



Air pollution and transport

Policies at the city level



Content

- Background
- State of play of the transport sector
 - Emission levels
 - Ambient concentrations
- Policy interventions
 - Impacts of 5 selected measures
- Main conclusions

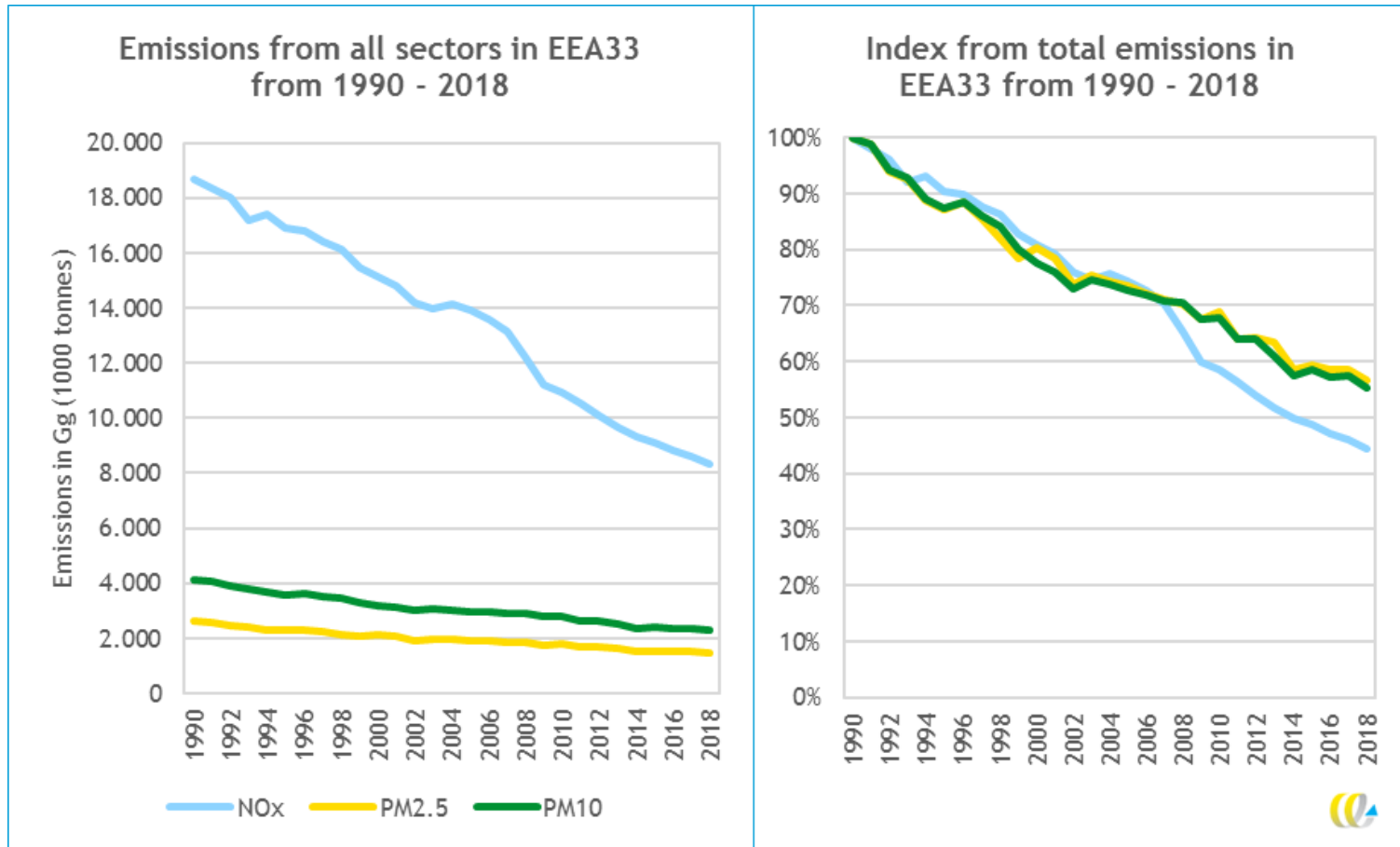
Background

- 2018 study by CE Delft for EPHA found that:
 - Currently, 67 to 80 bln € in road traffic related air pollution costs
 - Diesel vehicles
 - 90 to 95% of costs are health related
 - NOx has largest share in this (65%)
 - Social costs will decrease to 20 to 26 bln in 2030 due to policies already in place
- Exposure to traffic emissions high in urban areas → question from EPHA to CE Delft:
 - What transport policies can local/city governments adopt to reduce emissions and social costs?

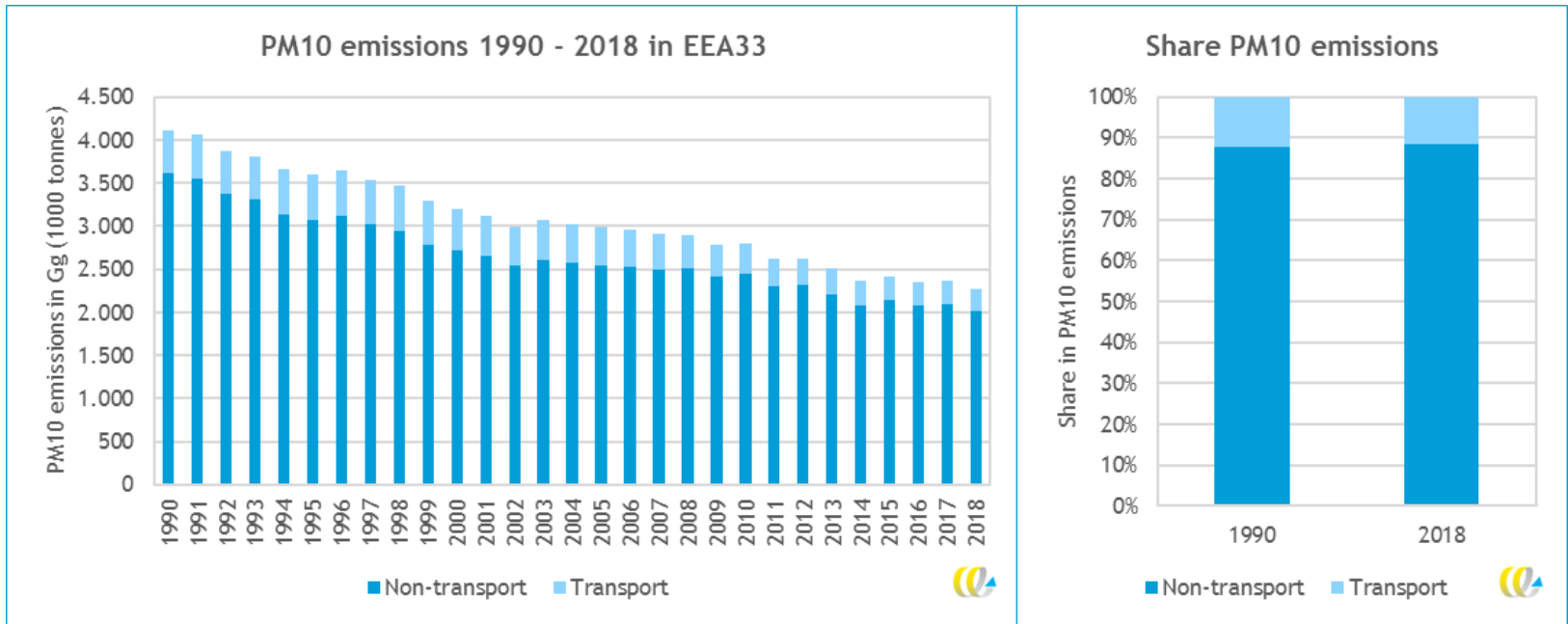
State of play - emission levels

- Quick glance at:
 - Current total emission levels and trends (NO_x and PM)
 - Share of transport in all emissions
 - Expected trend for 2030
 - Emissions vs ambient concentrations

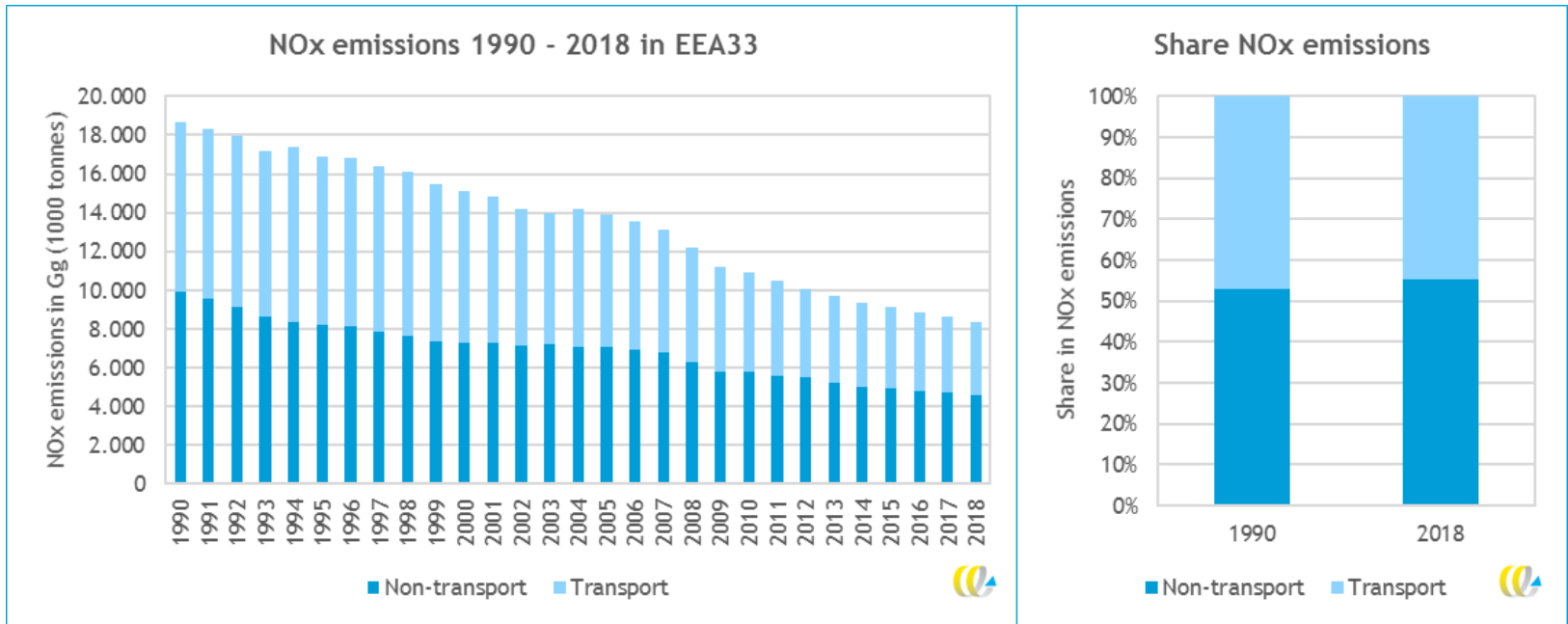
All sectors (1990- 2018)



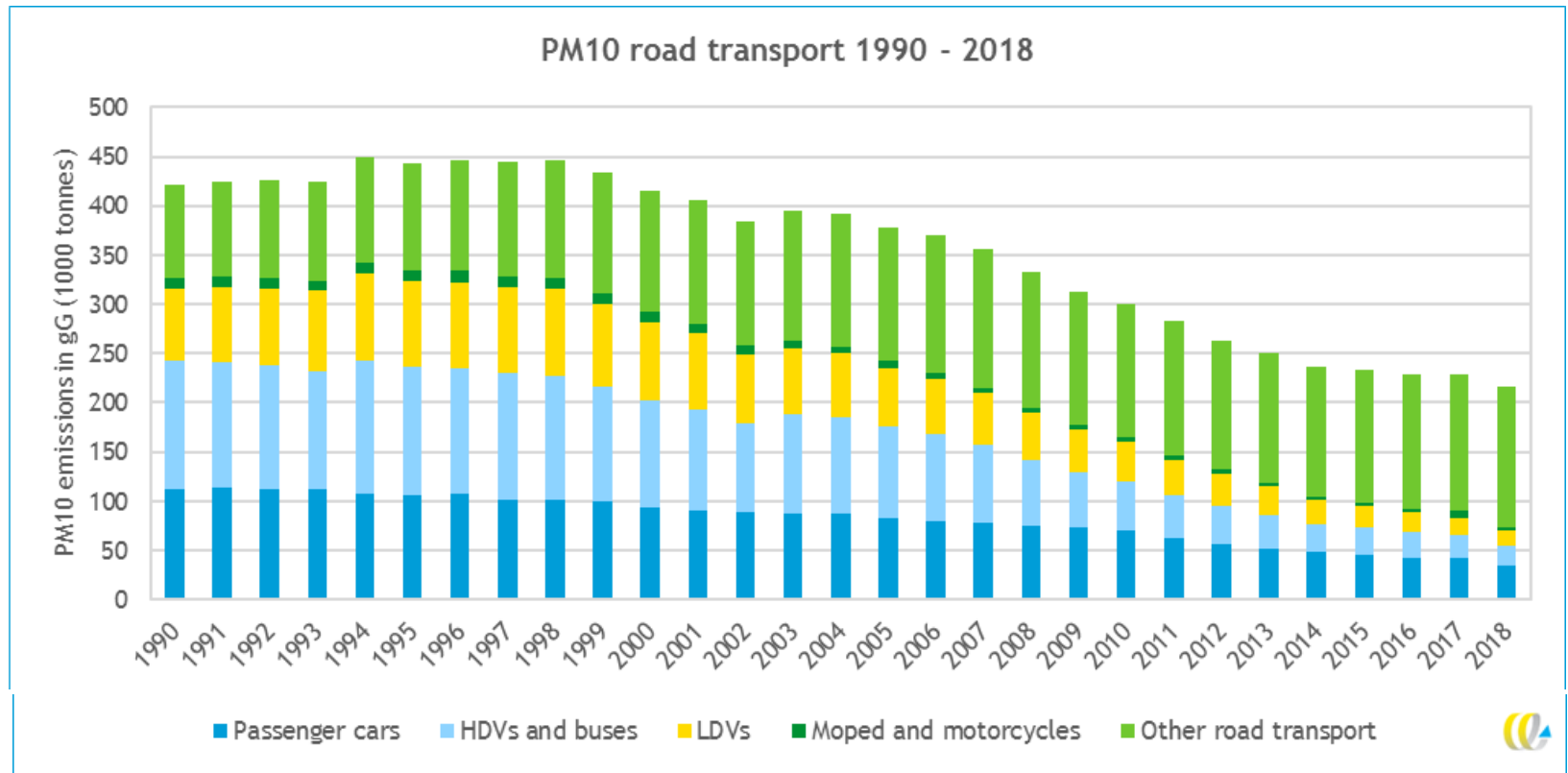
Share of transport (PM10)



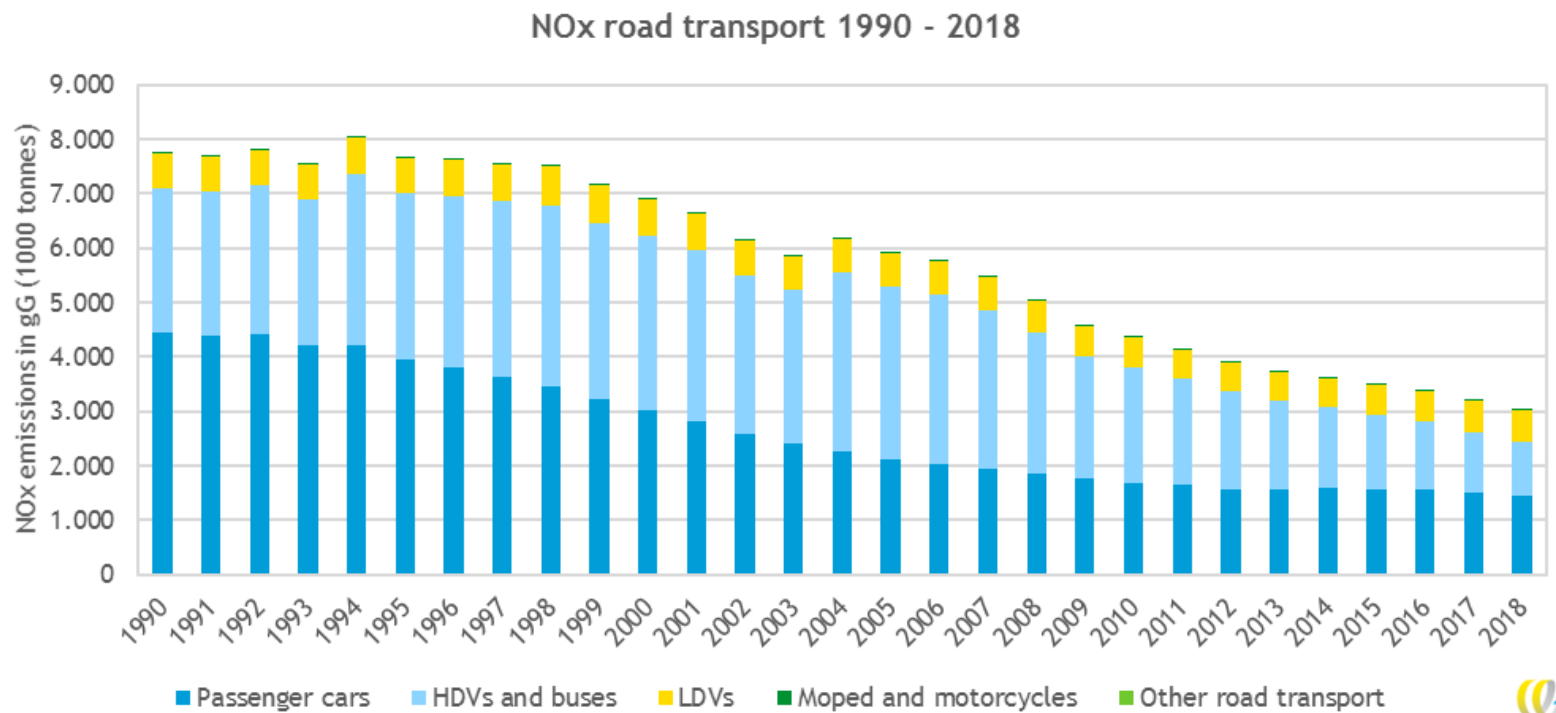
Share of transport (NOx)



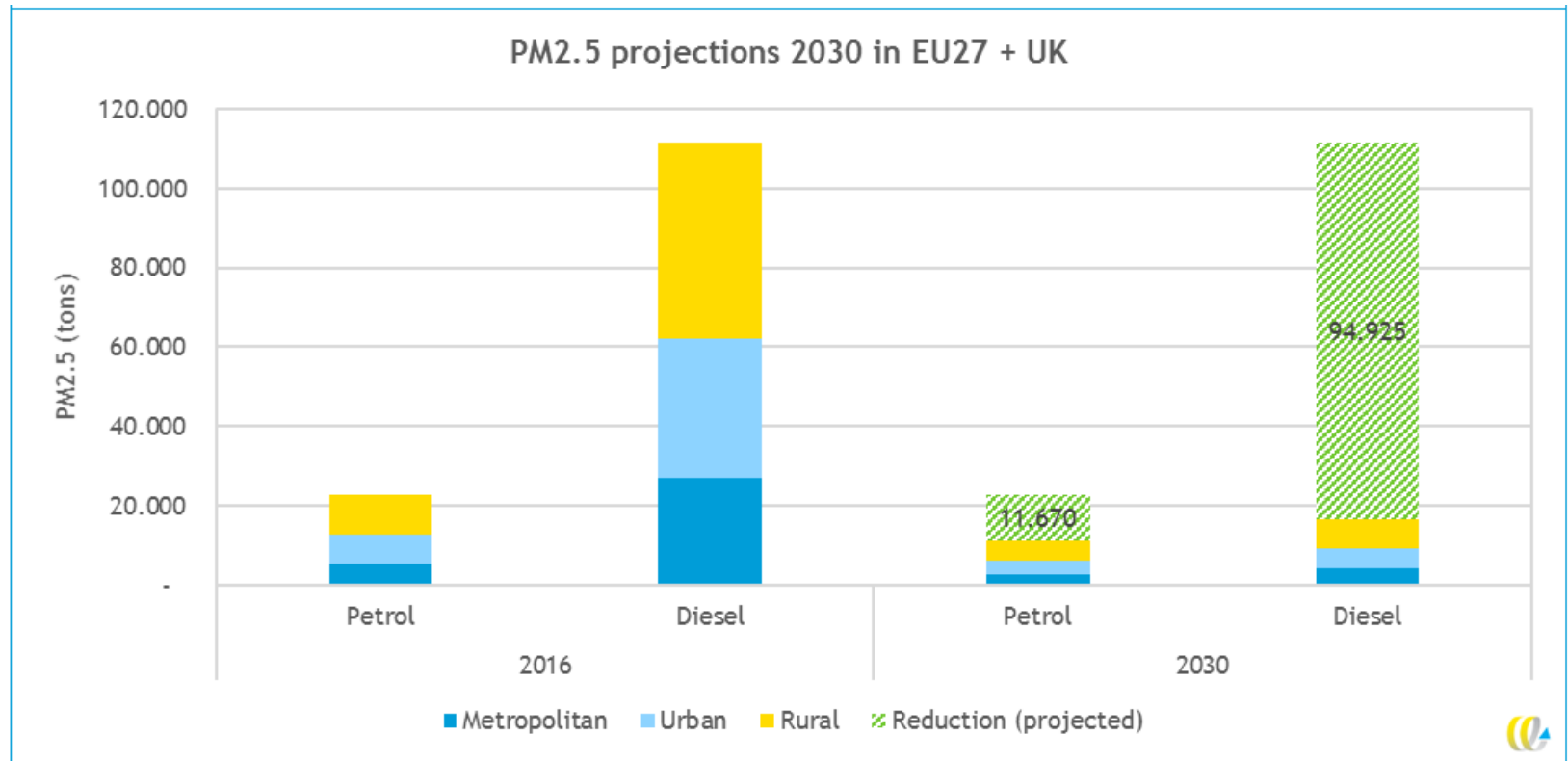
Shares of different modes (PM10)



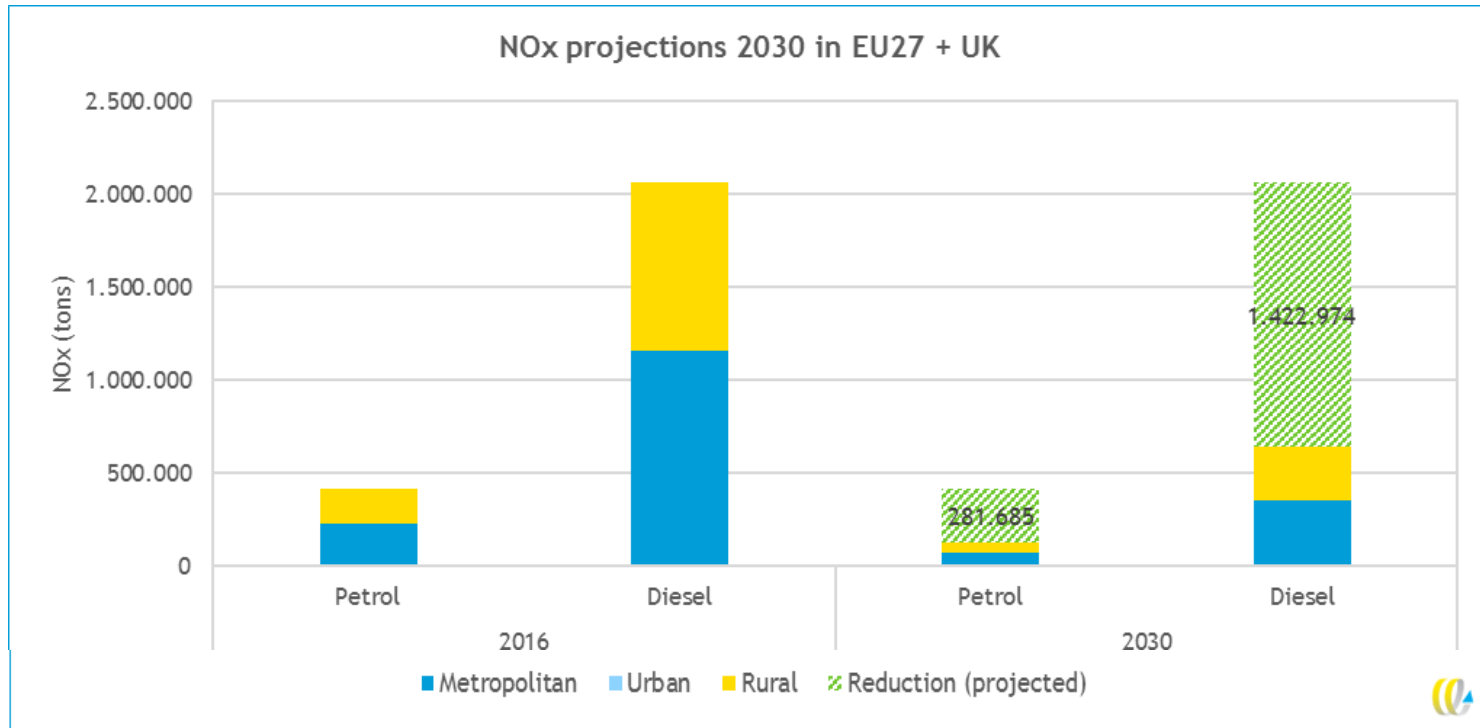
Shares of different modes (NOx)



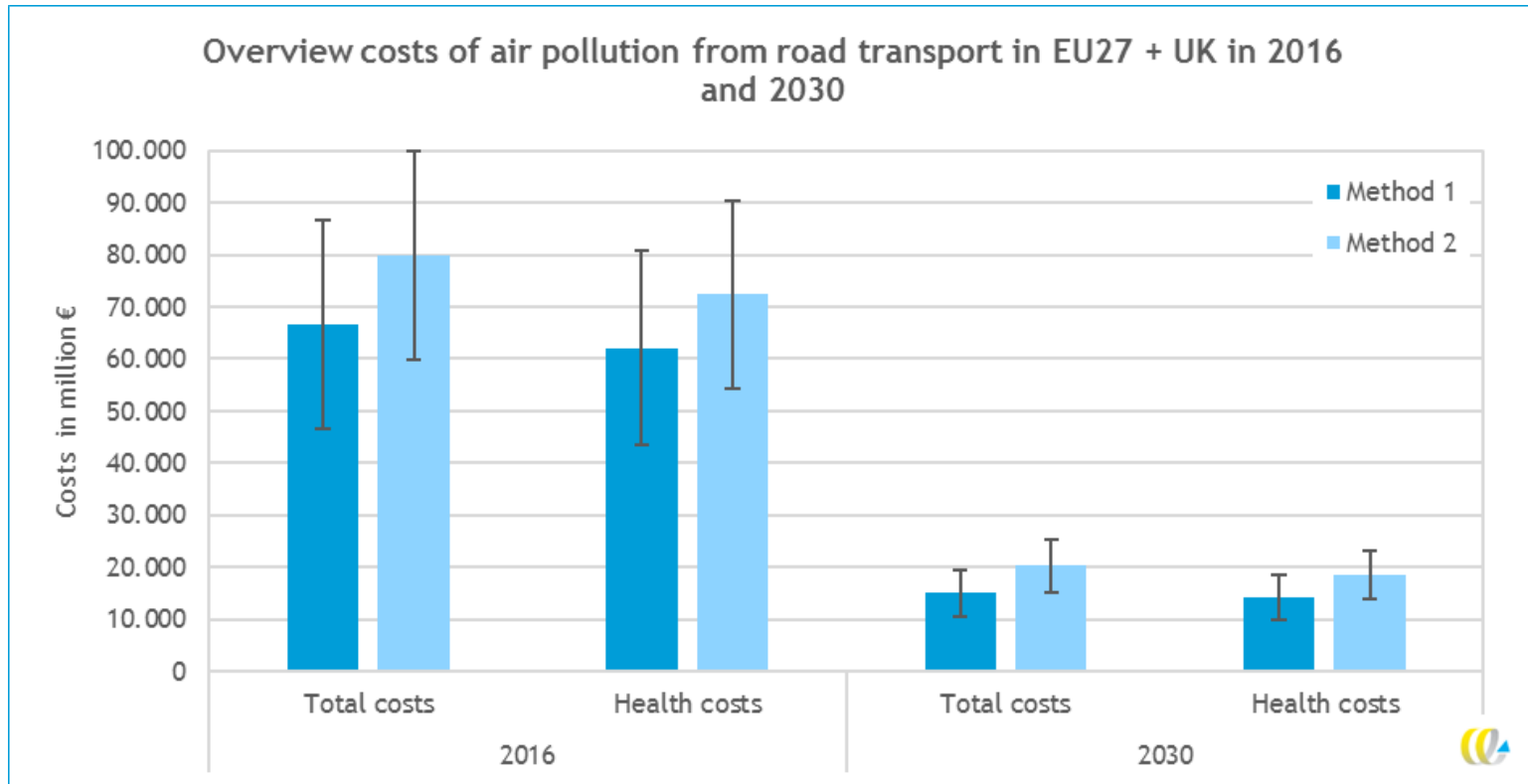
Projection 2016 - 2030 (PM2.5)



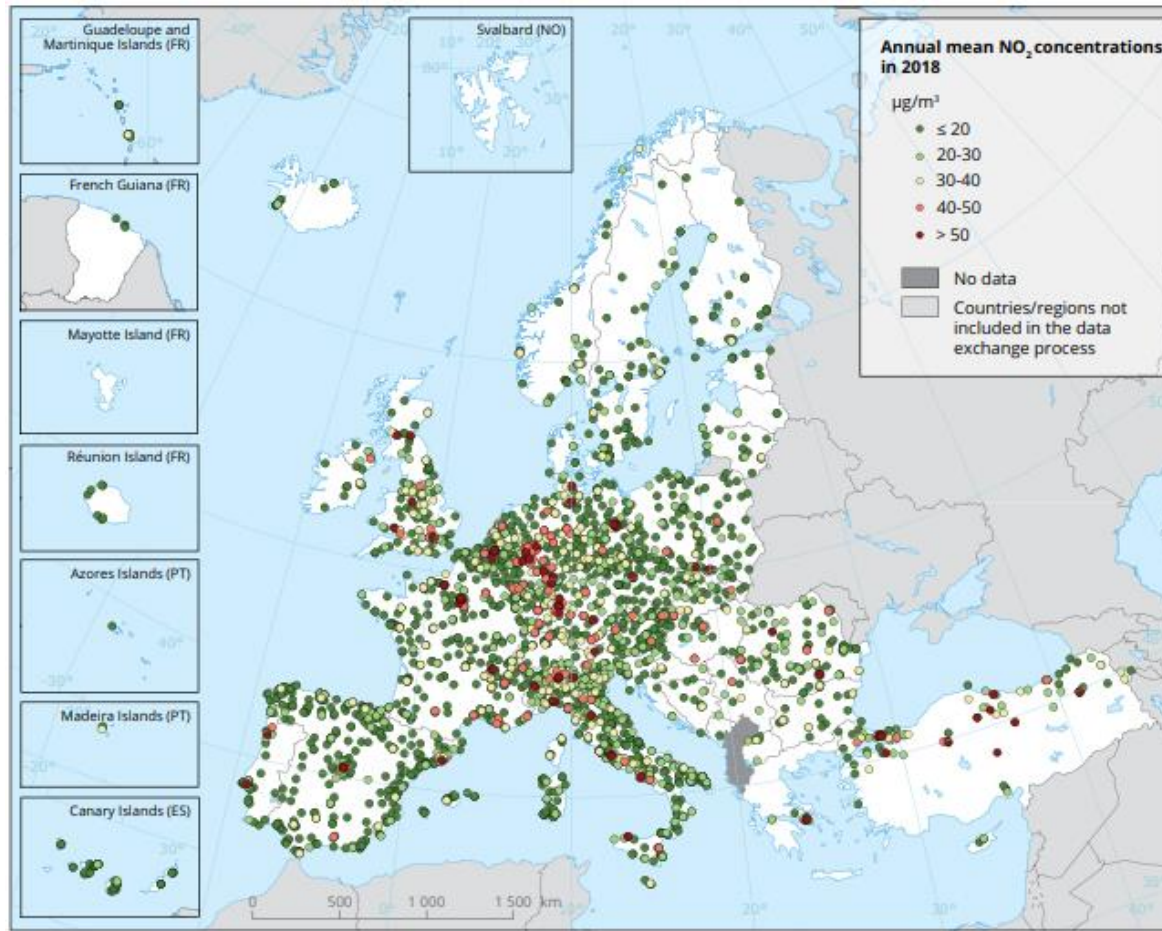
Projection 2016 - 2030 (NOx)



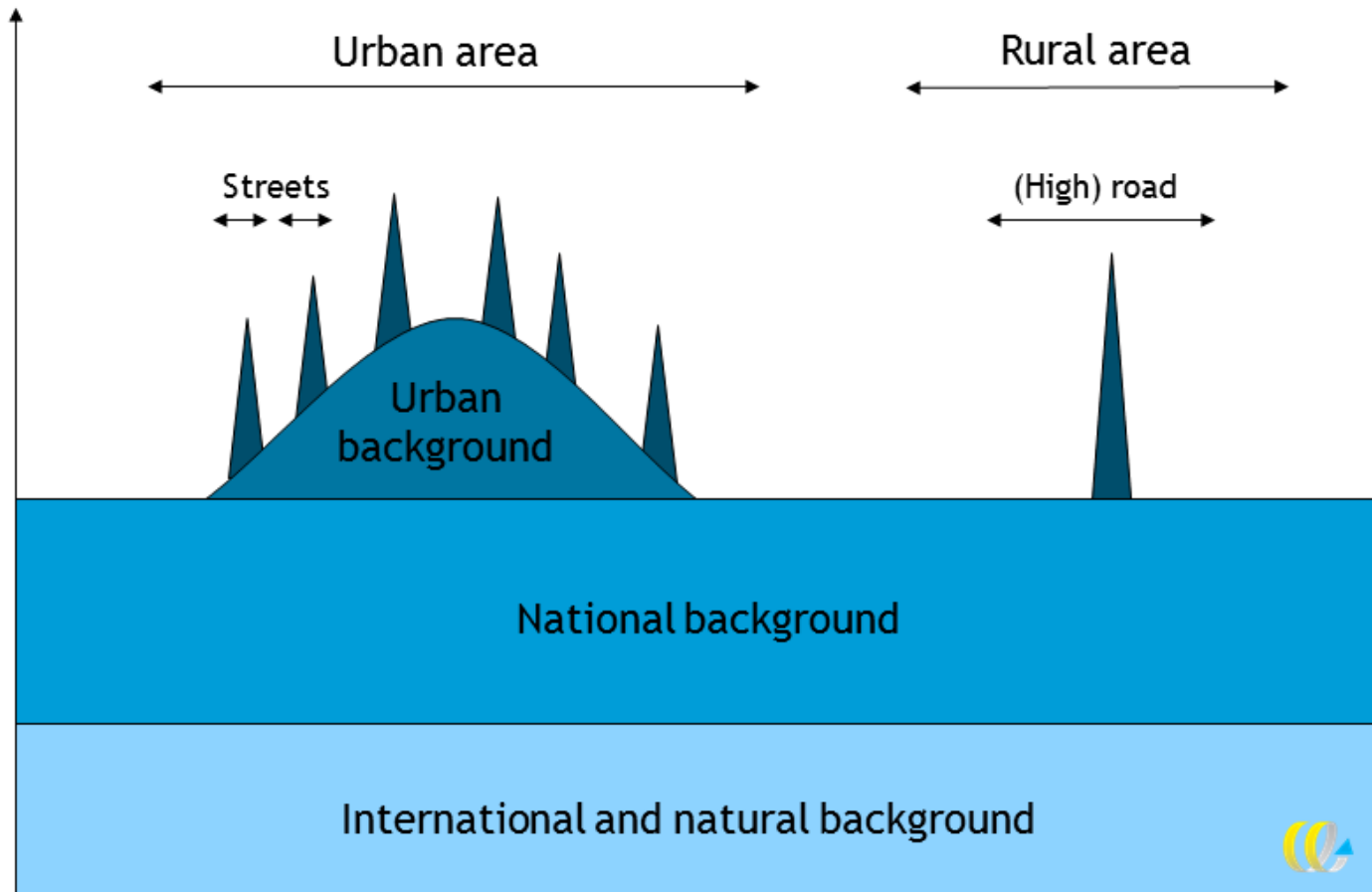
Costs of air pollution in 2030



Ambient concentrations



Build up of ambient concentrations



Resume state of play

- Total NO_x and PM emission have decreased in the last 20 years...
 - ... and are expected to decrease further
- Same is true for NO_x and PM emissions from transport
 - Passenger cars and Heavy duty dominant modes in NO_x (diesel)
 - Tyre and brake wear dominant in PM emissions
- Social costs will drop but still amount to 15 to 20 bln € in 2030
- Air quality (concentrations) poorest in densely populated areas
- Emission from transport in cities only partly contribute to ambient concentrations of NO₂ and PM
 - Local measures should be complemented by general measures



Policy interventions at city level

- Long list of measures (non exhaustive)

#	Measure	AIS	Type	Effectiveness ²⁾	Up-front investment costs
1	Congestion charge	Avoid/Reduce	Spatial planning/TOD	Very effective (++++)	High (++)
2	Diesel ban	Avoid/Reduce	Norms	Very effective (++++)	High (++)
3	Environmental / (ultra) LEZ zone	Avoid/Reduce	Pricing/fiscal incentive	Very effective (++++)	High (++)
4	Parking policies (pricing)	Avoid/Reduce	Spatial planning/TOD	Effective (+++)	Low (-)
5	Parking policies (availability)	Avoid/Reduce	Spatial planning/TOD	Effective (+++)	Medium (+/-)
6	Respacing road infrastructure/capacity reduction	Avoid/Reduce	Spatial planning/TOD	Effective (++)	High (+)
7	Speed limits	Avoid/Reduce	Spatial planning/TOD	Effective (+++)	Low (-)
8	ZE city busses	Improve	Norms	Effective (+++)	High (++)
9	ZE city logistics - clean vehicles	Shift	Spatial planning/TOD	Effective (+++)	High (++)
10	Cycle logistics	Shift	Spatial planning/TOD	Moderately effective (++)	Medium (+/-)
11	Increase public transport capacity	Shift	Pricing/fiscal incentive	Moderately effective (++)	High (++)
12	Promote cycling/cycling infrastructure	Shift	Norms	Moderately effective (++)	High (++)
13	Scrapping subsidy	Improve	Spatial planning/TOD	Moderately effective (++)	High (++)
14	Subsidy ZEVs	Improve	Subsidy	Moderately effective (++)	High (++)
15	Traffic management/ITS	Improve	Spatial planning/TOD	Moderately effective (++)	Medium (+/-)
16	Subsidy/regulation micro mobility	Shift	Spatial planning/TOD	Slightly effective (+)	Medium (+/-)
17	ZE privileges (dedicated lanes)	Improve	Norms	Slightly effective (+)	Low (-)
18	Shared e-scooters	Shift	Norms	Slightly effective (+)	Medium (+/-)
19	Air filters at hotspots	Improve	Spatial planning/TOD	Slightly effective (+)	Medium (+/-)
20	Car free (sun)day	Avoid/Reduce	Spatial planning/TOD	Slightly effective (+)	Low (-)
21	Car sharing schemes	Shift	Norms	Slightly effective (+)	Medium (+/-)
22	Green Public Procurement (GPP)	Improve	Subsidy	Slightly effective (+)	Medium (+/-)
23	Subsidized (or free) public transport	Shift	Pricing/fiscal incentive	Slightly effective (+)	High (++)
24	Increase charging infrastructure	Improve	Spatial planning/TOD	Neutral (0)	High (++)
25	15 minute city	Shift	Spatial planning/TOD	Unknown (?)	High (++)
26	Mobility as a Service (MaaS)	Shift	Spatial planning/TOD	Unknown (?)	Unknown (?)
27	ZE city logistics - spatial planning such as hubs	Improve	GPP	Unknown (?)	High (++)
28	ZE construction sites - (Non Road Mobile Machinery)	Improve	Norms	Unknown (?)	High (++)



5 selected measures

- More in depth analysis/review of 5 measures:
 - congestion charge,
 - environmental (low emission) zone,
 - car sharing,
 - parking policies, and
 - cycling/walking policies
- Selection based on:
 - Effectiveness
 - Experience
 - Different modes (diversity)



Congestion charge

- Adopted in London, Stockholm, Singapore, Gothenburg, Milan
- Pricing policy (tax/toll) aiming to influence demand of traffic in a certain time period and/or area
- ‘Simple’ charge-zone toll can also create significant effects
- Invest revenues in public transport and slow modes (walking, cycling)
- Effectiveness:
 - NOx, 8 to 10% reduction
 - PM, 7 to 17% reduction
 - Estimated reduction social costs in 2020
 - 31 - 96 mln Euro for cities > 1 mln
 - 1 - 3 mln Euro for cities < 200k



Low emission/environmental zone

- Adopted in Germany, The Netherlands, Milan, London, Malmö, Stockholm, Brussels (region)
- A LEZ is a designated area in a city where access is restricted for vehicles with a certain emission standard set by the (local) authority
- Success factors: a clear well drawn territory, legal enforcement, strict exemptions rules, clear communication to the public
- Effectiveness:
 - NOx, 2 to 36% reduction
 - PM, 2 to 23% reduction
 - Estimated reduction social costs in 2020
 - 9 to 131 mln Euro for cities > 1 mln
 - 0 to 4 mln Euro for cities < 200k



Car sharing schemes

- Adopted in many cities including Paris, Amsterdam, Cologne, other major cities in Europe/US
- Either platform between users (C2C) or (large-scale) business to consumer (B2C)
- Mostly (semi-)commercial initiatives, profitability issues
- Requires densely populated area
- Some competition with public transport and slow/active modes
- Effectiveness:
 - NO_x, and PM -5 to 5% reduction
 - Estimated reduction social costs in 2020
 - 22 to 28 mln Euro for cities > 1 mln
 - ~ 1 mln Euro for cities < 200k



Parking policies

- Widely used world wide
- Deals with pricing and supply
- Relatively easy to implement, generates steady income
- Restriction in supply best combined with Park and Ride
- Effectiveness:
 - NOx, and PM 5 to 10% reduction
 - Estimated reduction social costs in 2020
 - 22 to 56 mln Euro for cities > 1 mln
 - 1 to 2 mln Euro for cities < 200k

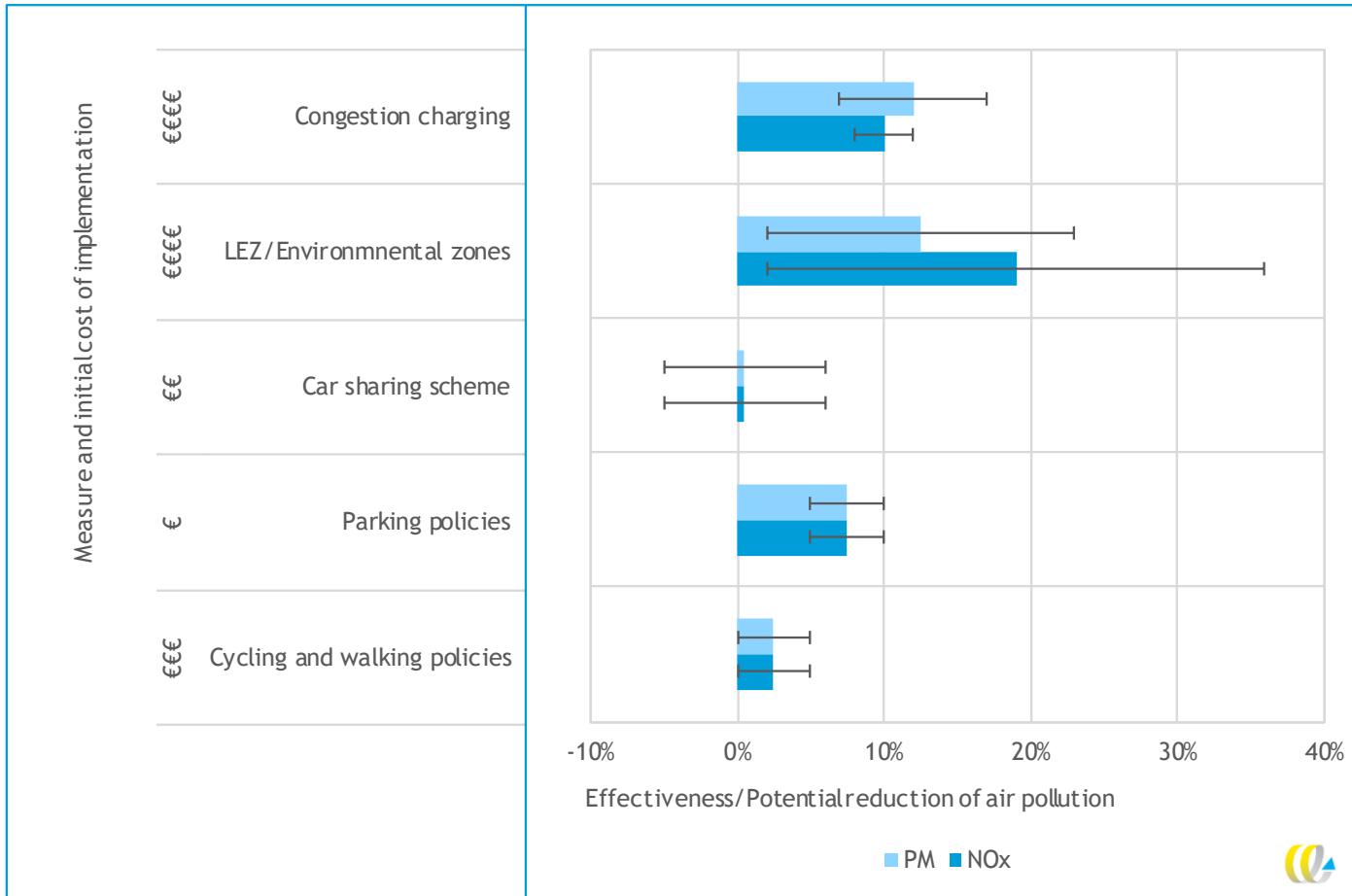


Cycling and walking (active modes)

- Adopted in Copenhagen, Rotterdam, Antwerp, Strasburg, Paris, Vienna, Berlin, London
- Mix of different measures (infrastructure, bike sharing, low/zero car zones),
- Seperate bike lanes preferable (safety), more challenging
- Often initiated from climate goals, not air quality
- City layout less of problem with electric bikes
- Effectiveness:
 - NOx, and PM 0 to 5% reduction
 - Estimated reduction social costs in 2020
 - 0 to 28 mln Euro for cities > 1 mln
 - 0 to 1 mln Euro for cities < 200k



Impacts of measures (emissions)



Impact of measures (social costs)

- Congestion charging and LEZ in metropolises 30 and 95 mln Euro per city, equivalent to 1 to 3% of the total social costs of these cities
- For small cities 1 to 3 mln Euro
- Other measures between 0 and 60 mln Euro in metropolises, 0 tot 2 mln Euro in small cities

Table 4 - Estimate of the change in social costs of congestion charging in 2020

	Metropolitan cities		Big cities		Small cities	
	Social return	% change	Social return	% change	Social return	% change
North	-	-	3.7 - 8.7 €mln	1.2 - 2.7 %	1 - 2.3 €mln	1.2 - 2.8 %
West	30.8 - 71.7 €mln	1.1 - 2.6 %	4.4 - 10.2 €mln	1.1 - 2.6 %	1 - 2.4 €mln	1.1 - 2.7 %
South	39 - 90.9 €mln	1.1 - 2.6 %	3.1 - 7.1 €mln	1.1 - 2.7 %	1.3 - 2.9 €mln	1.2 - 2.7 %
East	40.8 - 95.7 €mln	1.2 - 2.8 %	5 - 11.8 €mln	1.2 - 2.8 %	1.4 - 3.2 €mln	1.2 - 2.8 %



Main conclusions

- Local/urban measures are able to substantially reduce NO_x and PM emissions, however...
 - ...depends highly on local situation and design
- Impacts on emissions and social cost reduction highest for Congestion charging and LEZ/environmental zones
- Uncertainties are large (tailor-made approach necessary)
- General governance issues:
 - Public awareness (campaign)
 - Clear long-term strategy, ‘vocal’ policy maker/governor
 - ‘Car minded’ professionals
- Potential ‘savings’ of in social costs may encourage local/city governments to implement these measures



CE Delft

- Independent research and consultancy since 1978
- Transport, energy and resources
- Know-how on economics, technology and policy issues
- 70 employees, based in Delft, the Netherlands
- Not-for-profit



Clients



Industries
(Small and medium size enterprises, transport, energy and trade associations)



Governments
(European Commission, European Parliament, regional and local governments)



NGOs