Emission and pollution trends of BaP (1990-2015), contribution of main source categories with emphasis on domestic combustion

Sergey Dutchak
EMEP/Meteorological Synthesizing Centre - EAST
Pollution trends of BaP in the EMEP region (2005-2015)

Protocol on POPs
Article 9 REPORTING

EMEP shall provide information on the long-range transport and deposition of persistent organic pollutants

Mean levels of BaP in air measured at background, suburban, and urban sites

At 35% of stations annual mean BaP air concentrations were above the EU target level 1 ng/m³
Exceedances of BaP air quality standards

POP Protocol
Article 8 RESEARCH, DEVELOPMENT AND MONITORING

(f) An effects-based approach which integrates appropriate information ... on measured or modelled environmental levels, pathways, and effects on human health and the environment, for the purpose of formulating future control strategies ...

Exceedance of EU target level 1 ng/m³ - 9 countries (AirBase, 2015)

Exceedance of WHO reference level 0.12 ng/m³ - 16 countries (AirBase, 2015)
Protocol requirements for emission data

Protocol on POPs

Article 9 - REPORTING
Each Party within the geographical scope of EMEP shall report . . . information on the levels of emissions of persistent organic pollutants."

ANNEX III
SUBSTANCES REFERRED TO IN ARTICLE 3

Polycyclic aromatic hydrocarbons (PAHs): For the purposes of emission inventories, the following four indicator compounds shall be used: benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, and indeno(1,2,3-cd)pyrene.

ANNEX V

Major stationary sources of PAH emissions:
- Domestic wood and coal heating (Residential combustion)
- Open fires such as refuse burning, forest fires and after-crop burning
- Coke and anode production
- Aluminium production
- Wood preservation installations
Available BaP emission data (2005-2015)

Protocol on POPs  Article 9 - REPORTING

Each Party within the geographical scope of EMEP shall report . . . information on the levels of emissions of persistent organic pollutants."

**Required emission parameters:**
- Gridded emissions (0.1° x 0.1°)
- Seasonal variations
- Vertical distribution
- Global emissions

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**Seasonal variation of BaP emissions**

- **Sectoral emission data - 42 countries**
- **No data - 9 countries**

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**Official emission data**

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**Emissions, µg/m²/day**

- Jan
- Feb
- Mar
- Apr
- May
- Jun
- Jul
- Aug
- Sep
- Oct
- Nov
- Dec

3rd TFTEI Annual Meeting Rome, October, 20, 2017
PAH (BaP) emissions from main source categories in the most of EMEP countries

PAH emissions by sectors

- Residential combustion – the largest contributor of PAH emissions (>70%)
- Emissions of residential combustion are almost stable during the last decade (2005-2015)
BaP emissions from different source categories

Fraction of emissions from residential combustion, 2015

<table>
<thead>
<tr>
<th>Countries</th>
<th>BaP, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belgium</td>
<td>87</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>97</td>
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<td>Germany</td>
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<td>Poland</td>
<td>80</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>90</td>
</tr>
<tr>
<td>....</td>
<td>~ 70</td>
</tr>
</tbody>
</table>

*France*
- Residential combustion

*Norway*
- Industry

*Spain*
- Agriculture
Peculiarities of PAH (BaP) emissions in Spain: recent inventories - 2017

Residential combustion

Agriculture

Emissions, %

0 20 40 60 80

Residential combustion Agriculture Other

EMEP

Spain

3rd TFTEI Annual Meeting Rome, October, 20, 2017
Pollution of cities by BaP from different source categories – Czech Republic

Main sector of BaP emissions in Czech Republic – Residential combustion (97 %)

BaP air concentrations

BaP emission from sectors
Residential combustion

Fuel consumption per fuel type in 2012

Source: ETC/ACM Technical Paper 2015/1
Uncertainties of emission data

BaP pollution in the EMEP countries: discrepancies between modelling and measurements

- Germany: “the PAHs emissions in the inventory are likely to be overestimated” *(DE IIR, 2017)*
- "Underestimation of BaP emissions of France”
  CHIMERE modelling study *(Florian Couvidat, TFMM meeting, 2017)*
Transboundary transport of PAH pollution

PAH deposition in 2015

For about 70% of the countries contribution of transboundary fluxes exceeded contribution of national emissions to deposition
Future emission activities

Report  Air quality in Europe – 2016

3.2 Air pollutant emissions from residential combustion

In European emission inventories, combustion of fuels within the residential sector is the major source of primary \textbf{PM2.5} and \textbf{PM10}, as well as \textbf{BC} and \textbf{BaP} emissions, contributing 56 \%, 40 \%, 46 \% and 71 \% to emissions, respectively.

\textbf{Integrated Assessment of Black Carbon and Tropospheric Ozone, UNEP and WMO 2011}

Key findings (emission projections up to 2030)

Without implementation of measures beyond current and planned regulations, emissions of BC, OC and carbon monoxide (CO) are projected to \textit{remain relatively constant to 2030}.

Emissions from \textit{residential biomass combustion} are expected to become even more important in the future than they are today.
Protocol on POPs came into force in 2003, but levels of pollution by BaP are still higher than EU target value in many countries.

About 35% of sites showed increasing concentrations in period 2005-2015 (> 300 sites)

Protocol on POPs - Article 10

3. The Parties shall ... review the sufficiency and effectiveness of the obligations set out in the present Protocol. Such reviews will take into account the best available scientific information on the effects of the deposition of persistent organic pollutants, ... and the fulfillment of the obligations on emission levels.
Future work

Report of the ad-hoc Policy Review Group of experts (WGSR)

B. Maximizing the impact of the Convention and its Protocols

Updating the amended Protocols (POPs ...):

*Task Force on Techno-economic Issues (TFTEI)* explore to what extent the Protocol on POPs could be further developed with respect to UPOPs, especially on PAHs, and explore whether and which stricter measures could be recommended for the UNECE region.

Draft 2018–2019 workplan (Steering Body to the EMEP)

| 1.1.3.1 Analysis of effectiveness of implementation of Protocol on POPs | Contribution to evaluation of stricter measures for mitigation of BaP pollution levels; analysis of trends, key sources and projections Report in 2019 | MSC-East in support to TFTEI |