Environmental performance of inland shipping in comparison with other modes

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CE Delft
Committed to the Environment

CE Delft

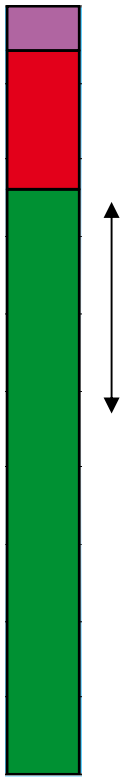
- Independent, not-for profit consultancy, founded in 1978
- Based in Delft, the Netherlands
- Transport, Energy, Economy
- 15+ years of experience with environmental policies for aviation and shipping
- Clients include European Commission, national governments, ports, branch organisation, NGOs, IMO

Outline

- Introduction
- Objectives
- Methodological framework
- Factors defining the specific emissions
- Comparison of transport modes on specific links
- Conclusions

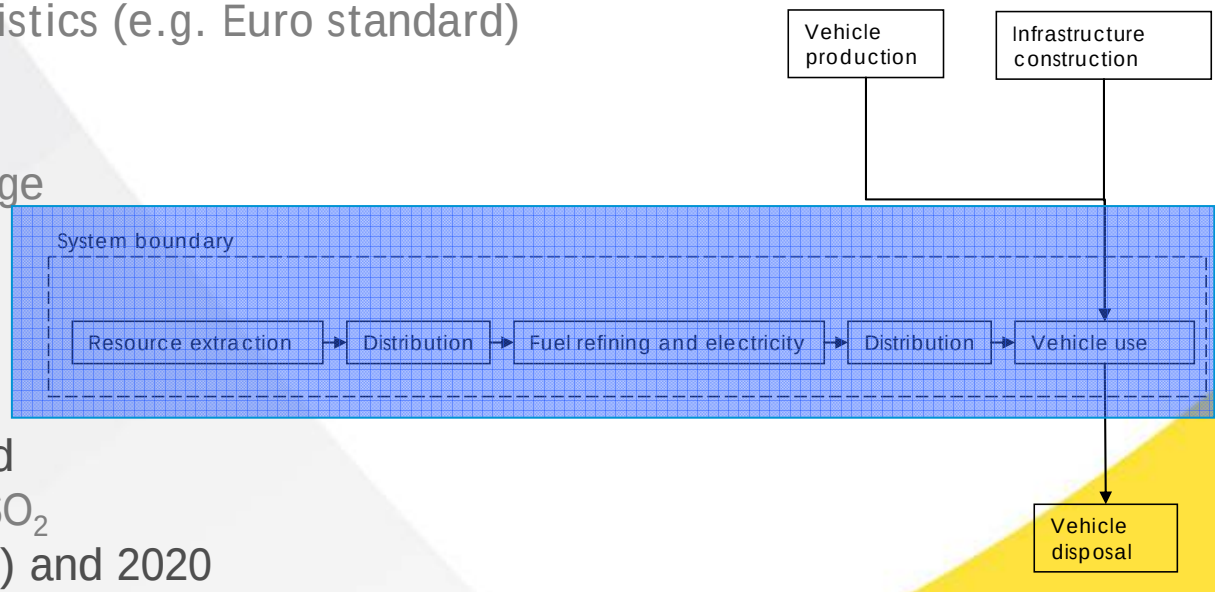
Objectives

- Why comparing emissions of transport modes ?
  - 60% emission reduction in transport
- EU Transport White Paper put modal shift on the agenda
  - Climate point of view now
  - Air quality remains important
  - 30-50% over 300 km distance by waterborne and rail in 2030-2050
- Ports face accessibility and sustainability difficulties
  - Rotterdam applies modal shift criteria at MVII:
    - Inland shipping: 45% (currently approx. 30%).
    - Rail: 20% (currently approx. 10%).
    - Road: 35% (currently approx. 60%).
- Sustainability programs of shippers



Methodology

- STREAM = Study into TRansport Emissions of All Modes
- Different factors define the emissions per output (tkm):
  - Emission characteristics (e.g. Euro standard)
  - Scale
  - Detouring
  - Pre- and end haulage
  - Type of goods
- Well-to-wheel analysis
- Main pollutants covered
  - CO_2, NO_X, PM and SO_2
- Current situation (2009) and 2020
- Representing the EU situation (electricity/refining)
- Focussing on longer distance



Methodology

- Calculation of emission factors grammes per tkm for all modes

$$EM_{overall} = \frac{vkm_{mode} EM_{mode} + (vkm_{truck} + EM_{truck})_{post-transport} + EM_{tranfer}}{vkm_{truck} \cdot load_{mode}}$$

- EM_{mode}: emissions per vehicle including the fuel cycle
- Load: maximum capacity * utilization factor
- Detour factor: vkm_{mode}/vkm_{truck}

- Emission data
  - Road: Dutch emissions inventory (TNO)/TREMOVE
  - Rail: Ecotransit
  - Inland barge: Dutch emissions inventory (TNO)
  - Seagoing ship: 2nd IMO GHG study

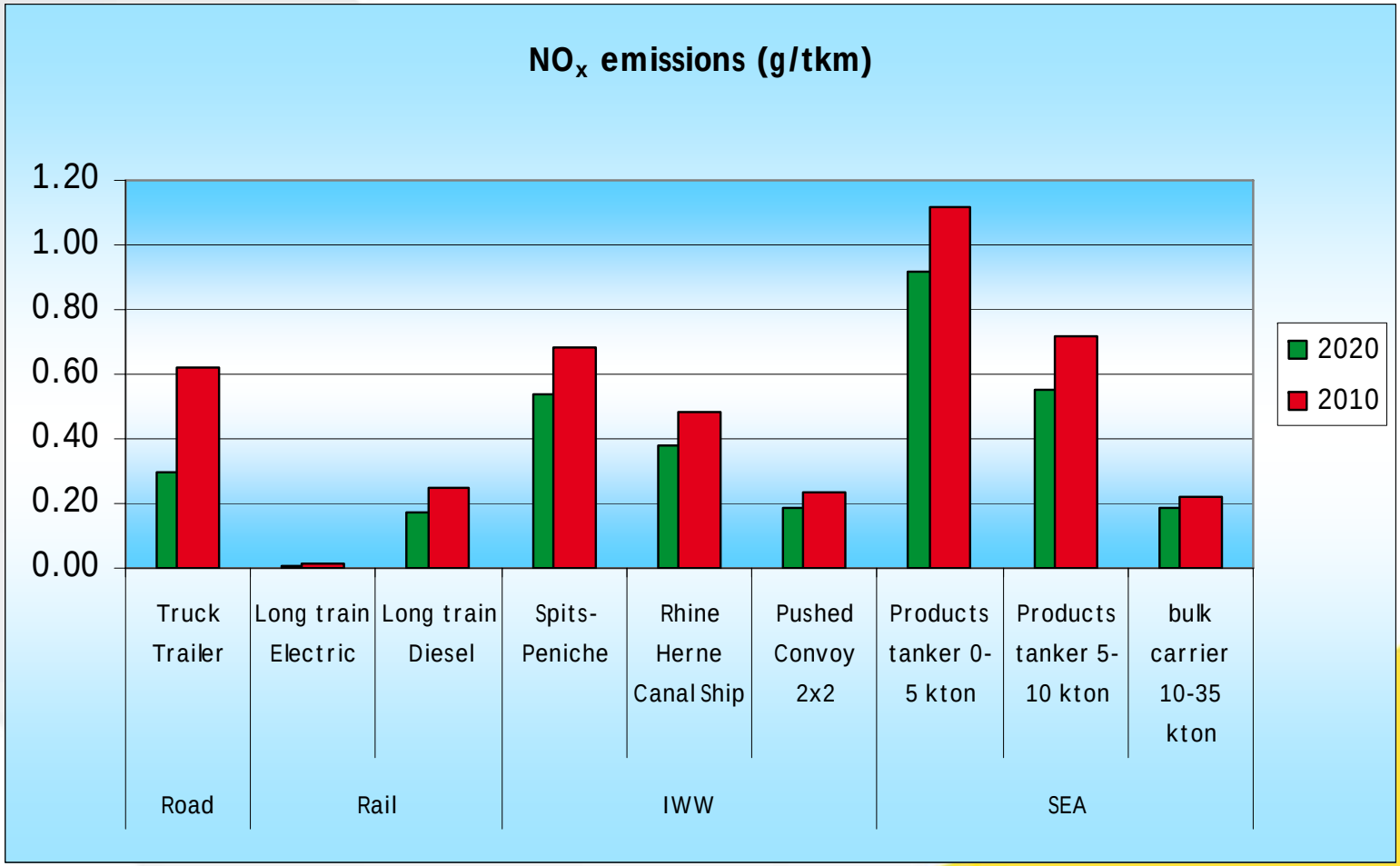
- Logistics data: market consultation

Impact of detouring/pre-end haulage

- Case: Large scale container transport Rotterdam-Duisburg-Essen
  - Road: Rotterdam-Essen; 230km
  - IWT: Rotterdam-Duisburg; 214 km + road 26 km

depart	arrival	rail/road	iww/road	SSS/road
Port of Rotterdam	Milan	1.06	--	
Port of Rotterdam	Koln	0.91	1.13	
Hamburg	Duisburg	1.00	--	
Port of Rotterdam	Thionville	1.02	1.72	
Port of Rotterdam	Vienna	1.07	1.43	
Port of Rotterdam	Duisburg	1.04	1.06	
Port of Rotterdam	*Essen via Duisburg*	*1.04*	*1.06*	
Port of Rotterdam	*Dortmund via Duisburg*	*1.09*	*1.10*	
Groningen Port	Vienna	1.24	1.50	
Antwerp Port	Barcelona	1.03	--	2.52
Bilbao Port	Port of Rotterdam	1.04	--	1.04
Amsterdam Port	Regensburg	1.05	1.41	

Impact of scale of transport/future outlook

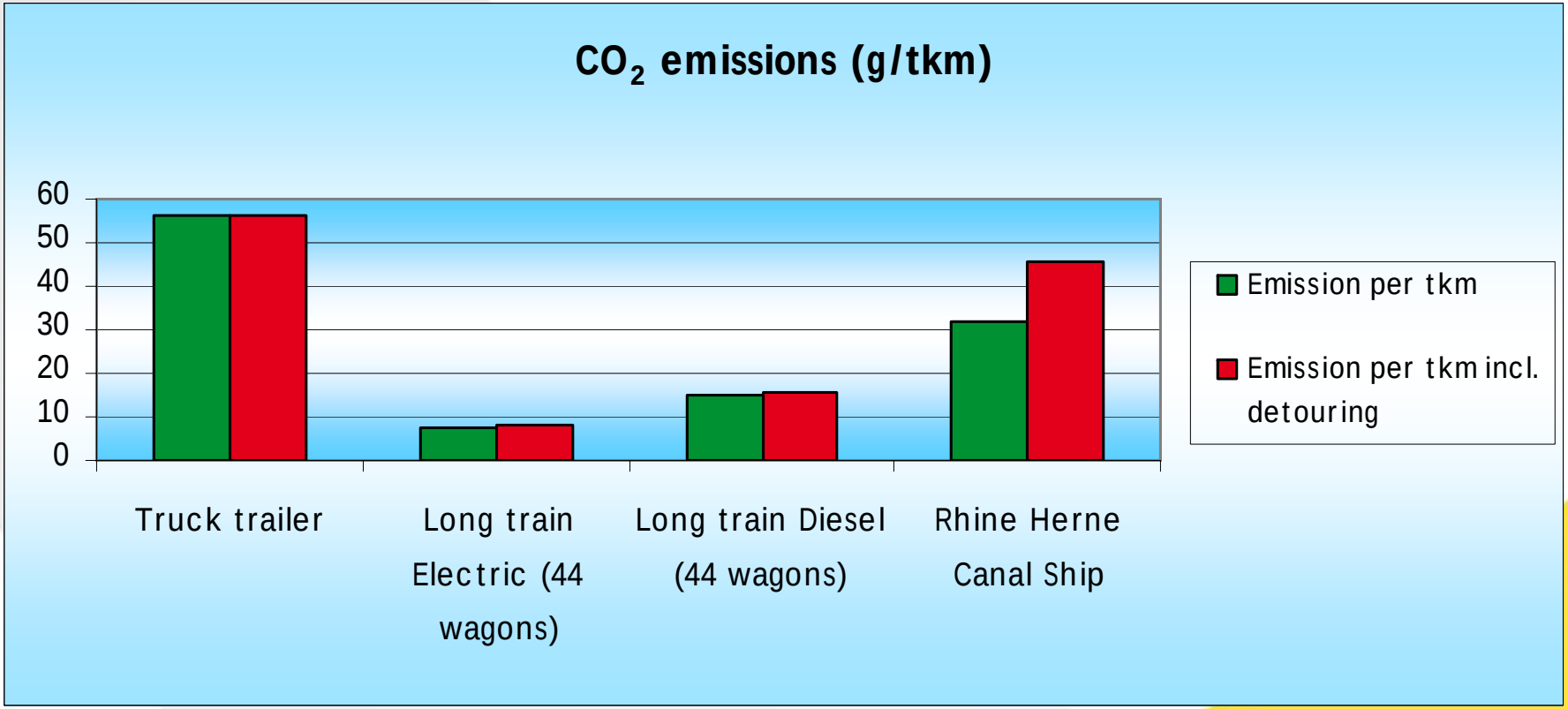


Comparison of specific modes on specific links

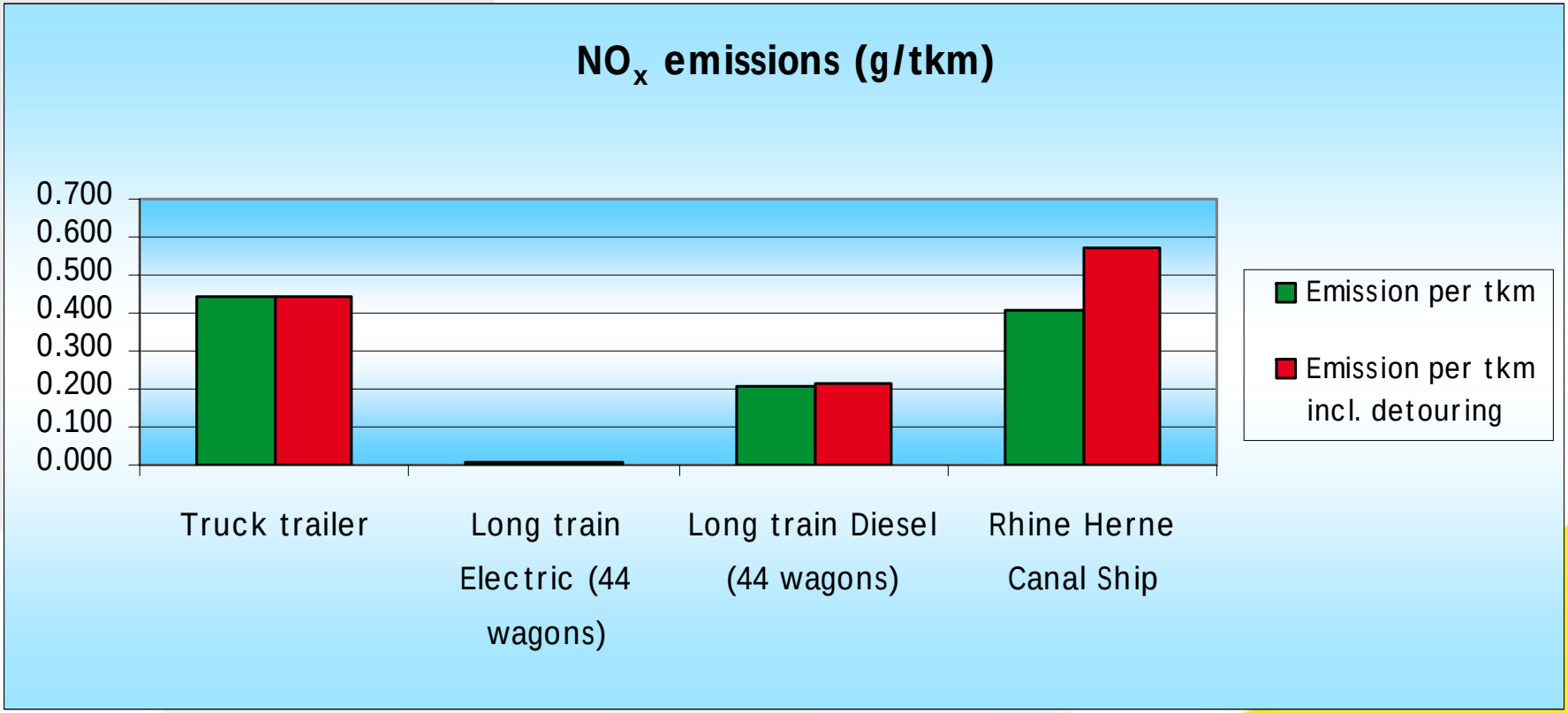
- Average emission technology (2010)
- Representative logistical data
  - Real world distances/detouring/end haulage
- Emissions of transhipment included
- Definition of goods types

- Amsterdam – Regensburg
- Rotterdam – Duisburg, incl. end haulage

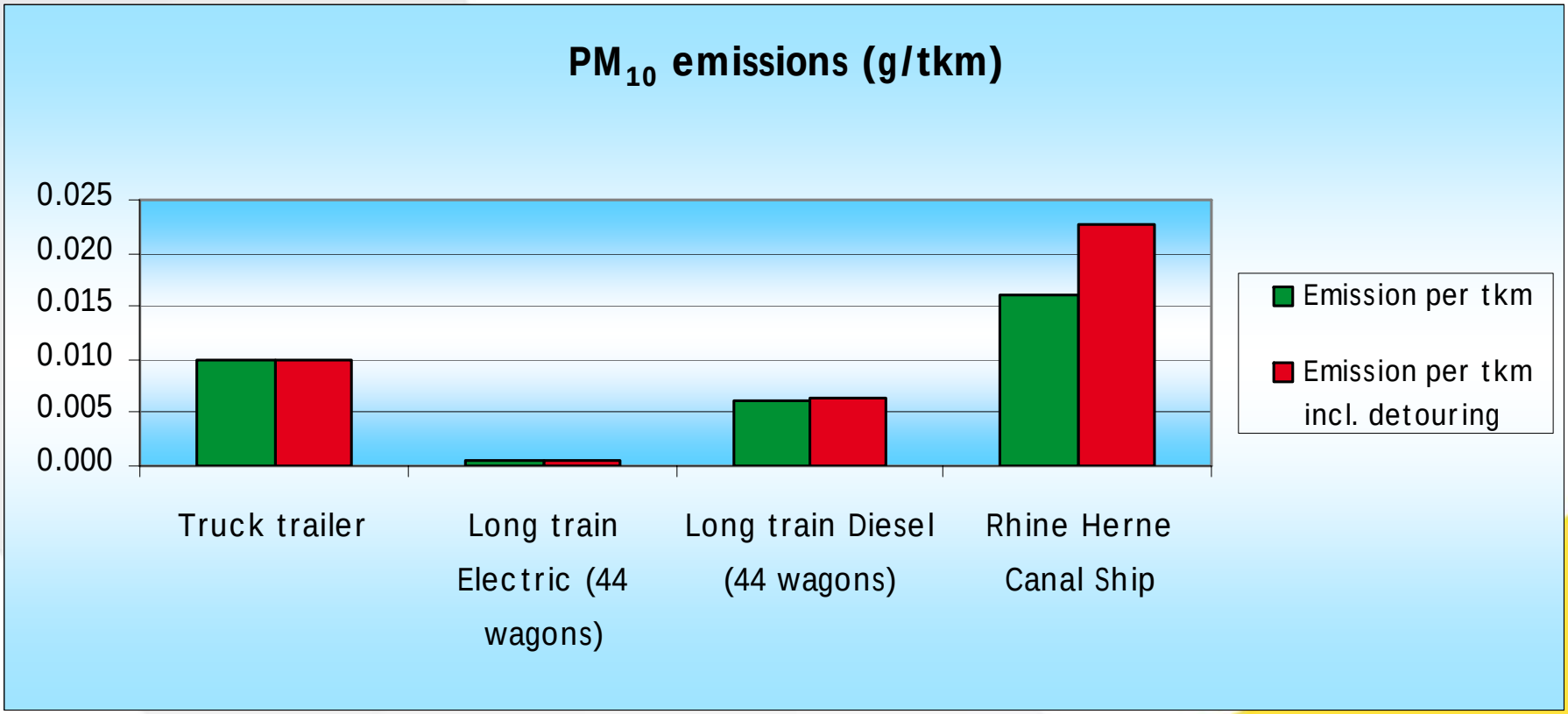
Steel Amsterdam-Regensburg



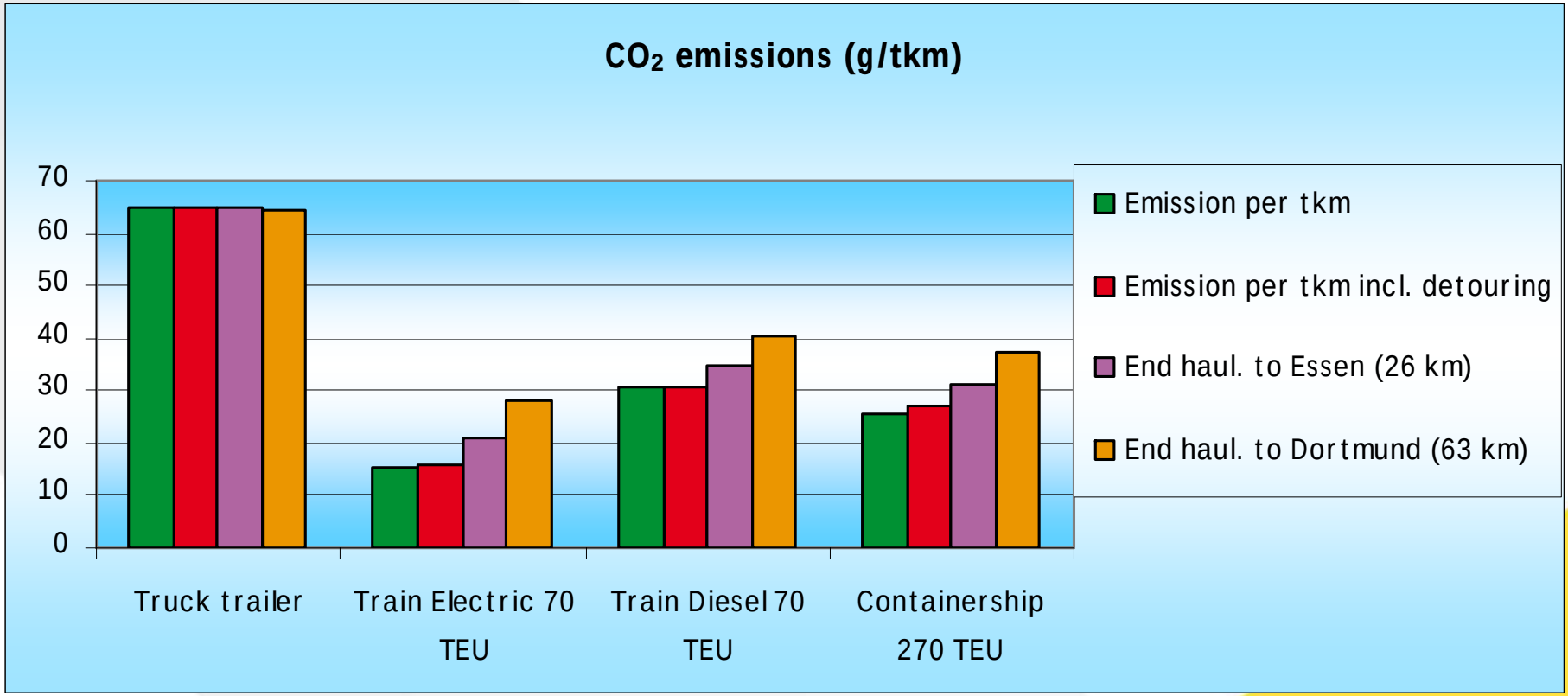
Steel Amsterdam-Regensburg



Steel Amsterdam-Regensburg



Containers Rotterdam-Duisburg



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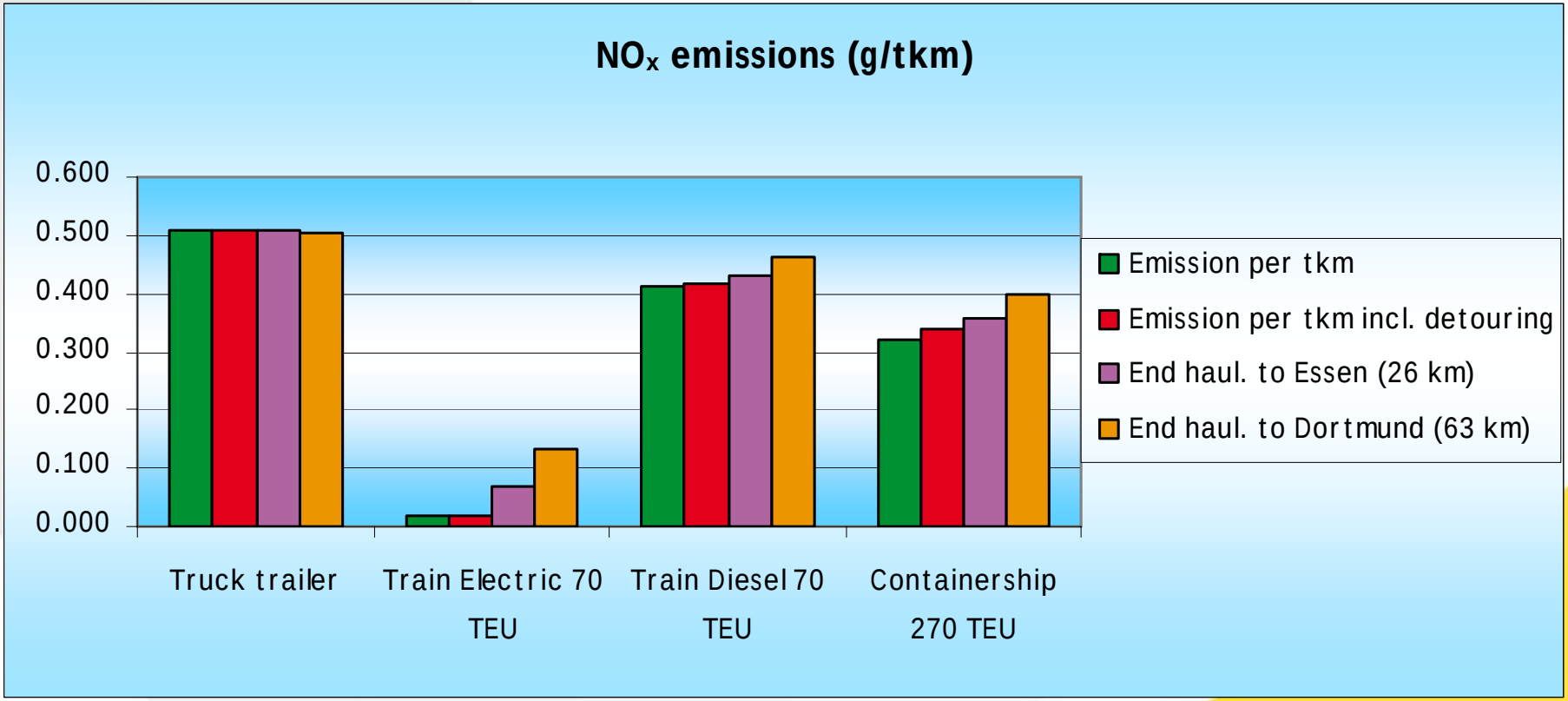
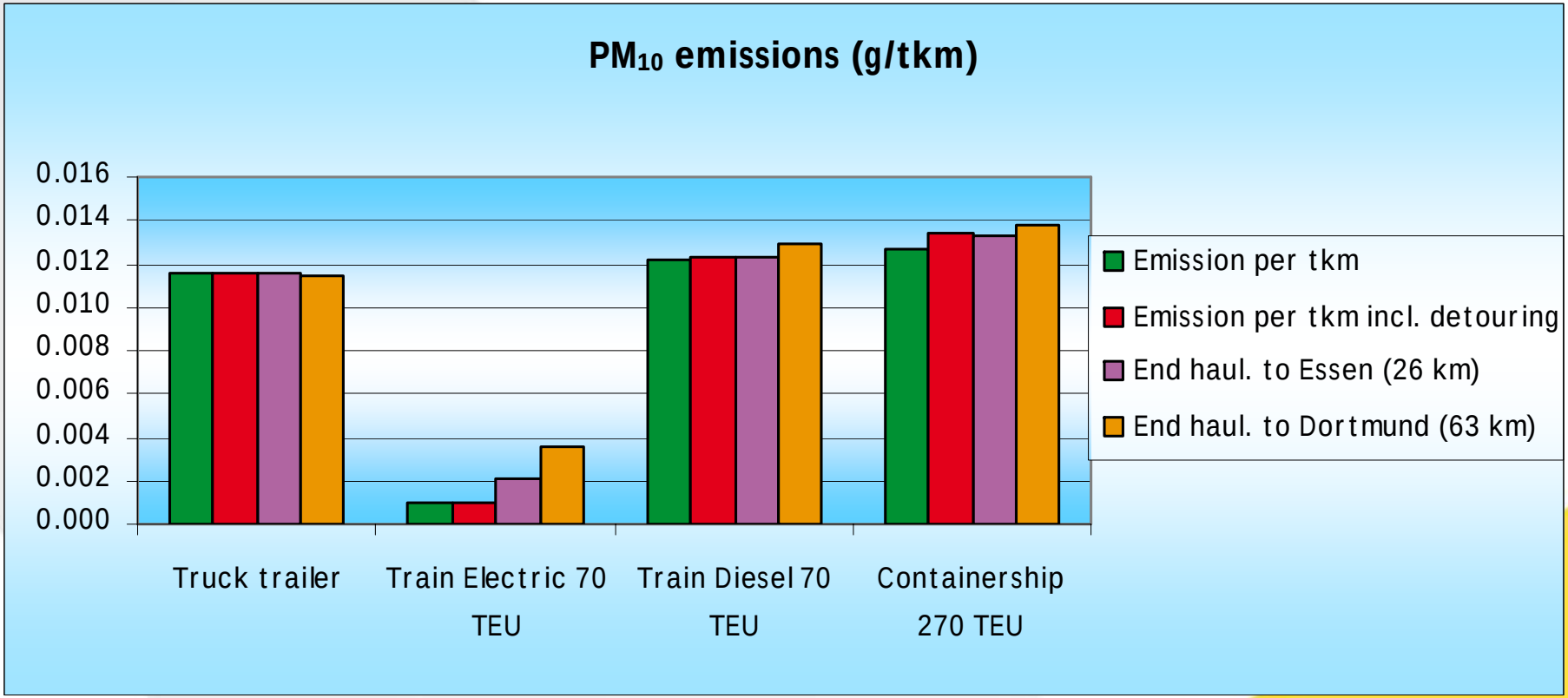


Containers Rotterdam-Duisburg



Conclusions

- Many factors influence emissions
  - Logistical characteristics
  - Emission standard
  - Type of good

- Modal comparisons depend heavily on vehicle capacity and utilisation
  - CO_2 emissions:
    - Clear advantage for large ships
    - Small ships: load factors decisive
  - Pollutant emissions: road transport comparable or cleaner
    - Strongly dependent on case
    - 2020 difference greater than 2010
  - Significant GHG reduction potential IWT
  - Fuel efficiency and carbon-intensity road likely to improve

Thank you for your attention!

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