to realize OPS in core locations can lead the way for a zero-emission power infrastructure by 2050.

More in afternoon session on Policy recommendations

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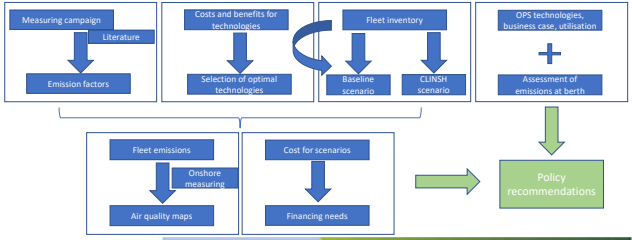

Mentimeter:

If you were in charge… Rank the Recommendations

1. Provide investment support to ship owners via a Greening Fund or grant schemes
2. Apply the Stage V (equivalent) emission standard to the existing fleet in 2035.
   → *Only if combined with initial investment support*.
3. Allocate revenue from the taxation of IWT fuels for greening the fleet
4. Investigate the feasibility and impact of low/zero emissions zoning in ports
5. Use emissions labelling as the basis for local regulation of IWT vessels
6. Develop funding mechanisms and tax exemptions to realize OPS