Air Pollution Policy Effectiveness

Impacts of selected EU emission policies on European emissions and air quality levels

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Outline

• Method
• Activity data:
  – fuel used in road transport
• Emission factors:
  – Implementation of EURO standards
• Emissions
• Concentrations
• Conclusions
Method

**DATA PREPARATION**

- **downloaded data**
  - TREMOVE: total no. of registered vehicles per vehicle category per vehicle weight class/engine volume per vehicle technology per country per year (1990-2005)
  - TREMOVE: annual average travelled vehiclekilometres per vehicle per vehicle category per vehicle weight class/engine volume per vehicle technology per country (only 2005 available)
  - EUROSTAT: total energy consumption (TJ) per fuel type per country per year for the road transport sector (1990-2004)

- **calculated data**
  - total vehicle kilometers per vehicle category per vehicle weight class/engine volume per vehicle technology per country and year
  - total energy consumption (PJ) per vehicle category, per vehicle weight class / engine volume, per vehicle technology, per country and per year

- **multiplied by the specific vehicle type, technology type and fuel type fuel consumption factor (g/km) (source: COPERT) and the typical energy consumption (MJ/km)**

- **EUROSTAT data are combined with calculated the total energy consumption, resulting in a disaggregation of the EUROSTAT data by vehicle category, weight class / engine volume and vehicle technology.**

- **calculated data**
  - **EUROSTAT: total energy consumption (PJ) split up per vehicle category, per vehicle weight class / engine volume, per vehicle technology, per country and per year**
  - **EUROSTAT: total energy consumption (TJ) per fuel type per country per year for the road transport sector (1990-2004)**

- **EMISSION CALCULATION INTO EMISSION ASSESSMENT MODEL (TEAM)**

- **Definition of activity rates (fuel use) for each source, country and year (aggregated over technologies)**

- **Available technology types per vehicle category, weight class and fuel type identified as separate technologies**

- **Set of 'emission factors' identified for each individual technology, One EF per technology and per pollutant (source: COPERT).**

- **Choice of one or more technologies with its applicable penetration level for each activity rate and scenario.**

- **Emission calculation TEAM model (kg)**
TNO Emission Assessment Model TEAM

Generalised database structure

\[ Emission = Activity \times \sum_{Technologies} \text{Penetration} \times \text{Emission Factor} \]

Investments

"Behaviour"

Economy

Innovation

Economic growth

Fuels and vehicle types

Fuels in road transport
- Share of diesel is increasing
- Gasoline decreases slightly
- LPG is negligible

Vehicle types
- Passenger cars dominate
- HDVs increase considerably

Data from EUROSTAT
Technologies penetration

Gasoline
  - Passenger Cars

Diesel oil
  - HDVs

Emission factors
  - From the revised Guidebook
  - Same as Copert/Tremove

Comparison of our estimate with national reports

Road Transport emissions of NOx

- this study
- EEA gapfilled air emissions
Comparison of our estimate with national reports

Road Transport emissions of PM2.5

- Emissions (Gg)
- This study
- EEA gapfilled air emissions

Effect of policies

- Emissions of NOx from all vehicles on gasoline (EEA-32 countries)
- Emissions of PM2.5 from all vehicles on Diesel (EEA-32 countries)
- No application
- Actual scenario
- Full application
- Economic growth only
- Population growth only
Contribution of different technologies

Effect on road vehicle emission standards on NOx in 2005

- No implementation
- No policy
- ECE 15
- Euro 1
- Euro 2
- Euro 3
- Euro 4
- Actual scenario

Emissions (Gg)

- NOx emission maps, 2005
PM$_{2.5}$ emission maps

Effect on air quality (aerosols)
Effect on air quality (ozone)

Conclusions

• Our approach reproduces the national reported emissions reasonably well
  – NOx EFs for “older” technologies might be too low
• A clear effect of the EURO standards is visible on the emissions’ time trend
  – NOx emissions from gasoline decreased by a factor 3
  – PM$_{2.5}$ emissions from Diesel decreased by a factor of 2
• Full implementation of the latest EURO standards will further decrease the emissions
  – NOx from gasoline by another factor of 4 to 5
  – PM$_{2.5}$ from Diesel by another factor of 2
• There is a significant effect on air quality
  – Total aerosols (primary and secondary particulates)
  – Tropospheric ozone
BAT in large combustion plants
some preliminary results

Next steps

• Similar analysis on the introduction of BAT in large combustion plants is underway
• We will produce a report later this year