PBL Netherlands Environmental Assessment Agency

Environmental impact assessment of a NOx Emission Control Area on the North Sea

Context and project plan 2011

February 2011 | P. Hammingh, J. Aben, G. Geilenkirchen

Introduction I

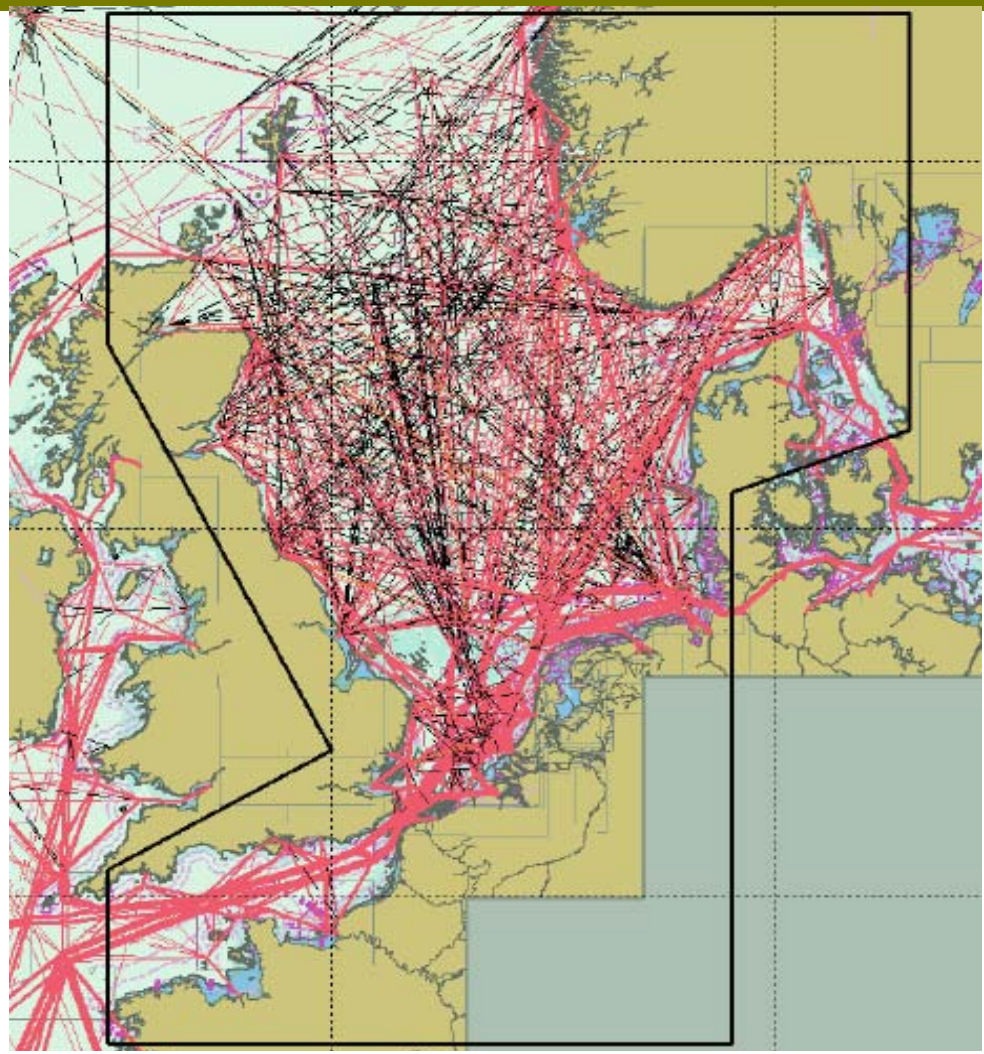
- 2008: new IMO regulations for NO_x emissions from sea shipping (and also for sulphur content in ship fuels)
- Stringent NO_x standard TIER III (80% red) only applicable on new ships after 2016 in a NO_x Emission Control Area (NECA)
- 200 miles zone around USA and Canada designated as a NECA already. Baltic States working on an application to IMO
- An application for a NECA must fulfill the IMO criteria for designation of an ECA (MEPC 58/23/Add.1, Article 3.1):
  - show contribution of sea ships to health and nature impacts
  - compare cost effectiveness NECA with land-based controls
  - economic impacts on sea shipping sector

Introduction II

- Establishment of a North Sea Consultation Group (2010): France, Belgium, the Netherlands, Germany, Denmark, Sweden, Norway and the United Kingdom.
- September 2010: the Group requested for an environmental and economic impact assessment study to support the decision making process for a NECA
- The environmental study will be carried out by the Netherlands, Norway and the UK
- The economic study will be carried out by other countries

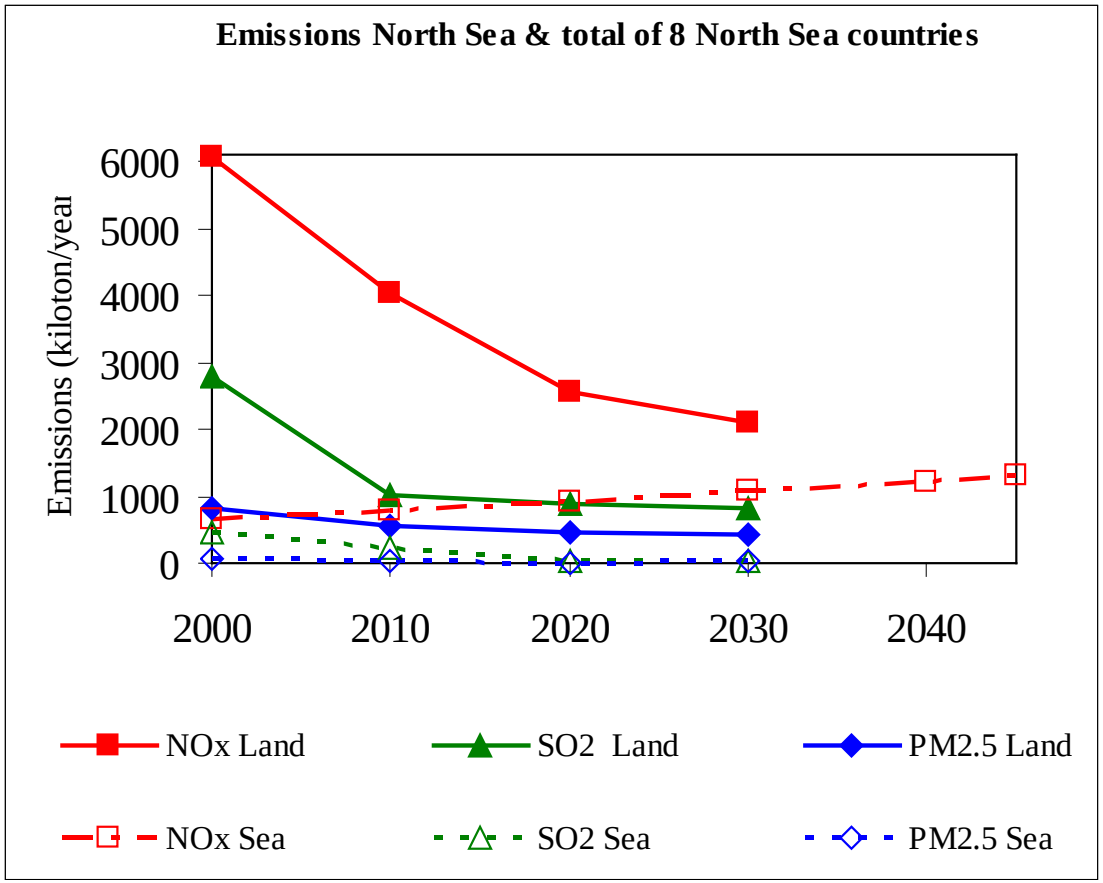
The North Sea

- 970 km long, 580 km wide, 90-700 m deep
- Shipping lanes amongst the busiest in the world
- High population densities close to major shipping lanes
- Large harbours: Rotterdam, Antwerp, Hamburg, Bremen, Felixstowe



Source Saladas et al., 2010

NO_x emissions: sea versus land-sources



Based on Cofola et al., 2007 (IIASA)

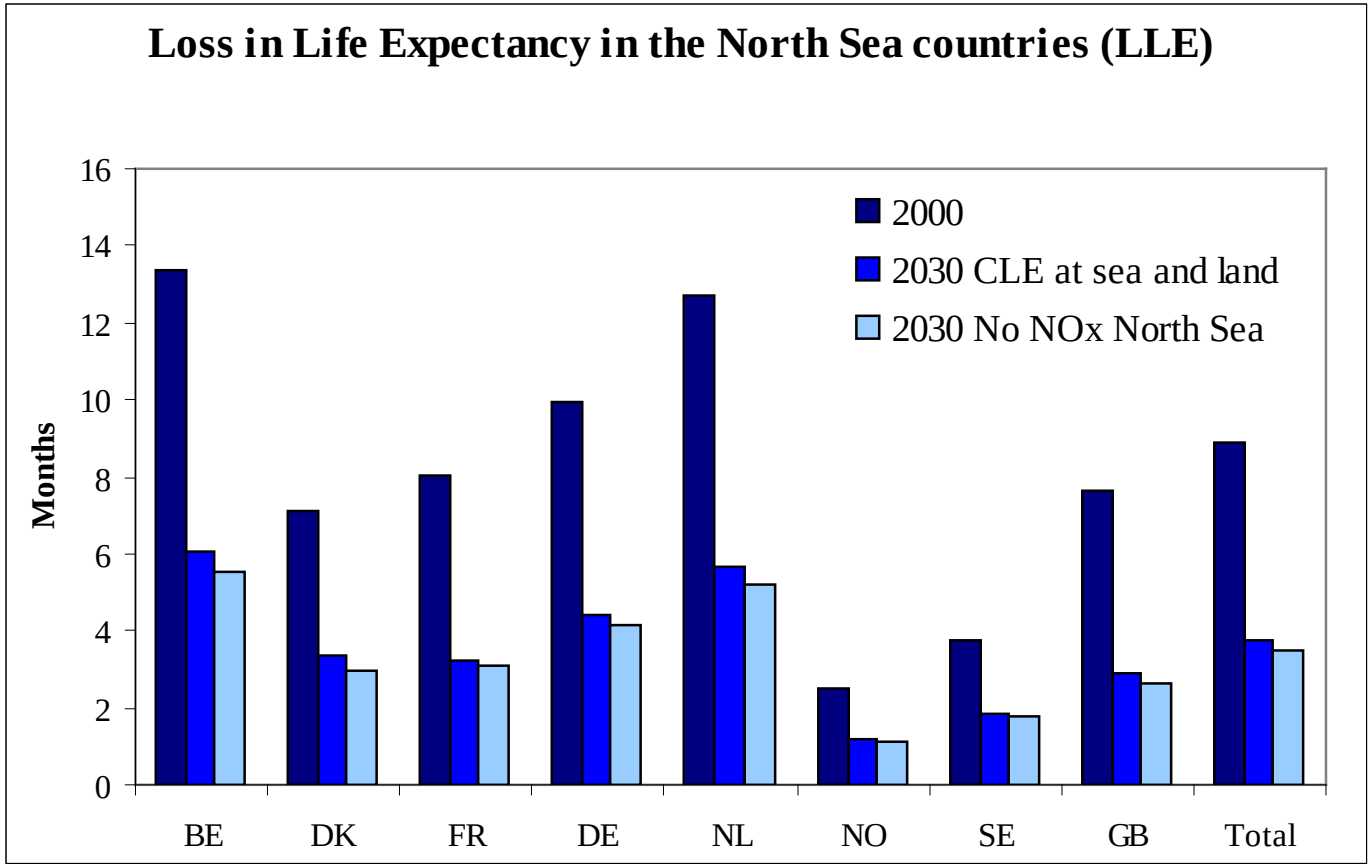
Preliminary estimations based on data kindly provided by Janusz Cofala (IIASA)

NOx emissions North Sea 2045: 1250-1450Kt

Growth assumptions: cargo 2.5%, ferry 3.9%

Literature: large range in growth assumptions of shipping up to 2050: 1-5%
Variations per ship type

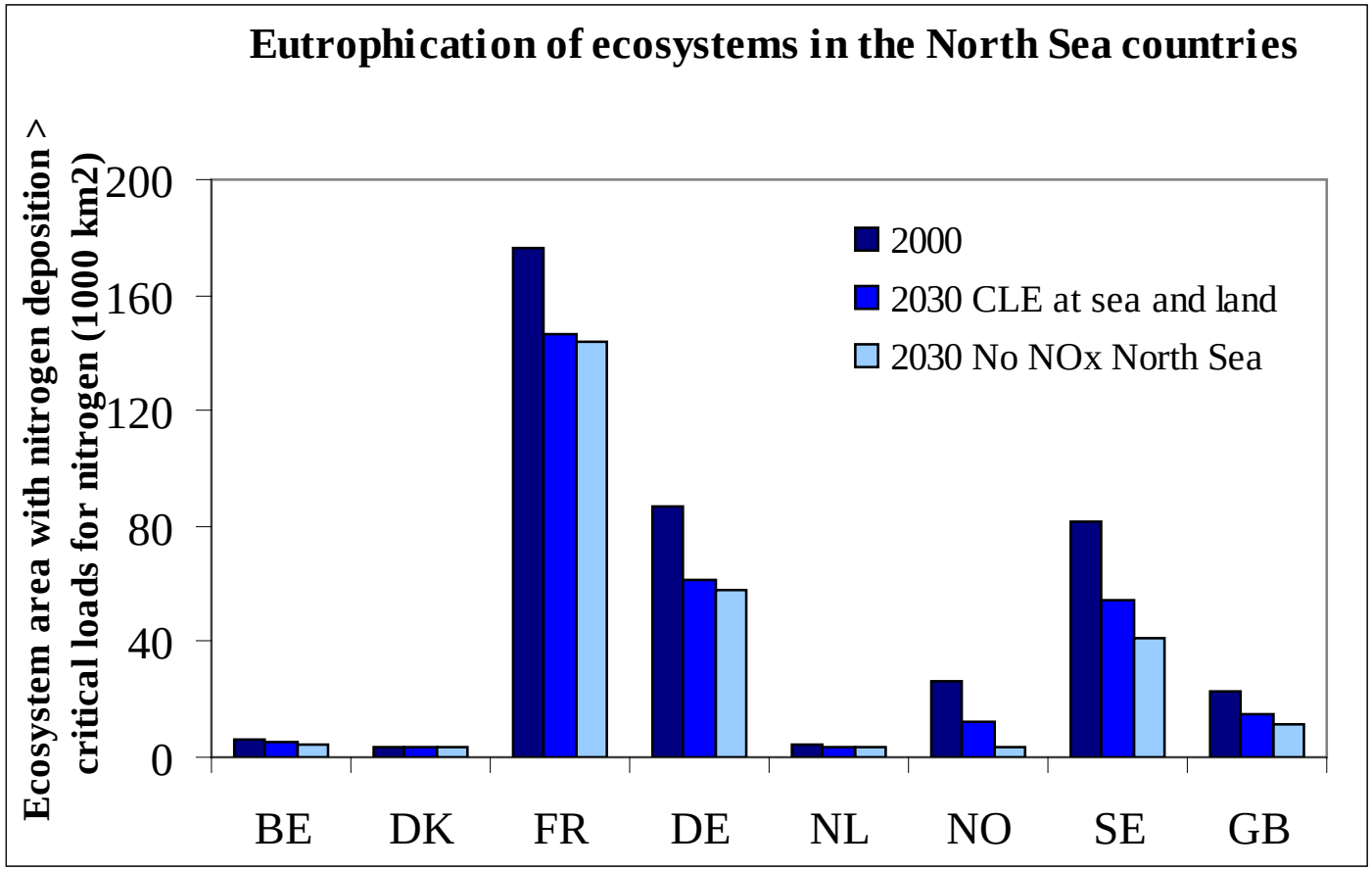
Contribution of North Sea shipping to air quality



In 2030, NOx emissions from North Sea shipping contribute 8% to LLE in the North Sea countries

Preliminary calculations with GAINS-NL

Contribution of North Sea shipping to air quality

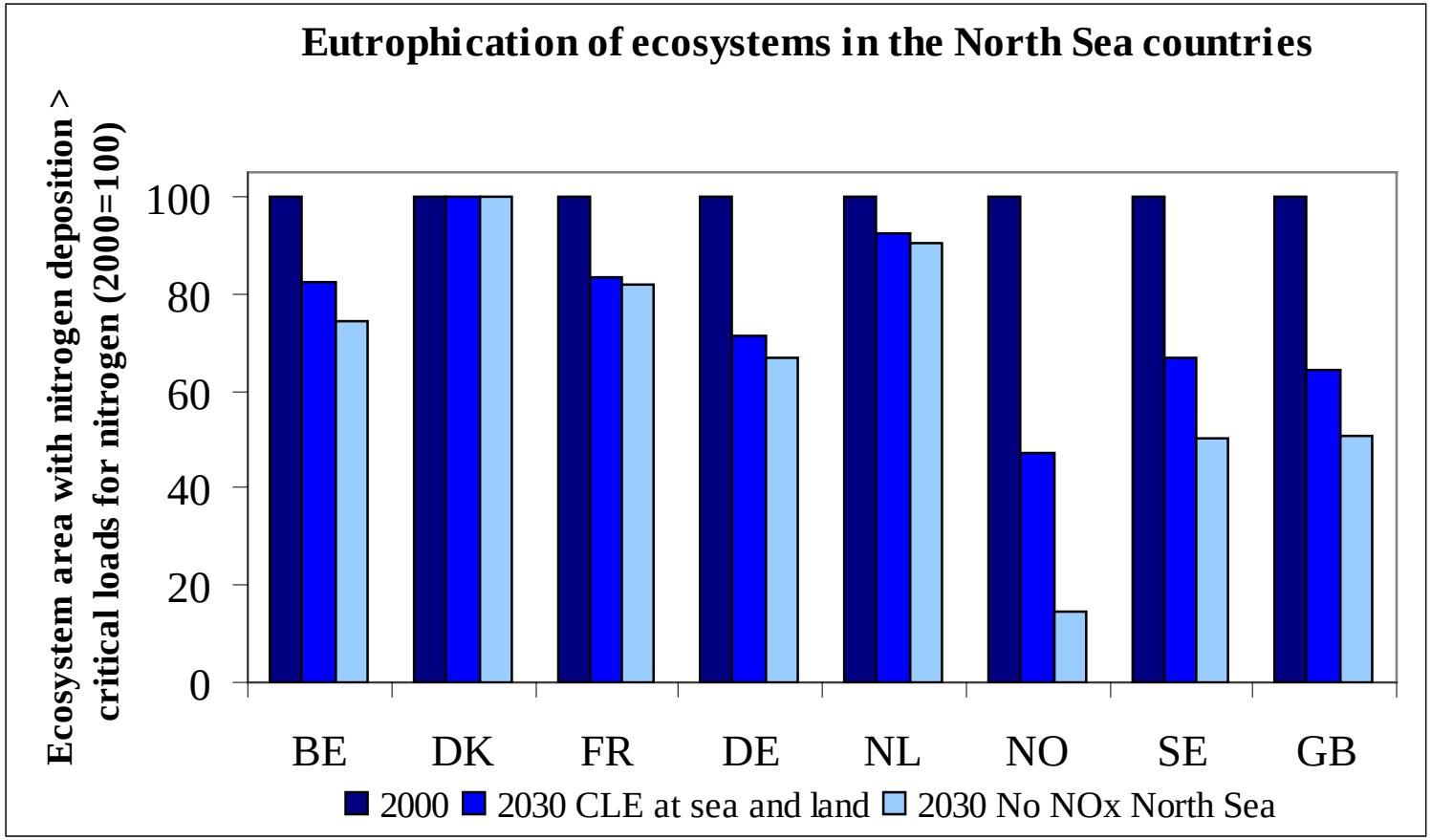


Preliminary calculations with GAINS-NL

In 2030, NOx from North Sea shipping contributes 11% to eutrophication in the North Sea countries,

…..and contributes 13% to acidification of forests.

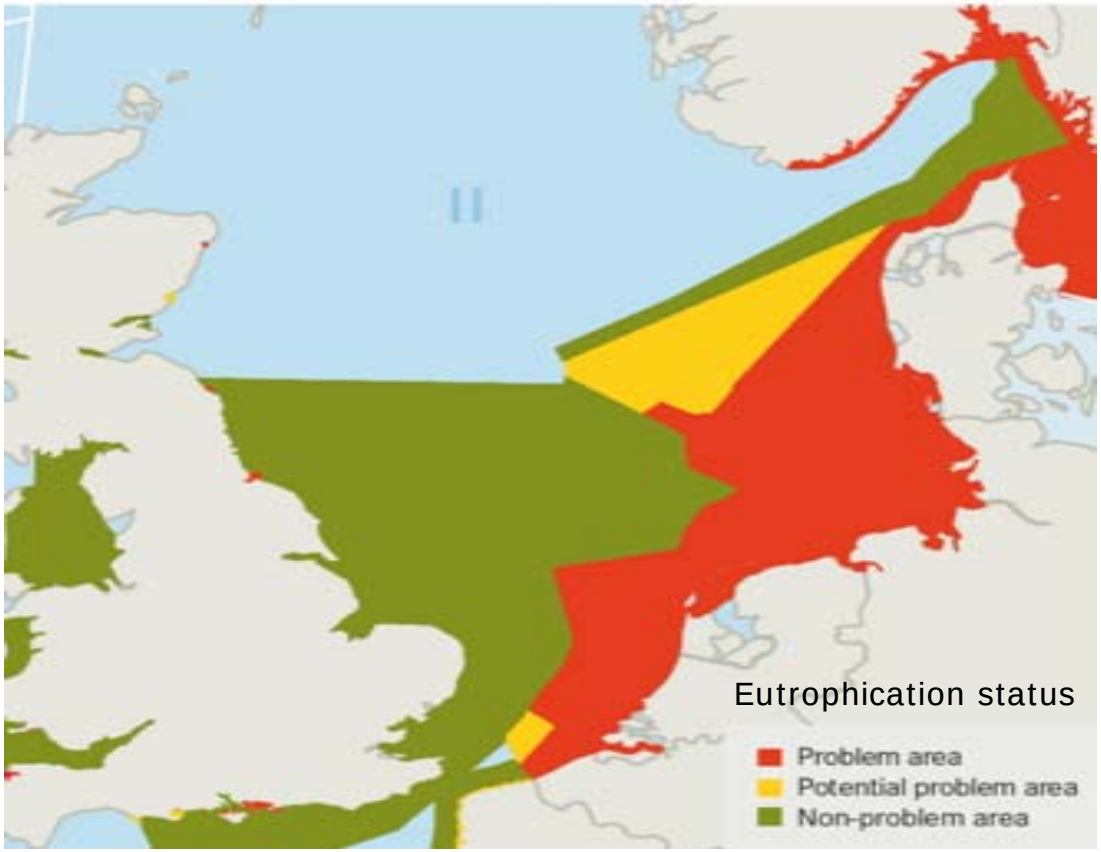
Contribution of North Sea shipping to air quality



Index: yr 2000=100

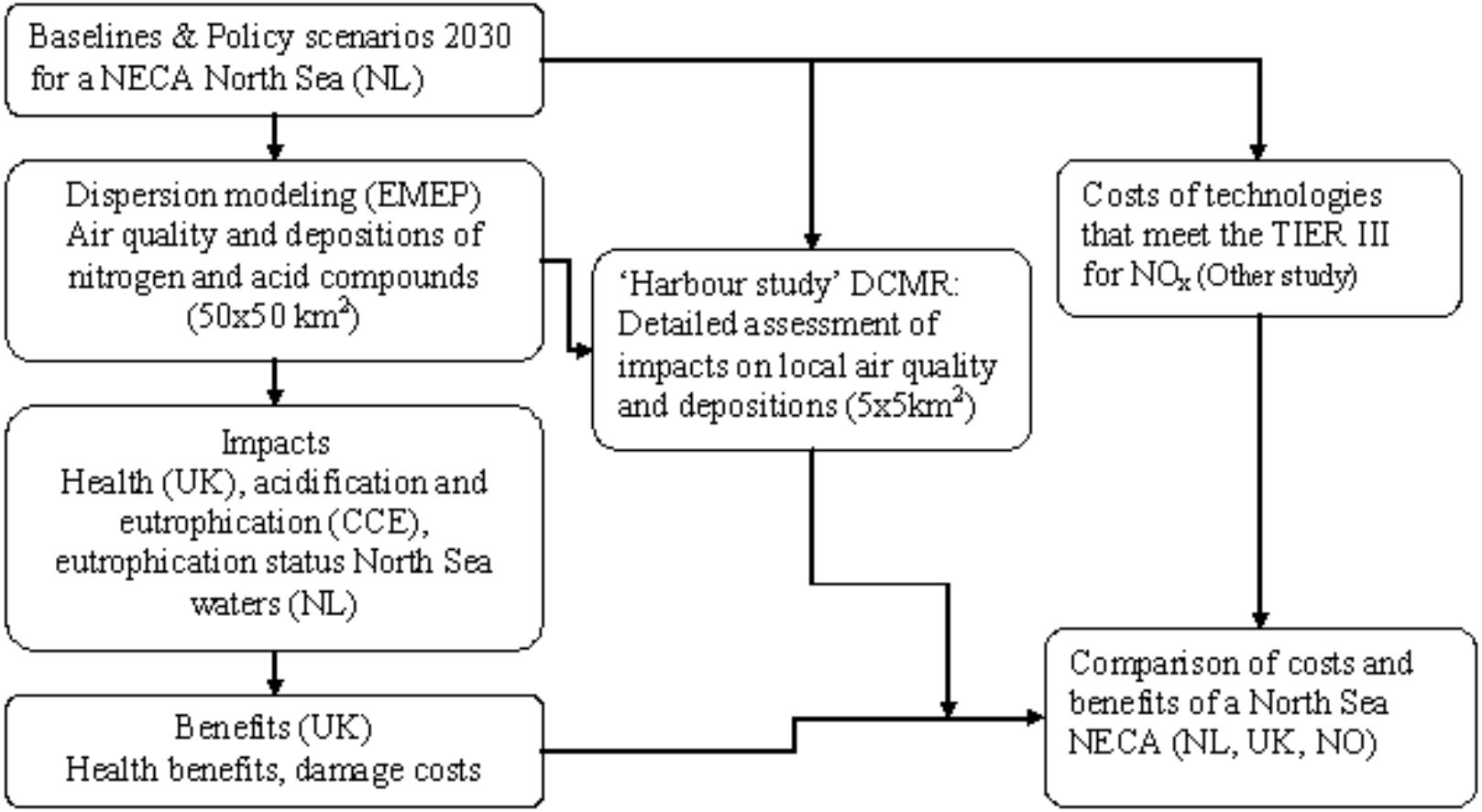
Preliminary calculations with GAINS-NL

Eutrophication of the North Sea still a problem



Source: OSPAR 2010

Environmental Impact Assessment NECA



Baselines and scenarios

- Baseline emissions 2000 and 2030 based on North Sea shipping model by TNO and an inventory of activities by MARIN in 2009 and 2010.
- Important assumptions: future growth rates of different ship types, lifetime per ship type, sailing speed
- Analysis of impacts up to 2030 because emission scenarios of land sources after 2030 are not readily available
- Suggested scenarios EIA NECA:
  - NECA-A: normal rate of implementation of TIER III, ~50% of the ships meet TIER III in 2030
  - NECA-B: All ships meet TIER III in 2030→ to indicate the impacts of the full NECA after 2030

How to compare cost-benefits of emission control at sea and land-sources -I?

1. By cost-effectiveness (euro per ton NO_x reduced) of NOx emission control at sea and land:
   - cost-effectiveness of SCR at ships is roughly between 600-2,600 €/ton NO_x. Total potential in 2045 up to 1050-1150 kiloton
   - cost-effectiveness of SCR in 2020 at coal, gas and biomass power plants between 2,000-10,000 €/ton NO_x (GAINS)
   - up to 2,600 €/ton, NO_x emissions in the North Sea countries can be reduced with (only) 240 kiloton. The maximum NO_x reduction is 460 kiloton at average costs of 4,900 €/ton (GAINS MRR 2020)

How to compare cost-benefits of emission control at sea and land-sources -II?

2. Integrated analysis: compare costs and environmental benefits of a NECA with an emission control package at land-sources in 2030.

   But….How to do that? Which emission control measures at land-sources in 2030 can we use to compare with?

   a. only include NO_x control at land sources?
   b. also include controls on the other air pollutants?
   c. assemble a ‘Land Package’ in the 8 North Sea countries (with GAINS) with costs equal to costs (range) of the North Sea NECA?

How to compare cost-benefits of emission control at sea and land-sources -III?

3. Comparing cost-effectiveness of reducing the shipping contribution to nitrogen in sea water versus reducing nitrogen discharge by rivers

- An important aspect for any cost benefit analysis here is a good estimation of the costs of NO_x control at sea. Essential is a proper allocation of the investment costs of SCR's at ships to the time that a ship is sailing in a NECA. [I.e.: SCR's only used in small NECA of 50 miles are more expensive per kg reduced NO_x than SCR's used in a large NECA of a 1000 miles].

Planning EIA 2011

- February draft Terms of Reference (ToR) to North Sea consultation Group
- March finalise ToR
- March emission baselines and scenarios
- April air quality modeling
- May production of indicators (health and ecosystem)
  CBA, start 'harbour study'
- June-July writing report & draft results to North Sea consultation Group
- October final report

Thank you for your attention

For further information contact

pieter.hammingh@pbl.nl

Clean, cleaner, cleanest….