Costs of environenmental regulation

Lecture 1 – Vienna 31/5/2016

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Case study:

New chemical **DIHYDROGEN MONOXID (DHMO)**:

- Causes numerous deaths
  - Causes serions burns in the gaseous form
  - Contributes to erosion in the liquid form
  - Can be detected in cancer and already in breast milk
  - Already detected in many lakes in protected areas
- A part of acid rains
- Contributes to the global warming (its not only CO2…)

Case study:

New chemical **DIHYDROGEN MONOXIDE (DHMO)**:

The industry desperately needs DHMO,

extremely costly to replace it

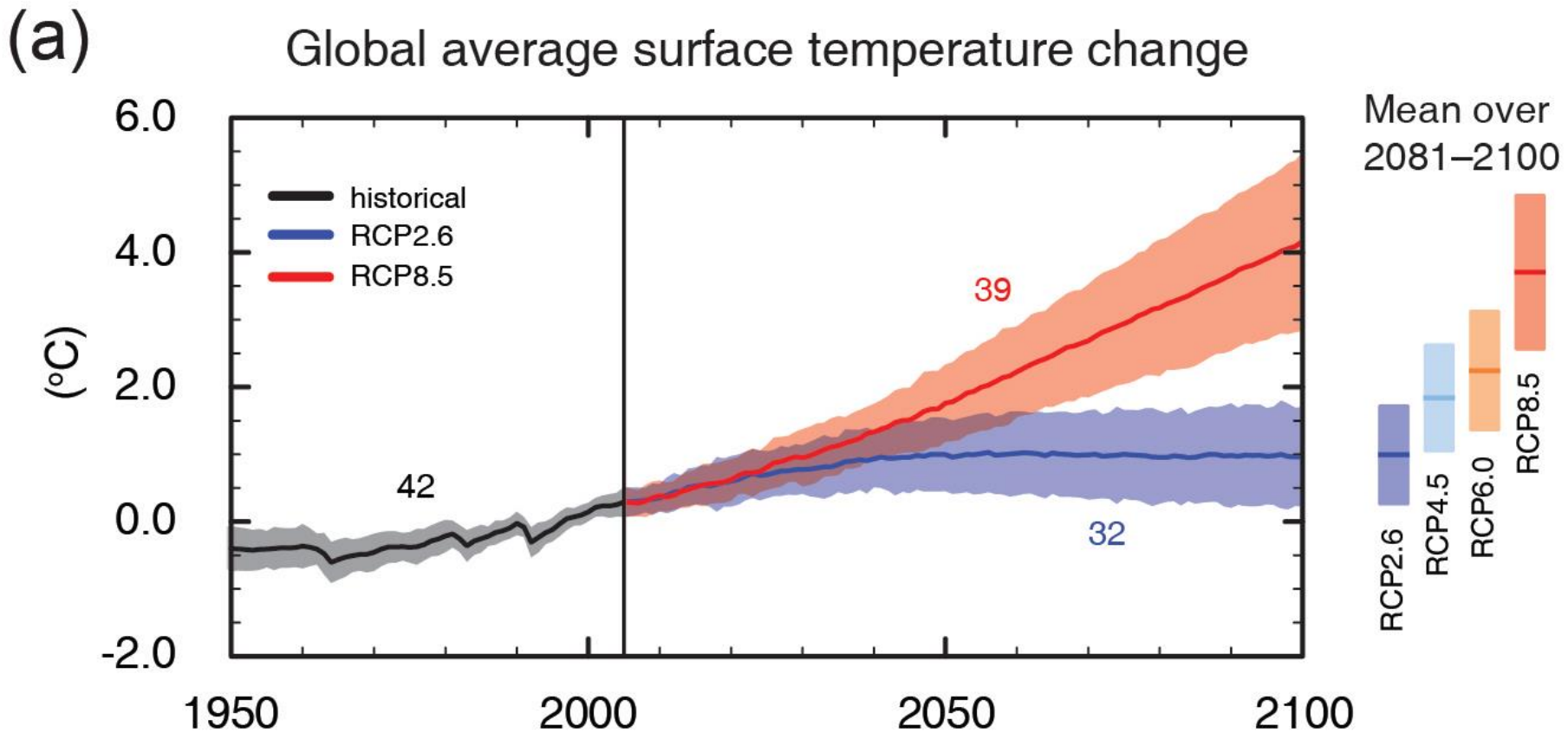
- As an industrial diluent
- Vastly used in nuclear energetics
- Used in pesticide application

Would you bann DHMO and force industry to replace it by other substance?

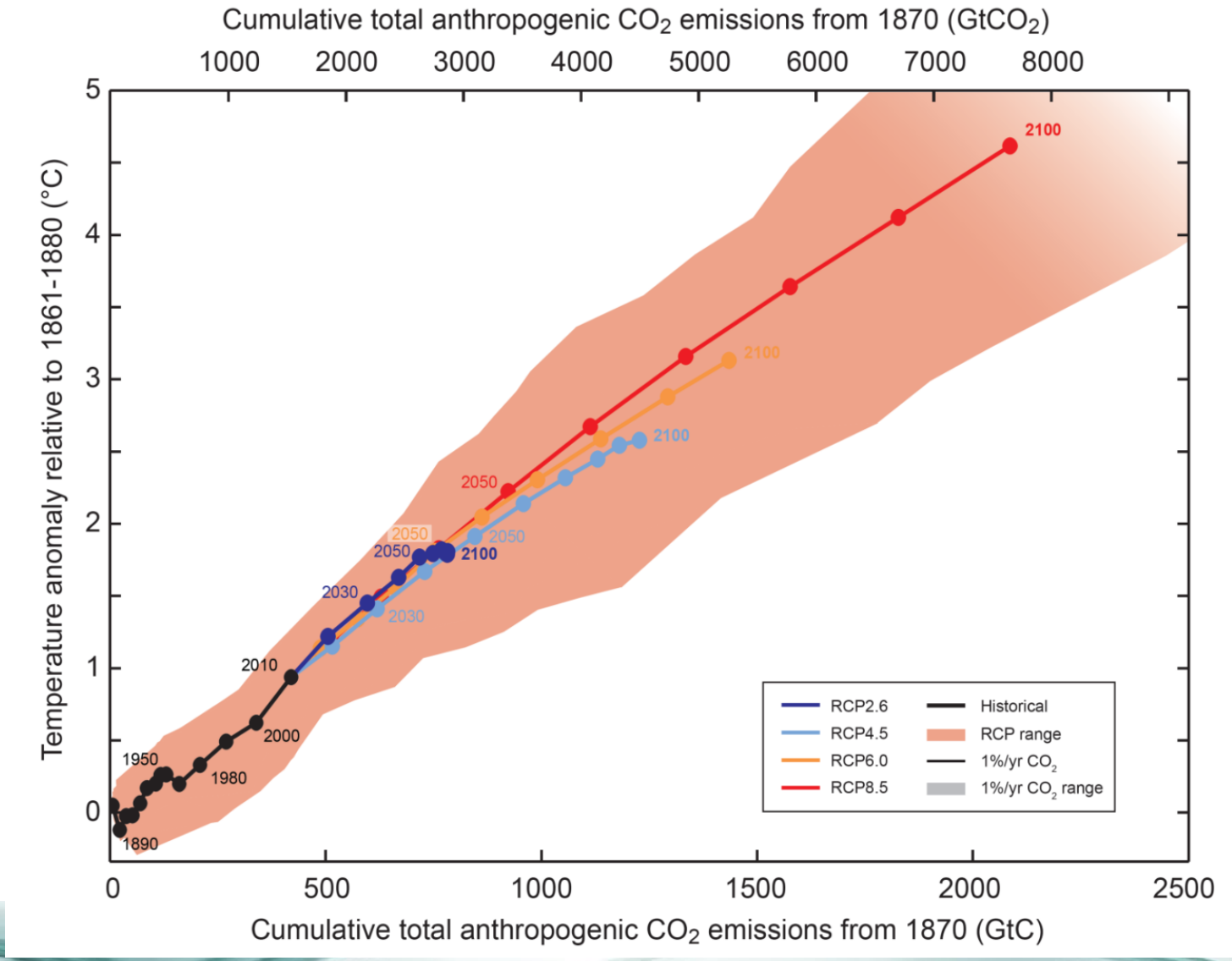
Content:

0. **Case studies for costs of envi regulation**
1. Current air quality analysis
   - Pollutant concentrations
   - Health impact
2. Possible measures and their effectivity
3. Synergies among air quality policy and climate change policy
4. Impact of the IPPC Directive
5. Benefits and their quantification
6. Case study Barcelona

Significant challenge: climate change



Significant challenge: climate change



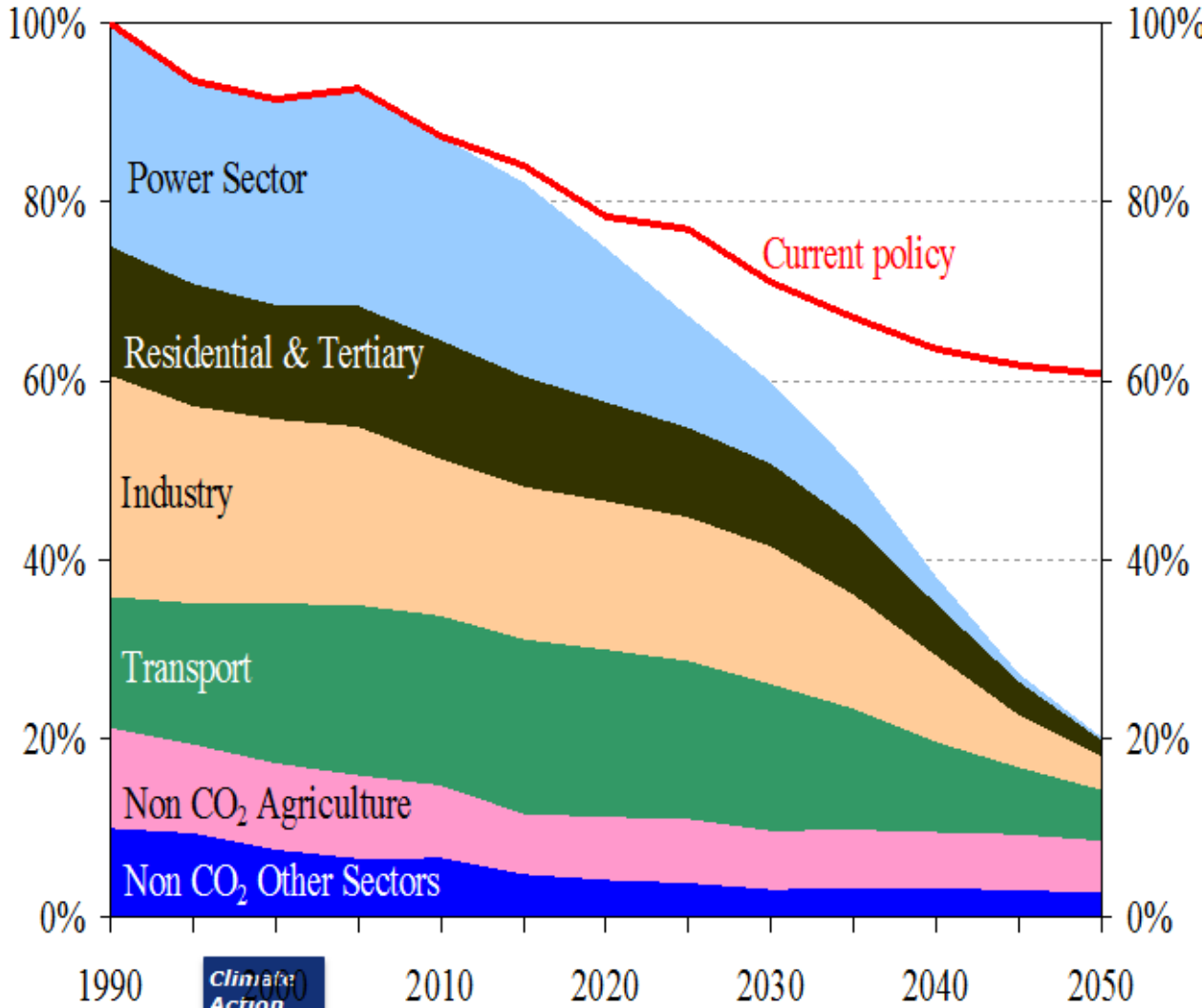
A cost-efficient pathway towards 2050

80% domestic reduction in 2050 is feasible

- with currently available technologies,
- with behavioural change only induced through prices
- If all economic sectors contribute to a varying degree & pace.

Efficient pathway:

-25% in 2020
-40% in 2030
-60% in 2040



How to decrease emissions effectively?

According average abatement cost per 1 tonne

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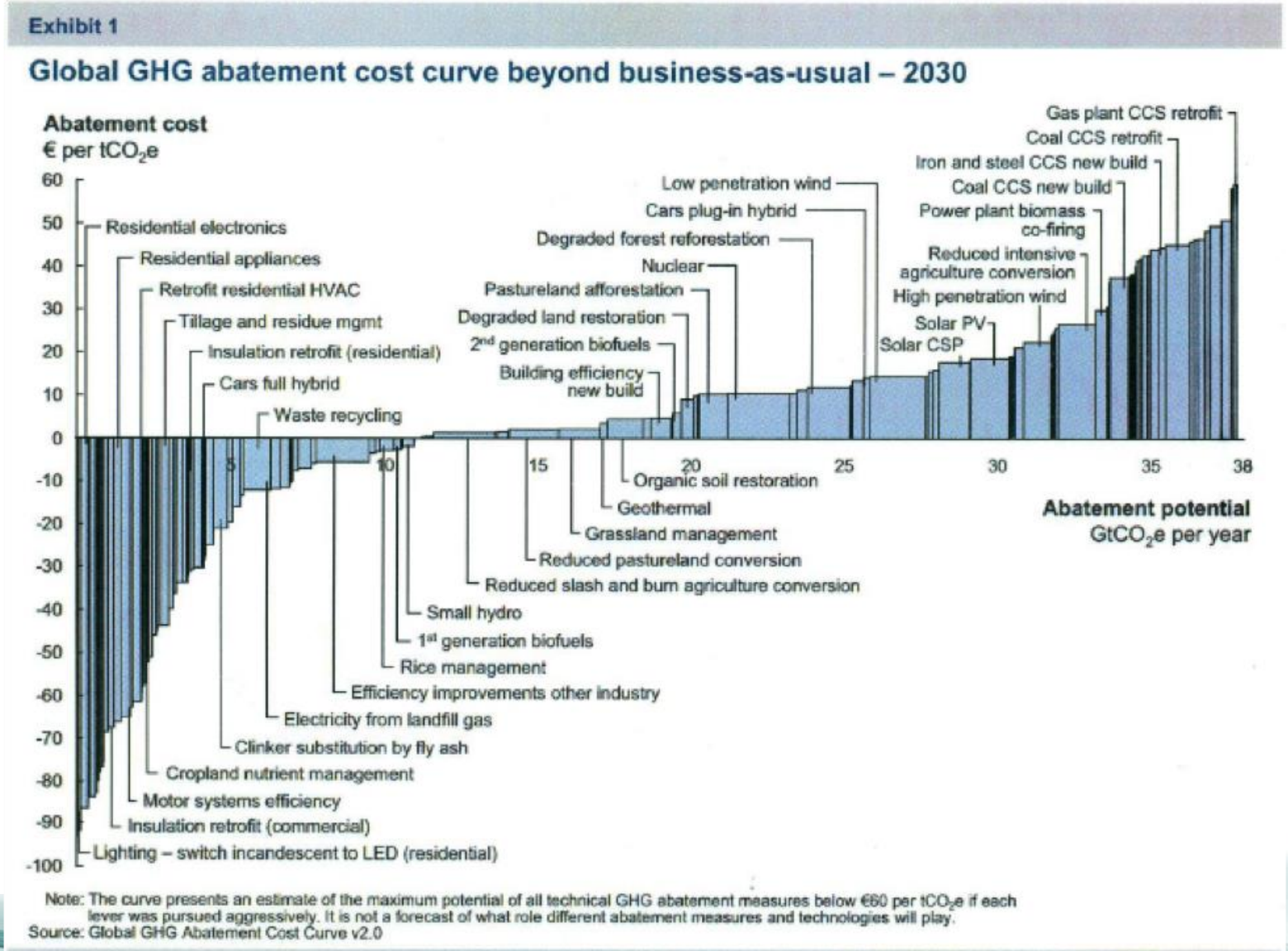

How to decrease emissions effectively?

In the fully rational world, all measures with negative marginal costs would be immediately realized.

In reality, there are obstacles as:

- lack of information
- discounting
- transaction costs
- different motivation of investor and bill payer
- imperfect substitution („quality of light from lightbulb vs. LED)

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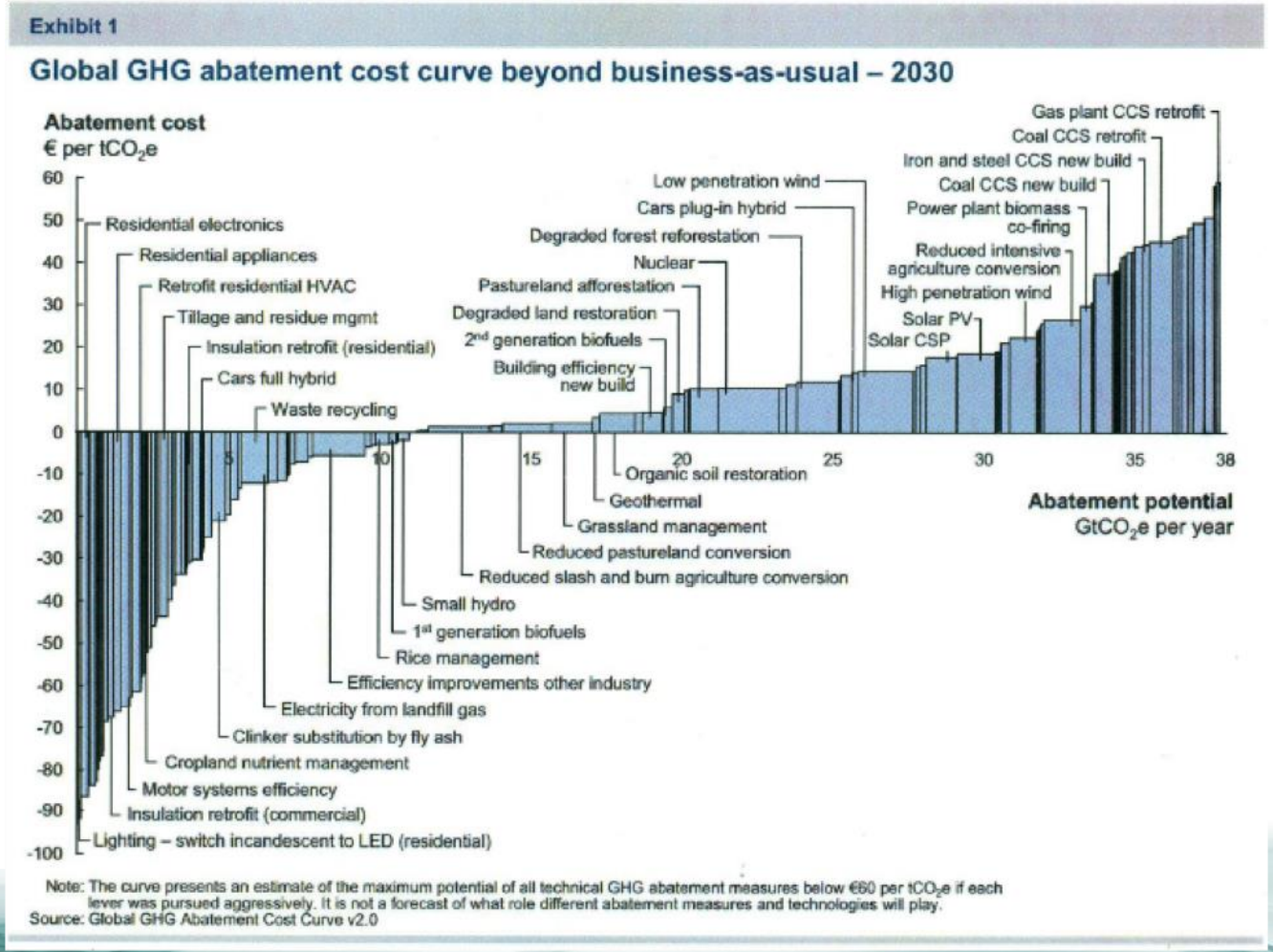
According average abatement cost per 1 tonne



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Market based instruments:

EU Emission Trading Scheme (EU ETS)

1 old factory for spaghetti

1 new factory for socks

Impact of the environmental regulation

- Problem set I:

- Calculate the real costs of IED, EU ETS and pollution fees for
  - real Czech 200MW heat plant
  - costs per household

- **Conclusion:**

  Price of heat will rise by 6000 CZK/year because of the regulation *(compare to minimal wage)*

Content

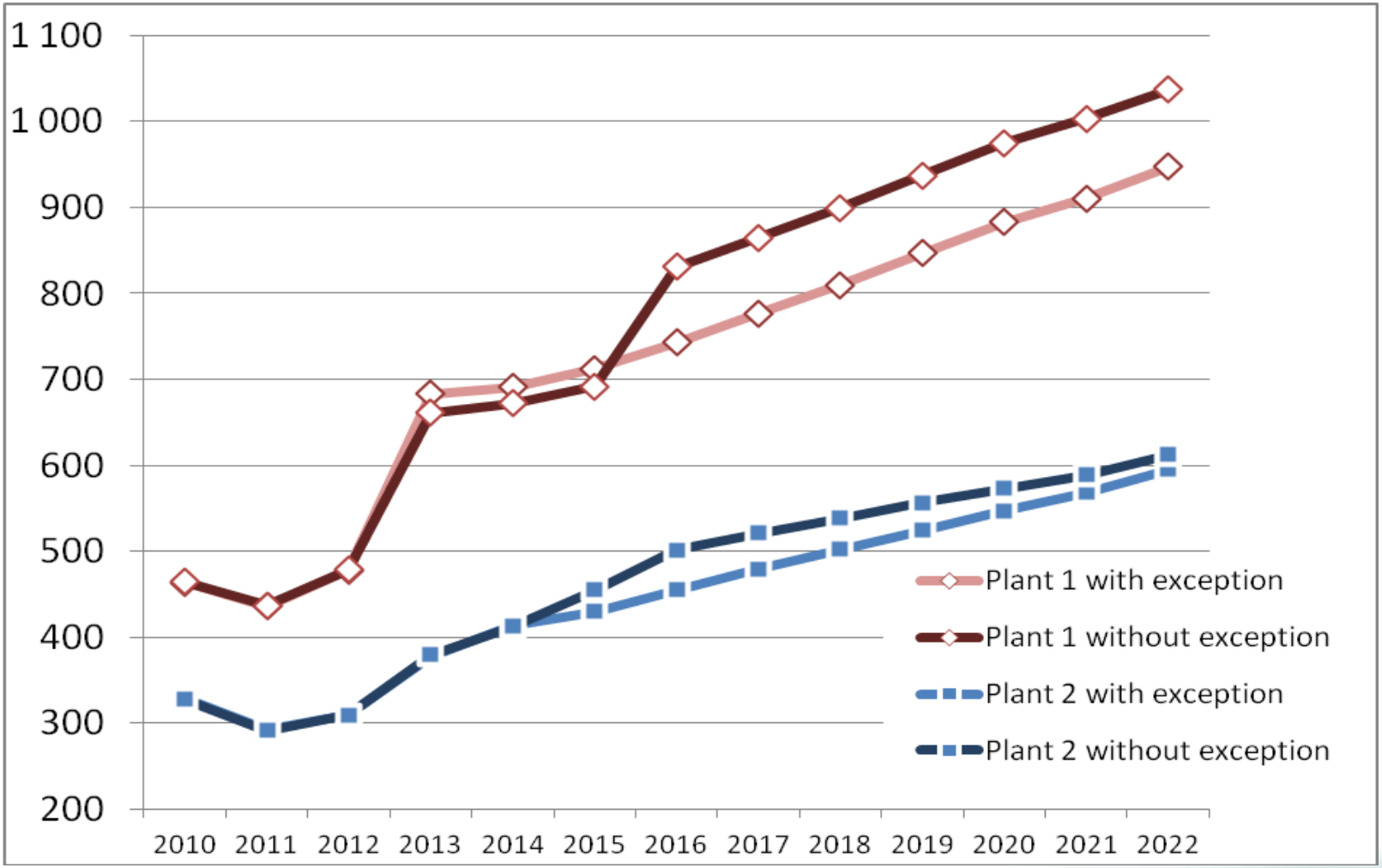
Emission reductions (IPPC)	Unit price	Amount (t)	Costs (EUR)	
Calcit (t/rok)	44	7 320	325 333	
Hydrate (t/rok)	90	16 544	1 484 671	
Urea (t/rok)	289	1 200	346 667	
Garbage removal	9	35 796	318 187	
Total costs			**2 474 857**	59%

CO2 reductions (EU ETS)	2010	*2016	
CO2 emissions (t)	214 862	149 663	
Free emission allocations (t)	242 629	56 188	
Difference (t)	-27 767	93 474	
Emission allowance unit price (CZK)	11	18	
Total costs	**-305 437**	**1 682 540**	40%

Emission fees (Czech envi law)	Unit fee	2010	*2016	
TZL	300	21	6 359	
SO2	100	210	20 991	
NOx	80	188	15 021	
			42 371	1%

IPPC Directive impact:

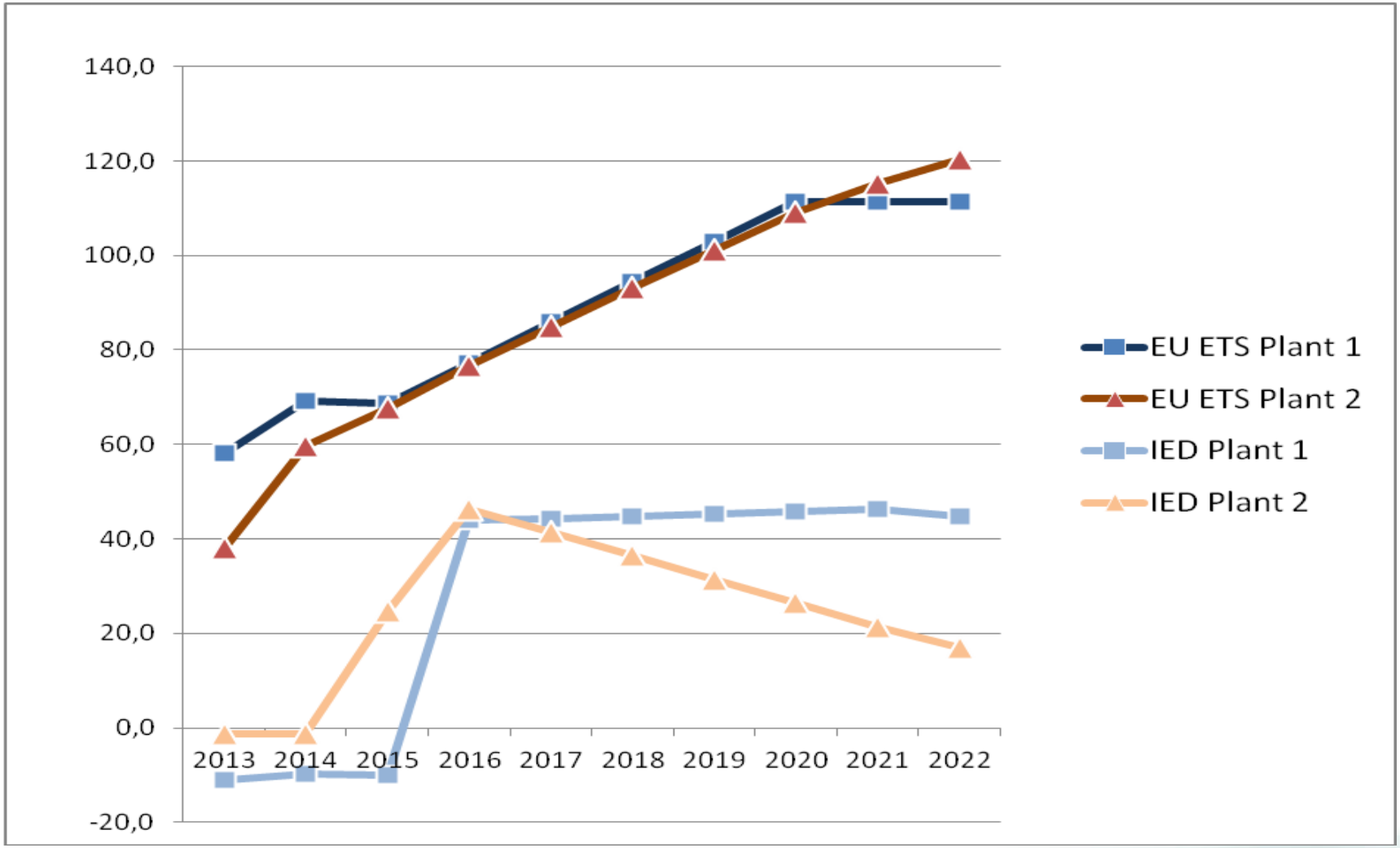
impact on heat price, Czech case study (CZK/GJ heat)



IPPC Directive impact vs EU ETS

CZK/GJ

On average, EU ETS seems to be more costly than IED



Price of one allowance?

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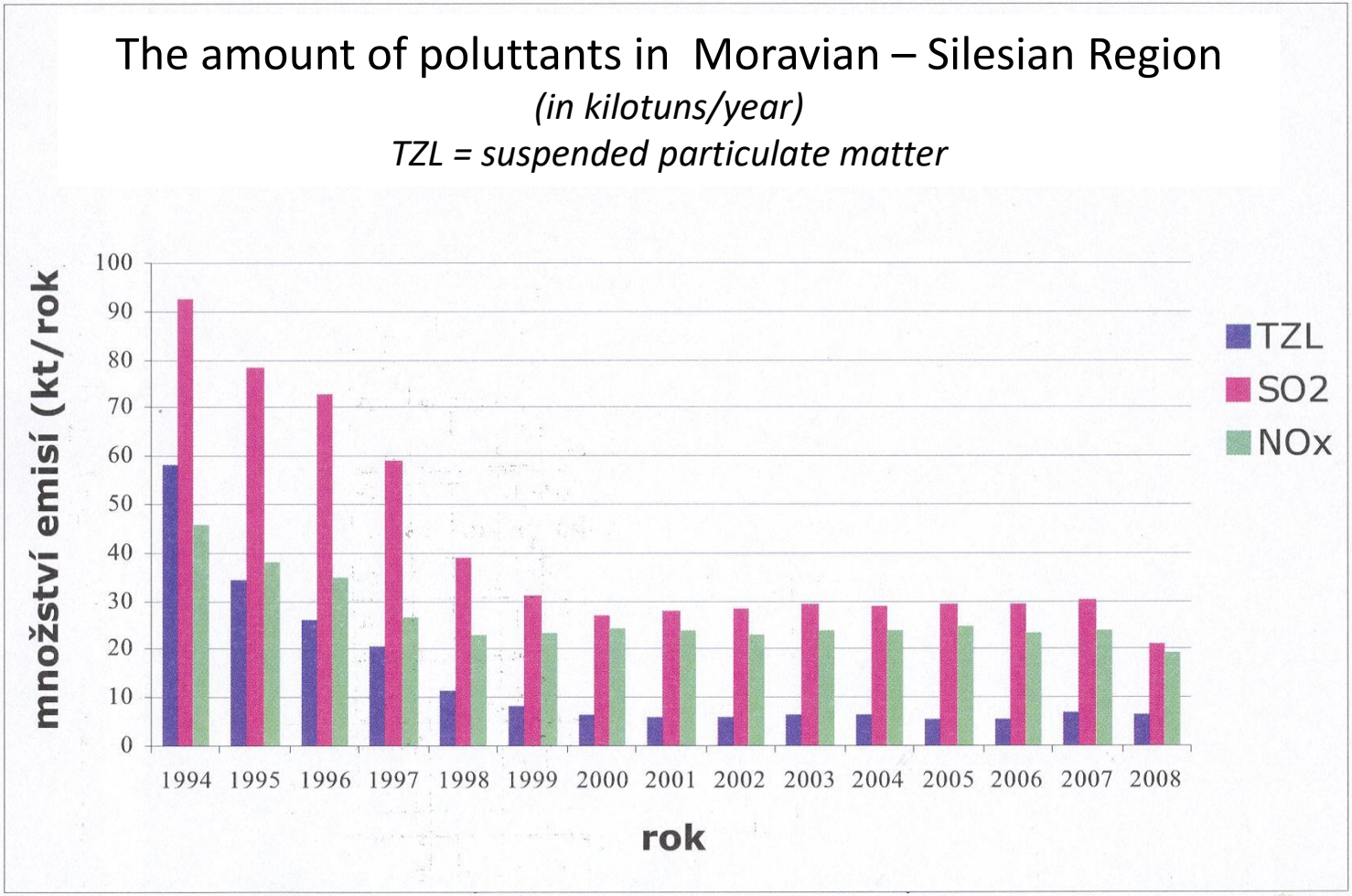
Emissions development in Czech republic (2010)

- What are the arguments:
  - saying the government did well?
  - arguing the government has not been doing much?



What is PM10?

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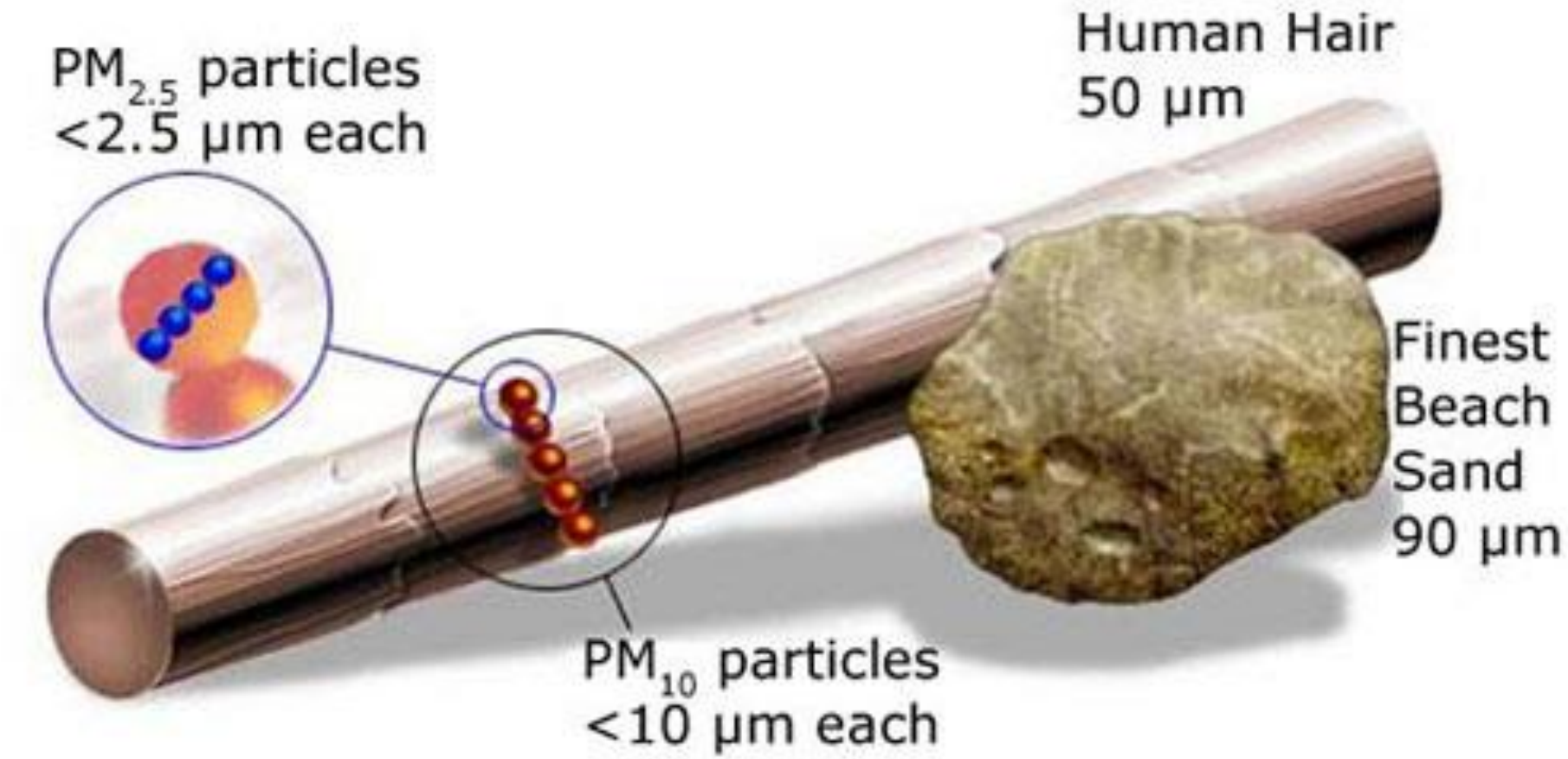

$PM_{2.5}$ particles
<2.5 µm each
Human Hair
50 µm
Finest
Beach
Sand
90 µm
PM_{10} particles
<10 µm each

Current emission limits

Which limit for PM10 is more strict? Daily or annual?

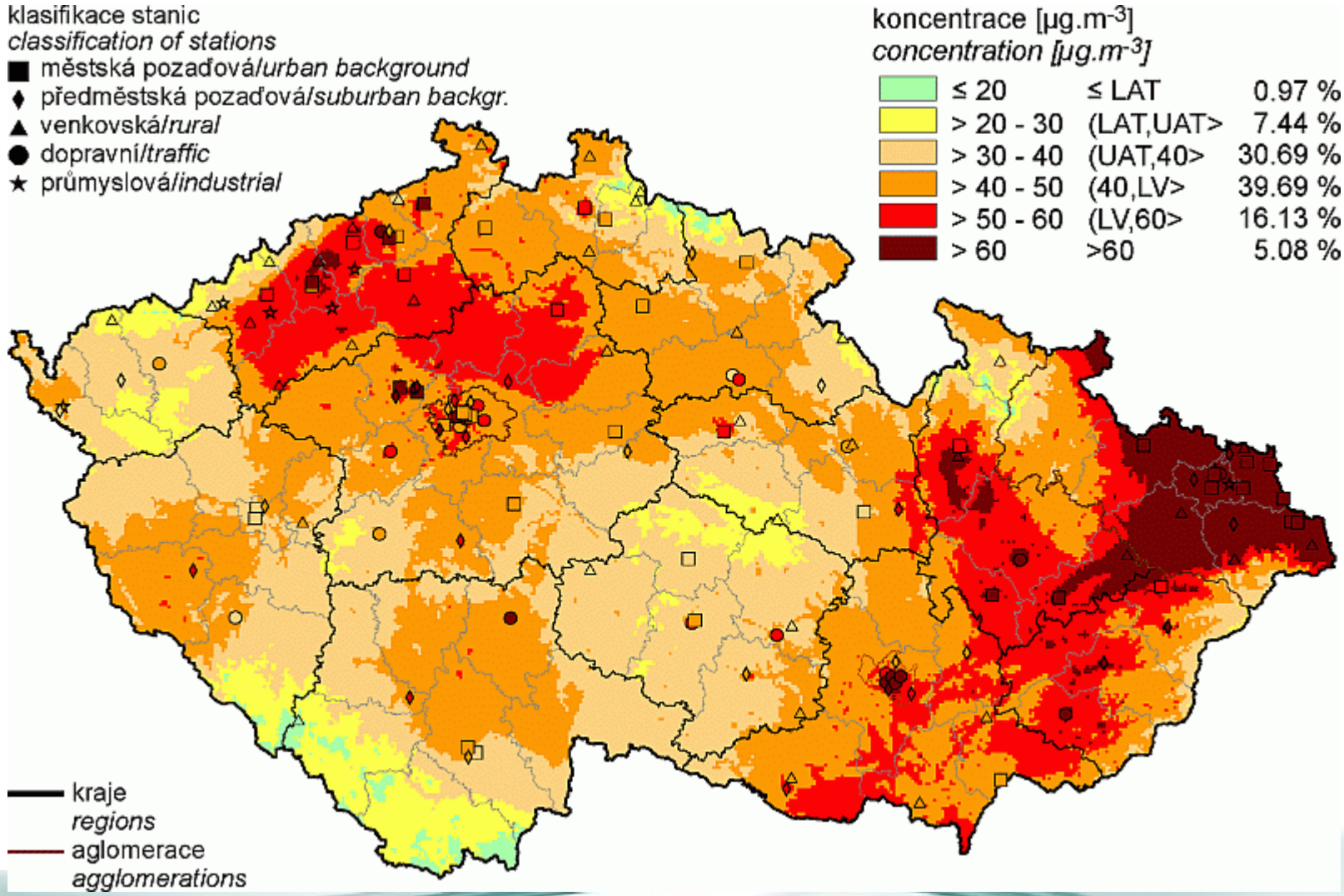
Polutant	Averaging time	imission limit (µg.m^{-3})
SO_2	1 hour	350 *1)*
	24hour.	125 *2)*
PM_{10}	24 hour.	50 *3)*
	1 year	40
NO_2	1 hour	200
	1 hour	40

1) Can not be excceded more than **24 x** *per year*

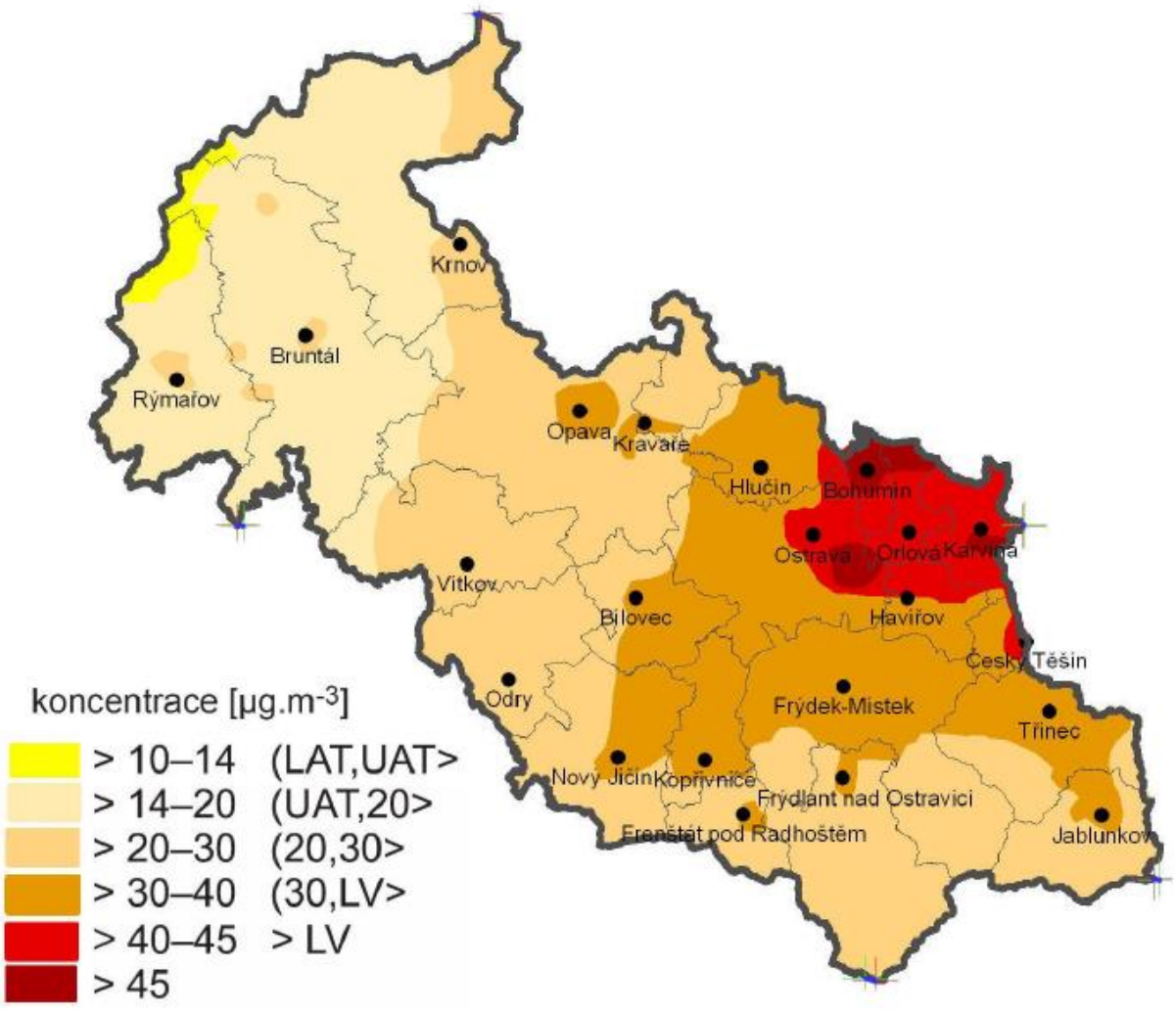
2) Can not be excceded more than **3 x** *per year*

3) Can not be excceded more than **35 x** *per year*

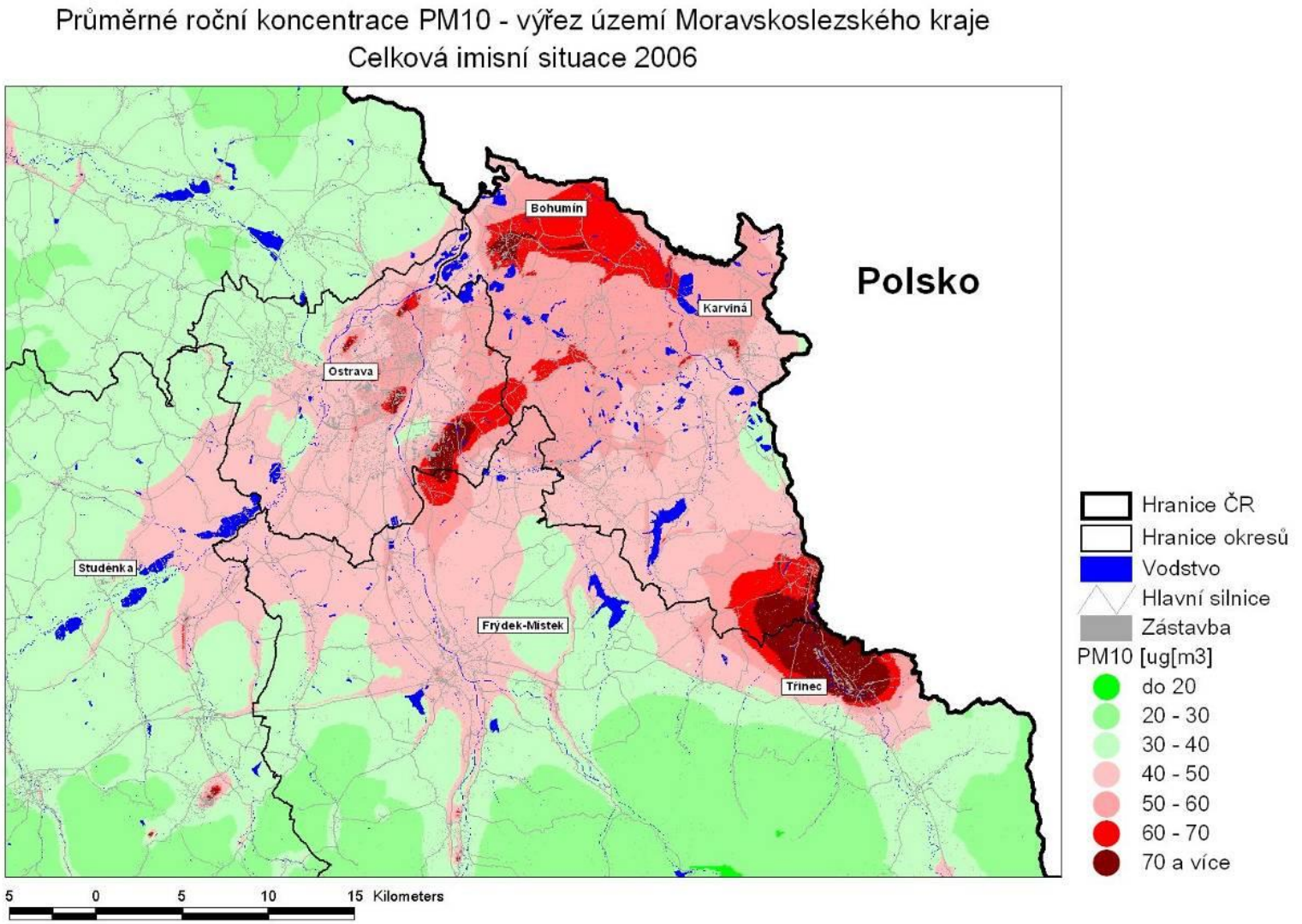
36th highest concentration of PM10 (2010)



Annual average concentrations of PM10 (2008)



Annual average concentrations of PM10 (2006)

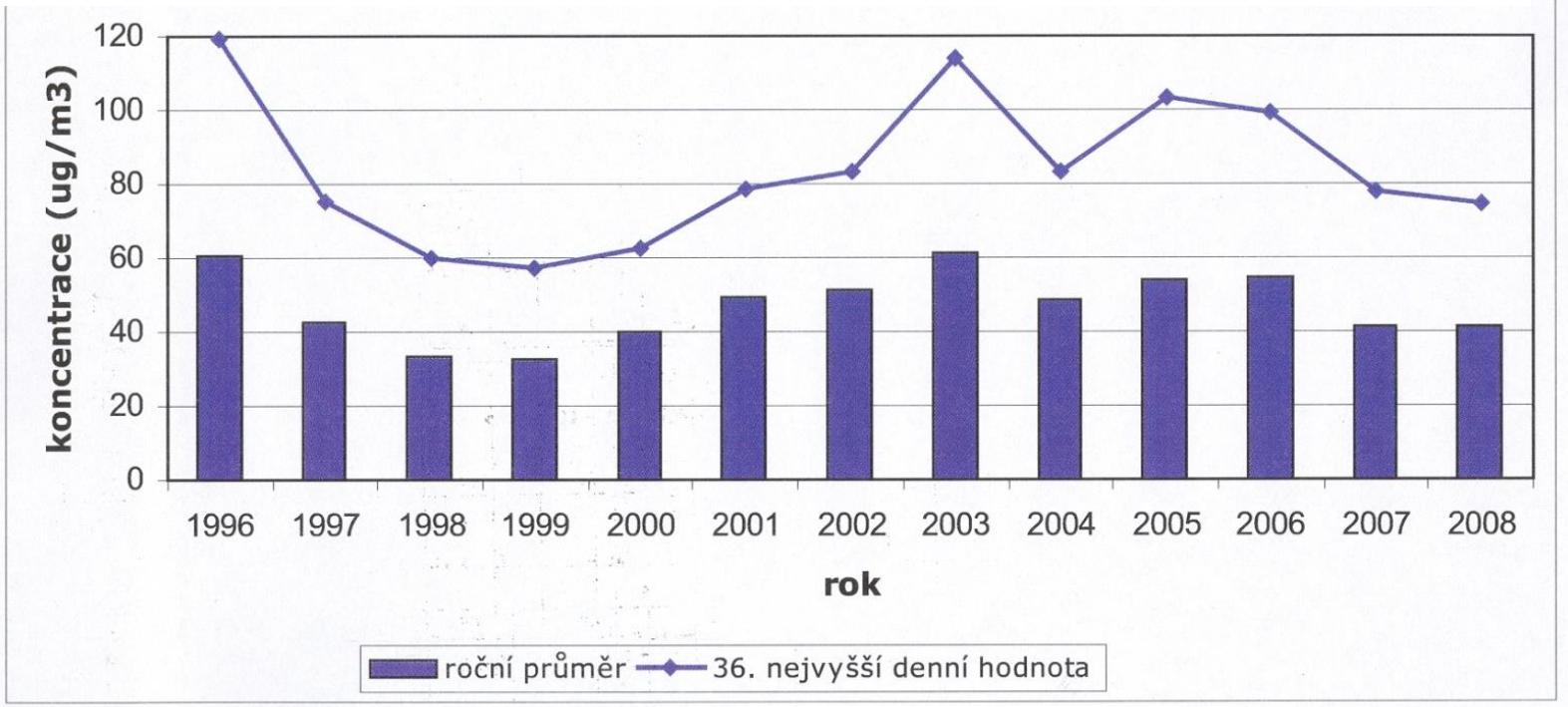


Who is to blame?

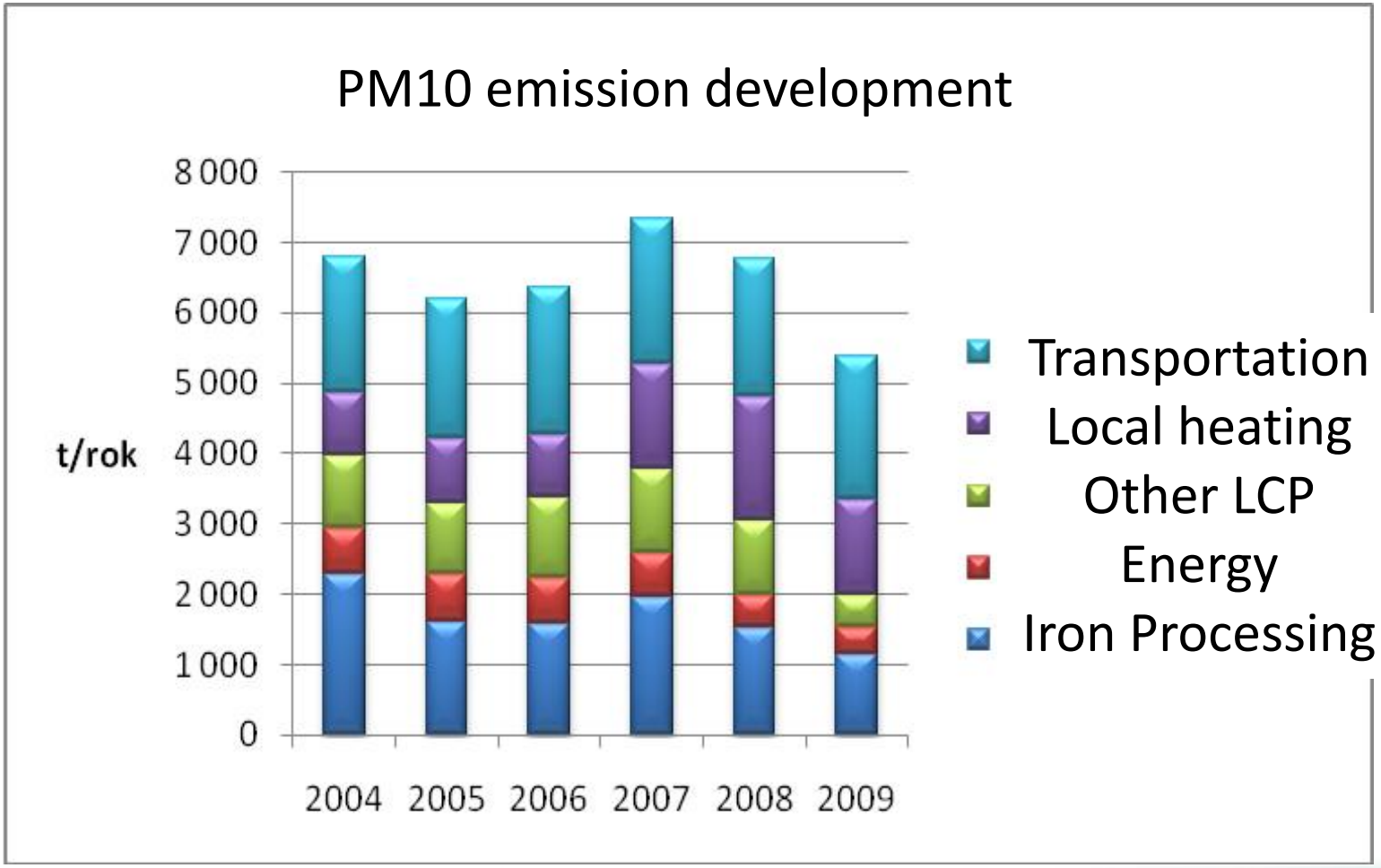
- Assume the 2009 concentrations were the same in 2009.

  How can industry argue it is the households who is to blame?

Average concentrations of PM10 in Moravian-Silesian region (bars = annual average), 2010

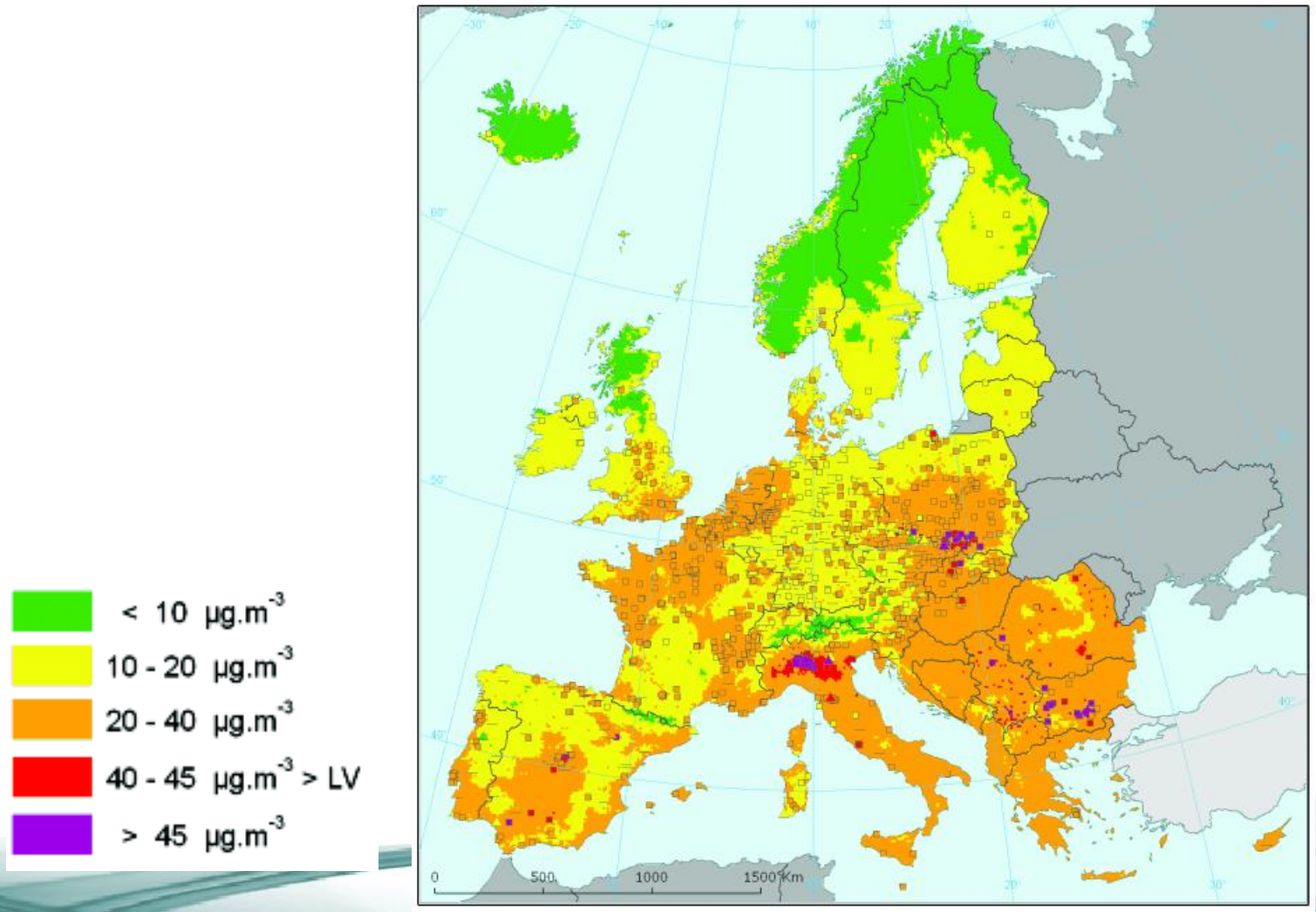


Sources of pollution:



EU comparison: CR, Poland and Italy

Average PM10 concentrations in 2007



World comparion – who is the worst?

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- Ulan Bator– Mongolia

- Highest imssions in Prague:2010 – 117 mg/m^3

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- Ulan Bator– Mongolia

- Highest concentrations in Prague:2010 – 117 mg/m^3
- Highest conc. in Ulan Bator: 2010 – 1400 mg/m^3
  - Daily average in winter: 700 mg/m^3
    - Equivalent of 60 cigarettes (just illustratons)
  - Reason?

- Usual problematic Chinese concentrations: Around 800 mg/m^3

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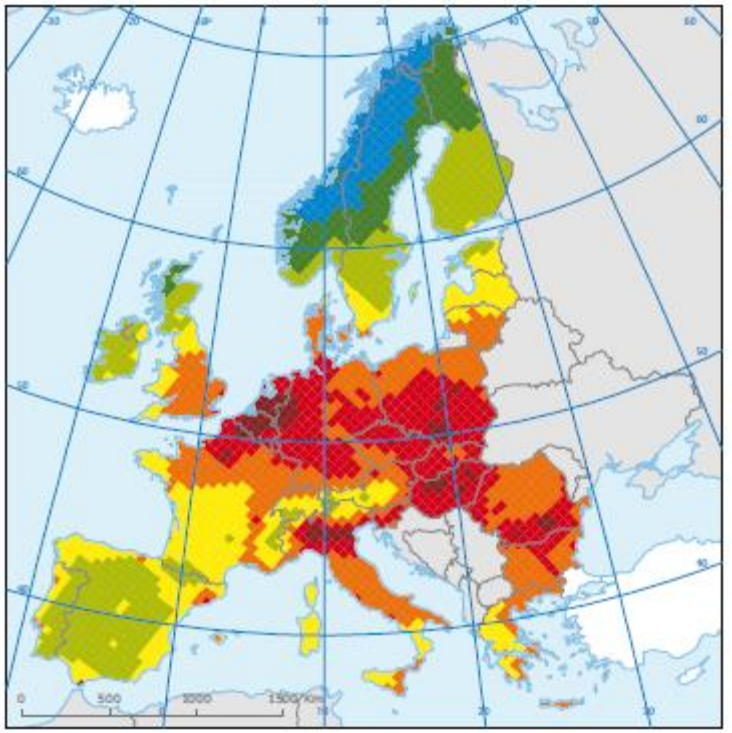
Health impacts:

Average life expenctancy reduction caused by $PM_{2,5}$

Average live expectancy in the Czech Republic?



Zdroj: EEA, 2007

Health impacts:

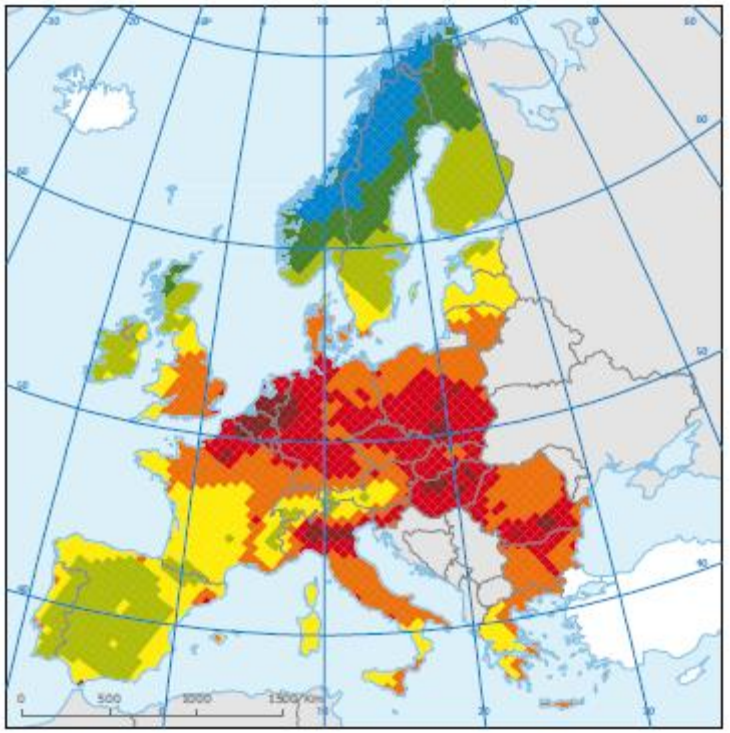
Life expenctancy loss caused by $PM_{2,5}$ in:

Europe: 6 – 24 months

China: 5 years in Norther China (Chen 2013)

Average live expectancy in the Czech Republic?

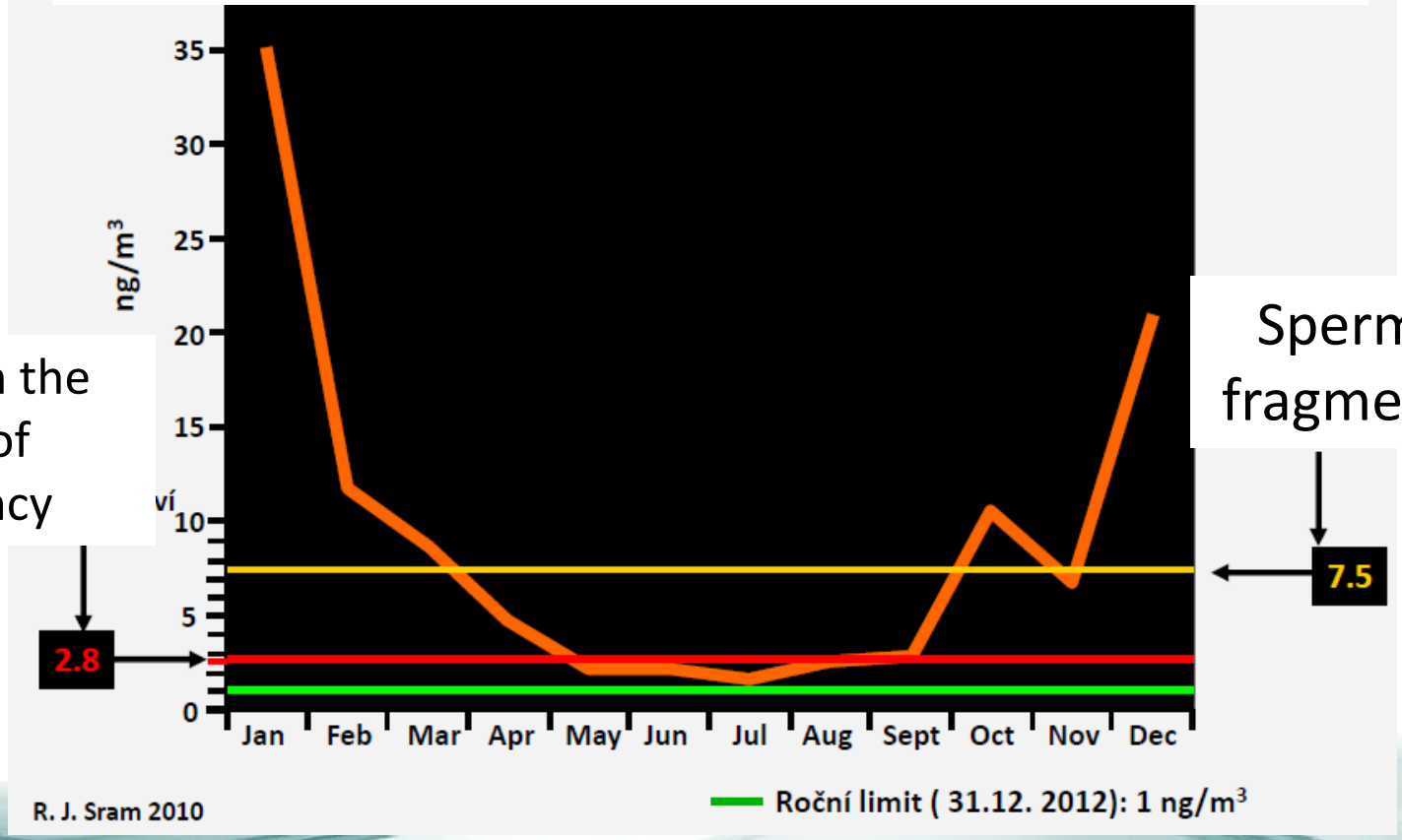
- Men: 73,5 let
- Women: 80 let



Zdroj: EEA, 2007

Health impacts: Fertility

Average benzo(a)pyren concentrations in Ostrava Bartovice 2009



Impact on the result of pregnancy

Sperm DNA fragmentation

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Regulative measures:

1. **Administrative:**
   Legislation – emission limits
   emission ceilings
   IPPC, IED – BAT and combinations

2. **Economic:**
   Pollution fees
   EU ETS

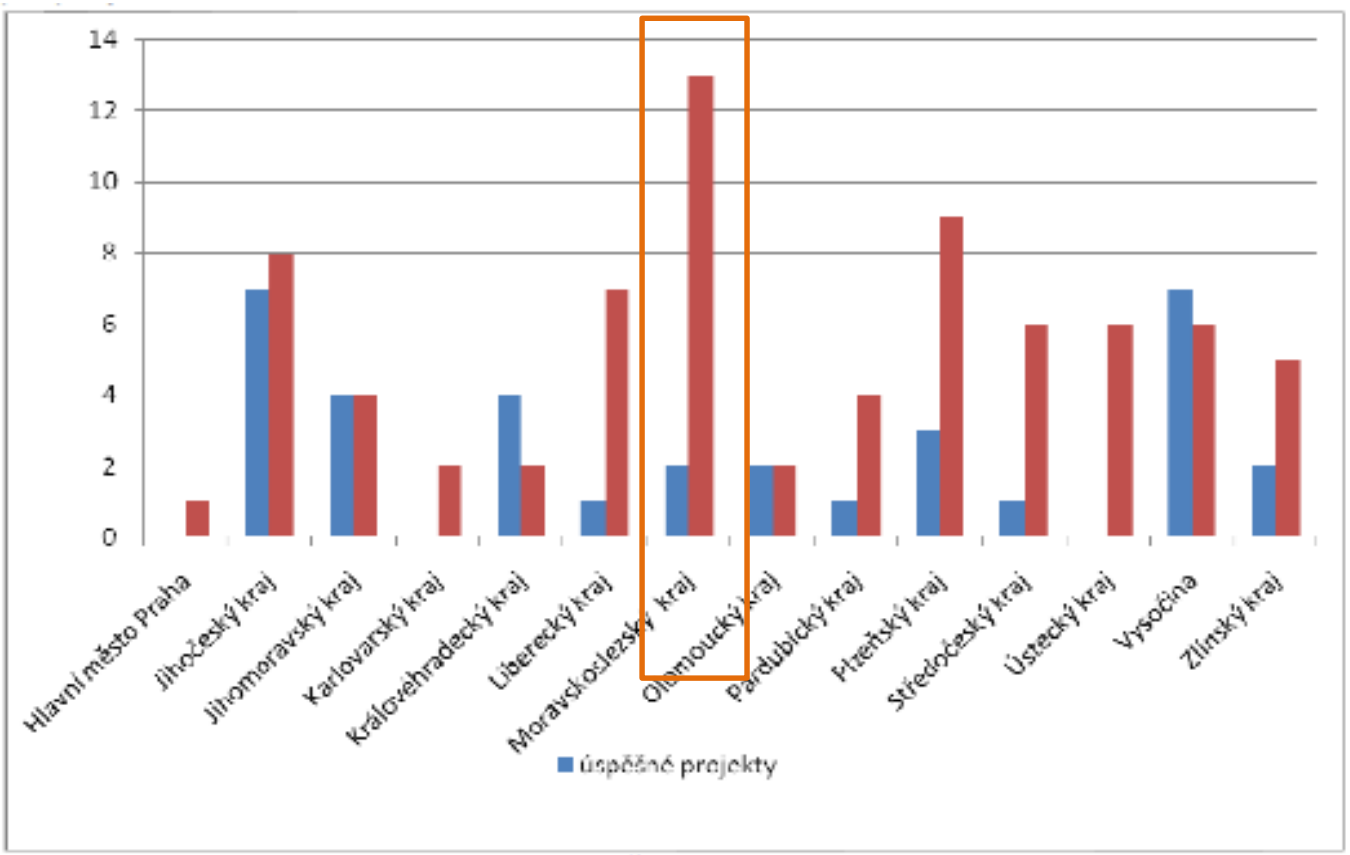
*IED: Industrial Emission Directive
IPPC: Integrated prevention pollution control

OPŽP fund investments

Succesfull/unsuccsefull projects of OPŽP

Is the fund allocation optimal?

(blue = number of funded projects, red = n. of refused)



Zdroj: vlastní zpracování na základě dat IS OPŽP

Thank you

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