Northern Maritime University
North Sea Region

Ship-emissions in harbours
Shore-side electricity

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Kiel meeting

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IVL Swedish Environmental Research Institute

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The Interreg IVB North Sea Region Programme

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Research and consultancy work

- in the entire field of environmental issues and sustainable development

- experienced coordinators of large international projects

- Long experience

  - founded in 1966

- Independent

  - owned by a foundation (SIVL) in which both the Government and commercial life are represented on the Board

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Environmental issues with shipping

- Air pollution
- Climate impact
- Impact on marine ecosystems
- Health issues with fuels
- Noise

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Ships in ports

- Noise
- Emission of climate gases
- Emission of
  - Nitrogen oxides
  - Sulphur dioxide
  - Organic compounds
  - Particulate matter

  These substances contributes to acidification, overfertilisation and health risks

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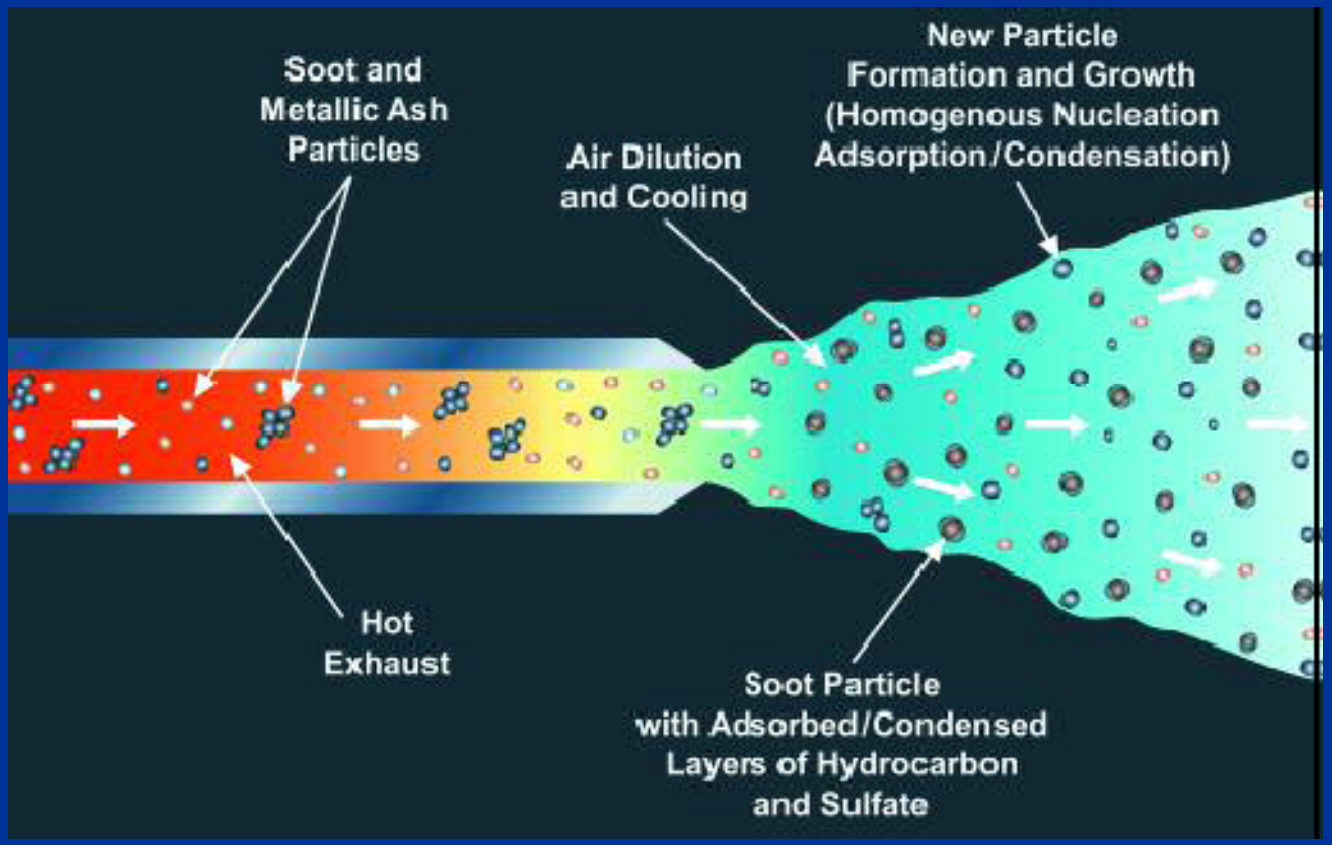
Particles from diesel engines



- Primary particles (soot, ash)
- Secondary particles (sulphates, hydrocarbons, nitrates)

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Particles from shipping – 60 000 deaths annually (Corbett et al. Env Sci Technol 2007)

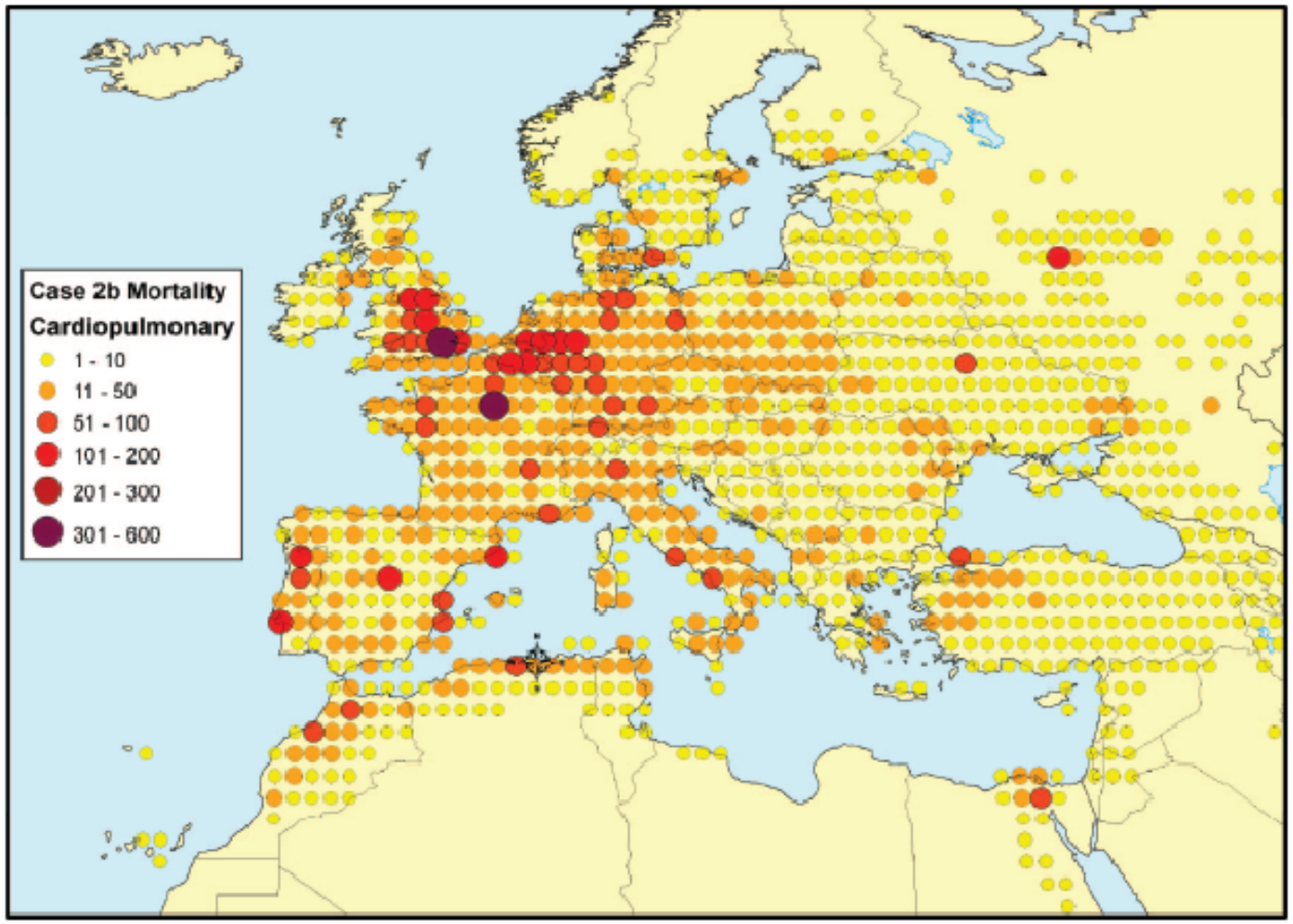

FIGURE 4. Case 2b annual cardiopulmonary mortality attributable to ship $PM_{2.5}$ emissions for Europe/Mediterranean.

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PM

- Particle cause 3 400 premature deaths annually in Sweden. Cost for society of 2.6 billion €.
- Many cities in Europe have problems reaching air quality standards for PM_{10} (and for NO_2).
- High costs to reduce emissions from road traffic and industries

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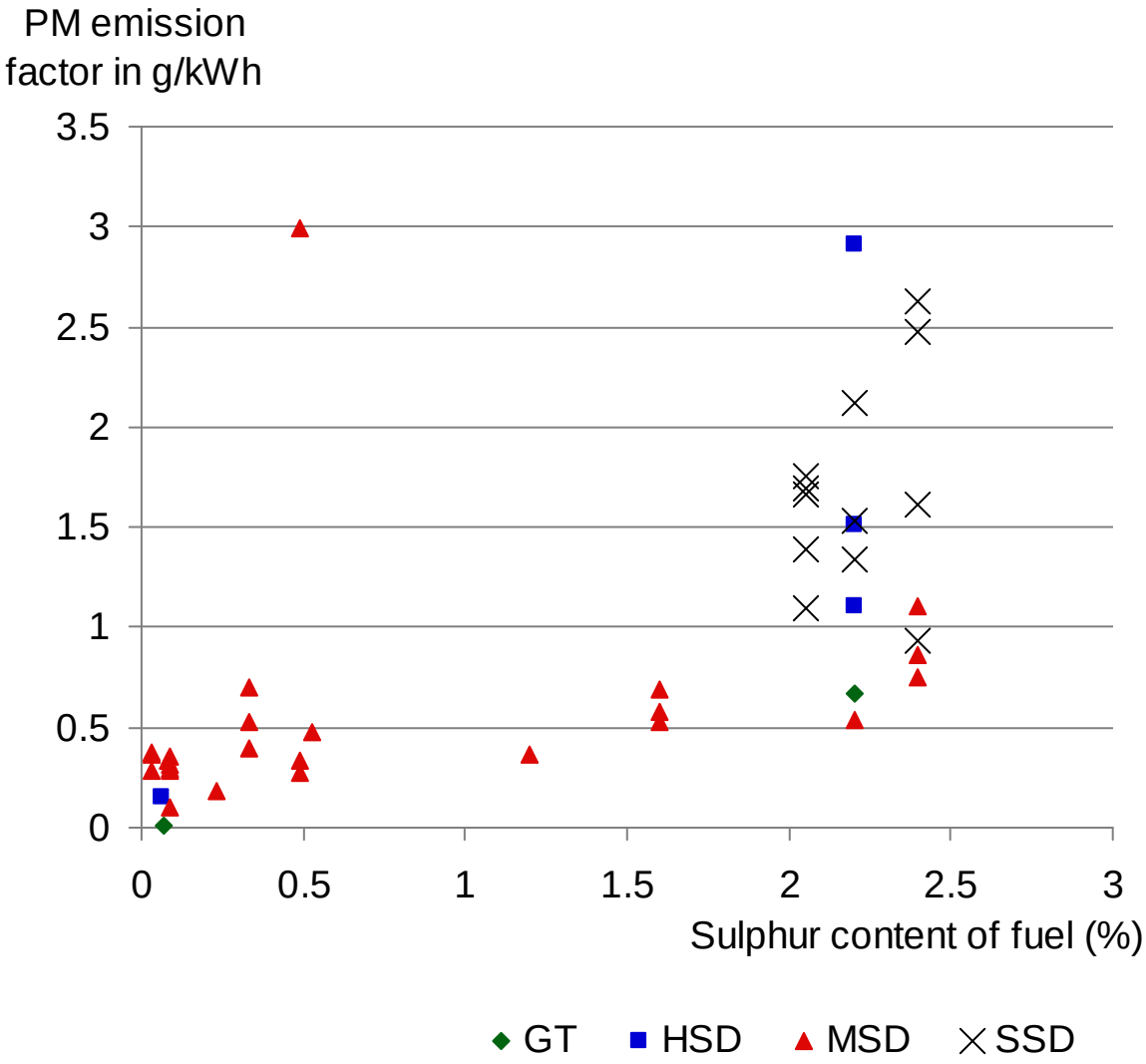
PM formation vs fuel sulphur



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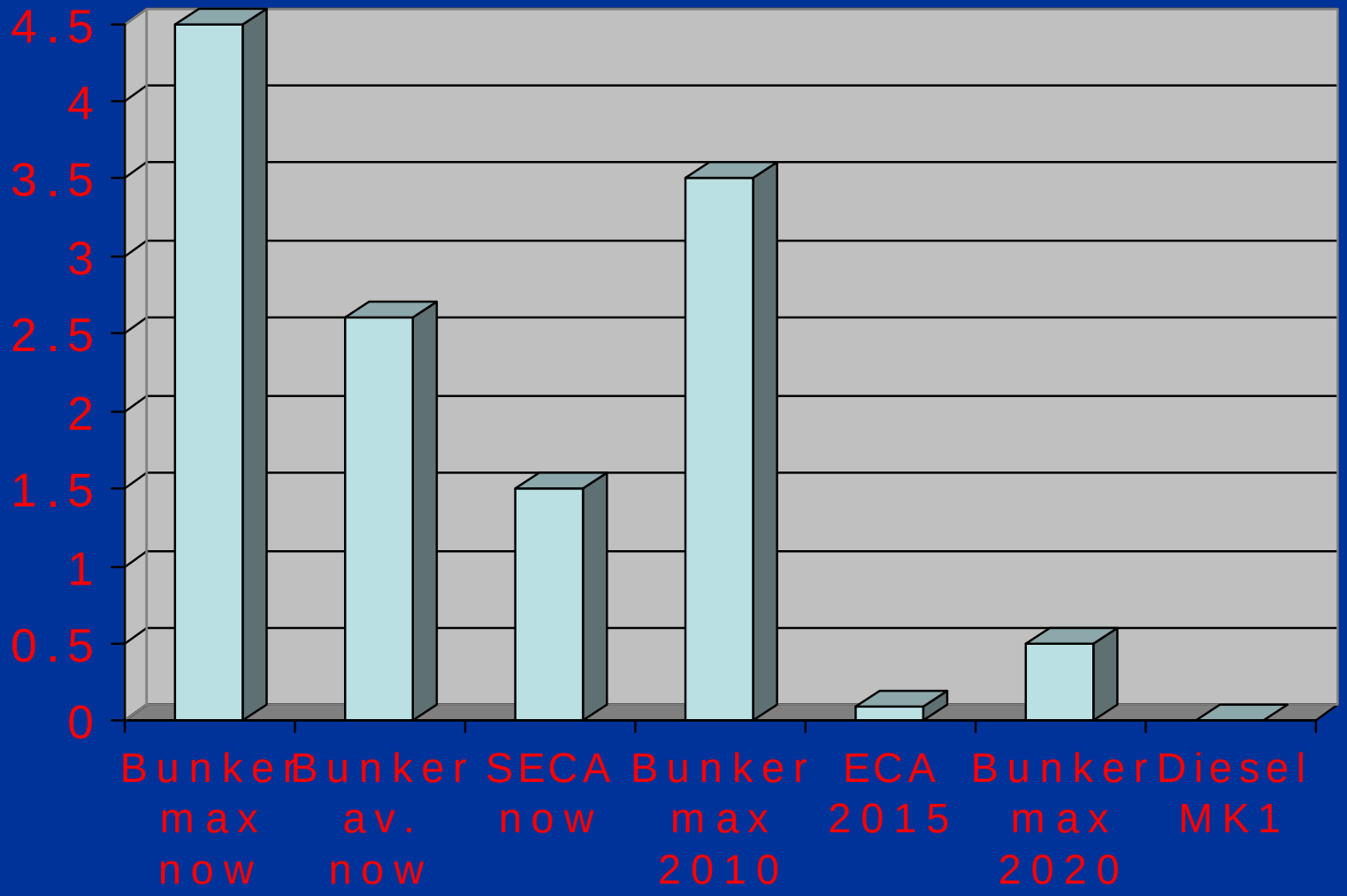
Sulphur fuel weight%



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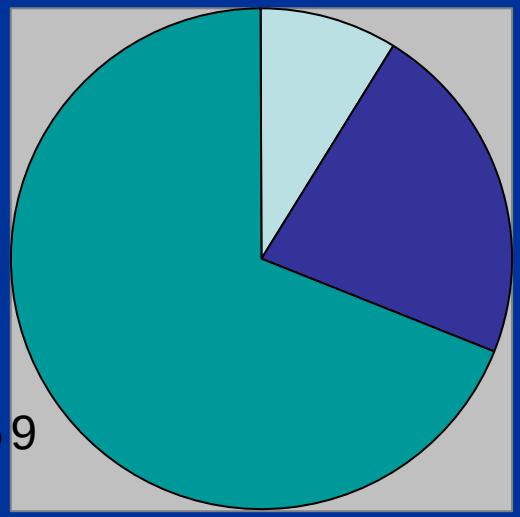
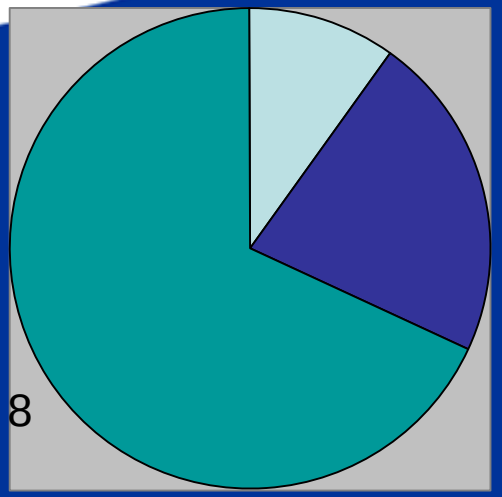
Sources for deposition in Sweden 2004 (%)

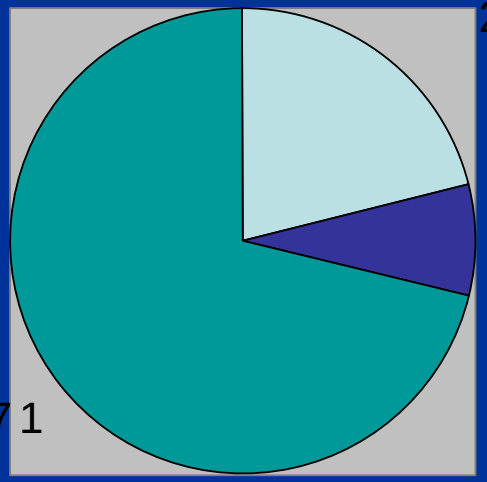
NOX



SOX



PM2.5



Source: EMEP

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Shore-side electricity in Sweden

- About 20 ships
- Göteborg, Stockholm, Helsingborg and Piteå
- At present 8 700 MWh per year
- Saves 1900 tonnes of fuel and 6000 tonnes of CO_2
- Lowers emissions by 121 tonnes of NO_X, 11 tonnes of SO_2 and 1.2 tonnes of PM
- Electricity tax 250 k€
- Saved external costs of 1 mill. €

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Climate gases

- CO_2 emissions are not site specific
- Net effect of shore-side electricity depend on method of electricity production
- Large benefit if wind-power, hydro-power or nuclear power is used
- No benefit or even larger CO_2 emissions if coal-power is used

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Alternatives

- NO_X reduction with SCR
- Low-sulphur diesel
- Scrubbers
- PM-filters
- Fuel-cells

Shore-side electricity seems to be the most cost effective way to reduce emissions

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- Shore-side electricity has a large potential to reduce the impact from shipping on health and on the environment
- The main advantage is the reduction in the emissions of toxic gases in port cities
- Effect on climate depends on method of electricity production

Thank You!

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