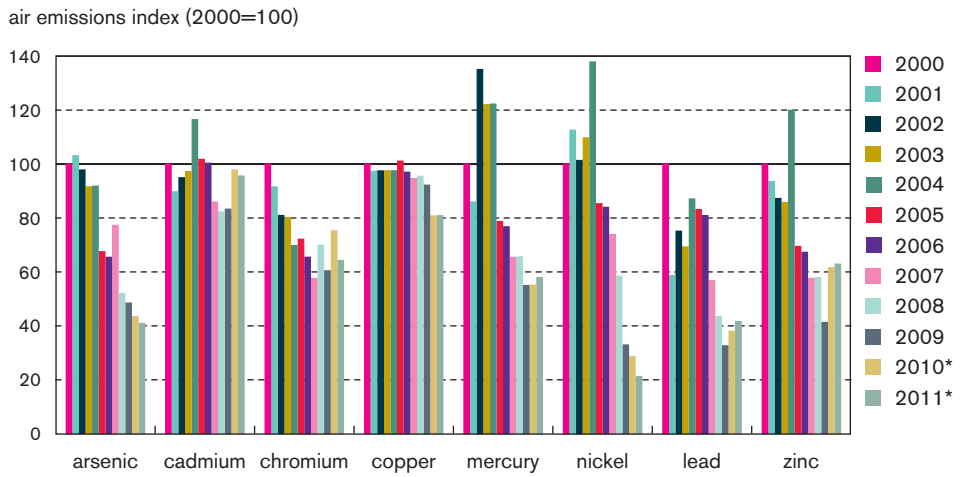
## 😐 Emission of heavy metals into the air

DPSIR




* provisional figures
emissions from road traffic for 2010 not comparable with 2000-2009 series due to model modifications; emissions from road traffic for 2011 assumed identical with those for 2010

Source: VMM

### Predominantly decreasing emissions

All emissions of heavy metals into the air have decreased since 2000. In the middle of the 2000s, the decrease seemed to stagnate somewhat. In 2008 and 2009, the emissions of most metals decreased again. The financial-economic crisis probably had something to do with this. The trends in 2010 and 2011 are not clear-cut.

Industrial emissions of all heavy metals decreased significantly in the period 2000-2009. The recent increase in the total cadmium and zinc emissions is caused mainly by the metal sector. When considering the whole period 2000-2011, the emissions of all heavy metals by the energy sector have decreased. The energy sector accounts for a major part of the mercury emissions, mainly from oil refineries and waste incineration.

The transport sector has a particularly large share in the copper emissions, mainly because of brake wear. With the exception of lead, the emissions of heavy metals from transport did not decrease in the period 2000-2009. Due to major model modifications, the figures for 2010 are difficult to compare with those of previous years. For 2011, the figures had to be kept constant at 2010 levels. These problems also have their impact on the total emissions of a number of heavy metals in Flanders. The impact is especially significant for copper and chromium and, to a lesser extent, for zinc and lead.

Emissions of heavy metals from households are mainly attributable to building heating. They do not show any pronounced trend in the period 2000-2010. In 2011, they were markedly lower than in 2010. The heating demand in 2011 was also lower than in 2010.

| emissions 2011* (%) | arsenic | cadmium | chromium | copper | mercury | nickel | lead | zinc |
|---|---|---|---|---|---|---|---|---|
| households | 12.1 | 9.5 | 6.6 | 8.8 | 12.9 | 4.2 | 3.5 | 5.1 |
| industry | 73.8 | 66.1 | 32.5 | 6.5 | 42.5 | 56.1 | 72.2 | 47.0 |
| energy | 11.1 | 17.9 | 12.7 | 2.1 | 41.0 | 21.0 | 5.6 | 2.6 |
| agriculture | 1.4 | 1.2 | 2.0 | 0.6 | 1.4 | 9.7 | 4.3 | 1.2 |
| transport | 0.3 | 3.4 | 44.6 | 81.8 | 0.3 | 5.2 | 14.1 | 42.6 |
| trade & services | 1.3 | 1.9 | 1.5 | 0.2 | 1.9 | 3.7 | 0.3 | 1.4 |

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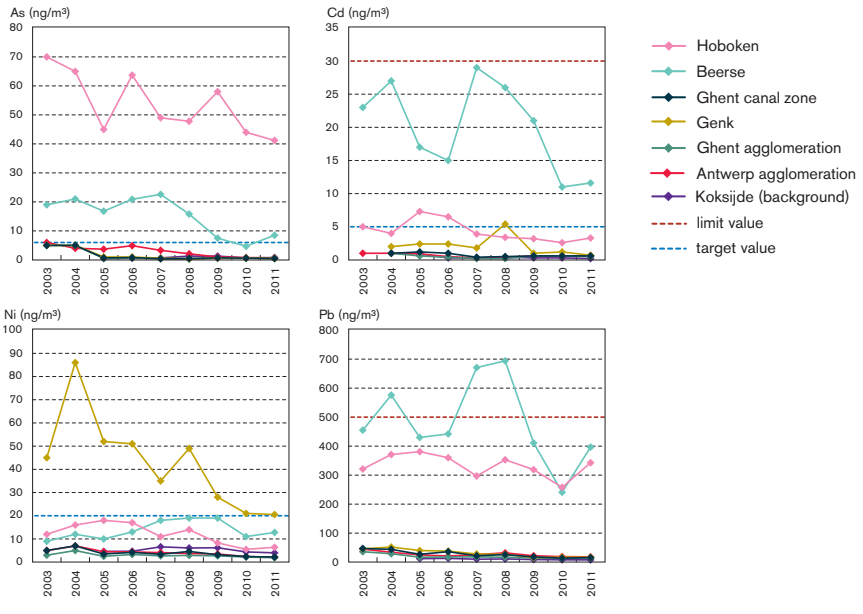



Source: VMM

**No limit values exceeded, only future European target values exceeded locally**

The presence of heavy metals in the air can be a health hazard. In monitoring their concentrations, most attention goes to places where problems can occur. The measurement stations in Hoboken, Beerse and Genk are therefore located in the vicinity of (non-)ferrous companies. All figures here are based on measurements in $PM_{10}$ particulate matter and at the measurement station with the highest concentrations and a complete time series.

Between 2003 and 2011, there was a change for the better in the concentrations of heavy metals in the air at most measurement stations. This means there is a general improvement in air quality. The total emissions in Flanders decreased significantly for the majority of heavy metals. The decreasing concentrations in the industrial areas are the result of emission-reduction measures but also of the financial-economic crisis. The concentrations in 2011 were often higher than in 2010. This may have been caused by the greater frequency of southwestern winds which carried more contaminated air over the measurement stations.

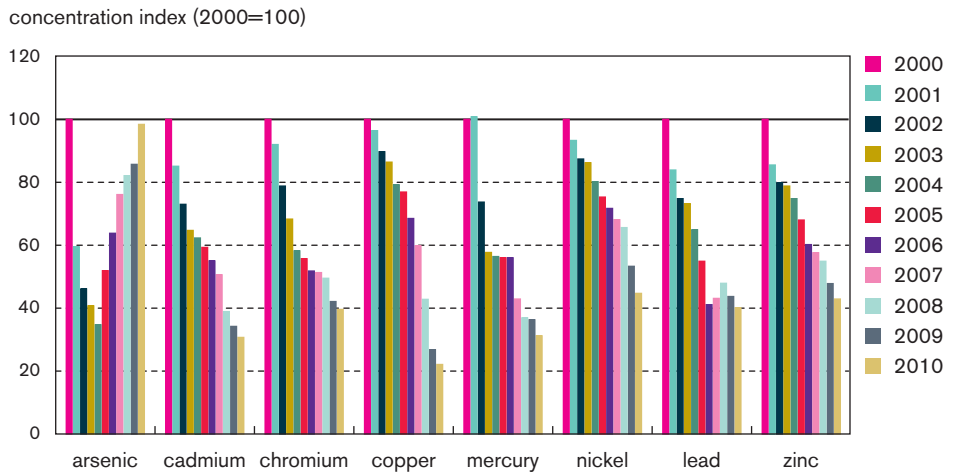
The European limit value for lead and the Flemish limit value for cadmium were achieved everywhere in Flanders in 2011. The European target values for arsenic, cadmium and nickel came into effect on 31 December 2012. In 2011, the target value for arsenic was exceeded at all four measurement stations in Hoboken and at one of the three measurement stations in Beerse. The target value for cadmium was exceeded at two of the three measurement stations in Beerse. The target value for nickel was exceeded at two of the four measurement stations in Genk. Problems with heavy metals in the air are thus limited to local areas in the sector downwind of the companies concerned. In cities and background areas, the concentrations of heavy metals in the air are much lower than in industrial environments.

In 2011, the numbers of inhabitants exposed to concentrations above the target values were as follows:

- Hoboken: some 3 000 inhabitants exposed to too high arsenic concentrations;
- Genk: some 300 inhabitants exposed to too high nickel concentrations;
- Beerse: some 90 inhabitants exposed to too high cadmium concentrations.

## 😐 Heavy metals in surface water

DPSIR




The values in the figure are moving average total concentrations where the value for year x is the average of x-1, x, x+1. Concentrations are expressed relative to the value for 2000.

Source: VMM

### Favourable trend for nearly all metals

Metals are by definition not degradable and (bio)accumulate in the aquatic environment. At higher concentrations, they can become toxic for aquatic organisms. Metals occur in surface water in dissolved and bonded forms.

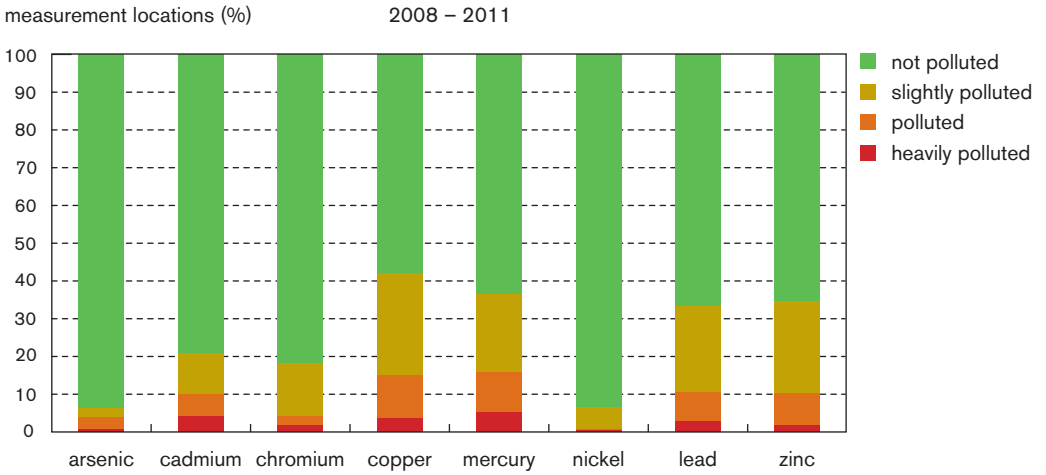
The average total concentrations of nearly all heavy metals have decreased significantly in the last decade. The decreases vary from 55 % for nickel to 78 % for copper and are the result of the efforts of companies and the expansion of the public waste water treatment. Arsenic is the sole exception to these positive trends. The recent increase in the arsenic concentrations does not occur everywhere. Increasing concentrations are observed at a number of measurement locations in the coastal region where the supply of arsenic-rich groundwater may be a possible cause. An increase in arsenic concentrations was also recorded at a few other measurement stations, e.g. in the Sea Scheldt. The cause of this increase is unclear.

### Zinc, arsenic and cadmium exceed the standards most often

Of the eight standard heavy metals, arsenic (19 %), zinc (15 %) and cadmium (7 %) exceeded the standard most often in 2011. The most important source of zinc in surface water is corrosion of construction materials, while for arsenic and cadmium it is soil erosion. The standards for nickel, copper, chromium, mercury and lead are rarely, if ever, exceeded. Further, the high percentage of measurement stations, where the standard for cobalt (59 % in 2011) is exceeded, is remarkable. The known discharges of cobalt do not seem to be able to fully explain this high percentage. Natural background concentrations could possibly also play a significant role.

## 😐 Heavy metals in watercourse sediments

DPSIR




Source: VMM

### Copper and zinc exceed the standards most often



The physico-chemical evaluation of the watercourse sediment includes, among other things, a study for the presence of heavy metals. The indicator shows the assessment of watercourse sediment measurement locations for the eight standard heavy metals against the reference values. The division into classes is based on the deviation with respect to the reference value. This value is determined from the geometric average of 12 carefully selected reference watercourses in Flanders. The measurement results are also evaluated against the environmental quality standards specified by decree for watercourse sediments. These standards are guideline values. They specify the environmental quality level that must be reached or maintained as much as possible. They do not qualify as remediation criteria or as remediation targets.

The measurement results for the period 2008-2011 indicate that mainly cadmium, copper, mercury, lead and zinc cause pollution. This pollution is partly the result of historic contamination. Copper and zinc exceed the standards the most, which is the case at 41 and 40 % of the measurement locations respectively.

### Predominantly positive changes

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. A trend analysis based on 241 measurement points sampled in the periods 2000-2003, 2004-2007 and in 2008-2011 shows that the situation has improved for most metals.

The quality of a watercourse sediment can change:

- by removing 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 so that 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.