

☺ **Emission of dioxins into the air**

DPSIR



* provisional figures

** other: agriculture + transport + trade & services

Source: VITO

Emission of dioxins remains unchanged

Dioxins are formed during the incomplete combustion of organic material in the presence of a source of chlorine. Dioxins can be ingested by humans via, among other things, food (e.g. dairy foods) and cause cancer, negative effects on growth and development, and various other disorders. The reduction of dioxin emissions, therefore, remains an important goal.

Between 2000 and 2002, dioxin emissions decreased by 20 % but since then have remained largely unchanged. In the 1990s, drastic remedial measures were taken, especially in the non-ferrous industry, the iron and steel industry and waste incineration, resulting in a significant decrease in industrial emissions.

Households were responsible for the largest part (68 %) of dioxin emissions in 2011. Three-quarters of the household emissions come from private, illegal burning of waste in open fires and small barrels. The remaining household emissions come from building heating with solid fuels (coal, but mainly wood). These emissions from the heating of homes were 28 % lower in 2011 than in 2010. The reasons for this are the milder winter and the continuing shift to liquid and gaseous fuels.

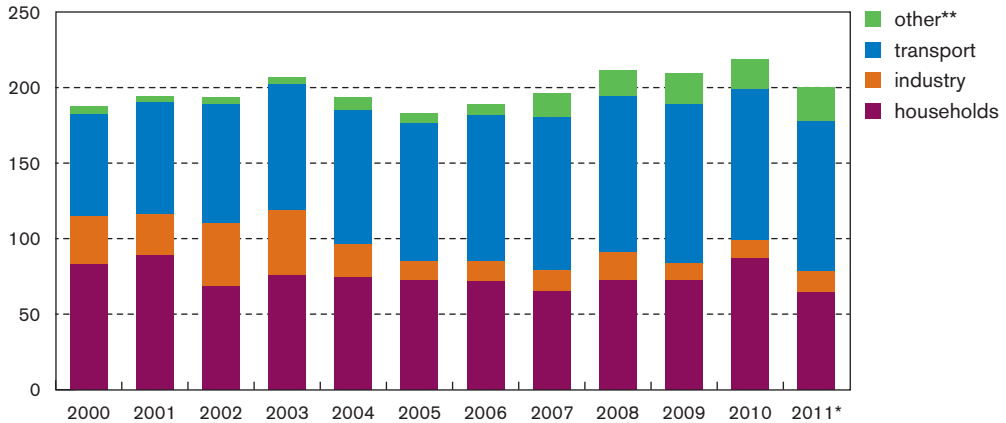
Convincing public awareness campaigns, support for an ambitious and cost-effective product standardisation at the federal and European levels, and (tax) stimulation of environmentally friendly technologies are the most important instruments for further reducing household dioxin emissions. Thus, in 2012, the Flemish Government launched a large-scale awareness campaign 'Stook Slim' to raise public awareness about the release of harmful substances during the burning of waste in open fires and the burning of treated wood in stoves used for building heating.

| dioxin emissions (g TEQ) | 2000 | 2005 | 2008 | 2009 | 2010 | 2011* |
|--------------------------|--------------|--------------|--------------|--------------|--------------|--------------|
| households | 32.55 | 31.52 | 31.39 | 31.38 | 33.06 | 30.25 |
| industry | 10.25 | 11.29 | 9.23 | 6.70 | 6.93 | 8.63 |
| energy | 12.40 | 3.91 | 4.87 | 4.75 | 4.80 | 4.75 |
| other** | 0.90 | 0.64 | 0.67 | 0.62 | 0.62 | 0.58 |
| total | 56.11 | 47.36 | 46.15 | 43.45 | 45.41 | 44.21 |

☺ Emission of PAHs into the air

DPSIR

PAH emissions (tonnes)



* provisional figures

** other: energy + agriculture + trade & services

Source: VITO

PAH emission not decreasing

Polycyclic aromatic hydrocarbons (PAHs) are formed during the incomplete combustion of organic material. When ingested by humans (mainly via food), some PAHs can give rise to cancer. The further reduction of PAH emissions, therefore, remains an important goal.

Total PAH emissions in Flanders in 2011 were still 7 % higher than in 2000. Compared with 2010, however, emissions decreased by 9 % in 2011.

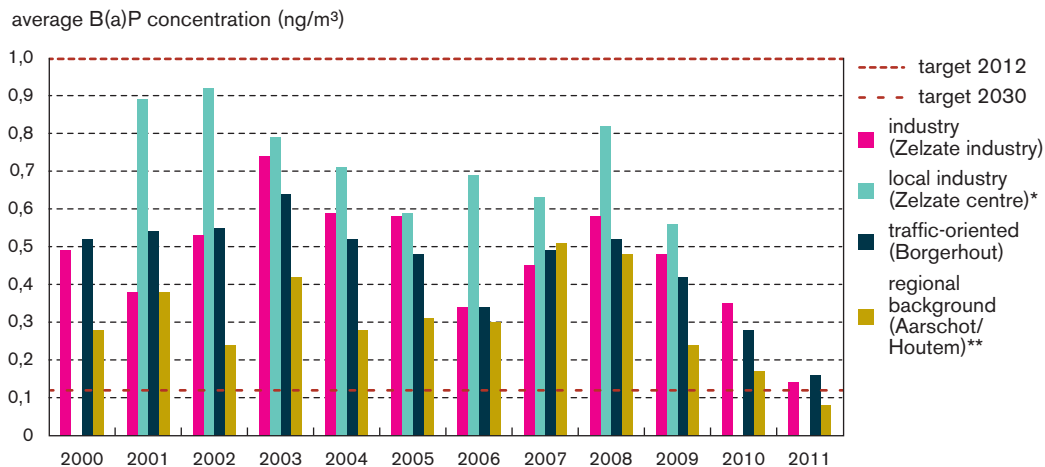
In 2011, households were responsible for 32 % of the total PAH emissions. The household sources are coal and wood-fired building heating (89 %) and the burning of waste in small barrels and open fires (11 %). Between 2010 and 2011, PAH emissions from building heating decreased by 28 %. The reason for this is the decreasing use of solid fuels thanks to the milder winter and the switch to more environmentally friendly fuels. However, the control of PAH emissions from both building heating with solid fuels (mainly wood) and the private, illegal burning of waste remains a point for attention. Emission reduction can be achieved, among other measures, by introducing specific regulations on heating buildings with solid fuels. Thus, new coal and wood stoves have had to meet minimum dust standards since October 2010. These standards will be tightened up step-by-step in the coming years, which will eventually have a positive effect on the emission of particle-associated PAHs.

Half of the PAH emissions are caused by transport. Since 2000, the PAH emissions from transport have increased by half, mainly as a result of the increasing transport flows and the growing use of diesel and catalytic converters. The latter are responsible for the increase in PAH emissions, more specifically of naphthalene. The phased introduction of higher euro classes will in most cases tighten up the emission standards for, among others, particulate matter and hydrocarbons from passenger cars, light duty vehicles and trucks. This is also expected to have a favourable impact on future PAH emissions from transport.

| PAH emissions (kg) | 2000 | 2005 | 2008 | 2009 | 2010 | 2011* |
|--------------------|----------------|----------------|----------------|----------------|----------------|----------------|
| households | 83 201 | 72 825 | 72 746 | 72 585 | 86 761 | 64 411 |
| industry | 31 363 | 12 245 | 17 919 | 11 271 | 12 419 | 13 894 |
| transport | 68 001 | 91 448 | 103 476 | 105 124 | 99 541 | 99 517 |
| other** | 5 284 | 6 096 | 17 599 | 20 545 | 20 297 | 22 259 |
| <i>total</i> | <i>187 849</i> | <i>182 614</i> | <i>211 740</i> | <i>209 526</i> | <i>219 019</i> | <i>200 080</i> |

 PAH concentration in ambient air

DPSIR



* no methodologically comparable measurements in 2010 and 2011; ** from 2009 no measurements in Aarschot but in Houtem (Aarschot is no longer considered as background, Houtem is)

Source: VMM

Sustained attention needed for public health

Since 2000, VMM has been measuring polycyclic aromatic hydrocarbons (PAHs) in the ambient air. B(a)P (benzo(a)pyrene) is one of the best known PAHs because of its carcinogenic properties and is used as reference for the total PAH concentration. Nitro-PAHs are secondary pollutants and result from photochemical reaction of PAHs. These secondary pollutants are usually more mutagenic and carcinogenic than the actual PAHs, but occur in smaller concentrations. The health hazard of nitro-PAHs for humans, animals and the environment is, therefore, of the same order of magnitude as that of PAHs.

The 4th Air Quality Daughter Directive (2004/107/EC) uses a target value of 1.0 ng B(a)P/m³ in the air as an annual average to be reached in 2012. In its Air Quality Guidelines, the World Health Organization indicates a cancer risk of 1 in 100 000 exposed people for a lifelong exposure to 0.12 ng B(a)P/m³ in the air. This can be used as a target value for 2030. For nitro-PAHs, there are as yet no target or limit values at the European or Flemish level.

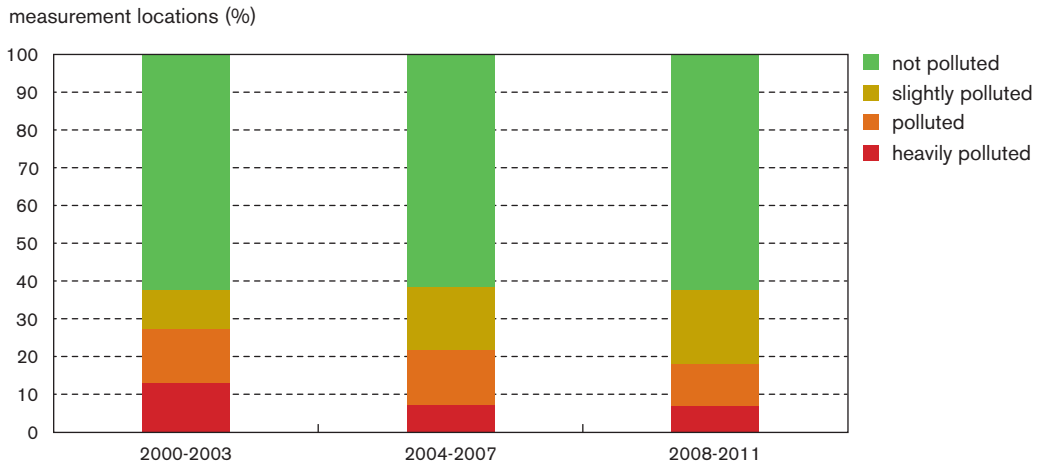
Average annual concentrations have fluctuated between 0.3 and 0.6 ng B(a)P/m³ in recent years. In 2011, they were everywhere less than 0.2 ng B(a)P/m³. Weather conditions and local conditions, such as wood burning for heating in residential areas, are major factors and can have a great impact on the B(a)P concentration in the surrounding area. In winter, higher concentrations are measured than in the summer, which is a consequence of building heating with solid fuels (coal, and mainly wood).

The concentration of nitro-PAHs broadly corresponds to that of PAHs, albeit less pronounced and not at all measurement locations. For some nitro-PAHs, we see an increase in summer as compared to winter due to the more favourable conditions for photochemical reactions (higher temperature and more UV light).

The policy on PAHs and nitro-PAHs is focused on reducing the emissions and, consequently, the concentrations. This is achieved, among other measures, by applying Best Available Techniques (BAT) for industrial installations and by introducing regulations on building heating with solid fuels. New coal and wood stoves have had to meet minimum dust standards since October 2010. These standards will be tightened up step-by-step in the coming years.

☺ PCBs in watercourse sediments

DPSIR



Source: VMM

PCB pollution decreasing but standards still often exceeded

Polychlorobiphenyls (PCBs) were once used in, among other things, transformers and condensers. Due to leaks or improper dismantling of these appliances, PCBs have escaped into the environment. Some PCBs are toxic and can, when ingested by humans and animals, have harmful effects on health, such as developmental disorders and immune system dysfunctions. Some PCBs are also carcinogenic.

The monitoring of the watercourse sediment quality has been running for more than ten years and many of the measurement locations have already been sampled more than once in that period. In order to find out to what extent the watercourse sediment quality has changed in that period, 240 measurement points were selected that had been sampled in the period 2000-2003, 2004-2007 and in 2008-2011 (see figure). The percentage of heavily polluted measurement locations has almost halved, whereas the percentage of unpolluted or slightly polluted watercourse sediments has increased.

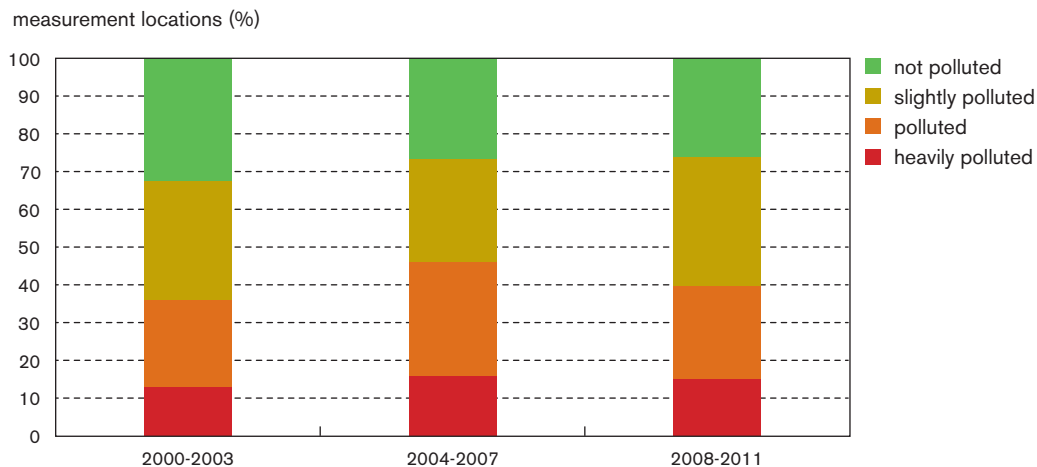
The measurement results from all sampled measurement locations for the period 2008-2011 (more than the aforementioned 240) indicate that 61 % of the measurement locations show no deviation from the reference value for PCBs and are, therefore, considered not to be contaminated. 17 % of the measurement locations are slightly contaminated, 12 % are contaminated and 10 % are heavily contaminated. Individual PCBs are often the cause of the standards being exceeded. For a few PAHs, that is the case in more than 30 % of the watercourse sediments investigated.

Improvements in the watercourse sediment quality can have various causes:

- removal of sediment (although remediation does not always lead to an improvement in the watercourse sediment quality because the historic contamination has sometimes penetrated deep into the sediment);
- due to reduced discharges of toxic substances, the newly formed watercourse sediment – in other words the top layer of sediment – is less contaminated;
- due to the changed physico-chemical quality of the water column, for example a higher oxygen concentration, release of toxic substances from the watercourse sediments into the water column can occur.

☹ PAHs in watercourse sediments

DPSIR



Source: VMM

No noticeable improvement

Polycyclic aromatic hydrocarbons (PAHs) are formed during the incomplete combustion of organic material. When ingested by humans (mainly via food), some PAHs can cause lung and digestive system cancers.

The monitoring of the watercourse sediment quality has been running for more than ten years and many of the measurement locations have already been sampled more than once in that period. In order to find out to what extent the watercourse sediment quality has changed in that period, 240 measurement points were selected that had been sampled in the period 2000-2003, 2004-2007 and in 2008-2011 (see figure). In contrast to, for example, organochlorine pesticides and PCBs, the PAH contamination of the Flemish watercourse sediments has not improved.

The measurement results of all sampled measurement locations for the period 2008-2011 (more than the aforementioned 240) indicate that 26 % of the measurement locations show no deviation from the reference value for PAHs (sum of the six Borneff PAHs) and are, therefore, considered not to be contaminated. 32 % of the measurement locations are slightly contaminated, 27 % are contaminated and 15 % are heavily contaminated.

Individual PAHs are often the cause of the standards being exceeded. For a few PAHs that is the case in about one quarter of the watercourse sediments investigated.