

NO_x Abatement in the Baltic Sea

An Evaluation of Different Policy Instruments

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Policy instruments evaluated in the study

- *NECA*
- *NECA5500* (*NECA* with extended geographical boundaries)
- *Slow steaming*
- *Financial investment support* (0% interest rate)
- *Environmental differentiated port dues*
- *CO₂ tax*
- *NO_x tax*
- *Refundable emission payment* (NO_x-fund)

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→ ***Refundable emission payment***

What is refundable emission payment?

→ In literature:

$$\pi_s = p \cdot q_s - c_s(q_s) - (1 - s) \cdot m_s \cdot y_s - fee_{NO_x} \cdot e_s(r_s, y_s)$$

Where:

s :	the subsidy degree of the investment.
r_s :	represents the reduced output.
fee_{NO_x} :	the fee (€/kg NO _x)
P:	the price per unit of output
q_s	the quantity of the output.

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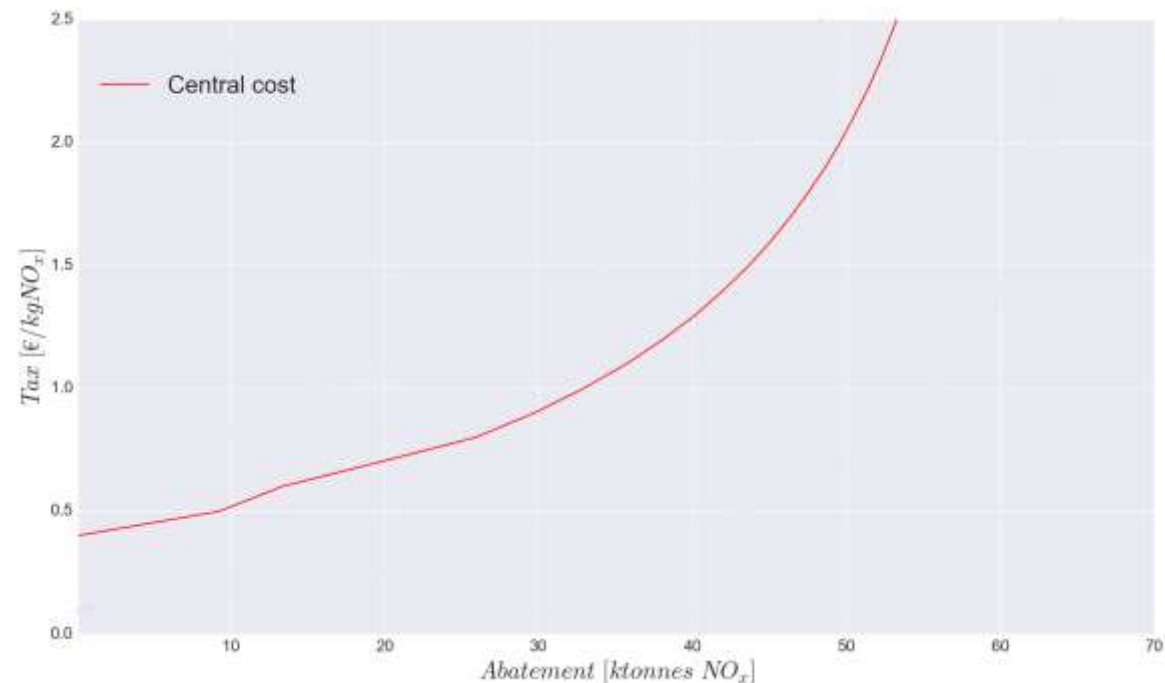
- $Profit = Revenue - Cost - Fee + Refund$
- Fee: €/kg NO_x
- Refund: output or **expenditures**
- In our case Refund=Subsidy rate (% of Investment and operational cost)

Example: The NO_x Agreement in Norway

2011-2017

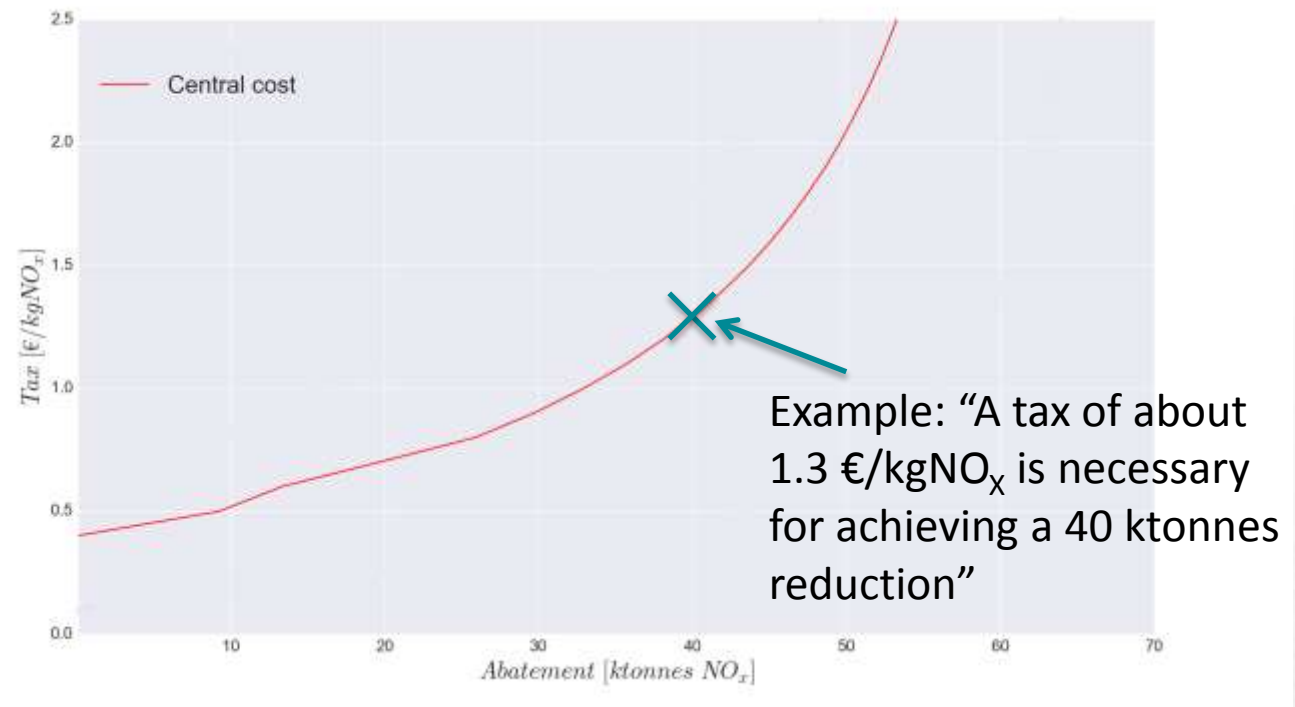
- Business response to the tax imposed by the Norwegian state, 2.2 €/kg NO_x.
- Norwegian business argued that they could reduce emissions more with a lower fee if the revenues were refinanced.
- Members of the environmental agreement do not have to pay taxes and instead pay a fee of 0.44 or 1.21 €/kgNO_x
- About 99% of the shipping industry affected by taxes is instead members of the NO_x Fund.
- The money goes to a fund that actors on the Norwegian market can seek support from.

IVL Result fee without refund - Theoretical abatement for the Baltic Sea (shipping, SCR, 2030 including NECA)



Cost model – Real world data

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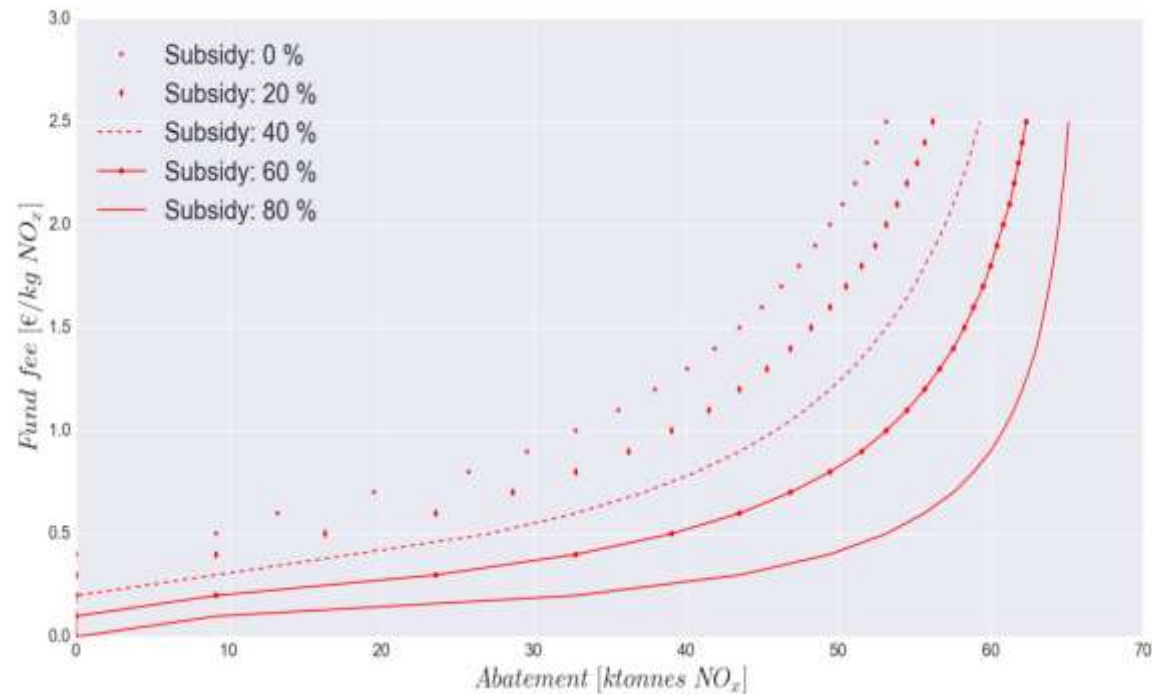


Fee or tax level,
required according
to the model

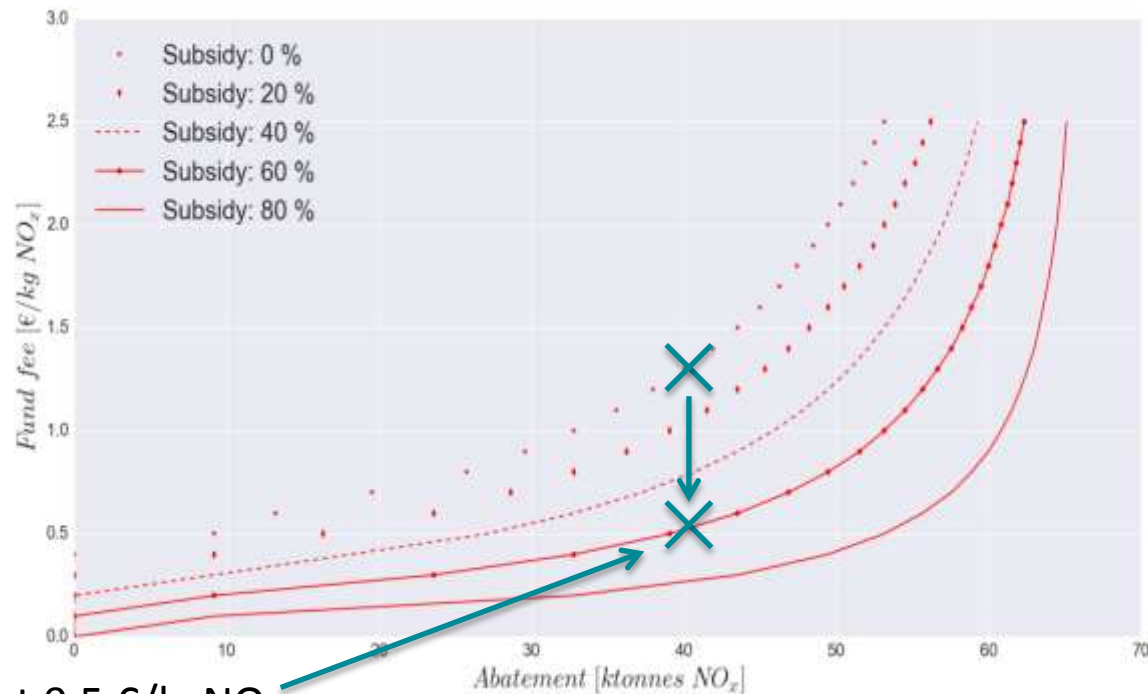


Policy makers perspective

IVL Results fee with refund – Theoretical abatement for the Baltic Sea (shipping, SCR, 2030 including NECA)



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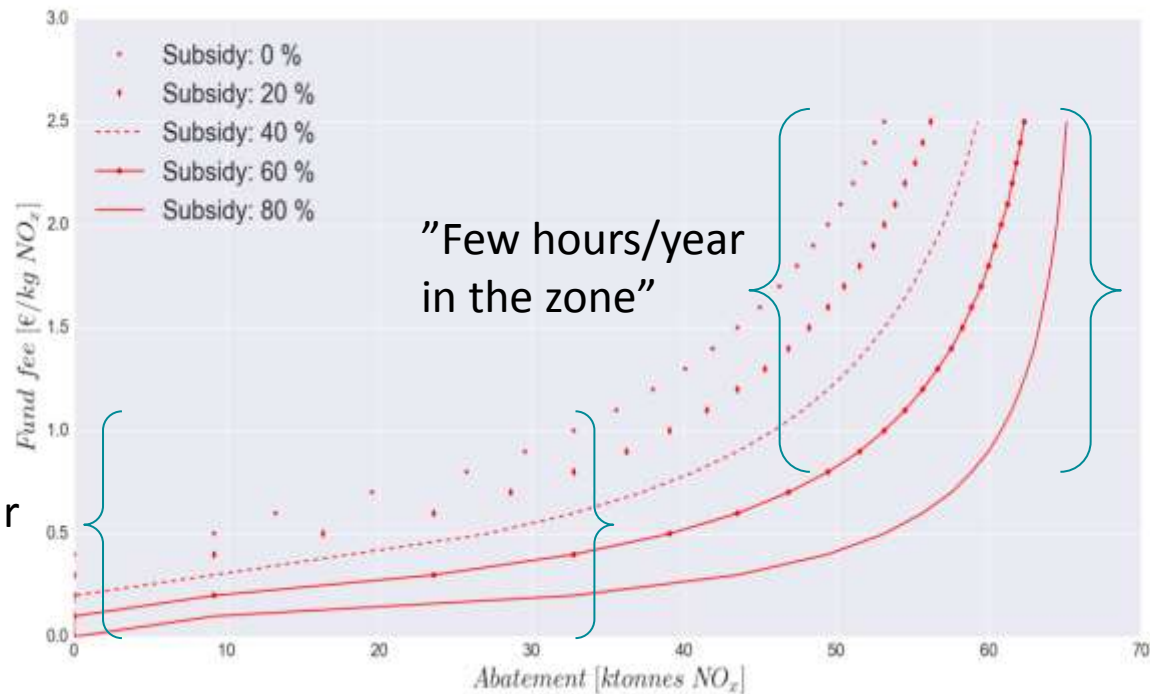


Example: “A fee of about 0.5 €/kgNO_x is necessary for achieving a 40 ktonnes reduction with 60 % subsidy rate”



Policy makers perspective

IVL Results fee with refund – Theoretical abatement for the Baltic Sea (shipping, SCR, 2030 including NECA)



“Many hours/year in the zone”

“Few hours/year in the zone”

Results – Norway

- Reduced emissions: 30 ktonnes NO_x (according to NHO)
- Investments in different types of technologies, e.g. LNG, SCR and engine technical modifications
- The fund also supports NO_x measurements and LNG infrastructure
- 14% of the world's LNG vessels have a Norwegian flag (SEAWEB)

Conclusion

- ➔ A tax would:
 - significantly reduce NO_x emissions
- ➔ A fee with a refund would:
 - reduce the abatement cost for the industry
 - probably increase acceptance compared to a tax
 - increase investment in different types of technologies (expenditure based)
- ➔ However:
 - possible legal obstacles are excluded from the study

The report can be downloaded from IVL's webpage: [NO_x Abatement in the Baltic Sea](#)

Thank you for listening

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Air Pollution & Abatement Strategies

IVL Swedish Environmental Research Institute

