Second national implementation plan for the Stockholm Convention on Persistent Organic Pollutants

Belgium

2009-2012

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1 Acronyms list

AGW: Order of the Walloon Government

AWAC: The Walloon Agency for Air and Climate

BCR: The Brussels-Capital Region

BDE: bromodiphenyl ether

BFR: brominated flame retardants

Bw: body weight

CCIEP: Coordination Committee for International Environmental Policy

CEN: European Committee for Standardisation

COP: Conference of Parties

DDD: dichlorodiphenyldichloroethane

DDE: dichlorodiphenyldichloroethylene

DDT: dichlorodiphenyltrichloroethane

DGARNE: Directorate General for Agriculture, Natural Resources and the Environment

DGATLPE : Directorate General for Land-Use Planning, Accommodation, Heritage and Energy

DGEER : Directorate General for Economy, Work and Research

EPER: European Pollutant Emission Register

E-PRTR: European Pollutant Release and Transfer Register

FASFC: Federal Agency for the Safety of the Food Chain

FPS SPSCAE: Federal Public Service (FPS) Health, Food Chain Safety and Environment

GDP: gross domestic product

HAP: polycyclic aromatic hydrocarbon

HCB: hexachlorobenzene

HCH: hexachlorocyclohexane

IBGE-BIM : Brussels Institute for Management of the Environment

INBO: Institute for research into nature and forests

IRCEL-CELINE: Belgian Interregional Environment Agency

ISSeP: Public Service Scientific Institute

Kg: kilogram

LNE: Environment, Nature and Energy

LOQ: Limit of Quantification

LRTAP: Long-Range Transboundary Air Pollution

LW: Lipid Weight

MB: Belgian State Gazette

mg: milligram

ml: milliliter

MRL : Maximum Residue Limits

MSWI : Municipal Solid Waste Incinerators

NIP: National Implementation Plan

OECD: Organisation for Economic Co-operation and Development

OVAM : Flemish public waste company

OWD: Waste Walloon Office

PAH: polycyclic aromatic hydrocarbons

PBDE : polybromodiphenylether

PCB : polychlorobiphenyl

PCDD : polychlorodibenzo-para-dioxins

PCDF: polychlorodibenzofurans

PCT: polychloroterphenyl

PeCB: pentachlorobenzene

PFOS: perfluorooctane sulfonic acid

PFOSF: perfluorooctane sulfonyl fluoride

pg: picogram

PIC: Prior Informed Consent

PM: Particulate Matter

POP: Persistent Organic Pollutant

PPP: Plant Protection Products

RASFF: Rapid Alert System for Food and Feed

REACH: Registration, Evaluation, Authorisation and Restriction of Chemicals

SPAQuE: Walloon Ground Sanitising Company

SPGE: Public Water Management Company

SPW: Walloon Public Service

SWDE: Walloon Water Company

TEF: Toxic Equivalency Factor

TEQ-WHO: Toxic Equivalency Quotient according to the World Health Organization

TWI: Tolerable Weekly Intake

UNECE: United Nations Economic Commission for Europe

UNEP: United Nations Environment Programme

VLAREA: Flemish Regulation on Waste Prevention and Management

VLAREBO: Flemish Regulation on Soil Remediation

VLAREM: Flemish Regulations Governing Environmental Licenses

VLAREMA: Flemish Regulation on Sustainable Management of Material Cycles and Waste Materials

VMM: Flemish environmental company

WGD: Walloon Government Decree

2 Introduction

2.1 The Stockholm Convention

The Stockholm Convention on Persistent Organic Pollutants (POPs) of 22-23 May 2001 compels the Parties to eliminate the production and use of certain chemicals (those listed in appendix A and B of the Convention) and to reduce or eliminate releases from unintentional production of other chemicals (those featuring in appendix C of the Convention).

Following the ratification of the Stockholm Convention on 25 May 2006[1], Belgium elaborated a National Implementation Plan (NIP) to meet its obligations under the present Convention in accordance with indent a) of paragraph 1 of article 7 of the text of the Convention[2] [3]. According to indent c) of that same paragraph, each Party shall review and update, as appropriate, its implementation plan on a periodic basis and in a manner to be specified by a decision of the Conference of the Parties (COP).

The guidelines to review and update the national implementation plans have been specified in the appendix of decision SC-1/12 [4]. According to paragraph 7 of this appendix, for those changes in the obligations arising from amendments to the Convention or its appendix, a Party shall review and update its implementation plan and, transmit the updated plan to the COP within two years of the entry into force of the amendment for it, consistent with paragraph 1 b) of article 7 of the Convention.

The Stockholm Convention was amended in May 2009 and April 2011 to include respectively nine and one new chemicals in its appendix A, B and C. Pursuant to paragraph 4 of Article 21 of the Convention, these amendments were communicated by the depositary to all Parties on 26 August 2009 and 27 October 2011 respectively. On the expiry of one year from the date of the communication by the depositary of the adoption of the amendment, the amendment shall enter into force for all Parties that have not submitted a notification in accordance with the provisions of paragraph 3 b) of article 22. These amendments entered into force for most of the Stockholm Convention Parties, of which Belgium, on 26 August 2010 and 27 October 2012. These amendments constitute a trigger for the need to review and update the NIP within two years.

When reviewing and updating their NIP Parties should take into account the need to implement the following measures with respect to the newly listed POPs:

• Implement control measures to reduce or eliminate releases from intentional production and use (Article 3 and 4)

[1]http://chm.pops.int/Countries/StatusofRatifications/tabid/252/Default.aspx
[2]http://chm.pops.int/Convention/ConventionText/tabid/2232/Default.aspx
[3]Belgium submitted its National Implementation Plan to the Conference of Parties on 6 February 2009.
[4]http://chm.pops.int/Convention/ConferenceofthePartiesCOP/Meetings/COP1/COP1documents/tabid/70/Default.aspx

• Develop and implement action plans for unintentionally produced chemicals (Article 5)

• Develop and implement strategies for identifying stockpiles, products and article in use, and wastes with POPs (Article 6)

• Include the new chemicals in the programme for the effectiveness evaluation (Article 16)

• Include the new chemicals in the reporting (Article 15).

Our NIP shall act as a guideline for the future management of what has been mentioned.

2.2 Persistent Organic Pollutants (POPs)

2.2.1 Definition[5]

POPs are organic molecules that have one or several adverse effects on Man and the Environment. They are characterised by their poor biodegradability, their persistence in the environment, by their ability to bioaccumulate and to easily travel great distances.

To various degrees, POPs are resistant to photolytic, biological and chemical degradation which is what causes them to persist in the environment. They do not dissolve well in water but are soluble in fats. Their high liposolubility makes that these substances can bioconcentrate in organisms via their environment. Aside from persisting in the environment and being resistant to biodegradation, their liposolubility causes them to bioaccumulate in the food chain.

At that, these compounds are semi-volatile, which means that they can exist as a vapour or can be adsorbed on atmospheric particulate matter rendering them sufficiently mobile to allow them to reach relatively high concentrations in the atmosphere, which is what enables them to travel great distances via ocean and air currents. As a result, they are found all over the planet, even in places where they have never been used. They typically travel from warmer environments (with high concentrations of human activity) to colder environments.

2.2.2 POPs retained by the Convention

Initially, the Convention specifically identified 12 chemicals to be eliminated[6], 9 of which organochlorine pesticides (aldrin, chlordane, endrin, dieldrin, heptachlor, dichlorodiphenyltrichloroethane (DDT), toxaphene, mirex, hexachlorobenzene (HCB)), one used in industrial applications (polychlorinated biphenyls (PCBs)), and two by-products unintentionally released by thermal processes involving organic matter and chlorine (dioxins, furans). On the basis of a number of criteria, they were inventoried into three different appendix : A products subject to

[5] IPEN – POPs elimination network - http://www.ipen.org/ UNEP – POPs - http://www.chem.unep.ch/pops/
Guide pour les ONG sur les POPs, cadre d'Action pour protéger la Santé Humaine et l'environnement des POPs [Guide for NGOs on POPs, Framework for Action to protect Human Health and the Environment from POPs] - http://www.ipen.org/ipenweb/documents/book/ngo_guide_french.pdf
POPs toolkits - http://www.popstoolkit.com/about/chemical/hcb.aspx

[6] http://chm.pops.int/Convention/ThePOPs/The12InitialPOPs/tabid/296/Default.aspx

elimination, B products subject to restriction, and C products formed and released unintentionally (appendix I, section 1).

This list is not exhaustive and new POPs may be added on the basis of a proposal from any Party. For a new substance to be enshrined in the Convention, the criteria defined in appendix D of this Convention have to be adhered to. These relate to information about:

- Chemical identity
- Persistence
- Bioaccumulation
- Potential for long-range environmental transport
- Adverse effects

Proposals that contain all the relevant information are forwarded to the POPs Review Committee, which, on the basis of the information provided for under Article 8 of the Convention, examines the proposal and decides whether it should be followed up or not. In the event of a positive decision, the Committee shall recommend that the COP considers the chemical substance for listing in appendix A, B and/or C of the Convention or otherwise.

The 9 chemicals identified as POPs at its fourth meeting, held from 4 to 8 May 2009, are (decision SC-4/10-SC-4/18[7]) (appendix I, section 2):

- alpha-Hexachlorocyclohexane(α-HCH)
- beta-Hexachlorocyclohexane (β-HCH)
- kepone
- hexabromobiphenyl
- hexabromodiphenyl ether and heptabromodiphenyl ether (hexa-BDE and hepta-BDE)
- lindane (γ-HCH)
- pentachlorobenzene (PeCB)
- perfluorooctane sulfonic acid (PFOS) its salts and perfluorooctane sulfonyl fluoride (PFOSF),
- tetrabromodiphenyl ether and pentabromodiphenyl ether (tetra-BDE and penta-BDE)

And, at its fifth meeting, held from 25 to 29 May 2011, the COP adopted an amendment to appendix A to the Convention to list technical endosulfan and its related isomers with specific exemptions (decision SC-5/3 [8]).

In 2012, a total of 22 POPs are listed under the Convention.

More information about chemicals under review in appendix III.

[7] http://chm.pops.int/Convention/ConferenceofthePartiesCOP/Meetings/COP4/COP4Documents/tabid/531/Default.aspx
[8] http://chm.pops.int/Convention/ConferenceofthePartiesCOP/Meetings/COP5/COP5Documents/tabid/1268/Default.aspx

3 The country's reference data

3.1 Geography and population

Located in the north-west of Europe, Belgium borders the Netherlands in the north, the Federal Republic of Germany and the Grand Duchy of Luxembourg in the east and France in the south and west, and it also has a maritime border with the North Sea.

The country is situated between latitudes 49°30' and 51°30' north and between longitudes 2°33' and 6°24' east. It has three distinct geographic zones:

- Lower Belgium (less than 100 m above sea level) which stretches from the flat and fertile polders in the west to the poor and sandy soils of the Kempen in the east,
- Central Belgium (between 100 and 200 m above sea level) which gradually rises as far as the valleys of the rivers Sambre and Meuse, which includes the highly urbanised province of Brabant and the agricultural land of Hainaut in the west and la Hesbaye in the east.
- Upper Belgium (between 200 to more than 500 m above sea level) is the least densely populated and most forested area, boasting the Signal de Botrange, Belgium's highest point (694 metres).

It has a temperate oceanic climate, characterised by modest fluctuations in temperature, predominantly westerly winds, large levels of cloud cover and frequent and regular rainfall. The two main rivers add about 5 billion cubic meters of water to the 12 billion cubic meters of net precipitation (precipitation minus evapotranspiration) the country gets on average. Despite its high population density, Belgium is relatively poor in water resources[9].

The country's three official languages are Dutch, French and German, hence the three language communities, officially recognised as each having their own cultural identity. Belgium is located on an axis of regions that stretches from England to the north of Italy and which has been densely populated and intensively developed since the Middle Ages. Table 1 gives an overview of Belgium's geography and population. Further information can be found in the report 'Aperçu statistique de la Belgique, 2011 [Statistical Overview of Belgium, 2011][10].

Table 1. Geographic, political and social data that characterise Belgium.

Total area of the country:	33 900 km² of which 30 528 km² taken up by land
Land use (km²) (2009)[11]:	15351 agricultural land 6 971 forest and other wooded land 6 050 built-up land and related land 1 961 natural open spaces and wetlands

[9] Belgium Website - http://www.belgium.be/fr/la_belgique/connaitre_le_pays/ [http://www.belgium.be/en/about_belgium/]
[10] 'Aperçu statistique de la Belgique 2011 [Statistical Overview of Belgium, 2011]' http://economie.fgov.be/fr/binaries/Chiffres%20cl%C3%A9s_2011_FR%20_tcm326-148284.pdf
[11] http://statbel.fgov.be/fr/binaries/chiffrescles_agriculture_2010_fr_tcm326-106257.pdf

Total population (inhabitants) (2010)[12] • The Brussels-Capital Region • The Flemish Region • The Walloon Region	10 839 905 • 1 089 538 • 6 251 983 • 3 498 384
Population density (2010) [13]	355 inhabitants per km²
Average age of the population (2001)[14]	39.8 years
Active population (15-64 years) (2010)[15]	5 138 000
Birth rate per 1000 inhabitants (2010)[16]	11.7
Life expectancy at birth (2009)[17]	77.3 years for men 82.8 years for women
Average level of education (2010)[18]	19.2% primary education 20.2% lower secondary education 33.2% higher secondary education 17.8% higher non-university education 9.5% university education
Unemployment rate (2010)[19]	8.2% (M 7.2 and W 9.5)

The country numbers 15 conurbations of more than 80 000 inhabitants, housing 53 percent of the population and providing 63 percent of the employment; it is also characterised by many quasi-urban developments in rural areas. The five largest cities are Brussels, Antwerp, Ghent, Liege and Charleroi, which are also the largest conurbations, home to at least one million residents each. The urban growth is partly due to the strong demand for housing ensuing from the combined effects of demographic growth, a decrease in family size and higher standards of living.

3.2 Political and economic situation

The Kingdom of Belgium is a constitutional monarchy. The 1993 reform of the Belgian Constitution is the last one in a series of revisions of the Constitution (1970, 1980, 1988) which transformed the country into a Federal State composed of three communities and three regions. The three communities are the French-speaking Community, the Flemish Community and the German-speaking Community. The three regions are the Walloon Region (5 provinces), the Flemish Region (5 provinces) and the Brussels-Capital Region. Decision-making powers are divided between these entities, equal under common law, which independently exercise their responsibilities in different areas. A new constitutional reform forms part of the political agreements concluded during the formation of the new federal government which came into power on 6 December 2011

[12] http://statbel.fgov.be/fr/statistiques/chiffres/population/structure/
[13] http://economie.fgov.be/fr/binaries/Chiffres%20cl%C3%A9s_2011_FR%20_tcm326-148284.pdf
[14] http://statbel.fgov.be
[15] http://www.nbb.be/belgostat/PublicatieSelectieLinker?LinkID=758000040|910000082&Lang=F
[16] http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&language=en&pcode=tps00112&plugin=1
[17] http://epp.eurostat.ec.europa.eu/portal/page/portal/product_details/publication?p_product_code=KE-ET-10-001
[18] http://statbel.fgov.be/fr/binaries/Niveau%20d%20instruction1987-2010_tcm326-44615.xls
[19] http://statbel.fgov.be/fr/statistiques/chiffres/travailvie/emploi/relatifs/

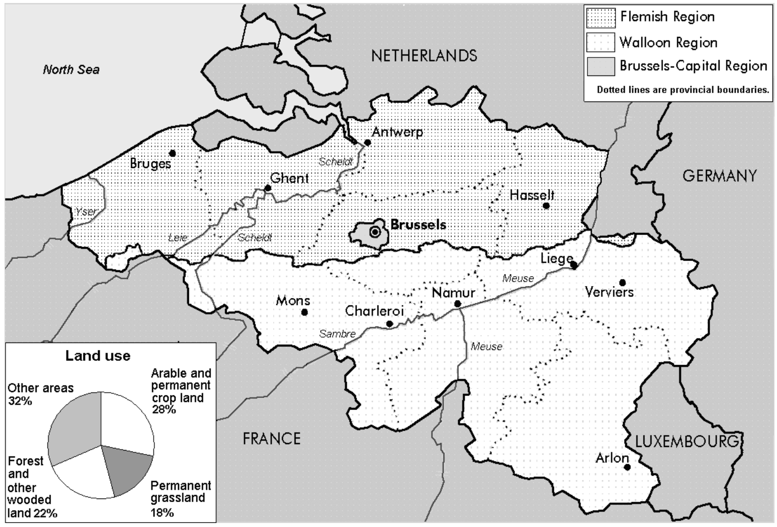

Figure 1: Map of Belgium

The Federal State, the communities and the regions each have their own parliament and government, save for the Flemish Region and the Flemish Community which are governed by one and the same parliament and government. In other words, the country has six different governments and parliaments. Various structural relationships between the parliaments ensure a connection between the different decision-making levels.

The country's economy, which relies on private enterprise, is well-served by the country's central geographic location, boasts an extensive transportation network and has a diversified industrial and commercial basis. It is one of the most open economies in the OECD (Organisation for Economic Co-operation and Development) zone; the total exports and imports of goods and services represent about 70% of its GDP (gross domestic product). Industry is mainly centred in the north of the country. The Belgian industrial sector can be compared to a complex machine: it imports raw materials and semi-finished products, before re-exporting them again once they have been processed. Almost three quarters of the country's trade is conducted with the other EU countries. Aside from coal, which is no longer being mined, Belgium does not have any natural mineral resources, with the result that its economy is dependent on the state of the world market. Yet, thanks to its transportation infrastructure and geographic location, its economy also has a number of traditional sectors: steel, textile, oil refining, the chemical industry, agri-foodstuffs, pharmaceuticals, car manufacturing, electronics and mechanical engineering [20] .

In 2010, the country's GDP amounted to 348.1 billion euro, or to 32 600 euro per inhabitant. The services sector accounts for 77%, the secondary sector for 22% and agriculture for 1% (2010) of the country's GDP [21].

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[20] http://economie.fgov.be/fr/binaries/Chiffres%20cl%C3%A9s_2011_FR%20_tcm326-148284.pdf

[21] http://stats.oecd.org/index.aspx http://epp.eurostat.ec.europa.eu/portal/page/portal/national_accounts/data/database

3.3 Overview of the environment

In a country that is as densely populated and economically developed as Belgium, the pressures on the environment are immense. More than one quarter of the country is built up or covered by roads, railroads or inland waterways. Industry, private cars and heavy goods vehicles, intensive cattle farming and crop production also take a toll on the air, the soil, water resources and nature. Further development that is economically, environmentally and socially sustainable in a context like this does present a challenge. As Belgium has a very open economy (exports account for 83% of the GDP and imports for 81%) and is in a unique geographic position, there is a marked physical and economic interdependence between Belgium and its European and non-European partners. This explains Belgium's highly proactive attitude to international environmental issues [22].

Issues that are specific to the regions can be defined on the basis of their activities and/or their geographic location. These specificities are elaborated on below.

3.3.1 The Brussels-Capital Region (BCR)

An overview of the environmental situation in the BCR can be found in:

- The State of the Environment Report 2003-2006 (Brussels-Capital Region)(2007 edition 2007, published every four years)
  http://www.bruxellesenvironnement.be/Templates/etat/Niveau2.aspx?id=3036&langtype=2060
- The Summary Report of the State of the Environment 2007-2008 (2009 edition, biennial publication)
  http://www.bruxellesenvironnement.be/Templates/etat/home.aspx?langtype=2060
  http://documentation.bruxellesenvironnement.be/documents/SEE_completFR_Def_290910_web.pdf

These reports notably present and analyse the water, air, energy and waste issues.

3.3.2 The Flemish Region

In Flanders, the energy, water and water bottom issues, including combating particulate matter emissions feature top of the environmental agenda.

- **Energy usage in Flanders: impact on the environment**

During the 1990-2000 period energy consumption by transport rose by 26 %, but over the past 5 years only a 1% increase has been recorded. Since 2006, energy consumption in Flanders has been on the decrease though in 2010 the gross national energy consumption once again rose by more than 10 %. While electric modes of transportation (tram, metro, train) are the most energy efficient, the least energy-efficient means of transport are by far the most popular ones. Private motorised transport (cars and motorcycles) in fact accounts for 88.7 % of all mileage

[22] Environmental performance review of Belgium, Conclusions and recommendations, approved by the Working Party on Environmental Performance at its meeting on 25 September 2006.
Voir aussi: http://www.oecd.org/dataoecd/17/63/38168611.pdf

travelled. And even though the average energy consumption of new private cars did improve, this trend has slowed down over the past few years due to the popularity of heavier cars. Transport activity increased during the 2000-2010 period. While passenger transport rose by 12% (kilometres per person), haulage rose by as much as 24 % (tons per kilometre). However, that trend did reverse temporarily during the 2008-2009 period on account of the financial-economic crisis. Passenger transport managed to achieve an absolute decoupling between the emissions created by passenger transport and kilometres per person during the 2000-2010 period. And even though trucks have also become more energy friendly, greenhouse gas emissions generated by goods transportation were higher in 2010 than in 2000 on account of the increase in activity (relative decoupling). In line with passenger transport, the emissions of air pollutants by goods transportation decreased as a result of the more stringent European emission standards. While diesel accounted for three quarters of fuel usage in 2000, its share rose to 83 % in 2010, mainly on account of the increase in diesel vehicles and haulage. Road transport has been using biofuel since 2007. In 2010, biofuel accounted for 5% of the fuel consumption. In 2010, CO_2 emissions generated by new passenger cars dropped more than ever before, to 134 g/km on average, which is one of the reasons why the average eco score of the new car fleet improved more than in previous years. If the more dramatic reduction of 2007-2010 persists over the coming years, Belgium will attain its 2020 emission target by 2017, provided of course that the share of hybrid, plug-in hybrid and electric passenger cars continues to rise.

In most sectors greenhouse gas intensity (number of greenhouse gasses emitted per unit of activity) decreased. All industrial sub-sectors show a reduction in emissions per unit of production (most strikingly so in the chemical sector, the metallurgical industry and the food sector). Emissions by household only dropped slightly while domestic emissions per inhabitant actually rose somewhat due to a reduction in the number of inhabitants per household. Measures such as the installation of insulation, the replacement of single glazing and the use of efficient heating systems should boost the energy efficiency of homes however. The improvement in greenhouse gas intensity across most sectors is insufficient to fully compensate for the effects of the increase in activity on greenhouse gas emissions.
An increase in the efficiency of heating systems, enhanced insulation and the changeover to renewable sources of energy have clearly had a positive impact on the greenhouse gas emissions of buildings over the past few years. However, these changes did not suffice to offset the effects of a number of bitterly cold months.

The share of energy-related emissions – 99% of which are CO_2 – in the Flemish greenhouse gas emissions rose from 77 % in 1990 to 85 % in 2010. The fact that the total greenhouse gas emissions in 2010 were 1% lower than the emissions generated during 1990 can mainly be attributed to non-energy-related measures (e.g. a reduction in the livestock population and the installation of catalysts in chemical processes). Taking domestic primary energy production into account, Flanders was still directly dependent on fossil fuels for 80.0% of its energy consumption in 2010.

As defined in Directive 2009/28/EC, Flanders managed to derive 3.4% of its overall gross final energy consumption from renewable sources of energy in 2010; a figure which been rising systematically since 2000. The first and most crucial step in reducing Flemish greenhouse gas emissions will therefore remain an as rational as possible consumption of energy.

- **Increased precipitation intensity also noticeable in Flanders**

The rising concentrations of greenhouse gasses in our atmosphere lead to climate change. The consequences of this are also becoming gradually noticeable in Flanders. Aside from a rise in temperatures, our country seems to experience more wet than dry years. Also the number of days with heavy precipitation is on the rise. The sea level on the Flemish coast is rising by 2-3 mm a year on average, rising more strongly during high tide than during low tide. Periods of more intense rainfall and rising sea levels will only increase the risk of flooding in highly densely populated Flanders.

- **Water, still some work to be done**

Both the quantity and quality of groundwater are coming under pressure.

Groundwater is without a doubt the main source of fresh water in Flanders (a. o. used to produce drinking water and by industry and agriculture). In almost 44% of cases, groundwater levels decreased significantly during the 2000-2011 period. As the trends vary greatly according to aquifer and area, a tailored approach is called for (cf. also the climate variations). Total water consumption (excluding cooling water) showed little or no evolution during the period 2000-2006. The period 2006-2009 showed a clear decline, which did not continue in 2010 however. The entire period 2000-2010 is still marked by a decline. Surface water consumption shows a very similar evolution. The period 2000-2010 is marked by a decline for both tap water consumption and groundwater consumption.

As to groundwater quality, a decline of the weighted average nitrate concentration in groundwater is observed: it dropped from 45.3 mg NO_3^-/l in spring to 40.3 mg NO_3^-/l during the 2010 spring campaign, which is an improvement of 11%. This decline has continued over the past few years: in the autumn 2012 a weighted average nitrate concentration of 36.5 mg NO_3^-/l was measured. However, the goal to have a good quantitative nitrate level by 2015 is still far away due to the slow recovery of groundwater. But the presence of heavy metals can also pose a problem for consumption and those heavy metals often naturally occur in groundwater. In addition, about half of the measurement points record an exceed of the norms for pesticides.

- **Surface water: quality remains below**

The loads of domestic waste that Flemish surface waters have to swallow have continued to drop steadily during the period 2000-2011 thanks to the systematic development and improvement of public water treatment. Yet, households still have a major nitrogen and phosphorus impact on surface water.

Companies managed to make it drop significantly in the period 2000-2005 but in 2006 and 2007 there was no evident evolution. 2008 and 2009 were once again marked by a clear decline. Probably, the financial economic crisis played an important role here. There has not been recorded a new reduction since. It is striking to see that companies are responsible for only a small proportion of the nitrogen and phosphorus impact on surface water.
The modelled nitrogen and phosphorus losses from agriculture were lower in the year 2011 than in the early years of 2000. This decline is less clear than that observed for households and companies. Manuring makes agriculture responsible for the major part of the total load of nitrogen and phosphorus that ends up in surface water.

During the 2011 measurement campaign, the BBI (Belgian Biotic Index) was determined at 361 measurement points. Surface water was found to be of good to very good biological quality at almost 34% of the measurement points. According to the Multimetric Macro invertebrate Index Flanders (MMIF), only 19% of the water bodies scored 'good' or 'better', 29% scored 'moderate', 33% 'insufficient' and 18% 'bad'.
During the past two decades, the biological quality of Flemish surface waters has slowly but steadily improved. The proportion of measurement points recording an extremely or very bad quality has sharply decreased and the proportion of measurement points recording a moderate or good quality has considerably increased. These positive evolutions are the result of the development and improvement of public water treatment and of the efforts made by companies and the agricultural sector.

However, not nearly all of the measurement points show an improvement of the biological quality. This was demonstrated by a statistical trend analysis performed for each measurement point during the period 2000-2011. 83% of the 521 measurement points, which were sampled at least five times during that period, showed no significant linear trend. 16% of them showed a significant improvement and a bit less than 1% deteriorated significantly.
Strenuous efforts still need to be made to achieve the final objective, not only to further reduce the loads of waste that end up in surface waters but certainly also to allow watercourses to take a more natural course (e.g. by restoring meandering courses, constructing nature-friendly banks, etc.).

- **Dredging and clearing material: an integrated approach is needed**

The Flemish watercourses have an excess of (heavily) polluted sediment to cope with. A large proportion of this sediment is caused by the erosion of arable land, overflow spillways and waste water discharges. Roughly estimated, our watercourses contain some 24 million tons of sediment. And while another 1.8 million ton is added to this load every year, only 1 million ton is being dredged or cleared on average. In some cases, alleviation creates problems for shipping or gives rise to local flooding. At that, polluted water bottoms have a negative impact on the ecosystems in and around the water, and, in some cases, hamper the amelioration of the quality of surface water. This issue calls for an integrated approach. Though sedimentation and the amount of pollutants ending up on the water bottom must be reduced, the dredging and clearing pace must also be significantly stepped up whilst more (cost-effective) means of dealing with the spoil have to be found.

- **Particulate matter: a Flemish and an international problem**

Flanders both imports and exports particulate matter. Since 1 January 2005, new and more stringent particulate matter standards have come into effect (PM10). In various locations across Flanders the daily average standard is exceeded. The majority of these overruns are recorded in industrial and in urban areas. That having been said, Flanders does meet the annual average standard.

Cross-border transport and air pollution are the main sources of particulate matter in Flanders. According to model calculations, only 29 % of PM10 concentrations in Flanders are generated by the Region's own emissions, 43 % by foreign emissions and 28 % by natural and non-attributable sources. As regards PM2.5, the Region's own contribution amounts to 26 %, the foreign contribution to 55 % and the natural and non-attributable share to 19 %. But Flanders also exports air pollution to its neighbouring countries.

Because Flemish emissions have an impact on a territory that is home to more than 500 million people (as far as the Scandinavian and Baltic countries), particulate matter exported by Flanders is twice as detrimental to the health of people living outside of Flanders than the damage foreign emissions cause in Flanders itself. The impact of particulate matter emission reductions in Flanders must therefore be assessed on the basis of the health effects both in Flanders and abroad.

The average annual PM10 and PM2.5 concentrations chart the population's long-term exposure and showed a downward trend during the 2000-2010 period. The average daily PM10 concentration is a measure of short-term exposure and charts peak times. Since 2006, the number of days at which concentrations exceeding 50 µg/m3 were measured has more than halved although 2010 still saw excesses being recorded at 5 of the 33 monitoring stations. After 2009, PM10 and PM2.5 emissions rose once again, probably on account of the revival of the economy. During 2011, transport and industry were the main sources of PM 2.5, the most harmful fraction, accounting for 35% and 30% respectively. Further reductions will be required if the MINA Plan 4 targets are to be attained by 2015.

- **Environmentally hazardous substances**

All in all, the evolution of heavy-metal emissions into the air is a positive one. In 2011, emissions of cadmium, nickel, arsenic and lead were lower than the pre-set target. In comparison to 1995, emissions of chrome and mercury had reduced by as much as 60% in 2011. For copper and zinc however, there still is a long way to go. Following a significant drop during the early 90s, the emissions of polycyclic aromatic hydrocarbons (PAHs) once again rose slightly between 1995 and 2005. Since then, the PAHs emissions trend has been fluctuating. During 2009, about 200 tons of PAHs were released into the air. Dioxins follow the same formation pattern as PAHs. One important source of dioxins in the air is the small-scale practice of burning refuse by private citizens. Following a significant decrease between 1990 and 2000, emissions continue to hover around 43 g TEQ/year (44 g TEQ/year in 2011) from 2002 onwards.

3.3.3 The Walloon Region

Extract from the Walloon 2010 Environment Scoreboard[23]

- **Territorial aspects**

Land use is the result of the intimate interaction between man and his environment. In the Walloon Region, the physical environment and the type of climate are conducive to agriculture north of the Sambre-Meuse line, while, south of that line, they lend themselves to pastureland and forestry. The Meuse and Sambre valleys, for their part, form the Region’s traditionally urban zone. These days, urban pressure is rising steadily, mainly at the expense of agricultural land as a whole. Even though 84 % of the territory remains undeveloped, urbanisation is having a major impact on the territory and the environment. In 2006, only 1 % of the land in Wallonia was devoid of any man-made structure. The Sectoral Plans (Plans de secteur - PDS) and more specifically the Walloon Code of Town and Country Planning, Urban Development, Heritage and Energy (Code wallon de l’urbanisme, de l’aménagement of territoire, of patrimoine et de l’énergie - CWATUPE) were notably drawn up to organise and manage the pressures of urbanisation on the territory. Well-thought out urban development and the judicious location of facilities and infrastructures should form the basis of any actions that are undertaken with a view to meeting major environmental challenges (reduction in air pollutant emissions, biodiversity, soil and water cycle conservation, waste management).

- **Production and consumption patterns**

Eco-efficiency indicators compare the evolution of the pressures on the environment (materials, energy, air, water…) to specific socio-economic parameters (gross domestic products, added value, industrial production index, employment, number of households…). This type of indicator is also used at European level, more specifically in the Shortlist of Structural Indicators. For Wallonia, the following elements present a number of eco-efficiency indicators:

- Unfavourable evolution in transport needs and the economy’s overall demand for commodities;
- Favourable evolution in terms of energy intensity (overall and sectoral) and the economy’s internal consumption of commodities;
- The trends noted in terms of pollutants being released into the air, the consumption of water and the generation of waste vary by sector and by type of pollutant, while the overall trend is rather a favourable one.

[23] The full report (232 pages) is available on http://etat.environnement.wallonie.be/index.php?page=le-tableau-de-bord-2010

- **Components of the environment**

  - Air

Atmospheric emissions from several pollutants in the Walloon Region are dropping, even though these emissions are at times insufficient to meet the targets set by European legislation (e.g. acidifying pollutants, precursors of ground-level ozone). Concentrations of certain pollutants in the ambient air have also decreased (nitrogen and sulphur oxides, lead…). They do remain a cause for concern as regards particulate matter (PM10 and PM2.5) measured in urban and industrial zones and as regards the ozone measured in rural areas, notably in respect of the deviations with regard to the guide values on health and ecosystem protection. The transboundary nature of air pollution has led to the international community adopting a number of measures to ensure that the targets on the reduction of atmospheric emissions are met. These have notably been defined under the Montreal Protocol (stratospheric ozone), the Kyoto Protocol (Greenhouse gas emissions) the Gothenburg Protocol (precursors of ground-level ozone). The relevant measures taken in the Walloon Region have been reinforced via the Air Climate Plan.

  - Water

The draft River Basin Management Plans the Walloon Region needs to finalise and submit to the European Commission contain 153 measures. More than 40 % of the measures that were proposed have already been translated into regulations (baseline measures). The remainder are complementary measures which probably need to be enforced with regard to bodies of groundwater deemed to be at risk, i.e. where baseline measures will prove to be inadequate. The problems mainly relate to the Scheldt area, to certain Meuse sub-basins (Sambre, Vesdre and downstream of the Meuse) and to certain areas prone to nitrate pollution from the agricultural sector (the Herve, the basins of the Geer and the Mehaigne, the sandy soils of Brussels and Comines-Warneton…). Furthermore, in spite of the dredging and clearing of the inland waterways, the accumulation of sediment remains a particularly worrying problem on account of the probable undervaluation of the “liability” in terms of dredging and the cost of managing the sediment removed from the watercourses.

  - Soil

Soil degradation is becoming an ever more worrying problem in Europe. In the Walloon Region, deficiencies in organic matter and potential soil losses caused by water erosion are the main changes agricultural land is facing. The problem of local soil pollution is basically a legacy of past practices, though its potential impact on health, the environment and economic activity has become a major modern-day issue.

  - Fauna and Flora

The European objective to halt the decline in biodiversity by 2010 has been enshrined in the 2009-2014 Regional Policy Declaration via the development of a transversal regional plan on biodiversity. To list the priorities in terms of species conservation, not only those featuring on the Red Lists are taken into consideration but also other factors come into play such as the heritage value of species, their role in the ecosystems, the cost and the effectiveness of the measures taken. All in all, 31 % of the species studied are threatened with extinction in the Walloon Region. Moreover, almost 9 % have already disappeared from the regional territory. Progress is being made however: certain species have benefitted from the conservation and restoration of natural habitats (numerous flights of butterflies are now found locally while the numbers of some rare species are also on the increase).

- **The link between the environment and health**

During 2008-2009, the way in which environmental health issues were approached changed somewhat both at a national level and within the Walloon Region. At the end of 2008, the Walloon Government decided to create two new structures with responsibility for the health of the environment: the Walloon Health Observatory (l'Observatoire wallon de la santé) and the Permanent Environment-Health Cell (Cellule permanente environnement-santé). The Health Observatory, attached to the Walloon Public Service's (Service public de Wallonie - SPW) Directorate General of Local Authorities, Social Action and Health (Direction générale des Pouvoirs locaux, de l'Action sociale et de la Santé (DGO5), has amongst others been tasked with centralising the region's health data and with linking these data to other regional data, notably those on environmental health. Operational since mid-2009, the Health Observatory has published the 2009 Walloon Region Health Scoreboard, which dedicates one section to the links between health and the environment. The Permanent Environment-Health Cell, attached to the Secretariat General of the SPW, for its part, has been charged with implementing the Regional Environment-Health Action Programme (Programme d'actions régionales en environnement-santé - PARES) the Walloon Government adopted on 12/12/2008. This programme is the culmination of a lengthy process that was launched in 2003 and on which experts, political stakeholders and representatives from the world of associations reached consensus in 2006.

- **Aspects of environmental management**

Some (non-exhaustive) general observations can be made:

- In the Walloon Region, environmental management measures are largely implemented at the initiative of the public sector, which, generally, establishes a specific regulatory framework, in the main driven by European legislation. Even though this observation is based on a non-exhaustive list of measures, it highlights the fundamental role of the legislator in addressing the environmental issues. On account of its binding nature, the regulatory framework notably contributes to the proper implementation of measures and ensures that all the various stakeholders are treated equally;
- The implementation of more than half of the management methods inventoried is the result of at least two types of tools. Waste management, for instance, mobilises both regulatory tools (which define the exact framework to ensure that the environment and human health are protected) and financial tools

(preventative measures in application of the principle “the polluter pays” via taxes, charges, subsidies and deposit-return systems);

- Voluntary initiatives are usually met with some form of financial support (subsidies, premiums, tax credits…).

4 Institutional, political and regulatory framework on POPS

4.1 Environmental and sustainable development policy and the institutional framework governing the whole

The right to a healthy environment has been enshrined in article 23 of the Belgian Constitution[24]. Competences with regard to the environment have been divided between various authorities. The Federal State remains responsible for certain areas, i.e. the transit of waste, product standards, the nuclear industry, imports, exports and the transit of exotic species and for European and international coordination. The other responsibilities have been handed over to the Regions. The regional governments must also see to the implementation of international agreements at a regional level and are directly involved in the preparation of Belgium’s international policies, its viewpoints and positions.

Many aspects of environmental cooperation are shared between the federal and the regional authorities. In these cases, treaties are signed by the federal and the regional representatives or by the Federal Minister for the Environment, a representative of the Minister for Foreign Affairs, vested with the powers to sign on behalf of the two government levels. Ratification is subject to the approval by the Federal Parliament and the Regional Parliaments (of all the Regions concerned). The implementation of laws and decrees must be decreed both at a federal and at a regional level. This procedure makes that all the parties concerned are closely involved.

Belgium’s complex institutional framework in matters of the environment calls for several coordination mechanisms, such as the Inter-Ministerial Conference on the Environment (CIE), which seats Belgium’s federal and regional ministers, the CCIEP, which seats representatives from the federal and regional authorities with competence for the environment (ministerial departments and the administrations), whose main brief includes preparing the Belgian positions within the framework of international negotiations, the Interregional Environmental Cell (Cellule interrégionale de l’environnement - CELINE), tasked with monitoring atmospheric emissions and structuring air data, and the North Sea and Oceans Group (Groupe de la mer du Nord et des oceans). The Federal Council for Sustainable Development seats representatives of the federal and regional ministers. Representatives of the Regional Minister-Presidents also take part in the Council’s work, as do

[24] http://www.senate.be/doc/const_fr.html

representatives of NGOs (environmental, development aid and consumers' rights), trade unions, employers, and the world of business and the scientific community.

4.1.1 Federal institutional framework

At federal level, the "Risk Control" Department of the Directorate-General (DG) for the Environment (DG V) of the Federal Public Service (FPS) Health, Food Chain Safety and Environment (Service Public Fédéral Sante Publique, Sécurité de la Chaine Alimentaire er Environnement - SPSCAE) is notably in charge of preventing damage to the environment, poisoning and other health risks posed by hazardous products and chemical substances. The "Biocides" Cell, which forms part of that department, manages and scientifically assesses applications to introduce biocides to the market. The Minister for the Environment, for his part, grants licences on the basis of the advice issued by the Biocides Advisory Committee. With a view to harmonising the biocide procedures, a reform of this system is currently being prepared at European level.

The "Inspection" Department of the FPS SPSCAE monitors adherence to the prevailing biocides and chemical substances regulations and has also been given the powers to carry out inspections at retailers' and users'.

The DG Animals, Plants and Foodstuffs (DG IV) of the FPS SPSCAE is in charge of implementing the rules and standards with regard to the quality and health aspects of any products entering the food chain. The Food, Feed and other Consumer Products Department is responsible for the standards on contaminants in foodstuffs and undesirable substances in feedstuffs. The Pesticides and Fertilizers Department of this DG is tasked with managing applications to market pesticides for agricultural use in Belgium. Approval is granted by the Minister for Public Health on the advice of a Licensing Committee. This Licensing Committee is not only composed of administrative experts and experts from scientific institutions but it also seats all the competent federal and regional authorities.

As regards food safety, the FPS is notably tasked with the food safety policy. The Federal Agency for the Safety of the Food Chain (FASFC) ensures that food safety legislation is implemented. The Agency is amongst others in charge of:

- Monitoring and analysing and lending its expertise with regard to foodstuffs and their raw materials throughout the various stages of the food chain (production, processing, storage, transport, retail, imports and exports);
- issuing permits, authorisations and licences to carry out certain activities within the food chain ;
- fine-tuning the traceability and identification systems that facilitate following food products and their raw materials throughout the various production and processing stages.

Within the framework of its official monitoring assignment, the FASFC notably takes samples of food products and feedstuffs, checking them for levels of POPs such as dioxins, PCBs and organochlorine pesticide residues. It also carries out inspections among retailers and users of phytopharmaceuticals to ensure that good agricultural practices are observed: approved products, dosage, crops…

4.1.2 Regional institutional frameworks

Regional competences in matters of the environment are very broad now. The Regions are notably responsible for the following matters:

- Forestry, nature, green spaces, hunting, fishing;
- Protection of the environment, notably preventing soil, subsoil, air and water pollution and protecting them against a range of pressures;
- Noise control;
- Waste policy (save for the transit of waste and radioactive waste);
- Protection of the drinking water distribution system, including the technical regulations on the quality of drinking water, the purification of waste and drainage water;
- The policy on dangerous, insalubrious and uncomfortable buildings, save domestic measures with regard to labour protection;
- Town and country planning and regional development;
- Agriculture.

4.1.1.1 The institutional framework of the BCR

Brussels' Environment - Institut Bruxellois pour la Gestion de l'Environnement IBGE / Leefmilieu Brussel – Brussels Instituut voor Milieubeheer BIM – which has gradually been assigned all the competences with regard to the environment, was founded as per Royal Decree of 8 March 1989 (MB 24/03/89).

Its organisational chart anno 2011 can be found on:
http://www.bruxellesenvironnement.be/uploadedFiles/Contenu_du_site/Qui_sommes_nous/ORG_20130916_Synthetique_FR.pdf?langtype=2060

The initial brief the Decree assigned to Brussels Environment-IBGE, comprised:

- Studying the application and transposition of the European Community environmental regulations ;
- Assisting the local authorities with environmental matters (master plans, audits, advice...) ;
- Issuing advice on the granting of operating licences ;

- Checking, monitoring and tackling air, water and soil pollution, noise disturbance and waste collection ;
- Developing, monitoring and organising a waste plan ;
- Promoting recycling and the reuse of waste ;
- Nature protection and conservation, monitoring flora, fauna and natural resources ;
- Management of green spaces ;
- Management of natural and semi-natural sites.

The tasks of Brussels Environment-IBGE gradually followed the changes in the administrative structures of the BCR and regulations and nowadays include:

- Drafting the biennial report on the State of the Environment in the BCR ;
- The right to participate in any consultation committees within the framework of town and country planning and environmental licence procedures ;
- Issuing class IA and IB environmental licences and class-II licences if the applicant is a public body filing a public utility application ;
- Drawing up specifications with regard to impact studies and chairing advisory committees tasked with following up these studies ;
- Monitoring adherence to the environmental legislation (environmental police) and notably the legislation governing environmental licences ;
- Managing an environmental information service ;
- Managing an Environmental Research Laboratory (Laboratoire de Recherche en Environnement - LRE) whose main activity involves monitoring and managing the air quality measuring networks across Brussels and running periodic awareness-raising campaigns ;
- The creation of a “noise” laboratory within the Environmental Research Laboratory ;
- Taking over the management of more than 340 hectares of green spaces and 1640 hectares in the Sonian Forest ;
- Managing a tax system on the discharge of waste water by industry ;
- ...

Also in the field of energy, Brussels Environment-IBGE has been given new competences (decree of 20 January 2004 – MB 21/04/94) :

- The distribution and local transportation of electricity via networks with a nominal voltage of less than or equal to 70,000 Volt ;
- The public distribution of gas ;
- The community heating system distribution networks ;

- Renewable sources of energy (save for those involving nuclear energy) ;
- Energy recovery ;
- The rational consumption of energy ;
- Regulating the gas and the electricity markets.

In the area of water, Brussels Environment also saw its competences broadened in 2007 (decree of 26 April 2007 – MB 22/05/2007):

- Managing 1st and 2nd class non-navigable watercourses (sludge clearing, maintenance...) ;
- Managing groundwater (issuing pumping licences, monitoring water quality, managing the piezometer network, reporting, flood prevention) ;
- The granting of certain subsidies.

Brussels Environment-IBGE is not the only body to have been assigned powers in relation to environmental management however. In fact, Bruxelles-Propreté (Brussels-Cleanliness), the Regional Cleanliness Agency (ordinance of 19 July 1990 – MB 25/09/1990) was assigned the following tasks:

- Exercising the conurbation competences in matters of the removal and treatment of refuse ;
- Participating in the establishment of a Brussels Waste Plan by Brussels Environment ;
- The total or partial implementation of the waste policy at the request of the Executive ;
- Cleaning the roads the Conurbation Council agrees to have cleaned at the request of one or several Regional municipalities ;
- Road sweeping and cleaning.

The Agency is authorised to carry out the following tasks

- Corporate waste removal at a business's request and expense ;
- Cleaning the public roads and the areas around them, at the request and the expense of the relevant public authorities ;
- Sweeping, cleaning and collecting refuse on sites owned by the Société des Transports intercommunaux de Bruxelles (Brussels Inter-Municipality Transport Company) in accordance with well-defined conditions agreed with the Minister with competence for Transport and the Regional Road Network.

4.1.1.2 Institutional framework of the Flemish Region

The organisational structure of the Policy Area Environment, Nature and Energy within the Flemish Region is depicted in figure 2. Following on from that, the role and the responsibilities of the various entities are amplified.

- **The Environment, Nature and Energy Department**

The Environment, Nature and Energy Department (Departement Leefmilieu, Natuur en Energie - LNE) is in charge of preparing, following up and evaluating the Flemish environmental policy. Sustainability, integration and harmonisation take centre stage here. The Department supports and conducts its own awareness-raising campaigns, sees to the enforcement of the environmental policy and deals with applications for environmental licences and accreditations.

On the initiative of the Department, coordination on the issue of chemical substances is organised (implementation of European and international obligations, defining the position of the Flemish Government, policymaking...) in which also the relevant Flemish authorities that do not form part of the Department itself are involved.

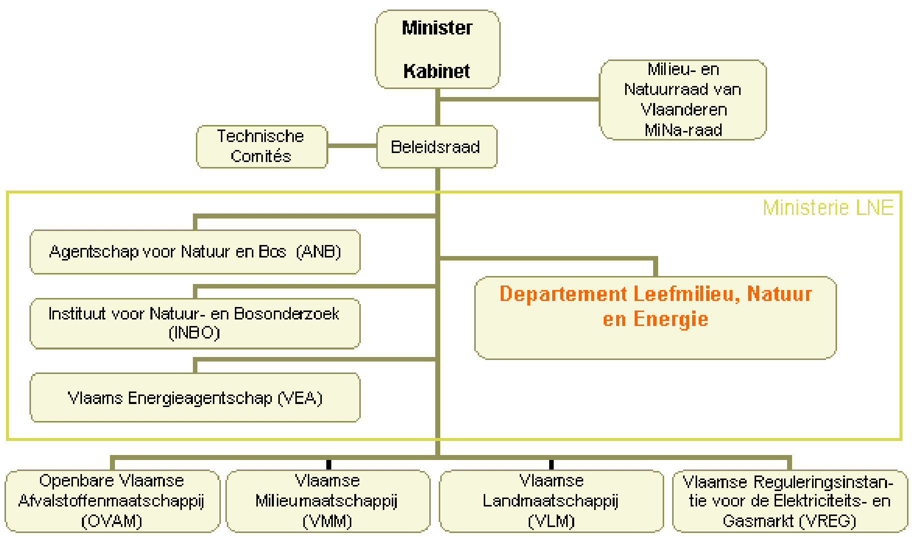


Figure 2. Organisational structure of the Environment, Nature and Energy Policy Area in the Flemish Region

<u>Agencies</u>

The agencies pursue the policy and offer their policy input with regard to environment, nature and energy. The agencies and the department engage in structural consultation and systematically exchange information.

The Environment, Nature and Energy Policy Area comprises various agencies:

- <u>The Agency for Nature and Forests (Agentschap voor Natuur en Bos - ANB)</u>
    - Supports the sustainable management and the increase in natural, woodland and green areas
    - Manages the Flemish Region's and partners' green areas

- The Institute for Nature and Forest Research (Instituut voor Natuur- en Bosonderzoek - INBO)
    - Carries out scientific research into the development and sustainable use of nature
    - Compiles annual nature reports

- The Flemish Energy Agency (Vlaams Energieagentschap - VEA)
    - Implements the sustainability-oriented energy policy by promoting the rational use of energy and environmentally friendly means of producing energy

- The Flemish Environmental Agency (Vlaamse Milieumaatschappij - VMM)
    - Supports the protection and the restoration of the atmospheric and water quality
    - Assesses the condition of the atmosphere and water
    - Compiles biennial reports on the state of the environment which it publishes under the name MIRA (Milieurapport – Environment Report)
    - Regulates and integrates the water policy
    - Monitors air quality
    - Identifies what is discharges into the air

- Public Waste Materials Company (Openbare Vlaamse Afvalstoffenmaatschappij - OVAM)
    - in charge of the sustainable management of material streams and waste
    - in charge of soil remediation and tackling soil contamination

- The Flemish Land Company (Vlaamse Landmaatschappij - VLM)
    - Pursues the qualitative design of open spaces
    - Manages manure surpluses

- The Flemish Regulatory Body for the Electricity and Gas Market (Vlaamse Reguleringsinstantie voor de Electriciteits- en Gasmarkt - VREG)
    - Regulates, monitors and promotes transparency in the electricity and gas market within the Flemish Region

These entities jointly make up the Environment, Nature and Energy Policy Area.

MiNa (Environment and Nature) Council

- Issues advice on the environmental policy and the environmental aspects of sustainable development ;

- Contributes to the vision on the environmental policy and the environmental aspects of sustainable development ;
- Monitors social and policy developments with regard to the environment and the environmental aspects of sustainable development ;
- Reflects on white papers on the environmental policy and the environmental aspects of sustainable development in Flanders.

4.1.1.3 Institutional framework of the Walloon Region

In the Walloon Region, it is mainly the SPW, more specifically the Operational Directorate-General for Agriculture, Natural Resources and the Environment (Direction générale opérationnelle de l'agriculture, des Ressources naturelles et de l’Environnement - DGARNE) which is tasked with overseeing environmental matters.

Aside from the numerous European directives and international undertakings, its task is underpinned by environmental planning, the Environmental Plan for Sustainable Development (1995), subdivided into sectoral plans (cf. the Walloon Waste Management Plan, the River Basin Management Plans…).

The Operational Directorate-General for Regional Planning, Housing, Heritage and Energy (Direction générale opérationelle de l’Aménagement du Territoire, du Logement, du Patrimoine et de l’Energie – DGATLPE) is tasked with organising the development of public and private activities in the region and to ensure their harmony. This task has important environmental implications (conservation of undeveloped and natural areas, the environmental pressures created by development, authorized activities…).

In view of the close relationship between their competences and the environment, some authorities, more so than others, put the environment top of their agenda. For instance, the energy policy the Operational Directorate-General for Economy, Employment and research (Direction générale opérationnelle Economie, Emploi et Recherche - DGEER) pursues has an impact on atmospheric pollutants. The DGARNE also elaborates and implements measures to reduce the effects of agriculture on the environment.

The SPW notably manages the road network and inland waterways and integrates infrastructures that have a positive impact on the environment (the installation of fish ladders on dams, the arborisation and mowing of roadsides, the winter-sanding or salting of roads, the construction of storm water basins…).

The Walloon Government has set up various bodies charged with specific tasks, some of which focussed on the environment. A number of these bodies already existed at a national level or were put in place after the regionalisation. We can notably list:

- The Public Service Scientific Institute (Institut scientifique de service public - ISSeP), a research and technological assessment institute;
- The Public Environmental Quality Enhancement Company (Société publique d'aide à a qualité de l'environnement - SPAQuE) with whom the Walloon Region has concluded a service-level agreement and which very much focuses on contaminated soils;
- The Public Water Management Company (Société publique de gestion de l'eau - SPGE), a public limited liability company, tasked with protecting the intake of drinking water and the public purification of waste water;
- The Walloon Water Company (Société wallonne de l'eau -SWDE) which produces and distributes mains water across most of the territory and monitors the potability of the water;
- The Walloon Agency for Air and Climate (Agence wallonne de l'Air et du Climat - AWAC), which has become an autonomous agency since 2008, in charge of air and climate policy at Walloon, intra-Belgian and at European level. The Agency notably monitors air quality, analyses the effects of pollution on human health and on the environment and develops tools to protect both.

4.2 International and European undertakings to be taken into account

Table 2. International obligations and undertakings to be taken into account with regard to the policy to eliminate POPs

Agreements, programmes and Organisations	**Comments**	**Date of ratification and entry into force**
Member of the European Union	Since 1957, when it was called the EEC (European Economic Community), established on foot of the Rome Treaty.	
Member of the OECD	Since 1948, when it was called the OEEC (Organisation for European Economic Cooperation).	Ratification of the OECD Convention on 13 September 1961.
The Stockholm Convention on POPs	Regulates the elimination or the reduction of POP emissions into the environment. It was signed on 23 May 2001.	Ratified on 25 May 2006.
The Rotterdam Convention on the Prior Informed Consent (PIC)	Regulates the exports and imports of banned or, at EU level, strictly regulated hazardous chemical substances. It was signed on 11 September 1998.	Ratified on 23 October 2002.
The OSPAR Convention	Protects the marine environment of the North Sea and the North-East Atlantic, signed in 1998.	Ratified on 20 January 1999.
The Aarhus Convention	Informs and fosters public participation in the environmental decision-making process. It was signed on 25 June 1998 within the framework of the United Nations Economic Commission for Europe.	Ratified on 21 January 2003.

The Basel Convention	Monitors the transboundary movement of hazardous wastes and their elimination, signed in 1989.	Ratified on 1November 1993.
The Kiev Protocol	Pollutant Release and Transfer Register (industrial pollution emissions) as a follow-up to the Aarhus Convention. It was signed on 21 May 2003.	Approved by the European Community on 21 February 2006.
The Montreal Protocol	Regulates the use and production of chlorine and bromine containing products that deplete the ozone layer. It was signed on 16 September 1987.	Ratified on 30 December 1988.
The Long-Range Transboundary Air Pollution (LRTAP) Convention	Undertaking to develop policies and strategies to reduce atmospheric emissions and to participate in a programme which monitors and assesses the long-range transport of these emissions, signed in 1979.	Ratified on 15 July 1982.
The Aarhus Protocol to the LRTAP Convention	POP Protocol to the LRTAP Convention signed on 24 June 1998.	Ratified on 21 January 2003.

At European level, there are various types of legislation to be taken into account: regulations which have direct effect and directives which must first be transcribed into federal and/or regional law. The table below features the European texts governing the management of POPs.

Table 3. European POPs legislation

Legislation	**Title**	**POPs concerned**
POPs Regulation		
Regulation (EC) No 850/2004 of the European Parliament and of the Council of 29 April 2004	On persistent organic pollutants and amending Directive 79/117/EEC. Retranscribes the Stockholm Convention and the United Nations Economic Commission for Europe (UNECE) Protocol	All
Food products and feedstuffs		
Commission Regulation (EC) No 901/2009 of 28 September 2009	Concerning a coordinated multiannual Community control programme for 2010, 2011 and 2012 to ensure compliance with maximum levels of and to assess the consumer exposure to pesticide residues in and on food of plant and animal origin	Chlordane, DDT, dieldrin, aldrin, endosulfan, endrin, HCB, heptachlor, α-HCH, β-HCH, lindane
Regulation (EC) No 299/2008 of the European Parliament and of the Council of 11 March 2008 amending Regulation (EC) No 396/2005 of 23 February 2005, amending Council Directive 91/414/EEC	On maximum residue levels of pesticides in or on food and feed of plant and animal origin,	HCB, heptachlor, aldrin, dieldrin, endrin, DDT, chlordane, mirex, toxaphene, endosulfan, lindane, α-HCH, β-HCH, chlordecone, PeCB
Commission Regulation (EC) No 1881/2006 of 19	Setting maximum levels for certain contaminants in	PCB, dioxins/furans,

December 2006	foodstuffs	benzo[a]pyrene as a marker for polycyclic aromatic hydrocarbons (PAHs)
Commission Regulation (EC) No 1883/2006 of 19 December 2006	Laying down methods of sampling and analysis for the official control of levels of dioxins and dioxin-like PCBs in certain foodstuffs	PCBs, dioxins/furans
Directive 2002/32/EC of the European Parliament and of the Council of 7 May 2002	On undesirable substances in animal feed	Aldrin, dieldrin, toxaphene, chlordane, DDT, endosulfan, endrin, heptachlor, HCB, HCH, dioxin
Marketing, sales and use		
Regulation (EC) No 1107/2009 of the European Parliament and of the Council of 21 October 2009, repealing Council Directives 79/117/EEC and 91/414/EEC	Concerning the placing of plant protection products on the market	HCB, heptachlor, aldrin, dieldrin, endrin, DDT, chlordane, mirex, toxaphene, endosulfan, lindane, α-HCH, β-HCH, Chlordecone, PeCB
Regulation (EC) No. 689/2008 of the European Parliament and of the Council of 17 June 2008	Concerning the export and import of dangerous chemicals (PIC Regulation)	All
Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006	Concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC	Testing on persistent, bioaccumulative and toxic criteria according to appendix XIII
Directive 2009/128/EC of the European Parliament and of the Council of 21 October 2009	Establishing a framework for Community action to achieve the sustainable use of pesticides	Pesticides
Directive 2005/69/EC of the European Parliament and of the Council of 16 November 2005	Relating to restrictions on the marketing and use of certain dangerous substances and preparations (polycyclic aromatic hydrocarbons in extender oils and tyres)	PAHs
Directive 2002/95/EC of the European Parliament and of the Council of January 2003	On the restriction of the use of certain hazardous substances in electrical and electronic equipment	PCBs, Polybrominated biphenyls (PBBs), polybrominated diphenyl ethers (PBDEs)
Directive 98/8/CE of the European Parliament and of the Council of 16 February 1998	Concerning the placing of biocidal products on the market	All
Waste and pollutants		
Regulation (EC) No 1013/2006 of the European Parliament and of the Council of (repealing Regulation 259/93/EC)	On shipments of waste	PCBs
Regulation (EC) No 166/2006 of the European Parliament and of the Council of 18 January 2006, amending Council Directives 91/689/EEC and 96/61/EC (repealing EPER Decision 2000/479/EC)	Concerning the establishment of a European Pollutant Release and Transfer Register	All, save PFOS
Directive 2008/1/EC of the European Parliament	Concerning integrated pollution prevention and	All

and of the Council of 15 January 2008 (repealing Council Directive 96/61/EC of 16 Septembeer1996) – IPPC directive (which in turn will be replaced by Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010)	control	
Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 (notably repealing Directive 91/689/EEC, 2006/12/EC and 75/442/EC)	On waste	PCBs
Directive 2002/96/EC of the European Parliament and of the Council of 27 January 2003	On waste electrical and electronic equipment	PCBs, PCTs
Directive 2000/53/EC of the European Parliament and of the Council of 18 September 2000	On end-of life vehicles - Declarations by the Commission	PCBs, PCTs
Council Directive 96/59/EC of 16 September 1996	On the disposal of polychlorinated biphenyls and polychlorinated terphenyls (PCBs/PCTs)	PCBs/PCTs
Water		
Directive 2008/105/EC of the European Parliament and of the Council of 16 December 2008	On environmental quality standards in the field of water policy	Substances subject to a review on account of their possible identification as priority substances or as priority hazardous substances: PFOS, dioxins, PCBs. Environmental quality standards for priority substances and certain other pollutants: diphenyl ethers bromines, aldrin, dieldrin, endrin, DDT total, endosulfan, HCB, HCH, PeCB, PCP, PAH
Directive 2006/118/CE of the European Parliament and of the Council of 12 December 2006	On the protection of groundwater against pollution and deterioration	HCB, heptachlor, aldrin, dieldrin, endrin, DDT, chlordane, mirex, toxaphene, endosulfan, lindane, α-HCH, β-HCH, chlordecone, PeCB
Directive 2000/60/CE of the European Parliament and of the Council of 23 October 2000	Establishing a framework for Community action in the field of water policy (The Water Framework Directive)	Priority substances: Pentabromodiphenyl ether (congeners nos.: 28, 47, 99, 100, 153, 154), endosulfan, HCB, PeCB, PCP, PAHs
Council Directive 76/464/EEC of 4 May 1976 + Directive 2006/11/CE of the European Parliament and of the Council of 15 February 2006	On pollution caused by certain dangerous substances discharged into the aquatic environment of the Community	All

Air		
Directive 2004/107/EC of the European Parliament and of the Council of 15 December 2004	Relating to arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons in ambient air.	Benzo[a]pyrene as a marker of PAHs
Directive 2000/76/EC of the European Parliament and of the Council of 4 December 2000 (in time to be replaced by Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010)	On the incineration of waste	Dioxins, furans, PCBs
Others		
Council Directive 96/82/EC of 9 December 1996	On the control of major-accident hazards involving dangerous substances	Polychlorodibenzodioxins and polychlorodibezofurans
Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008	On classification, labelling and packaging of substances and mixtures	Inventory of classification and labelling of hazardous substances

Other provisions are taken into consideration at federal level :

Table 4. European recommendations on POPs

Legislation	Title	POPs concerned
Recommendation 2010/161/EU of 17 March 2010	On the monitoring of perfluoroalkylated substances in food	PFOS
Commission Recommendation 2006/88/EC of 6 February 2006	On the reduction of the presence of dioxins, furans and PCBs in feed and food	dioxins, PCBs
Commission Recommendation 2006/794/EC of 16 November 2006	On the monitoring of background levels of dioxins, dioxin-like PCBs and non-dioxin-like PCBs in foodstuffs	dioxins, PCBs
Commission Recommendation 2004/704/EC of 11 October 2004	On the monitoring of background levels of dioxins and dioxin-like PCBs in feedingstuffs	dioxins, PCBs

4.3 Presentation of the prevailing legislation and regulations dealing with POPs

4.3.1 AT EUROPEAN LEVEL

The European regulations and directives dealing with the POPs issue feature in table 3 of the present document.

The European legislation covers the obligations ensuing from international environmental Conventions, which Belgium subscribed to, including any obligations ensuing from the Additional Protocols to these Conventions.

The majority of measures taken at regional and/or federal level are the result of the transposition and the implementation of this legislation, mainly of Regulation (EC) No 850/2004 on POPs.

4.3.2 AT FEDERAL LEVEL

Measures regarding pesticides for agricultural use [25]

- Royal Decree of 28 February 1994 on the storage, marketing and use of pesticides for agricultural purposes (MB 11-05-1994), last amended by the Royal Decree of 30 November 2011,
- Royal Decree of 28 February 1994 on the accreditation of companies manufacturing, importing or packaging pesticides for agricultural purposes (MB 11-05-1994), as amended by the Royal Decree of 16 January 2006 (MB 02-03-2006) and of 16 October 2007 (MB 14-11-07),
- Law of 21 December 1998 on product standards to promote sustainable production and consumption patterns and to protect the environment and public health (Act, (MB 11-02-99), last amended by the Law of 27 July 2011,
- Ministerial Decree of 12 November 2007 appointing the members of the Committee tasked with approving pesticides for agricultural use (MB 28-11-2007), as amended by the Royal Decree of 27 November 2008 (MB 19-12-2008) and of 26 January 2012 (MB 23-02-2012).

Measures regarding authorised residue levels of pesticides on and in foodstuffs

- Royal Decree of 13 March 2000 (MB 10-05-2000), as amended by the Royal Decree of 29 September 2008 (MB 29-10-2008), setting the maximum authorised residue levels of pesticides on and in foodstuffs. Since, 1 September 2008, the maximum residue levels have been laid down in Regulation 396/2005/EC.

Programme to reduce the use of pesticides for agricultural use and biocides [26]

- Royal Decree of 22 February 2005 on the first programme to reduce the use of pesticides for agricultural use (MB 11-03-2005).

Foodstuff and feedstuff-related measures

- Royal Decree of 18 February 1991 on specific foodstuffs, last amended by the Royal Decree of 27-09-2006, which retranscribes Directives 2003/13/EC and 2003/14/EC,
- Ministerial Decree of 12 February 1999 on the sales and use of feedstuffs, as amended by the Ministerial Decree of 23-04-2007, which retranscribes Directive 2002/32/EC,
- Royal Decree of 19 May 2000 laying down the maximum levels [...] of polychlorinated biphenyls in certain foodstuffs, last amended by the Royal Decree of 27-09-2006,

[25] Source: Phytoweb - http://www.fytoweb.fgov.be/indexFr.asp - This website gives access to the database containing details about pesticides for agricultural use authorised in Belgium. The information on this page reflects the decisions of the Accreditation Committee recorded in the approval documents on pesticides for agricultural use.
[26] Programme to reduce the use of pesticides for agricultural use and biocides - PRPB
http://www.health.belgium.be/eportal/Environment/Chemicalsubstances/PRPB/index.htm

- Royal Decree of 14 January 2002 on the quality of water for human consumption packaged or used in food establishments producing and/or marketing foodstuffs, which retranscribes Directive 98/83/EC.

Water-related measures

- Royal Decree of 8 February 1999 on natural mineral waters and spring waters, last amended by the Royal Decree of 15-12-2003,
- Royal Decree of 23 June 2010 establishing a framework to achieve a good surface water status.

Varnish and paint-related measures

- Royal Decree of 7 October 2005 on the reduction of volatile organic compounds in certain varnishes and paints and vehicle refinishing products (MB 19-10-2005).

Hazardous equipment and hazardous substances-related measures

- Royal Decree of 9 July 1986 regulating substances and preparations containing PCBs and PCTs, transposing Directives 76/769/EEC and 85/467/EEC,
- Royal Decree of 12 October 2004 on preventing the use of hazardous substances in electrical and electronic equipment, as amended by the Royal Decree of 14-06-2006.

4.3.3 AT REGIONAL LEVEL

4.3.3.1 THE BRUSSELS-CAPITAL REGION

Since 1989, the BCR has had a veritable legal arsenal in place that has allowed it to effectively, both directly and indirectly, curtail and eliminate the presence, use and dispersion of POPs across the various environmental compartments.

The BCR approved the Stockholm Convention on POPs and the Aarhus LRTAP POPs Protocol:

- Ordinance of 20 April 2006 approving the POPs Convention, signed in Stockholm on 22 May 2001 (MB 09/05/2006).
- Ordinance of 20 April 2006 approving the Protocol to the 1979 Convention on LRTAP on POPs, and its appendix, signed in Aarhus on 24 June 1998 (MB 09/05/2006).

The implementation basis of the obligations ensuing from the Stockholm Convention are the specific operational requirements for every classified plant comprising rules on the individual environmental compartments (air, water, waste, soil, noise) and the monitoring and supervision to ensure that these requirements are adhered to.

From the obligation to eliminate PCBs/ PCTs in oils used by transformers and condensers, the obligation to remediate contaminated soil to the obligation to treat flue gasses generated by waste incineration and waste water purification, the waste water discharge standards, the disposal of waste and the conditions attached to environmental licences, the BCR has introduced more than 250 different pieces of environmental legislation to tackle the POPs issue.

Ordinances dealing with POPs in the BCR :

- **Ordinances aimed the elimination of PCBs/PCTs**
  - Decree of the BCR Executive of 19/09/1991 regulating the elimination of PCBs (MB 13/11/1991),
  - Decree of the BCR Government of 04/03/1999 on the planning and elimination of PCBs and PCTs (MB 04/08/1999).

- **Decrees aimed at reducing atmospheric pollution caused by waste incineration**
  - Decree of the RBC Government of 21/11/2002 on waste incineration (MB. 20/02/2003),
  - Decree of the BCR Government of 13/11/2003 amending appendix II of the Decree of the RBC Government of 18 April 2002 on the landfilling of waste (MB 18/12/2003).

- **Decrees aimed at inventorying the stocks of fire-fighting foams containing perfluorooctane sulfonate (PFOS)**
  - Decree of the Government of the BCR of 2 September 2010 containing, various measures on the running and monitoring of facilities using certain substances, as they are or as part of a mixture, governed by the REACH Regulation.
- **Water-related Decrees**
  - Ministerial Decree of 18 March 2005 establishing a programme to reduce the pollution of water by certain hazardous substances - PCBs and PCTs;
  - Ministerial Decree of 18 March 2005 establishing a programme to reduce the pollution of water by certain hazardous substances – PAHs;
  - Decree of the BCR Government of 30 June 2005 replacing appendix II to the Decree of the BCR Government of 20 September 2001 on the protection of surface water against pollution by certain hazardous substances;
  - Decree of the BCR Government of 17 December 2009 laying down the intervention standards and the sanitation standards;
  - Decree of the BCR Government of 10 June 2010 on the protection of groundwater against pollution and deterioration;

- Decree of the BCR Government of 24 March 2011 establishing the environmental quality standards, the basic quality standards and the chemical standards for surface water to protect it against pollution caused by certain hazardous substances and other pollutants.

The thematic plans and programmes in the BCR can be found on the website of the IBGE (available in Dutch and French only):
http://www.bruxellesenvironnement.be/Templates/etat/niveau2.aspx?id=3048&langtype=2060

4.3.3.2 THE FLEMISH REGION

The legal framework within which Flanders pursues its environmental policy in general, and tackles POPs in particular, consists of a number of decrees and their implementing orders. Below, we shall list the main ones. Aside from implementing its own decrees, Flanders also actively implements the European Directives.

The main Directives, with relevance for the regional POPs policy, are also listed here.

Decree of 5 April 1995 laying down the general provisions relating to environmental policy (DABM)

This decree stipulates that Flanders' environmental policy is shaped by the environmental policy plan with as cornerstones the Environment Report (milieurapport - MIRA), the Environmental Policy Plan (Milieu& Natuur Plan - MINA) and the yearly environmental programmes.

- **The environment report** scientifically underpins the environmental policy. The first Nature Report (Natuurrapport[27] - NARA), which specifically deals with nature and biodiversity, was published in May 2005. Nature Reports were also published during 2007 and 2009[28]. The 2009 Nature Report is the first nature report to describe the future.

Flanders Environment Report
MIRA, the Flanders Environment Report, has a three-fold task: *MIRA describes, analyses and assesses the current state of the environment *MIRA assesses the environmental policy pursued thus far *MIRA describes the expected environmental developments according to a number of scenarios deemed relevant both in case of an unchanged policy and of a changed policy. There are three different MIRA reports:

[27] Natuurrapport [Nature Report] 2005 - http://www.inbo.be/content/page.asp?pid=BEL_NARA-NARA2005
[28] Natuurrapport 2007 en 2009 - http://www.inbo.be/content/page.asp?pid=BEL_NARA-MAIN-startpagina

The annual MIRA-T report (T = themes), a detailed scientific study that charts an overall picture of the current state of the environment in Flanders by means of indicators; the biennial MIRA-BE report (BE = beleidsevaluatie = policy evaluation), an evaluation of the existing environmental policy; the five-yearly MIRA-S report (S = scenarios), a description of how the environment in Flanders can evolve given various (policy) circumstances.

Further information on this policy instrument can be found on http://www.milieurapport.be/en/home.

- **The Environmental Policy Plan**[29] defines the main lines of the environmental policy that must be pursued by the Flemish Region and by the provinces and municipalities in matters of regional interest. The plan, on the one hand, aims to protect and manage the environment and, on the other hand, to enhance the effectiveness, efficiency and the internal cohesion of the environmental policy across all the various policy levels.

  The Flemish Government implemented the 2003-2007 Environmental Policy Plan (MINA 3) on 19 September 2003. As a result of an amendment to the DABM, the 2003-2007 Environmental Policy Plan was extended to 2010, following a number of updates and amendments, notably in terms of objectives. The 2011-2015 Environmental Policy Plan (MINA 4) is the successor to the MINA 3(+) Plan, which ran from 2008 until the end of 2010.

  As regards hazardous substances, the Flemish Region follows the approach described in the 2003-2007 Environmental Policy Plan. That approach is based on the objective of zero emissions, as formulated by the Third North Sea Conference. This particular policy plan also features all the aspects of timing and the deployment of financial and manpower resources.

  The Environmental Policy Plan lists measures per particulate matter (group): it features a whole series of measures on metals, pesticides, dioxins, particulate matter and PAHs. These measures were introduced to enhance the inventorying and monitoring of emissions, to chart and quantify the various sources (point and diffuse); awareness-raising campaigns (especially in relation to pesticides and dioxins), collaboration with the federal government…

  The Flemish Region follows the European and international policies on hazardous substances and complies with its obligations on the matter.

  Regarding water emissions, ‘Priority' substances are pollutants or groups of substances which, on account of their inherent danger and wide-spread polluting effects, are so toxic to or in the aquatic environment that standards and measures to reduce their dispersal are being developed at European level as a matter of

[29] Het Mileubeleidsplan 4 (Environmental Policy Plan 4) - http://www.lne.be/themas/beleid/mina4/leeswijzer/het-milieubeleidsplan

priority. ‘Priority hazardous’ substances constitute an important subcategory within this group as they pose an even higher risk (on account of their toxic, persistent and bioaccumulative properties), therefore warranting even more stringent measures. The goal is to put a complete stop to or phase out any such discharges or emissions.

- **The yearly environmental programmes** implement and put the Environmental Policy Plan into operation, with an emphasis on the organisation, timeframe and the prioritisation of the various measures.

The Decree concerning environmental licences

On 28 June 1985, the Flemish Parliament ratified the Decree concerning environmental licences. This Decree forms the basis for the so called VLAREM (Vlaams Reglement betreffende de Milieuvergunning - Flemish Environmental Licences Regulation), which implements the Decree concerning environmental licences.

- **VLAREM I**

On 1 September 1991, the first order of the Flemish Government, VLAREM I, came into effect. VLAREM I defines who must apply for an environmental licence, which authority has the relevant competence, which procedures must be respected and who is in charge of monitoring whether the licence requirements are adhered to.
Depending on the degree to which businesses are deemed to have an adverse effect on man and the environment, they are subdivided into three categories in a category list appended to VLAREM I.

- **VLAREM II**

On 1 August 1995, the second order of the Flemish Government, VLAREM II, came into effect. VLAREM II lays down the general and sectoral standards businesses must satisfy in order to obtain an environmental licence, allowing them to carry out their activities (see also appendix III and IV).
As a general rule, VLAREM II provides that operators shall invariably use the best available techniques to protect man and the environment, and this both in terms of the treatment methods at emission level and of the containment measures implemented at source (appropriate production techniques and methods, feedstock control and such like).

The VLAREM legislation also imposes conditions on the processing of hazardous waste (see appendix IV).

Materials Decree

On 14 December 2011, the Members of the Flemish Parliament ratified the Materials Decree. For now, this forms the coping stone of the sustainable management of materials in Flanders. The Flemish Government already gave the decree its seal of approval on 24 June 2011. It implements European Directive (EC) 2008/98, known as the Waste Framework Directive, in Flanders and embeds the sustainable management of materials. The 1981 Waste Decree has been repealed. The decree presupposes that an integrated view on the materials chain is essential to come up with a lasting solution to the waste issue. The Materials Decree came into effect on 1 June 2012 (Cf. Appendix V).

VLAREMA

Parallel to the decree, a new order of the Flemish Government has replaced the Flemish Regulation on Waste Prevention and Management, known as VLAREA (Vlaams Reglement voor Afvalvoorkoming en –beheer). The Flemish Regulation on Sustainable Management of Material Cycles and Waste Materials (Vlaams Reglement voor het duurzaam beheer van materiaalkringlopen en afvalstoffen - VLAREMA), was ratified on 17 February 2012 and contains more detailed provisions on (special) waste, raw materials, selective collection, transport, the registration obligation and extended producer responsibility. The Materials Decree and VLAREMA came into effect at the same time, subject to some exceptions or transitory provisions.

The Soil Remediation Decree

The decree laying down general provisions in matters of environmental policy of 5 April 1995 formulates the objectives and principles of the Flemish environmental policy and establishes the legal basis for a long-term policy that deals with the environment in a sustainable fashion.

Preventing further pollution and remediating historical pollution are the main objectives of the Soil Remediation and Soil Protection Decree of 11 October 2006. This new Soil Remediation Decree is the successor to the 1995 version.

- VLAREBO - The Flemish Regulation on Soil Remediation (Vlaams Reglement rond de Bodemsanering – VLAREBO), implements the provisions of the Soil Remediation Decree. This regulation has been the subject of several amendments already. One important amendment concerns excavated soil. A new version of the VLAREBO came into effect as of 1 June 2008.

Decree on the reduction of the use of pesticides by public services in the Flemish Region

The “Decree on the reduction of the use of pesticides by public services in the Flemish Region” banned the use of pesticides by public authorities as of 2004, unless a reduction plan was submitted.

4.3.3.3 THE WALLOON REGION

Walloon environmental management plans:

- The Environmental Plan for Sustainable Development (Plan d’environnement pour le développement durable)
- The Walloon Air Plan
- The Walloon “Horizon 2010” Waste Plan

Walloon orders and decrees on POPs:

- **Waste and soil**
    - Decree of 27 June 1996 on waste and its implementing orders,
    - Order of the Walloon Regional Executive (Arrêté de l'Exécutif régional wallon - AERW) of 9 April 1992 on hazardous waste ,
    - AERW of 9 April 1992 on PCBs/PCTs,
    - Order of the Walloon Government (Arrêté du Gouvernement wallon - AGW) of 10 July 1997 establishing a waste catalogue,
    - AGW of 25 March 1999 on the elimination of PCBs/PCTs,
    - AGW of 25 April 2002 introducing the take-back obligation for certain types of waste with a view to their recovery or management, as amended by the Order of the Walloon Government of 10 March 2005, and replaced by the AGW of 23 September 2010,
    - AGW of 27 February 2003 laying down sectoral conditions on waste incinerators and waste co-incinerators,
    - AGW of 18 March 2004 banning the practice of sending certain types of waste to landfills (centre d'enfouissement technique),
    - Decree on the remediation of contaminated soil and on sites of economic activity requiring remediation (decree of 1/04/2004, the so-called "Soil Decree"),
    - Decree of 5 December 2008 on soil management (MB 18.02.2009).
- **Water**
    - AGW of 30 November 1995 on the management of matter removed from the bed and banks of stream and water bodies as a result of dredging or clearing activities and its amendments (notably the AGW of 10/06/1999),
    - AGW of 29 June 2000 on the protection of surface water against pollution caused by certain hazardous substances, as amended by the Order of the Walloon Government of 12 September 2002,
    - Decree of 27 may 2004 on Book II of the Environment Code, creating the Water Code and its subsequent implementing orders.
- **Air**
    - AGW of 23 June 2000 on the assessment and management of the quality of ambient air (which introduced PAHs in the monitoring programme),
    - AGW of 3 December 1998 amending the AGW of 9 December 1993 on combating atmospheric pollution created by household-waste incinerators.

- **Others**
    - Decree of 11 March 1999 on environmental licences and its implementing orders including those laying down sectoral conditions.

5 The Belgian situation regarding the POPs issue

With regard to the Belgian political situation in the realm of environment, several approaches need to be considered for the assessment of POPs. Federal powers include indeed the follow-up of the bringing on the market of chemicals, the prevention of intoxication and other health risks possibly caused by the use of chemicals, the quality and health aspects of all products entering the food chain and the control on chemicals brought on the market. Regions, on the other hand, are essentially competent for the prevention of risks for the environment (including for the purpose of health protection) possibly caused by the use of dangerous chemicals, the monitoring of emissions into the environment, the PCB phasing-out measures, the decontamination of soils and the legislation regarding unhealthy businesses and activities (environment permit, general and sectorial conditions).

The remainder of this chapter is therefore sub-divided according to these criteria.

The results of the release and transfer of Belgian POPs appearing in the E-PRTR http://prtr.ec.europa.eu/ (European Pollutant Release and Transfer Register) are also presented.

5.1 Monitoring POPs within the framework of the E-PRTR

The implementation of the Pollutant Release and Transfer Register through the European Regulation E-PRTR no. 166/2006 and the PRTR protocol of the UNECE under the Aarhus Convention has extended the data already available via the European Pollutant Emission Register (EPER) to most of the POPs covered by the Stockholm Convention.

Every year, each facility that meets the defined criteria must declare the following data to the competent authorities concerned (the regions):

- Releases to air, water and land of the 91 E-PRTR pollutants;
- Off-site transfers of the 91 E-PRTR pollutants in waste water destined for treatment outside the facility;
- Off-site transfers of waste for recovery or disposal. For transboundary movements of hazardous waste outside the reporting country, details of the waste receivers have to be provided.

Tables 5, 6 and 7 present an overview of the data reported by Belgian companies.

Table 5 : POPs under the E-PRTR classified by substrates, regions and emission sources in Belgium - 2007-2010 period (Source: http://prtr.ec.europa.eu/)

POP	Substrate	Region	Emission source
PBDE	Water	Flanders	Pretreatment or dyeing of fibres or textiles
PeCB	Air	Wallonia	Production and processing of metals
PCB	Air	Wallonia	Energy sector Production and processing of metals Mineral industry Waste and waste water management
	Water	Wallonia	Waste and waste water management
HCB	Air	Wallonia	Mineral industry
	Water	Wallonia	Production and processing of metals
Dioxin/furans	Air	Flander	Energy sector, Production and processing of metals, Paper and wood production processing
		Wallonia	Energy sector Production and processing of metals Mineral industry Chemical industry Waste and waste water management Paper and wood production processing
	Water	Wallonia	Landfill, Production and processing of metals
POP - pesticides: Aldrin, chlordecone, chlordane, DDT, dieldrin, endosulfan, endrin, heptachlor, HCH including lindane, mirex.	Not reported between 2007 and 2010 [2]		
Hexabromobiphenyl	Not reported between 2007 and 2010 [2]		
PFOS	Not included in the E-PRTR listing		

[2] i.e. no data returned for your query

Table 6: **Water** - Annual emissions reported by Belgian companies over the 2007 to 2010 period. The number of industries associated with the emissions is shown in brackets (Source: http://prtr.ec.europa.eu/)

POP	Region	2007	2008	2009	2010
PBDE (kg/year)	Flanders	2.49 [1]	38.8 [2]	5.29 [2]	11.6 [2]
PCB (kg/ year)	Wallonia	-	0.46 [1]	0.21 [1]	0.59 [2]
HCB (kg/ year)	Wallonia	-	-	1.13 [1]	-
Dioxin/Furans (g TEQ/ year)	Wallonia	0.26 [1]	11 [2]	1 [1]	-

Table 7: **Air** - Annual emissions reported by Belgian companies over the 2007 to 2010 period. The number of industries associated with the emissions is shown in brackets (Source: http://prtr.ec.europa.eu/)

POP	Region	2007	2008	2009	2010
PeCB (kg/ year)	Wallonia	-	1140 [2]	107 [1]	483 [2]

PCB (kg/ year)	Wallonia	78.4 [11]	56.6 [11]	53.8 [10]	29.72 [8]
HCB (kg/ year)	Wallonia	55.3 [3]	14.5 [1]	-	-
Dioxin/Furans (g TEQ/ year)	Brussels		-	-	-
	Flanders	4.99 [3]	7.67 [2]	5.35 [4]	5.28 [1]
	Wallonia	8.81 [9]	23.27 [11]	13.45 [8]	15.93 [6]
	Total	13.8 [12]	30.9 [13]	18.8 [12]	21.2 [7]

5.2 Assessment of the POPs issue at Federal level

5.2.1 Placing on the market, use and trade of POPs in Belgium: history

- **Pesticides POPs**

The "old pesticide POPs", namely **aldrin, chlordane, dieldrin, endrin, heptachlor, hexachlorobenzene, mirex and toxaphene**, listed in appendix A of the Stockholm Convention, were widely used until the 1960s. From the early 1970s, no further authorisation was granted to place these products on the Belgian market. The production, placing on the market and use of these products whether as chemical substances contained in preparations or as constituents of articles was prohibited across Europe and therefore Belgium by the European Regulation 850/2004 on POPs. Since the European Regulation 2455/92, repealed by Regulation 304/2003 and Regulation 689/2008/EC, concerning the international trade in hazardous chemicals and pesticides, these substances have also been subject to an export ban outside Europe.

The same applies in the specific case of **DDT** (dichlorodiphenyltrichloroethane) listed in appendix B of the Convention. The production, placing on the market and use of this substance is prohibited across Europe by the Regulation 850/2004 and any export outside Europe is prohibited by the Regulation 689/2008. Its use was banned in Belgium in 1974 for the agricultural sector and in 1976 for all other business sectors (official opinion 22/11/1974 and RD 01/11/1976). An inventory was carried out based on individual declarations and since no stock of this product was declared, it was concluded that there was no longer any DDT stock in the country.

The European Union notified the secretariat of the Rotterdam Convention on the Prior PIC procedure for certain hazardous chemicals and pesticides in international trade, that it does not consent to accepting imports of aldrin, chlordane, dieldrin, heptachlor, hexachlorobenzene, toxaphene or DDT.

With regards the new pesticide POPs listed into appendix A of the Stockholm Convention:

Lindane was not included in appendix I of Directive 91/414 concerning the placing of plant protection products (PPP) on the market with the result that no further authorisation to place lindane on the market and use it as a PPP was allowed after 20/06/2000. A grace period not exceeding 18 months could however be granted. In Belgium, the last approval for lindane as a PPP was withdrawn on 19 June 2001. The European Regulation 689/2008 prohibited any export of this substance outside Europe.

Endosulfan was not included in appendix I of the Directive 91/414 with the result that no further authorisation to place endosulfan on the market and use it as a PPP was allowed after 01/06/2006, with a grace period until 02/06/2007. In Belgium, the last approval for endosulfan as a PPP was withdrawn on 1 June 2006, with the use of existing stocks authorised until 1st June 2007. Directive 98/8 does not authorise the placing on the market and use of this active substance in biocidal products.

Pentachlorobenzene, chlordecone, alpha hexachlorocyclohexane (α-HCH) and beta hexachlorocyclohexane (β-HCH) have not been registered as active PPP substances in Belgium since at least 1992 and export of these substances outside Europe is prohibited by Regulation 689/2008.

The European Union notified the secretariat of the Rotterdam Convention that it does not consent to accepting imports of lindane or HCH.

- **Industrial chemical POPs**

The use of the <u>"old industrial chemical POP"</u>, **PCBs**, listed in appendix A (elimination) and C (unintentional production) of the Stockholm Convention, was banned in Belgium in 1986. Only use in confined conditions or for the purposes of research provided that they present no risk to the environment is allowed.

Indeed, the Royal Decree of 9 July 1986 (which transposes Directives 76/769/EEC and 85/467/EEC) regulates substances and preparations containing PCBs and PCTs. It prohibits the manufacture, import, export, sale, transfer free of charge or for commercial or industrial purposes of PCBs/PCTs or products, equipment, facilities or fluids containing them except for the operations carried out within the framework of the regulations in terms of waste management (collection, disposal, etc.). The use of these products, devices, facilities or fluids remains authorised until their disposal or the end of their life span.

Equipment containing PCBs (i.e. transformers, capacitors, hydraulic systems, etc.) were listed (see stocks and inventories chapter), in Directive 96/59/EC that provided for their disposal by 31 December 2010 at the latest.

Diffuse PCBs (i.e. paint, ink and insulation,...) are not subject to an inventory. The total quantity introduced onto the Belgian market has been estimated at 4500 tons, 80% of which is for open applications (rubber, paint, etc.) and 20% for closed applications (small washing machine capacitors, fluorescent tubes, etc.). About 400 tons introduced as production impurities in bulk chemicals must also be added to this. The estimate of PCB quantities still on the market in 1999 was based on the products' life span. For example, the life span of a layer of wall paint is estimated to be 20 years. Diffuse PCBs used in closed applications mainly come from small capacitors in fluorescent tubes. Although quantities of diffuse PCBs used in open applications represented about 80% of the quantities of diffuse PCBs introduced in Belgium, they only accounted for about 40% of the quantities of diffuse PCBs still present in 1999. This is partly due to the limited longevity of open applications and the fact that PCBs were no longer used in this kind of application after 1973.

With regards the "new industrial chemical POPs" included in appendix A or B of the Stockholm Convention, **hexabromobiphenyl, tetrabromodiphenyl ether, pentabromodiphenyl ether, hexabromodiphenyl ether, heptabromodiphenyl ether, PFOS and pentachlorobenzene**, these all appear in the appendix of Regulation 850/2004, whether as substances, in preparations or as constituents of articles; their production, placing on the market and use across the European territory is prohibited with the exception of several specific exemptions for PFOS. The European Regulation 689/2008 prohibits any export of this substance outside Europe excluding PFOS.

- **POPs from unintentional production**

Polychlorodibenzodioxins (PCDDs) and **polychlorodibenzofurans** (PCDFs), which are also known as dioxins are potentially the most problematic substances of those listed in the Convention. **PCBs** show a similar structure and are called "dioxin-like". Dioxins, together with **hexachlorobenzene (HCB)** are produced unintentionally following incomplete combustion and during the manufacture of pesticides and other chlorinated substances. The technological developments of the 20th century have therefore led to an increase in dioxin concentrations in the environment. Some sources have left traces but are no longer used today:

- Use of the pesticide 2,4,5-T
- Treatment of wood with pentachlorophenol
- Use of PCBs in industry
- Combustion of oil fuel and petrol (leaded)

Current sources are:

- Waste incineration (including medical and hazardous)
- The steel industry
- Burning of peat, coal and wood (industrial and household)
- Exhaust gasses (especially from diesel vehicles)
- Controlled, uncontrolled and accidental fires
- Sewage sludge
- Areas of past pollution (e.g. contaminated sites)
- Production of paper pulp using chlorine as a whitening agent
- Furans are also produced in this way, and are a by-product in the manufacture of PCBs.

In Belgium, in January 1999, the accidental contamination of recycled fat intended for animal feed by 100 litres of PCBs caused the "dioxin crisis". Following this incident, a series of analyses were carried out in order to check the population's risk of exposure to dioxins and PCBs (see federal, human and food chain monitoring chapter).

Pentachlorobenzene (PeCB), the new POP added to appendix C, is also produced unintentionally during combustion, thermal and industrial processes. It also present as impurities in products such as solvents or pesticides.

POPs unintentionally released into the environment are mainly monitored regionally (see regional monitoring and E-PRTR chapter).

5.2.2 Human monitoring

POPs in blood

- **Pesticide POPs**

Several national studies have showed human blood concentrations of several organochlorine pesticides. These concentrations increase with age. The results of these studies are given in table 8. It should be noted that DDE (dichlorodiphenyldichoroethylene) and DDD (dichlorodiphenyldichloroethane) are both degradation products of DDT and can be found in commercial preparations of DDT. DDT metabolises into DDE in the human body, which is why DDE was found in a larger quantities during the evaluations. Half-life in the human body is 4 years for DDT and 9 to 10 years for DDE (Noren & Meironyté, 2000). The DDT/DDE ratio gives an indication of the time elapsed since exposure.

Table 8 : Blood concentrations of organochlorine pesticides and their metabolites identified in different age groups of the Belgian population (M=male, F= female).

Year	age	sex	N	Pollutant	mean	SD	min.	median	max.	unit	ref.
1998-2000	19-63	F	20	HCB	32.0	19.6	7.3	27.2	66.9	ng/g lipids	Van Wouwe et al., 2004[30]
2001	20-24	M+F	18	HCB	21.8	9.1	9.6	18.1	39.7		Voorspoels et al.,2002[31]
2001	25-29	M+F	4	HCB	17	2.3	14.5	16.6	20		
2001	30-34	M+F	9	HCB	19.9	4.4	15.2	19.8	26.2		
2001	35-39	M+F	13	HCB	25.3	10.7	11.3	22.9	42.7		
2001	40-44	M+F	42	HCB	29.5	18.2	9.8	26.3	89.5		

[30] Van Wouwe N, Covaci A, Kannan K, Gordon J, Chu A, Eppe G, de Pauw E., Goeyens L (2004) Levels of contamination for various pollutants present in Belgian human plasma, *Organohalogen Compounds*, 66, 2818-2824.
[31] Voorspoels S., Covaci, A., Maervoet, J. & P. Schepens (2002) Relationship Between age and levels of Organochlorine Contaminants in Human Serum of a Belgian Population, *Bulletin of Environmental Contamination and Toxicology*, 69: 22-29.

2001	45-49	M+F	30	HCB	30.6	20.4	8.5	26.3	113.3		
2001	50-54	M+F	16	HCB	35.1	19	11.1	34.3	89.2		
’98-‘00	19-63	F	20	Β-HCH	23.1	14.7	5.6	16.7	53.2		Van Wouwe et al., 2004
’98-‘00	19-63	F	20	γ-HCH	5.4	2.7	3.1	4.5	14.6		Van Wouwe et al. 2004
’98-‘00	19-63	F	20	Oxy-chlordane*	22.3	19.9	4.0	15.8	67.4		Van Wouwe et al., 2004
’98-‘00	19-63	F	20	Trans-nanochlor	8.4.	4.7	2.5	7.6	16.7		
’98-‘00	19-63	F	20	p,p'-DDE	365.0	313.2	37.4	344.2	1390.3		Van Wouwe et al., 2004
2001	20-24	M+F	18	p,p'-DDE	96	56.4	40.9	74.4	256.1		Voorspoels et al.,2002
2001	25-29	M+F	4	p,p'-DDE	87.1	55	39.4	71.6	166		
2001	30-34	M+F	9	p,p'-DDE	171.9	135.2	37.2	147.2	417.1		
2001	35-39	M+F	13	p,p'-DDE	194.5	121.5	66.4	145.3	498.3		
2001	40-44	M+F	42	p,p'-DDE	190.4	88.8	53.8	183.2	424.8		
2001	45-49	M+F	30	p,p'-DDE	217.4	146.4	56	182.2	641.9		
2001	50-54	M+F	16	p,p'-DDE	254	140.5	90.1	245.2	689.2		
1998-2000	19-63	F	20	p,p'-DDT	9.1	2.5	6.0	8.3	13.5		Van Wouwe et. al., 2004

**trans-chlordane and cis-chlordane were below the limit of detection*

- **POPs from unintentional production**

In Belgium, in January 1999, the accidental contamination of recycled fat intended for animal feed by 100 litres of PCBs caused the "dioxin crisis". Debacker et al 2007[32] evaluated the impact of the 1999 Belgian dioxin incident on the blood plasma PCDD and PCDF levels among 232 Belgian blood donors (74% men, mean age 47 years). The Red Cross made plasma samples from before the incident of these donors available. A second plasma sample was collected during the second half of 2000. The sum of the 17 PCDD/PCDF congeners was significantly lower in 2000 compared to 1998 (417 pg/g fat versus 445 pg/g fat, respectively). However, the total toxicity remained unchanged (22.9 in 1998 versus 23.1 pg WHO-TEQ/g fat, $p > 0.05$). Moreover the observed congener profiles and the total PCDD/PCDF levels were similar to those of other European non-occupationally exposed populations.

In conclusion, the 1999 PCB/dioxin incident was traceable in the plasma profiles (rise of the two specific PCDF congeners), but comparison of the results for both years indicates that the changes were too small to cause an adverse public health effect (see also chapter about food chain monitoring).

[32] Debacker N, Sasse A, van Wouwe N, Goeyens L, Sartor F, van Oyen H. (2007) PCDD/F levels in plasma of a belgian population before and after the 1999 belgian PCB/DIOXIN incident. Chemosphere. 67(9):S217-23.

POPs in human milk

Generality

Following a joint request from the World Health Organisation (WHO) and the United Nations, a study focusing on the concentration of different POPs in human milk was conducted in 2006 across the whole of Belgium. This project, under the authority of the Joint Interministerial Conference on Environment and Health, which brings together all Belgium's federal , regional and community authorities responsible for environment and health[33], was part of the 4th survey of this type coordinated by the WHO.

The previous three surveys only took into account dioxins, furans, combustion products and industrial waste together with PCBs, while the 4th survey included all the POPs listed in the Stockholm Convention, with the exception of chlordecone, hexabromobiphenyl and PeCB.

The purpose of this study was to verify to what extent environmental pollutants were found in the human body. This study also made it possible to verify the content of POPs in the population in order to examine the effectiveness of the reduction measures that have been taken.

The results obtained were used to fill in any gaps in the current policy to combat POPs.

Analyses : Human milk was chosen because it is relatively easy to collect and contains enough fat to conduct the accumulation tests successfully. Two hundred participants from Flanders, Wallonia and Brussels were selected across 2 maternity clinics per province (in both rural and urban areas). The selection criteria were as follows:

- Breastfeeding mothers,
- Between 18 and 30 years old,
- Born in Belgium and domiciled in the catchment area for at least 5 years,
- HIV negative,
- Giving birth to a first child (twin births were not included in the study),
- Normal pregnancy,
- Full-term pregnancy (gestation > 36 weeks),
- Healthy babies.

[33] [VITO, 2007] *"4ème campagne OMS sur le lait maternel: Les POP dans le lait maternel: les résultats belges anno 2006"*. 2007/TOX/R/019, Vlaamse instelling voor technologisch onderzoek (VITO) – 1st edition: May 2007, p131. Executed at the request of the Environment and Health Unit on behalf of the Federal Government, the Flemish, French and German speaking communities, the joint community commission, the French community commission, the Flemish region, the Walloon region and the Brussels-Capital region. Study partners: Vlaamse instelling voor technologisch onderzoek (VITO)- Scientific Institute for Public Health: sample analysis - Provincial Institute of Hygiene and Bacteriology Mons: field work in Wallonia and Brussels - Provinciaal instituut voor Hygiëne Antwerp: field work in Flanders - Environment and Health Unit: coordination.
Colles A, Koppen G., Hanot V, Nelen V, Dewolf M.C., Noël E, Malisch R, Kotz A, Kypke K, Biot P, Vinkx C, Schoeters G. Fourth WHO-coordinated survey of human milk for persistent organic pollutants (POP): Belgian results. Chemosphere 2008, 73, 907–914

The samples were individually analysed by the Belgian Public Health Institute for the presence of PCBs and organochlorine pesticides. This concerns in particular the following substances: aldrin, chlordane, dieldrin, DDT - which also included DDE-, endrin, heptachlor, hexachlorobenzene, hexachlorocyclohexane (alpha-, beta- and gamma-HCH, also called lindane), PCB 28, PCB52, PCB101, PCB118, PCB138, PCB153, PCB180.

A pool of samples was also sent to a laboratory designated by the WHO to analyse pools of samples from all participating countries.

In this pool of samples, the substances that had already been measured in the individual samples in Belgium were analysed again in addition to a long series of other substances, namely toxaphene, the dioxin group, the dioxin-like PCB group, polybrominated diphenyl ethers and hexabromocyclododecane and finally polybrominated dibenzodioxins and dibenzofurans, and mixes of brominated and chlorinated dibenzodioxins and dibenzofurans.

Results

The results were processed collectively and incorporated into a final report available online[34]. The Belgian results were sent to the WHO which compared them with those of other participating countries.

The substances detected and/or quantified in the human milk collected in Belgium in 2006 were as follows (see table 9 for more detail):

- Dieldrin: present in 15 samples out of 190, including 3 below the limit of quantification (LOQ);
- Oxychlordane: present in 4 samples out of 190, including 2 below the LOQ;
- HCB: present in 172 samples out of 190, including 9 below the LOQ;
- PCB: present and quantifiable in 196 samples;
- o,p'-DDT: present in 1 sample out of 190, not quantifiable;
- p,p'-DDT: present in 13 samples out of 190, including 3 below the LOQ;
- b-HCH: present in 79 samples out of 190, including 38 below the LOQ;
- y-HCH: present in 1 sample out of 190, not quantifiable;

34 http://www.health.belgium.be/eportal/Aboutus/relatedinstitutions/NEHAP/PROJECTSANDACTIONS/WHO'sPOPurvey/index.htm?&fodnlang=fr

Table 9: Concentrations of organochlorine pesticides (ng/g lipids) present in 200 human milk samples collected in 2006 in Belgium.

	N	Mean	Geometric mean	Median	Minimum	Maximum	P25	P75	P10	P90	Dev. Std.	< LOD	< LOQ
Aldrin	190	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	190	0
Dieldrin	190	1.0		0.0	0.0	19.3	0.0	0.0	0.0	0.0	3.8	**175**	**3**
Endrin	190	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	190	0
Heptachlor + epoxide	190	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	190	0
Chlordane metabolites													
α-Chlordane	190	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	190	0
γ-Chlordane	190	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	190	0
Oxychlordane	190	0.2		0.0	0.0	10.8	0.0	0.0	0.0	0.0	1.2	**186**	**2**
Trans-nonachlore	190	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	190	0
HCB	190	15.2		15.5	0.0	40.6	12.2	19.1	5.0	23.3	7.6	**18**	**9**
HCH metabolites													
α-HCH	190	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**190**	**0**
β-HCH	190	11.0		0.0	0.0	1065.2	0.0	5.0	0.0	15.4	77.7	**111**	**38**
γ-HCH	190	0.1		0.0	0.0	19.8	0.0	0.0	0.0	0.0	1.4	**189**	**0**
Sum of endosulfan	190	0		0	0	0	0	0	0	0	0	**190**	**0**
PCB markers													
Sum of PCB markers	196	131.9	121.9	122.7	47.1	496.6	91.4	160.2	72.0	192.3	56.4	**0**	**0**
PCB 28	196	7.4		5.0	0.0	63.6	0.0	11.5	0.0	17.2	9.0	56	83
PCB 52	196	6.7		5.0	0.0	57.4	0.0	7.5	0.0	16.0	8.1	56	91
PCB101	196	4.3		5.0	0.0	36.9	0.0	5.0	0.0	11.0	5.7	84	86
PCB118	196	11.4		11.8	0.0	43.8	5.0	14.9	5.0	19.0	6.5	8	60
PCB138	196	33.3		32.0	0.0	127.1	24.3	39.7	20.4	48.3	13.8	2	0
PCB153	196	46.1	43.0	43.7	17.4	153.8	33.2	54.9	27.0	68.6	17.9	0	0
PCB180	196	23.3		22.7	0.0	63.1	16.6	29.7	13.0	35.4	10.1	3	6
DDT and metabolites:													
p,p'-DDE	190	121.6	101.3	95.9	26.1	724.5	70.7	140.5	49.8	211.4	93.3	**0**	**0**
p,p'-DDT	190	1.5		0.0	0.0	80.2	0.0	0.0	0.0	0.0	7.7	**177**	**3**
o,p'-DDT	190	0.1		0.0	0.0	17.3	0.0	0.0	0.0	0.0	1.3	**189**	**0**
p,p'-DDD	190	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**190**	**0**
o,p'-DDD	190	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**190**	**0**
o,p'-DDE	190	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**190**	**0**

- **Pesticide POPs**

Generally, old organochlorine pesticides are no longer found in human milk, with the exception of DDT, HCB and HCH (which has only recently been banned).

The tests carried out in 2006, as part of the 4th WHO survey, show a reduction in the rates of HCH in the human milk samples collected in Belgium compared with the Belgian study conducted in 2003 by Saunders on 60 samples of human milk. Only β-HCH was detected in 38 of the 190 samples analysed in 2006 with, in all cases, a concentration below the quantifiable limit (11 ± 77,7 ng/g lipids). The concentrations of HCH measured by Saunders are given in table 10.

Table 10: concentrations of HCH (ng/g lipids) collected in Belgium in 2003

Isomer	Mean	Median	Min	Max	Unit	Ref.
α-HCH	3.6	0.9	0.3	36.1	ng/g lipids	*Saunders et al., 2005*[35]
β-HCH	24.9	22.3	4.3	71.5		
γ- HCH	1.6	1.2	0.3	14.6		
δ-HCH	1.3	0.9	0.3	23.4		

It is therefore still necessary to verify whether these substances simply need more time to disappear completely or whether additional measures could be required.

- **Industrial chemical POPs**

The reduction in the level of PCB indicators between the 3rd and 4th WHO surveys is notable (over 50%). PCB levels fall from approximately 200 ng/g fat (sum of 6 PCB indicators PCB 28+ 52 + 101 +138 + 153 +180) in 2001, to 80 ng/g fat in 2006. This can be attributed to the strict monitoring of the disposal of oils containing PCBs and the necessary measures being taken to prevent the contamination of the environment.

The trend is less noticeable for dioxin-like PCBs which are more difficult to measure and were later in receiving the necessary attention; the standards have only been applied to animal feed and foods since late 2006. We are therefore still waiting for the effects of these measures.

- **POPs from unintentional production**

It is gratifying to observe that dioxin levels have once again decreased significantly.
During the 1st survey on human milk in 87-88, Belgium had the highest dioxin/furans values in the 19 participating countries (40.2 pg TEQ/g fat). During the 2nd and 3rd surveys, Belgium was also among the leaders, along with other industrialised countries. A reduction in the dioxin/furan levels was then observed between the 3rd (17 pg WHO1998-TEQ/g fat) and 4th WHO surveys (10.3 pg WHO1998-TEQ/g fat). Significant efforts have therefore been made in terms of reducing emissions, searching for residual sources, standardisation and testing in the food chain.

[35] Saunders M., Palkovicova L., Stoian I., Van Den Heuvel R., Desager K.Plutocracy Project. (2005) *Toxicology Letters*, 158, Suppl 1, S151

Table 11 illustrates the development of dioxin and furan concentrations over time in Belgian human milk.

	WHO[a] '88-'89	WHO[b] '91-'92	WHO[c] '01-'02	WHO[c] '05-'07
Belgium				
All regions				10.3 (N=178)
Brabant Walloon (rural)	33.7 (N=in)	20.8 (N=8)	14.8	
Liège (industrial)	40,2 (N=in)	27.1 (N=20)		
Liège (rural)				
Liège (urban)			19.1	
Brussels (urban)	38,8 (N=in)	26.6 (N=6)		
All countries				
Number of countries	18	19	20	*
Mean	21.8	14.5	9.8	*
Standard deviation	9.6	5.6	4.7	*
Minimum	4.9	3.8	3.9	*
Maximum	40.2	27.1	22.8	*
P10	9.3	8.1	6.1	*
P25	16.4	10.9	6.8	*
Median	19.5	14.4	8.9	
P75	29.4	17.6	10.5	*
P90	36.7	22.0	17.1	*

Dioxin/furan values expressed in pg TEQ/g fat. The TEQ value for successive surveys is based on the TEF values (Toxic Equivalency Factor) modified over time for individual congeners[36]. N = number of samples of milk in the sample, in = unknown, 64 individuals in total (Van Cleuvenbergen et al.,1994). * The result from the 4th survey is not yet available. [a] calculated by N-TEF, of: Van Cleuvenbergen et al. (1994), Tarkowsk and Yrjänheikki (1989), Liem et al. (1996). [b] calculated by I-TEF, of: Liem et al. (1996), WHO (1996) [c] calculated by WHO1998-TEF, of Van Leeuwen and Malish (2002), Malish (pers. Comm.)

Figure 3 illustrates the decrease in dioxin and furan concentrations in Belgian human milk between the four consecutive WHO surveys.

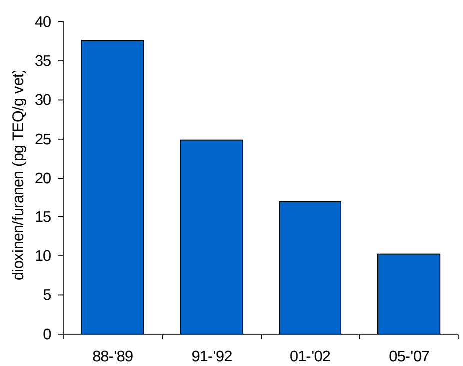


Figure 3

[36] There are various "calculation models" with different TEF for the individual congeners, when calculating a common TEQ (Toxic Equivalency Quotient) for the group. In the N-TEQ (Nordic) model, the congener dibenzofuran 1,2,3,7,8 pentachloride has a TEF of 0.01, while in the I-TEQ (NATO) model, this is 0.05. This leads to small, negligible differences of less than 1% between the results expressed in N-TEQ or I-TEQ. The OMS_{1998}-TEQ value for dioxins/furans can however exceed the I-TEQ value by 10%. This is mainly due to the higher TEF value of dibenzofuran 1,2,3,7,8 pentachloride, which is 1 rather than 0.5 in the I-TEQ system.

5.2.3 Monitoring of the food chain

Pesticide POPs

- **The National Pesticides Residues Control programme in food**[37]

In order to confirm that pesticides are being used properly (use of approved products on crops, compliance with doses and time periods before harvests, etc.) and to protect consumer health, Maximum Residue Limits (MRL) in foods are laid down in legislation. Foods that do not comply with these MRLs cannot be placed on the market. Since 01/09/2008, MRLs have been standardised across Europe ((EC) Regulation no.396/2005).

The Pesticides Residues Control Programme implemented by the FASFC is developed based on risk assessment. Foods likely to exceed the MRLs are closely monitored. At the request of the European Commission, particular attention has been paid to certain foods coming from some third countries. In the event that the MRL is exceeded, a consumer risk assessment is performed. If the exceeded limit represents a potential risk for the consumer, measures are taken to prevent consumption of the food in question (withdrawal from the market, press release and recall at consumer level). Furthermore, an inspection takes place at the premises of the person responsible for the food (Belgian producer or importer) to establish why the MRL was exceeded. Depending on the seriousness of the infringement, the operator responsible receives a warning or a fine.

In 2010, five accredited laboratories took part to the national control programme. Samplings were done according to directive 2002/63/EC2[38] implemented in the Belgian legislation. Samples were analysed by means of multi-residues and single-residues methods. There were 3 accredited laboratories from 2004 to 2005, 4 laboratories from 2008 to 2006 and 5 laboratories since 2009.

Concerning the improvement of the analytical performance of the laboratories these last years, more and more pesticides are analysed (from 181 in 2004 to 349 in 2008) with a higher sensitivity of detection. In 2010, more than 500 different pesticides were analysed (+30% in comparison with 2009).

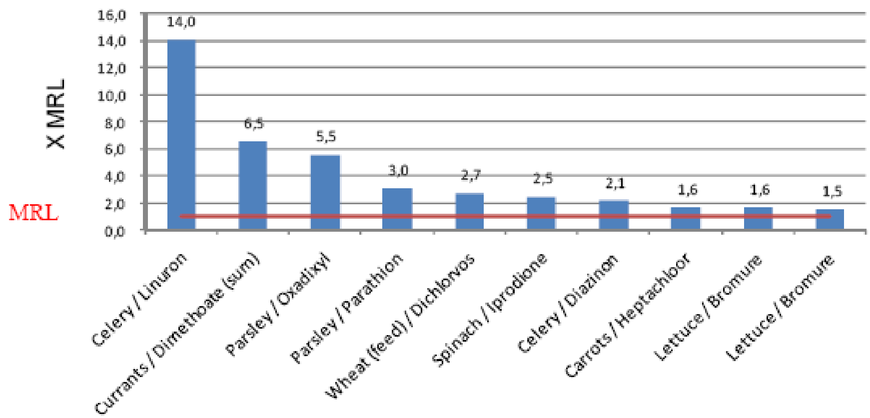
The 'National Pesticides Residues Control programme' identified pesticide POPs in food in 2006, 2008 and 2010:

[37] The reports of the National Pesticides Residues Control programme in food 2004-2010 are available on the Federal Agency for the Safety of the Food Chain (FASFC) website (http://www.favv.be/publicationsthematiques/pesticide-residue-monitoring-food-plant-origin.asp). From 2009 onwards, the "Controls of pesticide residues in food Belgium" report, has presented the results of the official controls in accordance to Regulation (CE) N°396/2005 and Commission Regulation (EC) N° 901/2009. Before 2009, the "Pesticide Residue Monitoring in Food of Plant Origin, Belgium" reported the monitoring results concerning Directives 90/642/EEC, 76/895/EEC and 86/362/EEC and Commission Recommendation 2006/26/EC.

[38] Commission Directive 2002/63/EC of 11 July 2002 establishing Community methods of sampling for the official control of pesticide residues in and on products of plant and animal origin and repealing Directive 79/700/EEC

- In 2006, a total of 1539 samples of fruits, vegetables, cereals and processed plant products (including baby food) from the Belgian market were analysed by the FASFC. The pesticides listed in the Stockholm Convention were among the residues tested. Only 2 substances were found in fruits and vegetables: DDT and heptachlor, both were present in only one sample. No pesticide was found in cereals. The results are given in appendix VI, part 1.
- In 2008, a total of 1602 samples of fruits, vegetables, cereals and processed plant products (including baby food) from the Belgian market were analysed by the FASFC. Endosulfan was mentioned among the main pesticide residues detected in fruiting vegetables and miscellaneous fruit (see appendix VI, part 2). HCH (0,98 mg/kg) and HCB (0,3 mg/kg) was found on Tea/herbal infusion originated from China. Rapid alert System for Food and Feed (RASFF) message was issued by Belgium (see appendix VI, part 2).
- In 2010, a total number of 2932 samples (2188 surveillance samples and 744 enforcement samples i.e. in case of suspicion of non-compliance) of fruits, vegetables, cereals, animal products and processed products (including baby food) were taken by the FASFC and analysed for the presence of pesticide residues in application of Regulation (CE) N° 396/2005. 35% of these samples were produced in Belgium, 14,5% in EU, 48% outside the EU and 2,5% were of unknown origin. Among the Belgian surveillance samples, a sample of carrots containing heptachlor exceeded 1,6 times the MRL were found (Figure 4). The residues resulted from previous use of a pesticide (e.g. persistent pesticides no longer authorized, soil residues taken up in succeeding crops). RASFF message was issued. These products were not put on the market or recalled from the consumers.
- In 2012, traces of endosulfan (sum) have been detected in 2.3% of the 2,554 samples analysed (tea of several origins, mint and coriander from Morocco, strawberries and courgettes from Belgium). Traces of dieldrin (sum) have been detected in 0.2% of the 2,606 samples analysed (lamb's lettuce and courgettes from Belgium and melons from France). Traces of DDT (sum) have been detected in 0.1% of the 2,558 samples analysed (tea from India).

Figure 4. Non-compliant products originating from Belgium with information about the importance of the non-compliances.



These results show the importance of controlling foodstuffs, whether they originate from Belgium or from countries with a less strict regulation on pesticides and other treatment substances.

- **CONTEGG study**

The CONTEGG project is a general study on egg contamination in Belgium (2006-2007)[39], which covered POPs. As part of the CONTEGG project, Windal et al 2009 studied the level of persistent organochlorinated pesticides in home-produced eggs. A set of egg samples belonging to private owners was collected from all over Belgium. Sampling was performed in the autumn 2006 (40 egg samples) and in the spring 2007 (58 egg samples; same location than in spring +18 other locations).

Windal et al 2009[40] identified that the concentration of DDT was above the norm for 17% of the eggs collected during the spring on 58 different locations. DDT had obviously been used in the past as a treatment against poultry parasites. For aldrin, dieldrin, and chlordane, 3–5% of the samples were above the norm too. These levels are surprisingly high for compounds banned for about 30 years. Higher concentrations in home-produced eggs are expected compared to battery eggs because of contact with the environment and especially the soil. For ten selected locations, the concentration in soils, excreta and feed was measured, but no simple correlation-between egg and feed or soil level could be established. Hexachlorohexane, endosulfan, endrin, methoxychlor and nitrofen were not detected in any sample.

[39] The Contegg study - http://www.coda-cerva.be/index.php?option=com_content&view=article&id=355&Itemid=298&lang=nl
[40] Windal I, Hanot V, Marchi J, Huysmans G, Van Overmeire I, Waegeneers N, Goeyens L. (2009) PCB and organochlorine pesticides in home-produced eggs in Belgium. Sci Total Environ. 407(15):4430-7.

POPs from unintentional production

- **Dioxin and PCB controls by the FASFC on foods (2004-2010)[41]**

The dioxin, PCB and dioxin-like PCB controls that can be performed by the FASFC at the operating location (farms, aquaculture farms, fish markets), during transport, in the processing sector (abattoir, etc.) and in the distribution chain concern:

- Milk and milk products
- Eggs and ovoproducts
- Meat and derived products (cattle, veal, pigs, sheep, horses, poultry, rabbits, pigeons and farmed game, wild deer). (PAHs are also monitored for this industry).
- Aquaculture products
- Fish products
- Various foods: baby food, vegetable oils and fats, food supplements. (PAHs are also monitored for these products as well as for cocoa butter and chocolate, spices, aromatic herbs, fish oil, vegetables).

In the event of non-compliance or excess dioxin content, the intervention levels established in the recommendation of 6 February 2006 requires the competent authority to conduct an investigation regarding the contamination source in order to identify it, remove it if possible or reduce it as much as possible.

- In 2004, there was a non-conformity in the PCB levels in 27 samples tested from a sample of eggs from free-range chickens.
- In 2005, there was a non-conformity in the dioxin levels in 9 samples tested from a sample of food supplements.
- In 2006, out of 857 analyses performed at the abattoir, 3 were non-compliant. Out of 77 samples of milk taken from dairy farms, all were compliant. With regards the processing and distribution sectors, out of the 427 dioxin analyses, 47 dioxin-like PCB analyses and 176 PCB indicator analyses performed, only 1, a fish-oil based food supplement was observed to exceed the norm at 3.7 pg WHO-TEQ/g fat. This sample was also non-compliant for dioxin-like PCBs and PCB indicators. A report and notification were drafted via the RASFF and the products in question were withdrawn from sale and destroyed.

[41] Annual report of the FASFC 2000 to 2012 http://www.favv.be/rapportsannuels. see also: Van Overmeire I, Pussemier L, Waegeneers N, Hanot V, Windal I, Boxus L, Covaci A, Eppe G, Scippo ML, Sioen I, Bilau M, Gellynck X, De Steur H, Tangni EK, Goeyens L. (2009) Assessment of the chemical contamination in home-produced eggs in Belgium: general overview of the CONTEGG study. Sci Total Environ. 407(15):4403-10.

- In 2008, within the framework of the monitoring plan, all the results were compliant except for a non-conformity in drinking milk. Outside the monitoring plan, dioxin, dioxin-like PCB and PCB analyses were carried out for 10 milk samples; 1 analysis was non-compliant, which gave rise to a definitive seizure. A sample of (free-range) eggs had too-high a dioxin and dioxin-like PCB level. The eggs were subject to a definitive seizure and a report was drawn up. Out of 226 analyses of beef carcasses sampled at the abattoir, one was non-compliant for dioxin and dioxin-like PCB levels. It was seized and destroyed. With regards fishery products, (processing and distribution), several non-conformities were detected; 1 fish in 22 analysed for their dioxin and dioxin-like PCB levels and 1 in 3 analysed for their PCB marker levels.
- In 2009, a non-compliant result was detected in a beef carcass at the abattoir out of the 202 analyses performed. The carcass was seized and destroyed.
- In 2010, fish and shellfish were analysed. In processing and distribution, only one was non-compliant for PCBs out of 81 analyses. In 2010, the FASFC notified 95 alerts via the RASFF following import controls (51 cases), self-monitoring of an establishment (21 cases), monitoring of the Belgian market (20 cases) or a consumer complaint (3 cases).

With regards mandatory notifications, any operator performing activities which fall under the responsibility of the FASFC must immediately inform the FASFC when it considers, or has reason to believe that a product that it has imported, produced, grown, bred, processed, manufactured or distributed may adversely affect human, animal or plant health (RD of 14/11/2003). In Belgium, laboratories are also required to report results that reveal a risk. The number of notifications in 2008, 2009 and 2010 regarding dioxins, was 62, 7 and 5 notifications respectively.

- **Dioxin and PCB controls by the FASFC on animal feed (2006-2010)[42]**

Control of dioxins in animal feed is crucial. Just one batch of raw materials used in the manufacture of these foods could contaminate a vast number of animals and their products. For example, in Belgium, the 1999 dioxin crisis (due to the contamination of animal fats by electric transformers) and the 2006 incident caused by the use of unpurified hydrochloric acid in the production of gelatine (see details further in this chapter).

Shortly after the 1999 dioxin crisis, a rapid detection programme for contaminants was implemented in Belgium. Certain high-risk raw materials were banned, such as recycled fats and oils from kitchens and chip shops. A PCB and, in some cases, dioxin analysis was imposed on any batch of critical products. From 1999, provisional national standards were established for PCBs, pending European standards.

[42] Annual report of the FASFC 2000 to 2012 http://www.favv.be/rapportsannuels.

European standards have now been established for dioxins by the Directive 2002/32/EC and the traceability of animal feed has been improved. In 2008, the mandatory PCB analysis was replaced by a dioxin analysis for the majority of raw materials and critical additives (animal fat, processed fish by-products, clays used as additives). This adjustment aimed to improve the self-monitoring of establishments for these products.

The result of controls on dioxin and PCB levels in animal feed carried out by the FASFC is as follows:

- In 2006, out of 1564 PCB analyses, 1186 dioxin analyses, and 91 dioxin-like PCB analyses, 3 results were non-compliant and concerned additives (sepiolite, manganese and zinc oxide),
- In 2007, out of 1290 PCB analyses, 1262 dioxin analyses, and 190 dioxin-like PCB analyses, 2 batches of additives sampled on import and a compound feed found in Belgium were non-compliant,
- In 2008, out of 1278 PCB analyses, 1119 dioxin analyses, and 145 dioxin-like PCB analyses, one premix was non-compliant and resulted in a warning,
- In 2009, all 2077 PCB and dioxin analyses were compliant with the standards,
- In 2010, the 2172 PCB and dioxin analyses were compliant with the standards, except for 3 non-compliances relating to dioxins: an imported (and forwarded to Canada) trace mineral, a batch of additives from Spain (the Spanish authorities were informed) and a batch of calcareous marine algae (intended for technical use), which resulted in a warning.

Dioxin incident in the gelatine production sector: in 2006, a batch of animal fat produced in Belgium and sampled by the Dutch authorities turned out to be non-compliant in terms of dioxins. The source of the dioxin contamination of this animal fat proved to be related to a failure in the process used to transform bones for gelatine production. The fat, a by-product of this gelatine production, was turned into animal feed. Many food samples were taken on this occasion in Belgium, leading to monitoring measures by both animal feed manufacturers and breeders. Considering the dioxin contamination risks inherent in the use of animal fat for producing animal feed, the FASFC, in consultation with the industry, deemed it necessary to improve the control measures for these raw materials using a systematic analysis of batches placed on the market. These regulatory provisions came into force in 2007.

Following this incident, the FASFC Scientific Committee determined the pig and poultry contamination level from contaminated foods and conducted a risk assessment in order to evaluate the consumer's exposure to dioxins via the consumption of animal products (pork and poultry) and gelatine.

For adult consumers (average consumption figures), the additional exposure that can be attributed to contaminated foods remains limited (below the weekly acceptable dose). For high-risk consumers, a temporary excess may occur, but the increase in the “body burden” remains very limited.

The health-risks represented by dioxins depend mainly on the base exposure and, in all probability, has remained only slightly or even unchanged as a result of this incident. Nevertheless, the incident is a step back in reducing the exposure through food observed in recent years.

- **Estimation of the daily intake of PCDD/PCDF and dioxin-like PCBs by the Belgian population**

A first estimation of the PCDD/PCDF and non-ortho PCBs dietary intake in Belgium was done by Focant et al. (2002)[43]. The mean intake was determined at 2,04 pg TEQ/kg body weight (bw)/day. An estimation of the exposure of the Belgian population concerning dioxin-like compounds was done at the same time by Vrijens et al. (2002)[44]. The mean intake was determined at 2,53 pg TEQ/kg bw/day.

In order to assess the current dietary exposure of the Belgian adult population to PCDD/PCDF and dioxin-like PCBs and to update exposure estimates of 2000–2001, a total diet study was designed in 2008 (Windal et al., 2010)[45]. The mean dietary intake of PCDD/PCDF and dioxin-like PCBs in the Belgian adult population in 2008 was estimated to be 0.72 pg TEQ $kgbw^{-1}$ d^{-1} (middle bound concentrations, Toxic equivalent factor (TEF) of 1998) based on occurrence data of 2008 and national food consumption data of 2004.

Considering the cumulative distribution, the intake was less than 1 pg TEQ $kgbw^{-1}$ d^{-1} for more than 80% of the population, and less than 2 pg TEQ $kgbw^{-1}$ d^{-1} for the entire population. When using the 2005 TEF instead of the 1998 TEF, the mean dietary intake in the Belgian adult population was estimated to be 0.61 pg TEQ $kgbw^{-1}$ d^{-1}.

The value of the 2008 total diet study is clearly below the Tolerable Weekly Intake (TWI) of 14 pg TEQ $kgbw^{-1}$ $week^{-1}$ set by the Scientific Committee on Food of the European Commission and below the provisional tolerable monthly intake of 70 pg TEQ $kgbw^{-1}$ $month^{-1}$ set by the JECFA - Joint Food and Agriculture Organization /WHO Expert Committee on Food Additives.

Belgium does not stand out from its European counterparts: dietary exposure to dioxins for European countries is between 1 and 4 pg/kg bw, which are permissible values under the Tolerable Daily Intake proposed by the JECFA.

The results of 2008 show a decrease of about 60-70% of the dietary intake of dioxin-like compounds since the last survey of 2000-2001. Dioxin-like PCBs contribute about 60% of the intake and PCDD/PCDF about 40%. The Figure 5 shows the decrease of concentrations of PCDD/PCDF in different food in Belgium compared to 2000-2001 reflecting: enforcing legislation on emissions of dioxins, phasing out of PCBs and enforcing of maximum levels in

[43] Focant, J.-F., Eppe, G., Pirard, C., Massart, A.-C., Andre, J.-E., De Pauw, E., 2002. Levels and congener distribution of PCDDs, PCDFs and Non-Ortho PCBs in Belgian foodstuffs. Assessment of dietary intake. Chemosphere 48, 167–179.

[44] Vrijens, B., De Henauw, S., Dewettinck, K., Talloen, W., Goeyens, L., De Backer, G., Willems, J.L., 2002. Probabilistic intake assessment and body burden estimation of dioxin-like substances in background conditions and during a short food contamination episode. Food Addit. Contam. 19, 687–700.

[45] Windal I., Vandevijvere S., Maleki M., Goscinny S., Vinkx C., Focant J.F., Eppe G., Hanot V., Van Loco J. Dietary intake of PCDD/Fs and dioxin-like PCBs of the Belgian population. Chemosphere 2010, 79, 334-340.

feed and food for dioxins and PCBs. The relative contribution of the different groups of food to the dietary intake of the mean population is shown on Figure 6.

Figure 5: Trends in concentration of PCDD/PCDF in different food in Belgium (lower bound concentrations, 1998 TEF) (Windal et al., 2010)

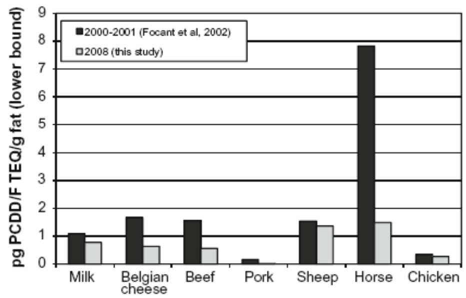
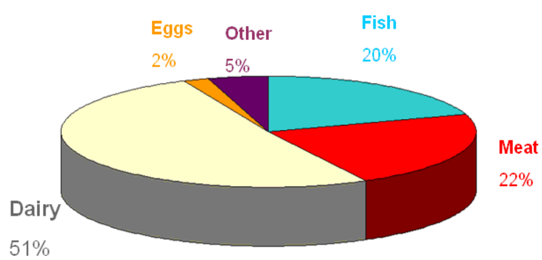


Figure 6: Relative contributions of the different groups of food to the dietary intake of the mean population



Van Overmeire et al 2009[46] within the CONTEGG project[47] (2006-2007) also contributed to study the exposition of the Belgian population to PCDD/PCDF and dioxin-like PCBs when consuming home-produced eggs. Van Overmeire al 2009 showed that the CALUX levels for eggs sampled in autumn were higher than the levels in eggs obtained at the same locations in spring (median values of 5.86 and 4.08 pg CALUX TEQ/g fat, respectively). The total WHO-TEQ levels in eggs, ranged from 3.29 to 95.35 pg TEQ/g fat in autumn and from 1.50 to 64.79 pg TEQ/g fat in spring. The dioxin-like PCBs contributed on average 47% to the total WHO-TEQ in eggs. The results showed a good agreement between egg and soil TEQ levels for PCDD/PCDF but not for dioxin-like PCBs. This study showed that current soil levels found in some private gardens do not lead to egg levels below the current EU maximal level of 6 pg total TEQ/g fat for dioxins and dioxin-like PCBs. The consumers of the analysed eggs attained 5-79% of the TWI

[46] Van Overmeire I, Waegeneers N, Sioen I, Bilau M, De Henauw S, Goeyens L, Pussemier L, Eppe G (2009) PCDD/Fs and dioxin-like PCBs in home-produced eggs from Belgium: levels, contamination sources and health risks. Sci Total Environ. 407(15):4419-29. See also: Van Overmeire I, Pussemier L, Waegeneers N, Hanot V, Windal I, Boxus L, Covaci A, Eppe G, Scippo ML, Sioen I, Bilau M, Gellynck X, De Steur H, Tangni EK, Goeyens L. (2009) Assessment of the chemical contamination in home-produced eggs in Belgium: general overview of the CONTEGG study. Sci Total Environ. Jul 15;407(15):4403-10.
[47] The Contegg study - http://www.coda-cerva.be/index.php?option=com_content&view=article&id=355&Itemid=298&lang=nl

of 14 pg TEQ/kg bw for dioxins and dioxin-like PCBs by exposure to their home-produced eggs only. Windal et al 2009[48] identified that for PCB 3–5% of the samples were above the norm too.

- **Estimation of the daily intake of non-dioxin-like PCBs by the Belgian population**

The same samples of the total diet study for dioxins and dioxin-like PCBs of Windal et al (2010) were analysed later for the non-dioxin-like PCBs (sum of PCB 28, 52, 101, 138, 153 and 180) (Cimenci and Goscinny, 2012, personal Communication). The mean intake was 5.33 ng/kg bw/day. The relative contribution of food groups for the mean intake was as follows: fishery products and derived foods 54.3%, dairy 28.5%, miscellaneous foods 10.1%, meat and derived foods 3.2%, eggs 0.2%.

5.3 Assessment of the POPs issue in the Brussels-Capital Region

5.3.1 Environmental monitoring

The BCR, with little industry has only a few institutions likely to be considered as unintentional point sources of POPs. Consequently, POPs management in the BCR is primarily conducted through individual authorisations and by imposing increasingly strict operating conditions in terms of the waste disposal, discharges and emissions of chemical substances into the environment. These impositions derive mainly from European and international obligations. They essentially cover direct action on PCBs/PCTs and dioxins and furans.

Other POPs, such as HCBs and PAHs, have benefited from a reduction or increased monitoring, either as a result of these impositions or by imposing stricter surveillance and self-monitoring conditions. The issue of POP pesticides does not arise to any great extent in the BCR given the urban nature of this region. Nevertheless, constant vigilance must be maintained in order to monitor and eliminate any old stocks.

POPs discharges in waste: rates, trends and major sources

- **HCB:** HCB discharges appear to have been stable since 1990 (0.05kg/year) and in total they are below the PRTR threshold. According to the available data, the main source sectors for HCB discharges in waste are the incineration of household waste (~95%) and secondary lead production (5%).
- **PAH:** Similarly, PAH discharges appear to have been stable throughout the period (0.003 t/year) and in total are below the PRTR threshold. Once again the main source sectors appear to be the incineration of household waste (~92%) and secondary lead production (8%).
- **PCDD/PCDF:** According to the data, PCDD/PCDF discharges have been reduced by 98% (from 102 gTEQ/year to 2.33 gTEQ/year) over the last seventeen years (1990-2007), but in total they are still significantly above the

[48] Windal I., Hanot V., Marchi J., Huysmans G., Van Overmeire I., Waegeneers N., Goeyens L. (2009) PCB and organochlorine pesticides in home-produced eggs in Belgium Science of The Total Environment, Volume 407, Issue 15, 15 July 2009, Pages 4430-4437

PRTR threshold. While the incineration of household and hospital waste was the dominant source in 1990, this has reduced sharply due to the fact that the incineration of hospital waste has been stopped across the entire Region, and the discharge from the incineration of household waste has decreased. Discharges in the form of waste from secondary lead production and cremation remain more or less stable.

- **PCBs / PCTs:** See § "stocks and inventories".

POPs discharges in water: rates, trends and major sources

An inventory of the unintentional discharge of POP products into water was produced, whereby their reduction shows the effectiveness of environmental measures imposed through environmental permits and the effective monitoring of facilities.

The abandonment (September 2009) of the sludge incineration at the Brussels South wastewater treatment plant (STEP Sud), has been a major factor in reducing emissions in BCR.

On 12/07/2012, the Region adopted its water management plan including measures to be implemented which are designed to improve water quality and particularly the reduction of POPs.

The Region is also currently developing a Regional Pesticide Reduction Plan within the framework of "Directive 2009/128 of the European Parliament and of the Council of 21 October 2009 establishing a framework for Community action to achieve the sustainable use of pesticides". This plan provides in particular for a ban on using pesticides near water abstraction points. It also establishes a general public awareness and information campaign in order to reduce and even eliminate the use of pesticides.

- **Water: overview**
    - **Surface water**

In the BCR, surface water quality is subject to regular monitoring during the year. Since 2001, measurements have been taken 5 times per year for those parameters not posing any problems and 12 times per year for all others. The measurements are taken at the entrances and exits to various waterways including the Senne, the Woluwe and the Brussels-Charleroi Canal.

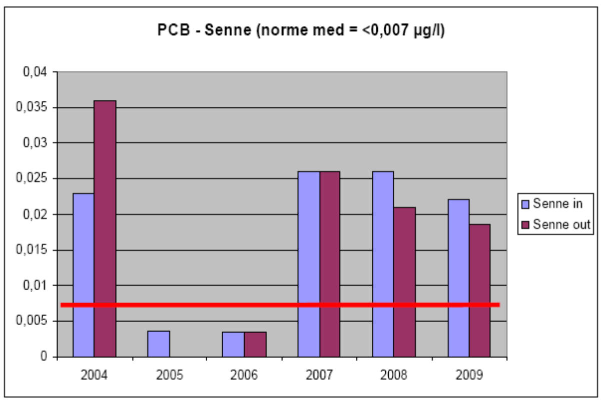
The POPs or potential POPs analysed are PAHs, pentachlorophenol, DDT, aldrin, dieldrin, endrin, hexachlorobenzene (HCB), hexachlorobutadiene (HCBD) and hexachlorocyclohexane (HCH), PCBs and dioxins[49].

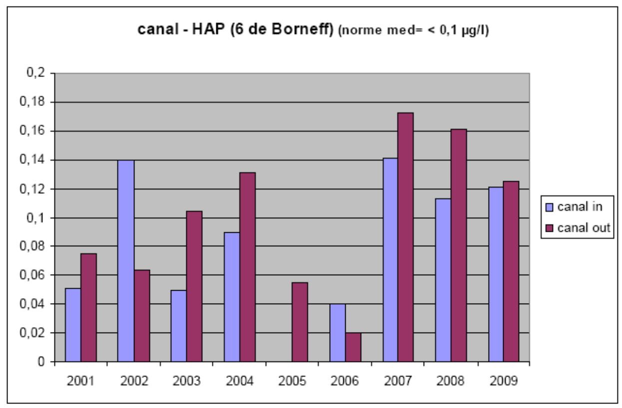
[49] Sur base de l'arrêté du 24/03/2011 du Gouvernement de la Région de Bruxelles-Capitale établissant des normes de

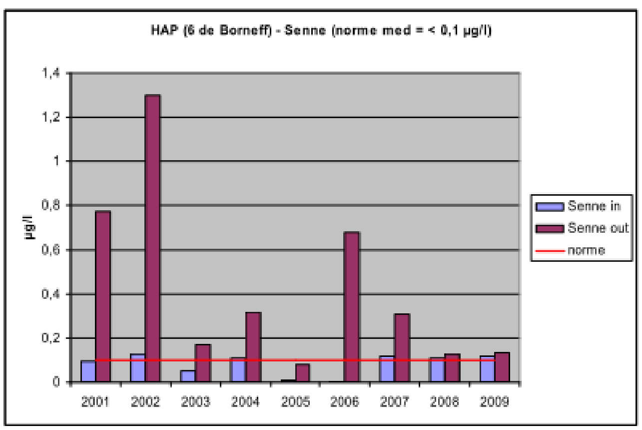
Of all these substances, only PAHs (not yet included in the Stockholm Convention) show a worrying concentration and require appropriate measures.

The development in the annual PAH and PCB concentrations in the waters of the Senne and PAH concentrations in the waters of the canal are presented in figure 7.

Figure 7: Developments in annual PCB concentrations – Senne IN and OUT, 2004 – 2009 and annual PAH/Borneff 6 concentrations - Canal IN and OUT, 2001 – 2009. Source: Bruxelles Environnement, 2010.







The PCB concentrations in the Senne in 2004, 2007, 2008 and 2009 all exceed the threshold of 0.007 µg/l, on both entering and exiting the Region.These high concentrations are probably the result of a salting-out from contaminated sediments (accumulated on the bed of the Senne or trapped in storm drains), resuspended in the water during heavy storms. The disposal of this pollutant requires both preventative and curative actions, both in Brussels and upstream of the Region.

qualité environnementale, des normes de qualité de base et des normes chimiques pour les eaux de surface contre la pollution causée par certaines substances dangereuses et autres polluants

Since 2001, the PAH concentrations have always been relatively close to the threshold of 0.1 µg/l on entering the Region, contrary to the concentrations measured on exit. A reduction programme for PAHs / Borneff 6, lasting 5 years was implemented in 2005 in BCR. The water that enters the Brussels Region is slightly contaminated with PAHs as shown by the graph. Efforts must therefore also be made upstream of the Brussels Region in order to reduce the concentrations entering the Region.

The available data is not sufficient to be able to calculate the medians prior to 2004 and in 2005 at the exit to the Region. However, there is a significant overall improvement in the physico-chemical quality of the waters of the Senne as it leaves the regional territory. With a tertiary treatment, the North STEP is used to reduce concentrations of nutrients, nitrogen (N) and phosphorus (P) exiting the Region. This improvement cannot however hide the fact that the PAH and PCB concentrations remain high and even now, still exceed the thresholds in force. At the entry to the Region, concentrations have also reduced in recent years, following, among other things the installation of purification plants upstream of the Region: Nivelles (2000), Beersel (2005), St-Pieters-Leeuw (2009).

Water quality standards in the Canal are for the most part observed, with the exception of PAH and PCB concentrations. PAH and PCB concentrations in the Canal are still high and have exceeded the thresholds in force for the past three years, both entering and exiting the Region. The same measures must be taken as for the Senne.

In general the water quality of the Canal is better on entering the Region than exiting, but there are sometimes exceptions (see results NH4 2007-2009). Since the storm drains have been connected to the STEPs, the Canal is no longer subject to the continual discharge of waste water. However, it still suffers certain pressures on its passage through the Brussels region: the direct arrival of low quality waters from the Neerpedebeek and the Broekbeek upstream, the pumping of mediocre quality water from the Senne into the Canal to compensate for evaporation, deposits from storm drains or the Senne during heavy rainfall, several direct and occasional discharges of polluted water and even the resuspension of pollutants (particularly PAHs and PCBs) during dredging and pollution due to river traffic. In view of its very slow flow, the Canal acts like a gigantic settling basin and must frequently be cleaned out in order to remain effective for navigation. The accumulation of pollutants in the sludge means that they must be treated in specific facilities.

- **Industrial water**

  - **PCDD/PCDF**

Over the past seventeen years (1990-2007), total PCDD/PCDF discharges have remained significantly below the PRTR threshold.

In 1990, the sole source was coking plants. From 2000 onwards, two factors were responsible for the increase in discharges. These were the installation of a wet gas purification plant at the household waste incineration facility and the commissioning of the South STEP. In 2012, the incineration facility no longer has wet discharge.

Within this context it should be noted that purification plants are not primary POP sources, they simply channel discharges from domestic and/or industrial sectors. So this is an increase in actual discharges.

The potential discharge from the dumping of waste in the BCR does not exceed 0.14 mgTEQ/year.

As shown in figure 8 and table 12, PCDD/PCDF discharges appear to have risen by 72%. Although there was a reduction between 1990 and 1995, discharges slowly increased until 2005 and are showing a strong increase until today. Even so, it should be noted that the discharges are still very low. Based on the available data, even the total emissions are significantly below the PRTR threshold.

Figure 8: Trend in PCDD/PCDF aqueous discharges in the BCR (red line = PRTR threshold)

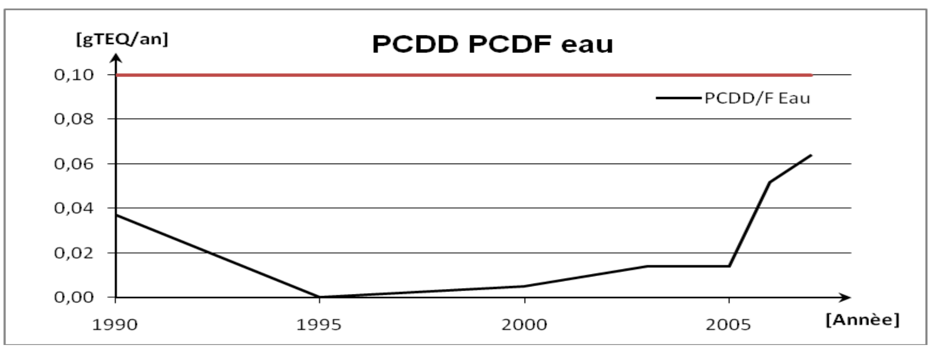


Table 12: Trend and sector-specific contributions for PCDD/PCDF aqueous discharges in the BCR

PCDD/PCDF µgTEQ/an	1990	1995	2000	2003	2004	2005	2006	2007	Difference compared with 1990	Pro rata Total (2007)	Pro rata Threshold PRTR
Waste incineration [µgTEQ/year]	0	0	2.000	2.000	2.000	2.000	2.255	1.636	-18%	3%	2%
Coking plants [gTEQ/year]	37.080	0	0	0	0	0	0	0	-100%	0%	0%
Incineration of sewage sludge [µgTEQ/year]	0	0	2.973	11.892	11.892	11.892	11.892	11.892	300%	19%	12%
Treatment of sewage sludge [µgTEQ/year]	0	0	0,0	0,0	0,0	0,0	37.640,6	50.187,5	33%	79%	50%
Total [g/year]	0,037	0	0,005	0,014	0,014	0,014	0,052	0,064	72%	100%	64%

As illustrated, the main sources of PCDD/PCDF aqueous discharges were very different between 1990 and 2007.

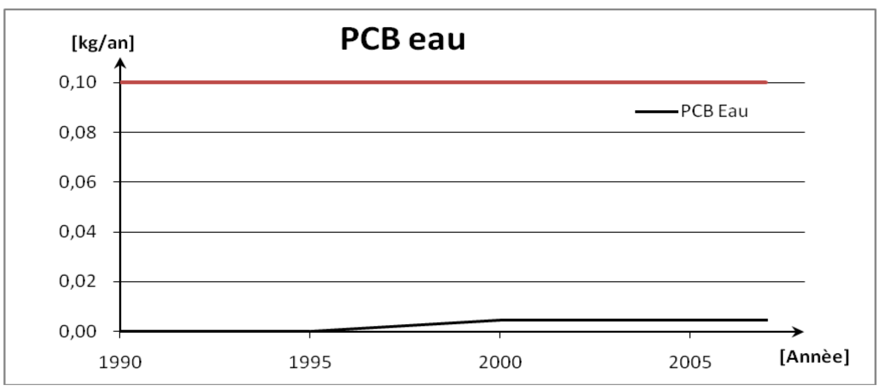
Even so, the estimates do suffer from a lack of data and from the inherent weakness of the emission factor which must be categorised into class E.

With regards the PCDD/PCDF discharges, potential discharges from the dumping of waste in the BCR must also be considered. As shown above, the maximum expected discharges do not exceed 0.14 mgTEQ/year (2% of the total). This supports the hypothesis that the dumping of non-hazardous waste, even if it is still active, represents negligible sources.

- **PCB**

As illustrated in figure 9, the PCB discharges are increasing very little (from 0 kg/year to 0.0046 kg/year) between 1990 and 2005 and in total are still well below the PRTR threshold. These discharges are solely due to SIOMAB waste incineration activities following the installation of the wet gas purification equipment in 2000.

Figure 9: Trend in PCB aqueous discharges in the BCR (red line = PRTR threshold)



Due to a lack of data (measurements are only available for 2007), there are no clear trends to be found. We also need to take into account the fact that, since the concentrations in water were below the limit of detection, the data presented is the estimated maximum emissions and the calculation was based on half the limit of detection. As presented in table 13, PCB discharges only began in 2000 and appear to have remained stable since this time. Based on the available data, the discharges are well below the PRTR threshold.

Table 13: Trend and sector-specific contributions for PCB aqueous discharges in the BCR

PCB mg/year	1990	1995	2000	2003	2004	2005	2006	2007	Difference compared with 1990	Prorata Total (2007)	Prorata PRTR Threshold
Household waste incineration SIOMAB [mg/year]	0	0	4.600	4.600	4.600	4.600	4.600	4.629	1%	100%	5%
Total [kg/year]	0,	0,	0,0046	0,0046	0,0046	0,0046	0,0046	0,0046	1%		5%

- **HCB**

HCB discharges appear to have been stable since 2000 (0.0006 kg/year) at a level well below the PRTR threshold. As for PCBs, the discharges are solely due to waste incineration activities at SIOMAB following the installation of the wet gas purification equipment in 2000. These are also estimated maximum emissions, as the concentrations in water are below the limit of detection.

Table 14: Trend and sector-specific contributions for HCB aqueous discharges in the BCR

HCB mg/an	1990	1995	2000	2003	2004	2005	2006	2007	Difference Compared with 1990	Prorata Total (2007)	Prorata PRTR Threshold
Waste incineration [mg/year]	0	0	660	660	660	660	660	661	0%	100%	0%
Total [kg/year]	0	0	0,0007	0,0007	0,0007	0,0007	0,0007	0,0007	0%		0%

- **New POPs**

No statistical data is currently available. Occasional data exists within the clean-up and survey documents for contaminated soils and should be subject to a detailed analysis.

POPs discharges in air: Atmospheric emissions, rates, trends and major sources [50]

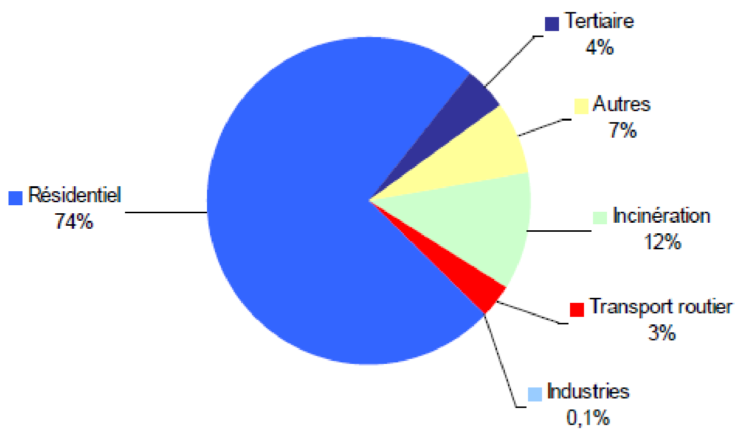
An inventory of unintentional POP product emissions into air was produced, whereby their reduction shows the effectiveness of environmental measures imposed through environmental permits such as DeNOX systems and the effective monitoring of facilities.

[50] Voir aussi : Fiche 15-IBGE - http://documentation.bruxellesenvironnement.be/documents/Air_15.pdf

The abandonment (September 2009) of the sludge incineration at the Brussels South STEP, has been a major factor in reducing emissions in BCR.

- **PCDD/PCDF**

Figure 10 shows the sector-specific breakdown of dioxin emissions across the BCR area in 2008[51].



Over the 1990-2007 period, **PCDD/PCDF** emissions were reduced by 97% (from 3.68 gTEQ/year to 0.07 gTEQ/year) thus falling below the PRTR threshold (table 15).

Table 15: Trend and sector-specific contributions for atmospheric emissions in the BCR

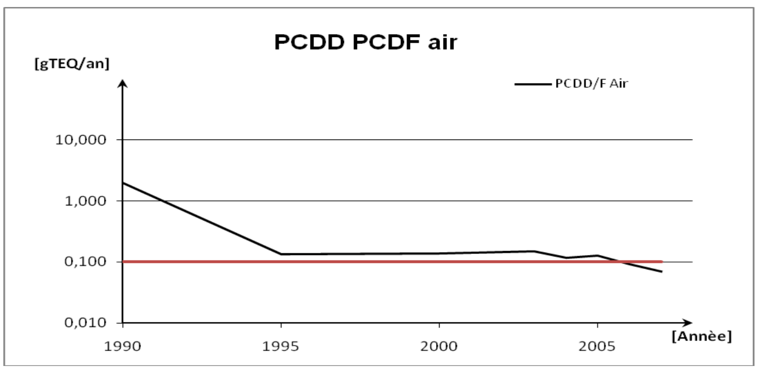
PCDD/PCDF [µgTEQ/an]	1990	1995	2000	2003	2004	2005	2006	2007	Difference Compared with 1990	Prorata Total (2007)	% PRTR Threshold
Industrial boilers [µgTEQ/year]	1.015	1.209	1.015	881	848	800	739	930	-8%	1%	1%
Service industry boilers [µgTEQ/year]	7.120	7.917	7.349	7.905	7.732	7.537	7.388	7.564	6%	11%	8%
Waste incineration [µgTEQ/year]	82.200	82.200	85.844	85.844	73.339	74.615	39.237	7.169	-91%	10%	7%
Incineration of sewage sludge [µgTEQ/year]	0	0	1.118	4.470	5.005	5.038	3.790	4.776	327%	7%	5%
Hospital waste incineration [µgTEQ/year]	1.676.293	1.676.293	0	0	0	0	0	0	-100%	0%	0%
Crematoria [µgTEQ/year]	43.397	32.934	32.850	37.005	19.278	36.235	36.777	36.121	-17%	52%	36%
Incineration of carcasses [µgTEQ/year]	1.115	0	0	0	0	0	0	0	-100%	0%	0%

[51] Source: Bruxelles Environnement, Dept. Air, Energy and Climate Planning (inventories submitted in 2011)

Metal production and smelting [µgTEQ/year]	10.000	10.000	10.000	12.600	9.582	2.549	3.103	13.236	32%	19%	13%
Coking plants [gTEQ/year]	1.854.000	0	0	0	0	0	0	0	-100%	0%	0%
Treatment of residual oils [µgTEQ/year]	3.241	3.241	3.241	3.241	0	0	0	0	-100%	0%	0%
Total [g/year]	**3,68**	1,81	0,14	0,15	0,12	0,13	0,09	**0,07**	-98%	100%	102%

With regards the contributions of individual sources, we can identify the disappearance of emissions linked with the following activities: coke production, hospital waste incineration, incineration of used oil, sludge incineration at the STEP. The dominant source now appears to be cremation (~ 50%). Secondary lead production (~19%), combustion in the service sector (~11%), incineration of waste and sewage sludge (10% and 7%) are other sources of emissions. Combustion in the industrial sector appears to be a minor source. As illustrated in figure 11, there was a sharp reduction between 1990 and 1995, followed by a more gradual reduction until 2007. The total PCDD/PCDF emissions in the BCR do not currently exceed the PRTR threshold for an individual facility.

Figure 11: Trend in PCDD/PCDF atmospheric emissions in the BCR (red line = PRTR threshold)



- **PCB**

As presented in table 16, PCB emissions have reduced over the past fifteen years by 41% to 3 kg/year.
The contribution of these different source sectors and changes which have taken place over the last fifteen years are illustrated in the table below.

Table 16: Trend and sector-specific contributions for PCB atmospheric emissions in the BCR

PCB mg/year	1990	1995	2000	2003	2004	2005	2006	2007	Difference Compared to 1990	Prorata Total (2007)	% PRTR Threshold
Industrial boilers [mg/year]	2.030	2.000	2.030	1.762	1.695	1.599	1.655	0	-18%	0%	0%

Service industry boilers [mg/year]	14.241	15.529	14.697	15.811	15.463	15.074	13.843	0	-3%	0%	0%
Waste incineration [mg/year]	2.900.460	2.900.460	2.900.460	2.900.460	2.900.460	2.900.460	2.900.000	2.900.460	0%	97%	2900 %
Hospital waste incineration [mg/year]	20.319	20.319	0	0	0	0	0	0	-100%	0%	0%
Metal production and smelting [mg/year]	90.145	90.145	90.145	96.280	99.390	80.243	88.102	86.710	-4%	3%	87%
Crematoria [mg/year]	2.887	2.191	2.185	2.462	1.282	2.410	2.446	2.403	-17%	0%	2%
Coking plants [mg/year]	2.163.000	0	0	0	0	0	0	0	-100%	0%	0%
Total [kg/year]	5,19	3,03	3,01	3,02	3,02	3,00	3,01	2,99	-42%	100%	2990 %

- **HCB**

In total, HCB emissions are significantly below the PRTR threshold.

Soil contamination by POPs

- **PCB**

14 sites contaminated (on 3234 investigated sites) have been identified for the BCR. The BCR has since 2004 for legislation concerning the management of the contaminated land.

For the unique pollution (caused by a single author and clearly identifiable), the soil is remediated to the sanitation standards and the excavated soil goes to a specialized center of soil-treatment. For mixed pollution (caused by several authors and distinctly non-identifiable) and orphan pollution (caused by unknown authors), a risk assessment is performed by a soil expert and in case of no tolerable risk to health or environment, risk management must be conducted on the site (for example: isolation of the site).

- **Lindane**

One site is polluted with lindane (and PCBs, PCDDs and PCDFs) following former wood treatment activities (factory fitted with a transformer with PCBs). This site is currently being cleaned up (end of clean-up scheduled for late

2012) within the framework of the "Brussels Greenfields" pilot programme. This programme aims to treat the pollution on contaminated and unoccupied land in the BCR with a view to then using it for economic and job creation projects. It covers the 2009-2013 period.

5.4 Evaluation of the situation for POPs in the Flemish Region

5.4.1 Environmental monitoring

- **Overview**

There are several ongoing measurement initiatives for POPs in Flanders. Measurements are taken in sediment, in surface water and in the air. Next to this an inventory of emissions in air and water is drawn up and certain POPs are also traced in waste.

The table 17 indicates for the various substances included in the UNEP (United Nations Environment Programme)-POP Treaty whether they have been included in the surface water monitoring network, the sediment monitoring network, the water and air emission inventory and/or the deposition monitoring network.

This overview shows that all the substances in appendix A are monitored in surface water – exept mirex, toxaphene, chlordecone, PBDE (4,5-6,7) and hexabromobiphenyl and in the sea bed – exept mirex, toxaphene and chlordecone. They have also been included in the emission inventory for air and water.

The substances from non-intentional production have been included in the annual reporting duty and the deposition of dioxins, furans and PCB 126 is also measured. The deposition of DDT is not measured.

Appendix A, B and C - substances	Surface water	Sea bed	E-PRTR Emission inventory		Deposition	
			water	air		
Aldrin	x	x	x	x	-	
Chlordane	x (cis, trans)	x	x	x	-	
Dieldrin	x	x	x	x	-	
Endrin	x	x	x	x	-	
Heptachlor	x	x	x	x	-	
Mirex	-	-	x	x	-	
PCB's	X	x	x	x	DL-PCB	
Toxaphene	-	-	x	x	-	
Chlordecone	-	-	x	x	-	
Endosulfan	X	X	x	x	-	
HCH, including lindane	X	X	x	x	-	
DDT	X	X	x	x	-	
PFOS	-	-	-	-	-	
PBDE (4,5 – 6,7)	-	X	x	x	-	

Hexabromobiphenyl	-	x	x	x	-	
Dioxines	-	-	x	x	x	
Furans	-	-	x	x	x	
Hexachlorobenzene	x	x	x	x	-	
PeCB	x	-	x	x	-	

Flanders also has a “pesticides monitoring network” which checks surface water for seventy or so pollutants. The presence of pesticides in groundwater is detected in about 500 filters of the groundwater measurement network of the Flemish Environment Agency (VMM: Vlaamse Milieumaatschappij). About 15 pesticides or their decomposition products are analysed by default. In a selection of wells, analyses are even performed on about 45 pesticides or their decomposition products.

Appendix VII provides a non-exhaustive overview of the various methods and techniques to analyse POPs in various environments.

Emission registration: air and water

- **Air**

Dioxin and furan air emissions for industry are partly obtained from the integrated environmental annual reports of companies and partly from collective additional estimates.

The dioxin and furan emissions are reported as a group under the denominator PCDD/PCDF and are expressed as mg TEQ/year in the integrated environmental annual report, on the air subform. By contrast with all other pollutants no threshold value for report has been set for PCDD/PCDF. If emission measurements are imposed for PCDD/PCDF in the permit for a facility these the results of these measurements have to be reported on and appended.

Results: over the years the number of facilities which measures and reports on dioxins and furans has significantly increased. Whereas only 2% of the 340 facilities that were subjected to a reporting obligation reported PCDD/PCDF in 1996 this share rose to 13% of 420 facilities in 2010.

In addition to these individual emissions the Flemish Environment Agency (VMM) also makes an additional estimate based on activity data and emission factors.

The emissions for the heating of buildings (sector population and sector trade and services) is estimated based on energy consumption and emission factors. The emissions as a consequence of burning off in open fires and barrels by the population are calculated based on activity data and emission factors.

Reporting for hexachlorobenzene is mandatory (emission inventory air). However no facility in Flanders did/does report an emission figure which exceeds the reporting threshold for hexachlorobenzene (0.010 tons).

The other substances were incorporated for the first time in the integrated environmental annual report in the 2007 reports (data for 2006) as a result of the E-PRTR Directive. Currently a study is being conducted, which has been commissioned by VMM, to optimise the emission inventory for POPs. The results are expected to be in by end 2012.

- **Dioxin emissions in the air: in detail**

The introduction of dioxin emission ceilings and target values as specifically mentioned in appendix VIII and IX, together with the remediation efforts of the Environment Inspectorate Department has led to significant emission reductions in the Nineties.

Evolution of dioxin emissions in Flanders: 1990 – 2010[52]

Sources of dioxin emissions for which sufficient information is available to draw up an inventory:

- the population (heating of buildings, mainly fireplaces and heaters and the burning off of waste in open fires and barrels);
- trade and services (including crematoriums, building heating, waste incineration);
- traffic and transportation (road traffic);
- industry (including metal and non-metal industry);
- energy (including electricity generation).

No estimates are currently made for sectors for which insufficient information is available. This applies among others to the manufacture of foodstuffs and stimulants.

Table 18, 19 and 20 show the evolution of dioxin emissions in the various sectors in Flanders for the period between 1990 and 2010.

Table 18: Evolution of the dioxin emission (g TEQ/year) by the various sectors in Flanders (1990-1997)

Dioxins	1990		1991		1992		1993		1994		1995		1996		1997	
	g TEQ	%	g TEQ	%	g TEQ	%	g TEQ	%	g TEQ	%	g TEQ	%	g TEQ	%	g TEQ	%
population	**32**	**7**	**33**	**7**	**33**	**7**	**33**	**8**	**32**	**8**	**33**	**9**	**35**	**12**	**33**	**12**
heating of buildings	9		10		10		10		9		10		12		10	
barrels, open fires	23		23		23		23		23		23		23		23	
industry	**202**	**41**	**202**	**43**	**202**	**46**	**202**	**48**	**201**	**52**	**201**	**55**	**201**	**71**	**201**	**76**
chemical industry	0,225		0,185		0,145		0,105		0,065		0,025		0,025		0,026	

[52] Jaarverslag lozingen in de lucht 1990-2010 - http://www.vmm.be/pub/jaarverslag-lozingen-in-de-lucht-1990-2010
Voir aussi : Huishouders en Verspreiding van POPs - http://www.milieurapport.be/nl/publicaties/mira-indicatorrapport-2011/

metal industry	127		127		127		127		127		127		128		127	
non-metal industry	68		68		68		68		68		67		67		67	
burning off of cables/motors	-		-		-		-		-		-		-		-	
wood, -protection	6		6		6		6		6		6		6		6	
paper, printers	-		-		-		-		-		-		-		-	
construction, asphalt, rubber	-		-		-		-		-		-		-		-	
traffic	**1**	**0,2**	**1**	**0,2**	**1**	**0,2**	**1**	**0,2**	**1**	**0,2**	**1**	**0,2**	**1**	**0,2**	**0,445**	**0,2**
road haulage	1		1		1		1		1		1		1		0,444	
shipping	0,001		0,001		0,001		0,001		0,001		0,001		0,001		0,001	
energy	**0,058**	**0**	**0,060**	**0**	**0,061**	**0**	**0,060**	**0**	**0,064**	**0**	**0,059**	**0**	**0,055**	**0**	**0,054**	**0**
refineries	-		-		-		-		-		-		-		0	
gas and electricity	0,058		0,060		0,061		0,060		0,064		0,059		0,055		0,054	
agriculture	**0,450**	**0,1**	**0,429**	**0,1**	**0,407**	**0,1**	**0,386**	**0,1**	**0,387**	**0,1**	**0,326**	**0,1**	**0,332**	**0,1**	**0,315**	**0,1**
agriculture & horticulture	0,450		0,429		0,407		0,386		0,387		0,326		0,332		0,315	
trade & services	**254**	**52**	**229**	**49**	**205**	**46**	**180**	**43**	**155**	**40**	**131**	**36**	**48**	**17**	**30**	**11**
incineration of household waste	x		x		x		x		x		x		x		x	
incineration of industrial waste	x		x		x		x		x		x		x		x	
hazardous waste	x		x		x		x		x		x		x		x	
heating of buildings	0,169		0,308		0,294		0,301		0,346		0,246		0,300		0,269	
crematoriums	x		x		x		x		x		x		x		x	
burning off of silt, etc.	x		x		x		x		x		x		x		x	
Total	490	100	465	95	440	90	416	85	390	80	366	75	285	58	265	54

Table 19: Evolution of the dioxin emission (g TEQ/year) by the various sectors in Flanders (1998-2006; reference year 1990)

Dioxins	1998		1999		2000		2001		2002		2003		2004		2005		2006	
	g TEQ	%	g TEQ	%	g TEQ	%	g TEQ	%	g TEQ	%	g TEQ	%	g TEQ	%	g TEQ	%	g TEQ	%
population	**33**	**18**	**33**	**42**	**33**	**58**	**33**	**60**	**31**	**71**	**32**	**73**	**32**	**76**	**32**	**69**	**31**	**73**
heating of buildings	10		10		10		10		8		9		9		9		8	
barrels, open fires	23		23		23		23		23		23		23		23		23	
industry	**129**	**69**	**31**	**40**	**10**	**18**	**7**	**13**	**7**	**16**	**6**	**14**	**7**	**17**	**10**	**22**	**7**	**17**
chemical industry	0,040		0,006		0		0,015		0,001		0,001		0,001		0,001		0	
metal industry	55		21		8		5		6		5		6		9		6	
non-metal industry	67		10		2		2		1		0,240		0,201		0,285		0,180	
burning off of cables/motors	-		-		-		-		-		-		-		-		0,282	
wood, -protection	6		0		0,038		0,179		0,457		0,374		0,210		0,189		0,243	
paper, printers	-		-		-		-		-		-		-		-		-	
construction, asphalt, rubber	-		-		0,013		0,018		0,020		0,007		0,075		0,104		0,082	
traffic	**0,384**	**0,2**	**0,328**	**0,4**	**0,273**	**0,5**	**0,233**	**0,4**	**0,202**	**0,5**	**0,180**	**0,4**	**0,160**	**0,4**	**0,144**	**0,3**	**0,127**	**0,3**
road haulage	0,383		0,327		0,272		0,232		0,201		0,179		0,158		0,142		0,126	
shipping	0,001		0,001		0,001		0,001		0,001		0,001		0,001		0,001		0,001	
energy	**0,094**	**0,1**	**0,029**	**0**	**0,266**	**0,5**	**0,653**	**1**	**0,909**	**2**	**0,214**	**0,5**	**0,097**	**0,2**	**0,287**	**0,6**	**0,071**	**0,2**
refineries	0		0		0,236		0,620		0,880		0,182		0,060		0,250		0,036	
gas and electricity	0,064		0,029		0,030		0,033		0,029		0,032		0,037		0,037		0,035	
agriculture	**0,28**	**0,**	**0,25**	**0,**	**0,25**	**0,**	**0,25**	**0,**	**0,25**	**0,**	**0,25**	**0,**	**0,25**	**0,**	**0,25**	**0,**	**0,24**	**0,**

	7	**2**	**1**	**3**	**5**	**5**	**4**	**5**	**3**	**6**	**1**	**6**	**2**	**6**	**0**	**5**	**9**	**6**
agriculture & horticulture	0,287		0,251		0,255		0,254		0,253		0,251		0,252		0,250		0,249	
trade & services	**23**	**12**	**14**	**18**	**12**	**22**	**14**	**25**	**5**	**10**	**5**	**11**	**3**	**6**	**4**	**8**	**4**	**9**
incineration of household waste	x		0,386		0,197		0,154		0,138		0,139		0,080		0,114		0,103	
incineration of industrial waste	x		10		12		13		4		4		2		3		3	
hazardous waste	x		0,480		0,139		0,114		0,118		0,109		0,171		0,157		0,203	
heating of buildings	0,275		0,264		0,281		0,280		0,280		0,268		0,267		0,245		0,204	
crematoriums	x		0,086		0,093		0,094		0,103		0,002		0,002		0,002		0,002	
burning off of silt, etc.	x		3		0,160		0,150		0,126		0,101		0,123		0,160		0,091	
Total	186	38	78	16	56	11	55	11	44	9	43	9	42	9	46	9	43	9

Table 20: Evolution of the dioxin emission (g TEQ/year) by the various sectors in Flanders (2007-2010)

Dioxins	2007		2008		2009		2010*	
	g TEQ	%	g TEQ	%	g TEQ	%	g TEQ	%
population	**31**	**74**	**31**	**70**	**31**	**74**	**33**	**74**
heating of buildings	8		8		8		10	
barrels, open fires	23		23		23		23	
industry	**6**	**14**	**8**	**18**	**6**	**13**	**7**	**14**
chemical industry	0		0,081		0,063		0,031	
metal industry	5		8		5		6	
non-metal industry	0,210		0,179		0,357		0,311	
burning off of cables/motors	-		-		-		-	
wood, -protection	0,370		0,132		0,136		0,087	
paper, printers	-		0,004		0,000		0,000	
construction, asphalt, rubber	0,044		0,062		0,010		0,014	
traffic	**0,121**	**0,3**	**0,105**	**0,2**	**0,089**	**0,2**	**0,107**	**0,2**
road haulage	0,120		0,104		0,088		0,106	
shipping	0,001		0,001		0,001		0,001	
energy	**0,095**	**0,2**	**0,141**	**0,3**	**0,030**	**0,1**	**0,061**	**0,1**
refineries	0,065		0,121		0,010		0,028	
gas and electricity	0,030		0,020		0,020		0,033	
agriculture	**0,343**	**0,8**	**0,339**	**0,8**	**0,287**	**0,7**	**0,309**	**0,7**
agriculture & horticulture	0,343		0,339		0,287		0,309	
trade & services	**5**	**11**	**5**	**11**	**5**	**12**	**5**	**11**
incineration of household waste	0,135		0,102		0,099		0,114	
incineration of industrial waste	4		4		4		4	
hazardous waste	0,194		0,085		0,085		0,085	
heating of buildings	0,211		0,208		0,240		0,272	
crematoriums	0,002		0,002		0,002		0,002	
burning off of silt, etc.	0,213		0,551		0,551		0,551	
Total	41	8	45	9	42	9	45	9

Table 18, 19 and 20 show that the dioxin emissions dropped from 490 g in 1990 to 45 g TEQ in 2010, or a reduction of 91%.

The share of emissions generated by the population was 7% in 1990. In 2010 this share had increased significantly (74%) as a result of significant reductions in the other sectors.

In 2010 the emissions of open fires and barrels made up half of the total of all dioxin emissions. In barrels and other appliances for the incineration of waste ‘cold spots' or oxygen shortages may arise in the fire, which result in an incomplete incineration, generating dioxins.

This is not only the case for the incineration of plastics, paper and so on but also for the incineration of substances which may seem harmless at first glance, such as garden waste.

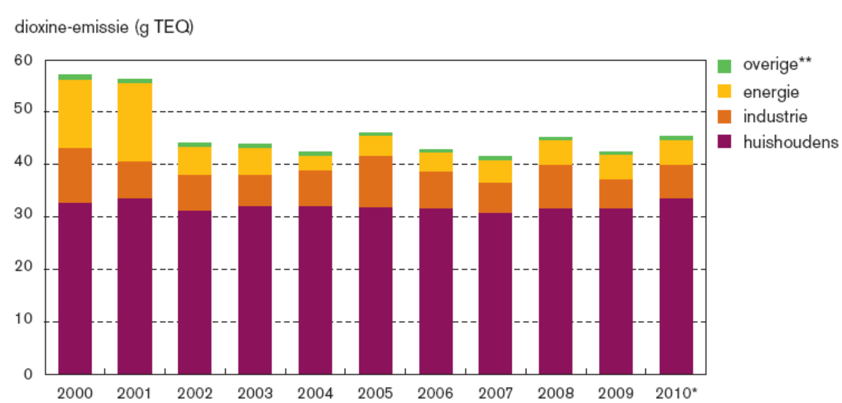
The share of emissions generated by the industrial sectors dropped significantly between 1997 and 2000, as a result of a reduction in the metalworking industry. The steel industry reduced its emissions thanks to a remediation programme and by installing a flue gas purification installation.

From 1999 the emission figures for the non-metalworking industry were taken from the integrated environmental annual reports. The share of the emissions of the industrial sectors in the overall emissions was halved over the entire period.

In the trade and services sector most emissions in 1990 were generated by household waste incineration installations. A global estimate was made for the trade and services sector for the period between 1990 and 1998.

The contribution of the subsectors to the emissions of the trade and services sector is indicated with a “x” sign. From 1996 the emissions for this waste incineration sector dropped significantly as a result of remediations. As a result the share of the trade and services sector in the total dioxin emissions figures dropped from 52% in 1990 to 11% in 2010.

Table 21: Dioxin emissions in air



* provisional figures:
** other: agriculture + transport + trade & services
Source: Flemish Environment Agency

- **Dioxin emissions of the ‘population’ sector**

In the next few years the Flemish dioxin policy will mainly focus on the 'population' sector with a relative share of 74% in the total emission inventory of 2010. In order to continue to reduce dioxin emission‘ attention will be paid to the emissions from the heating of buildings with solid fuels and waste incineration in open fires and barrels. This will be achieved by raising awareness among the population in combination with the introduction of emission standards for new heaters.

- **Heating of buildings with solid fuels and waste incineration in open air**

<u>Emission inventory</u>

In 2000 research was conducted into dioxin emissions as a result of the heating of buildings with solid fuels and possible policy measures such as a type examination, user regulations and awareness campaigns.

Based on a survey which was conducted among private users of heaters and fireplaces and emission factors from literature it was possible to draw up an updated inventory of dioxin emissions and PAHs generated by the heating of buildings with solid fuels. In the frame of an additional measurement programme measurements were carried out during the incineration of (garden) waste in barrels and on open fires and during the heating of buildings with fireplaces and heaters operating on solid fuels. An additional study commissioned by the Flemish Environment Agency in 2012 will have to further optimise these estimates.

<u>Protocol</u>

In 2001 the Flemish Environment Minister signed a protocol with a number of professional federations and the Association of Flemish Cities and Municipalities (*Vereniging van Vlaamse Steden en Gemeenten* (VVSG)) about the heating of buildings and waste incineration in open air. In the framework of this protocol these organisations actively contributed to the awareness campaigns and a dialogue was launched about the environmental quality requirements for heating appliances using solid fuels.

<u>Product standardisation</u>

The European Committee for Standardisation (CEN) has developed harmonised European standards for household heating appliances that use solid fuels, i.e., EN 13229:2001/A2:2004 and EN 13240:2001/A2:2004. These standards include a threshold value for the CO emission and efficiency of these appliances.

In consultation with the sector concerned and the Regions the Federal Government started to develop a Belgian Royal Decree in 2004 on the yield, the CO and particle emission and the quality of the solid fuels based on the European standards. Stricter performance requirements will be introduced in the period between 2007 and 2010 under the (draft) Royal Decree. A number of international developments as regards particulate matter will also be taken into account. The improved performance of these new appliances will indirectly also have positive effects on dioxin emissions.

- **Deposition measurements dioxins and PCBs**

Measurement strategy

The Flemish Environment Agency has implemented a new measurement strategy since 2010. In most locations measurements are carried out four to six time every month, which is a significantly higher frequency compared with the former spring and autumn campaigns. This allows the Flemish Environment Agency to have a better idea of the dioxin and PCB pollution for the entire year. The high number of measurements per monitoring station also meant that the number of stations had to be reduced. In 2012 there were about 30 monitoring stations, compared with about 70 in 2000. As from 2012, the Flemish Environment Agency (VMM) analyses all 12 dioxin-like PCBs in the deposition samples, and not only the most toxic, i.e. PCB126.

Currently the Flemish Environment Agency takes the destination of the area into account. An additional monitoring station will be installed in locations near agricultural areas or residential areas. The industrial monitoring station provides information about the source, while the monitoring station in a residential or agricultural area will provide information about potential health effects.

In 2012, there are 34 monitoring stations, which can be divided as follows:

- 20 monitoring stations are tested against the threshold value of which
  - 11 are situated in agricultural areas,
  - 9 in residential areas.
- 14 monitoring stations are not tested against the threshold value of which
  - 11 in industrial zones,
  - 3 in nature areas.

Every year the Flemish Environment Agency shares the results with the Environment Inspectorate and the FASFC. The Environment Inspectorate can undertake source-oriented action. It can decide to carry out measurements in industrial parks or impose that companies implement remediation procedures. The FASFC can choose to analyse food samples in case of increased depositions. When European food standards are exceeded the food products will be destroyed. These actions are all designed to protect consumers.

Threshold values

There are no legal standards for the deposition of dioxins or PCBs. The European Scientific Committee on Food in 2001 published an opinion on how many dioxins and dioxin-like PCBs we can consume on a weekly basis. The figure is 14 pg TEQ/kg of body weight per week. This dosage is lower than the acceptable dosage proposed by the World Health Organization (1 to 4 pg TEQ/kg.day).

The Flemish Environment Agency commissioned a study to calculate which average annual deposition is consistent with this EU opinion of 14 pg TEQ/kg. week and thus defined a threshold value. Given that the high analysis price does not permit for year-round measurements a threshold value was also calculated for average monthly depositions. Occasionally high depositions occur, which would be more than the average, if the measurements were year-round. That is why the average monthly deposition is checked against a higher threshold value (table 22).

These threshold values have been applicable since 2010. In comparison with the previous years there are two changes:

- the threshold values apply to the combined total of dioxins and dioxin-like PCBs.

- the threshold values only apply in areas where increased depositions can impact health, i.e., in agricultural areas and residential areas. Given that man absorbs dioxins and PCBS through food the Flemish Environment Agency no longer compares the depositions measured in industrial areas against the threshold values.

Table 22: Threshold values for the depositions of dioxins and dioxin-like PCBs.

1.1.1.1.1	Permitted dosage defined by the EU	Average annual deposition	Average monthly deposition	Where?
14 pg TEQ/kg.week		8.2 pg TEQ/m².day	21 pg TEQ/m².day	agricultural and residential areas

There are 12 compounds in the group of dioxin-like PCBs. The Flemish Environment Agency only measures the deposition of the most toxic compounds, PCB126. In the group of dioxin-like PCBs PCB126 is the most toxic. We estimate the share of the other DL-PCBs. As from 2012, the Flemish Environment Agency (VMM) analyses all 12 dioxin-like PCBs in the deposition samples.

These threshold values have no legal value but they allow the Flemish Environmental Agency to evaluate the depositions measured and to decide which regions deserve additional attention.

<u>Results and trends</u>

In 2012 the Flemish Environment Agency had 34 monitoring stations for the monitoring of the deposition of dioxins and PCBs. The results of 20 monitoring stations were compared with the threshold value which the Flemish

Environment Agency uses to evaluate the measurement values. The conclusion was that the average monthly deposition was too high for one in six samples. The annual average deposition was too high in 12 monitoring stations. It needs to be noted that due to the high analysing costs, measurements are never conducted all year round, at none of the measurement points. Comparisons with the annual average limit value are therefore indicative.

Near scrapping plants there is no general increasing or decreasing trend. The PCB values are higher than the dioxin values. In a number of cases the deposition is too high in residential or agricultural areas which border on scrapping companies. The pollution is caused by diffuse emissions from shredded material, which are quite difficult to control. It is recommended that there be a buffer zone between this type of company and areas where dioxins and PBCs have health effects, i.e., in residential and agricultural areas.

The trend is favourable in a number of region with a known dioxin problem. This is the case in regions with a (non-) metalworking company. The dioxin levels in a region with a lot of MDF-producing companies have also dropped. And yet occasionally high values do occur in Flanders which point to the existence of several sources.

Table 23 shows the amount of samples taken in some model locations as well as the average, minimum and maximum deposition rates for dioxins and PCB126. For the period 2009-2012, the Regional Development Plan has been consulted in order to verify which measurement points are situated in urban or rural areas. Those measurement points are often chosen because of a known industrial source. This means that the depositions recorded in an urban measurement point are not always caused by habitation or traffic but may be caused by a company situated in an adjacent industrial area. This also counts for measurement points situated in agricultural areas. This new categorisation of measurement points also implies that you cannot compare the results of measurement points situated in rural and urban areas from the period 2009-2012 with results from previous years.

Table 23: Specific information on deposition measurements dioxins, furans and PCB 126: 1995-2000-2009

Deposition	Dioxins, Furans, PCB126
Objective	Assessment of air quality
Type of measurements	Deposition samples with Bergerhoff jars (1 month)
Analytical method	HRGC/MS
Start of measurements	1995 (dioxins, furans) 2002 (PCB126) 2012 (12 dioxins like PCB)
Type of sampling points	Near potential sources, urban regions and rural areas
Measurement strategy	Measurements are stopped at locations with repeatedly low values Frequency and number of measurements are increased in regions with repeatedly high values 1995-2009 : mainly source-related monitoring network in order to follow up the source remediation Since 2010: monitoring network with focus on samples taken at urban and agricultural locations near potential sources in order to assess the impact on health
Number of sampling points	1995 : 10 – 2 samples per year 2000: 70 – majority: 2 samples/year – hot spots: 4-12 samples/year 2009: 39 – 9: 2 samples/year – 30: 4-6 samples/year 2012: 34 – 2 : 2 samples/year – 32 : 4-5 samples/year

Values dioxins (pg TEQ/m².day) (part of programme)	Rural area: 1995 – 2009 : 40 samples – mean: 5,4 – min: 0,7 – max: 36 Rural area: 2009 – 2012 : 180 samples – mean: 5,4 – min: 0,6 – max: 32 Urban location: 1995 – 2009 : 28 samples – mean: 8,3 – min 2,2 – max: 25 Urban location: 2009 – 2012 : 189 samples – mean: 8,7 – min 0,4 – max: 283 Near ferro-plant: 1998 – 2009: 68 samples – mean: 12 – min: 2 – max: 42 Near ferro-plant: 2009 – 2012: 29 samples – mean: 8,6 – min: 1,7 – max: 40 Near non-ferro plant: 1998-2008: 71 samples – mean: 17 – min: 3,2 – max: 119 Near non-ferro plant: 2009-2012: 41 samples – mean: 11 – min: 2 – max:86 Near shredder: 2003-2009: 43 samples – mean: 12 – min 2,3 – max: 45 Near shredder: 2009-2012: 336 samples – mean: 10 – min 0,4 – max: 283
Values PCB126 (pg TEQ/m².day) (part of programme)	Rural area: 2002 – 2009 : 17 samples – mean: 1,4 – min: 0,3 – max: 3,3 Rural area: 2009 – 2012 : 180 samples – mean: 3 – min: 0,1 – max: 203 Urban location: 2002 – 2009 : 17 samples – mean: 3,2 – min 0,9 – max: 6,1 Urban location: 2009 – 2012: 189 samples – mean: 7,7 – min 0,3 – max: 140 Near ferro-plant: 2002 – 2009: 34 samples – mean: 1,9 – min: 0,6 – max: 5,2 Near ferro-plant: 2009 – 2012: 29 samples – mean: 1,5 – min: 0,3 – max: 3,3 Near non-ferro plant: 2002-2008: 32 samples – mean: 2,8 – min: 0,6 – max: 5,8 Near non-ferro plant: 2009 – 2012: 41 samples – mean: 2,9 – min: 0,3 – max: 14 Near shredder: 2003-2009: 43 samples – mean: 64 – min 1,1 – max: 351 Near shredder: 2009 – 2012: 336 samples – mean: 37 – min 0,1 – max: 648
Data	On website vmm (www.vmm.be) In annual reports which are publically accessible (Dutch)

- **Waste Water**

All the substances have been included in the mandatory reporting in the integrated environmental annual report[53] for emissions in water.

Results:

Substance	In the IEAR since	Above the IEAR Threshold
Aldrin	1996	No
Chloordaan	2005	No
Dieldrin	1996	No
Endrin	1996	No
Heptachloor	2006	No
Mirex	2006	No
PCB's	2006	No
Toxafeen	2006	No
Chlordécone	2006	No
Endosulfan	2005	No
HCH, dont lindane	2005 (2006)	No
DDT	2006	No
PFOS	---	No
PBDE (4,5 – 6,7)	2005	Yes (2006 – 2010)
Hexabromobiphenyl	2006	No
Dioxines	2006	No
Furanen	2006	No
Hexachloorbenzeen	1996	Yes (2007)
PeCB	2006	No

53 Het integraal milieujaarverslag - http://imjv.milieuinfo.be/Het%20IMJV%20

No company has ever reported values that are above the threshold values of the integrated environmental annual report, except for PBDE and HCB.

See the chapter on E-PRTR.

- **Surface water measurements**

POPs are measured in surface water since 1991. Table 24 indicates for each pollutant in how many monitoring stations measurements were carried out for this substance. This does not mean, however, that the substance was effectively found in all these monitoring stations.

The number of monitoring stations rose from about 80 in 1991 to about 150 in 2004 and finally about 40 in 2007. The reason for this is that the substances were rarely or never found during recent years in the extended pesticides monitoring network. That is why the number of monitoring stations was limited since 2006 to a number of strategic monitoring stations; about 40 distributed across Flanders (including the ends of basins, inbound and outgoing points).

Results

Table 24 indicates the percentage of positive detections for the total number of analyses over the years. Whereas in the early 90s detection levels were still about 20% for some of the UNEP substances there are almost no positive analyses anymore in 2005. For these reasons the PCBs monitoring network was reduced in the following years.

Table 24: Overview of positive detections in surface water, expressed as percentages of the total number of measurements.

Year	PCB's*	Aldrin	Chlordane**	Dieldrin	Endrin	Heptachlor	Hexachlorobenzene	DDT
1991	5 – 37	18		21	16	12	19	10
1992	1 - 40	13		17	11	5	20	19
1994	0 – 20	3		0	3	0		5
1995	4 – 22	2		4	2	2	4	4
1996	2 – 20	1		6	7	0	9	0
1997	1 -10	0	1 – 5	1	3	3	12	1
1998	1 – 3	3	1 – 7	14	7	6	9	2
1999	0 – 1	2	1 – 2	19	2	1	2	0
2000	0 – 2	1	0 – 1	4	1	1	1	1
2001	0 – 1	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0
2003	0 – 1	0	0	0	0	0	1	0
2004	0 - 1	0	0	0	0	0	0	0
2005	0 - 1	0	0	1	0	0	0	0
2006	0-3	0	0	0	0	0	0	0
2007	0-6	0	0	0	0	0	0	0
2008	0-2	0	0	0	0	0	0	0
2009	0-1	0	0	0	0	0	0	0
2010	0-5	0	0	4	0	0	1	0
2011	0-13	1	0	1	0	0	0	1

* PCB 170; PCB 180; PCB 138; PCB 153; PCB 101; PCB 49; PCB 52; PCB 118; PCB 28; PCB 31; PCB 169

** chlordane (cis, trans)

The standards of the decree about pesticides in surface water are twofold: a maximum concentration to avoid acute effects and an average concentration to avoid chronic effects.

The situation has significantly improved for several substances, which used to exceed the standards in many ways. These include endosulfan and hexachlorocyclohexane. It is not a coincidence that restrictions and/or bans were enforced for these substances (table 25).

Table 25. Percentage of monitoring stations with an exceedance for the period between 2002 and 2011 which exceeded the norm at least once in over 10% of the monitoring stations. Source: Flemish Environment Agency

	Endosulfan	**Hexachlorocyclohexane**
2002	20	28
2003	24	14
2004	20	6
2005	29	10
2006	27	8
2007	15	7
2008	11	11
2009	12	5
2010	11	11
2011	10	4

Appendix IX presents the results in terms of PCBs in surface water.

- **Sea bed measurements**

The Flemish routine-based sea bed monitoring network was launched in March 2000 with the aim of mapping and monitoring the quality of the Flemish sea bed. Six hundred monitoring stations were identified. Taking into account the heterogeneity of sediment the ecological quality of sediment can thus be charted.

Given that the quality of sediment evolves very slowly, unless important remediations or pollutions take place, and taking into account the complexity of the research 150 monitoring stations are sampled annually.

Sediment monitoring network ultimately consists of 600 monitoring stations, which are sampled every four years, in other words the average concentrations of the various substances is comparable for the three campaigns, i.e., 2000-2003, 2004-2007 and 2008-2011.

Since 9 July 2010, the environmental quality standards for sediment have been enacted in a decree. These norms are target values. They define the environmental quality level that has to be achieved or maintained as much as possible. These values are not a remediation criterion, nor a remediation objective.

Results

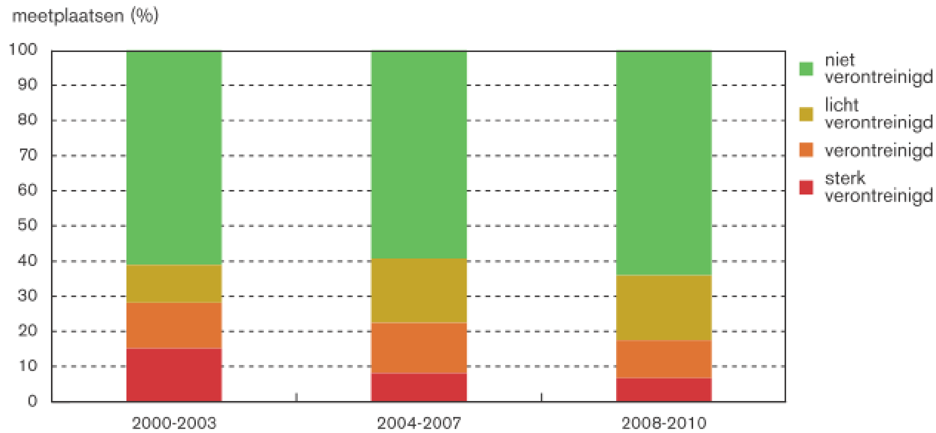
Table 26 shows an overview of positive detections for aldrin, chlordane, dieldrin, endrin and the PCBs measured in surface water, expressed as percentages of the total number of measurements over various years (1995-2006).

Year	Aldrin	Chlordane	Endrin	Dieldrin	PCB 101	PCB 118	PCB 138	PCB 153	PCB 169	PCB 170	PCB 180	PCB 28	PCB 31	PCB 49	PCB 52	PCB t
1995	0			17	39	37	48	46			46	20	23	43	29	48
1996	0			12	37	34	44	44			43	8	10	37	21	45
1997	6			21	40	36	52	56			49	10	2	22	23	57
1998	1			30	37	30	47	49			45	14	13	33	24	52
1999	4			13	45	44	57	60			52	25	0	20	32	63
2000	17	26	26	27	59	52	63	64			56	22	50	32	40	67
2001	0	1	1	3	37	35	44	44	0	25	40	13	12	13	18	44
2002	1	0	3	1	67	67	74	72	4	60	71	55	41	57	61	78
2003	0	1	2	4	62	60	65	69	2	43	62	42	28	42	45	73
2004	0	5	3	5	60	57	69	69	1	45	68	15	10	20	27	69
2005	0	0	2	2	54	54	63	63	0	50	61	19	18	23	20	65
2006	0	2	3	4	66	69	75	79	0	64	75	44	35	44	48	86

Compared with the situation in the water column the various congeners of the PCBs (except for PCB 169) are still regularly found in sediment (table 26).

Sediment quality evolves favourably but is still often a problem. When testing against the standards some substances seem to exceed the norms in over 40% of the monitoring stations. Several PCBs, a decomposition product of DDT, zinc and copper have been found.

A qualitative comparison of the 241 water bodies that were sampled in the periods 2000-2003, 2004-2007 and 2008-2011 shows a positive evolution. A sharp fall in the proportion of severely contaminated water bodies (from 50 to 24%) and the growth in the proportion of slightly contaminated water bodies (from 19 to 29%) illustrate this improvement. The proportion of non-contaminated water bodies shows no clear evolution however. The fall in the proportion of severely contaminated water bodies mainly resulted in a growth of the proportion of contaminated water bodies (from 29 to 41%).



Source: Flemish Environment Agency

To conclude, the quality of sediment had improved in the last years in terms of PCB concentrations but in 2008-2011, 22% of the monitoring stations was still polluted or even heavily polluted.

Improvements of sediment quality can have various causes:

• removal of sediment although remediation does not always improve sediment quality because the historic pollution in some cases has penetrated deep into the water bed;

• the newly shaped waterbed, in other words the upper sediment layer, is less polluted as a result of reduced discharges of toxic substances;

• the changed physical-chemical quality of the water column, e.g., higher oxygen concentrations, may result in the delayed discharge of toxic substances from the water bed to the water column.

Appendix IX contains the results regarding PCBs in sediments.

- **Groundwater**

When using certain pesticides there is a danger that they may end up in the groundwater. They may cause pollution in the groundwater for longer periods of time. Substances which have a low adsorption capacity of soil particles and which are difficult to break down are especially a potential threat for the groundwater.
However, no pesticide POPs listed in the Stockholm Convention have been identified in the groundwater in Flanders.

POPs in waste

Materials and articles containing POPs which are or should be disposed of are considered as waste. In most cases, those materials and articles are even considered as hazardous waste.

The relevant waste provisions are specified in VLAREMA, the Flemish regulations on waste management. VLAREM, the Flemish regulation on environmental licences, imposes conditions for the treatment of hazardous waste. (appendix IV).

In early July 2008 a study ended which compared the current Flemish environmental legislation, among others on waste management and soil management with the provisions of Regulation 850/2004 (POPs Regulation) and which highlighted points for attention and bottlenecks. Next to this a list was established of all the possible products and materials in general which become POPs-containing waste flows in the frame of Regulation 850/2004 so that the impact of the Regulation at policy level could be estimated.

The inventory showed that the number of waste flows which contains significant quantities of POPs was limited.

Risk flows included:

- Construction and demolition waste
- Insulation material
- Electric appliances
- Discarded vehicles and waste oil (PCBs)
- Fly ash and the waste from the gas treatment from the metalworking industry and incineration (dioxins and furans).

Significant quantities of PAHs can be found in: waste oil, tar-based asphalt and roofing, construction and demolition waste (e.g., demolition granulates) and rubber waste.

In Flanders POPs are no longer ‘purposefully' produced in view of the fact that the use of several POPs has been banned now for some time.

Those POPs that make it to the waste phase are due to the historical use of POPs in:

- construction (paint, sealing, insulation material, etc.)
- treated lumber (creosote, carbolineum) and cables (flame retardants)
- the illegal use in non-European countries (e.g. contamination of imported textiles and lumber)
- the involuntary generation of POPs as a result of thermal processes or chemical production (combustion residue or undesired by-products).

The inventory also shows that the POPs levels in certain materials has not been measured.

The study mainly focused on the contamination with dioxins and furans. There is some fragmented research available for PCBs. The presence of POPs pesticides, by contrast, in for example lumber or textile waste was/is not being analysed. There are not many data available either about the PAHs levels in waste.

No serious bottlenecks were identified in the compatibility analysis which would render the implementation of the POPs regulation impossible.

As regards the stocks of pesticides and other POPs that are present a research has been conducted in 2004 in order to see how many sectors, flows and quantities must be dealt with as a priority.

2004 Study: PCBs in waste

In the course of 2004 measurements were carried out to detect the presence of PCBs in certain types of waste. In waste flows such as construction and demolition waste, the fine fraction of shredded treated lumber waste and paper sludge lower concentrations of PCBs have been found, a few dozen µg/kg. This light pollution is probably due to the presence of applications (which are now prohibited) such as paint, putty and concrete sealant.

In the opinion of specialists in this matter there is a very low risk in the usage phase of products which contain this wood (MDF), given that PCBs tend to be rather immobile and that there are only very low concentrations.

The pollution has to be taken into account, however, in the end process.

Incineration installations

Approved incineration installations are equipped with the necessary flue gas scrubbers and facilities to avoid emissions. The incineration or heating of consumer products by consumers is obviously less easy to monitor. Here it is important to raise awareness, as is already the case for the generation of dioxins, for example in the case of combustion in household heating installations or illicit incineration

- **Register of polluted soils**

To map pollution in Flanders, systematically remediate soil and legally protect homeowners in land acquisition, an inventory of all the polluted plots is maintained. This database contains all the information known about a field, its pollution and phases of remediation.

5.4.2 Bio-monitoring - human

- **Flemish Human Biomonitoring programme 2007-2011**[54]

  - **Framework**

Between 2002 and 2006, new-borns, youngsters and adults in several areas for special attention (canal zone, port area, incinerators, fruit farming zones…) were examined in the scope of the first *Steunpunt Milieu en Gezondheid*. This measurement campaign confirmed that living in different regions in Flanders may be linked to the presence of certain pollutants in the body and subsequent effects on health. For instance, concentrations of chlorinated hydrocarbons (PCBs, dioxins, HCB and pp'-DDE) appeared to be higher in rural areas. The study also revealed that exposition to pollutants can be linked to health or biological effects. So, boys having a higher exposition to PCBs and chlorine pesticides showed earlier puberty development while mothers with higher serum values of PCBs, dioxins and benzene 6-chloride mentioned more fertility problems. Among youngsters and adults, more damage to the hereditary material (DNA-damage) was observed if there was a higher exposition to lead, cadmium or PAHs. The results are available on the website of *Steunpunt Milieu en Gezondheid*.

The second cycle of the human biomonitoring network which is implemented in the framework of the Environment and Health Support 2007-2011 is aimed to defining new reference values. These reference values allow us to measure the presence and impact of pollutants on the health of the general population in Flanders. In addition to the results of pollutants that were already previously found in Flanders (heavy metals, dioxins, PCBs and so on) this study for the first time reported data about the presence of new pesticides, flame retardants and chemicals which are used in care and consumer products. The reference values are also compared with the available data from other studies. The values that will be obtained in the biomonitoring in selected hotspots (the areas for attention Genk-Zuid[55] and Menen[56]) can be compared with these reference values.
A new perception survey will be carried out within the framework of the Environment and Health Support 2007-2011. Questionnaires will be used to ask participants in three age categories about their opinion, their concerns and their complaints regarding health and the environment. The idea is to generate a perception about the social significance of environment and health risks, which is relevant for the policy and which can contribute to analysing and controlling the risks and communicating about them. The results are compared with the perception study of the first Support Centre.

  - **Method (see appendix X)**
  - **Influence of environmental factors**

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[54] http://www.milieu-en-gezondheid.be/resultaten/referentiebiomonitoring/Eindrapport_referentiewaarden_finaal_met_voorblad.pdf
[55] http://www.milieu-en-gezondheid.be/onderzoek/luik%2021/hotspots/genkzuid/resultaten/STP%20MG%20Resultatenrapport%20Genk-Zuid%20-%20definitief.pdf
[56] http://www.milieu-en-gezondheid.be/onderzoek/luik%2021/hotspots/menen/resultaten/STP%20MG%20eindrapport%20Menen%20DEF.pdf

We found that environmental and lifestyle factors had a measurable influence on the levels of specific pollutants in human samples. Exposure to passive smoking was clearly detected with the cotinine marker in urine, but the exposure to passive smoking also led to increased internal levels of PAHs. The table below provides specific information about these factors, which are related to the environment and to lifestyle. We indicate for each factor which exposure biomarkers have a significant correlation with the factor. Only the significant results are shown in table 27.

Environmental factors	Significant trend p<0,05	Biomarkers	Population
Passive smoking	↑	PAHs in urine	Youngsters
	↑	PAHs in urine	Adults
Lifestyle factors			
Smoking behaviour	↑	PAHs in urine	Adults
Consumption of local eggs	↑	p,p'-DDE in cord blood	New-borns
	↑	p,p'-DDE in blood	Youngsters
	↑	PFOS in cord blood	New-borns
	↑	PFOS in blood	Adults
Consumption of local fish	↑	p,p'-DDE in blood	Youngsters
	↑	HCB in blood	Youngsters
Barbecue	↑	PAHs in urine	Adults

↑= positive association between the factor and the exposure biomarker; ↓ = negative association between the factor and the exposure biomarker.
Abbreviations: PAH = polycyclic aromatic hydrocarbons; DDE = dichlorodiphenyltrichloroethane; PFOS = *perfluorooctane sulfonate* ; HCB = hexachlorobenzene.

- Age: some pollutant markers increased with age and indicate that pollutants can be stored in the body. The PCBs marker and the p,p'-DDE marker in the umbilical cord were significantly associated with the mother's age.
- Sex: PCBs, p,p'-DDE, HCB dioxin-like compounds and the brominated flame retardant BDE153 were significantly higher in boys than in girls. The levels of perfluorinated compounds were higher in adult men than in women.
- BMI: In young people the levels of PCBs, p,p'-DDE and HCB were inversely correlated with the body mass index (BMI). PCBs in the umbilical cord were also negatively associated with the mother's BMI. Young people with a low or high BMI had lower concentrations of BDE153.
- Breastfeeding: once again it is confirmed that breastfeeding leads to higher levels of PCBs in young people.
- Parity: levels of perfluorinated compounds in the umbilical cord dropped the more children the mother had.
- Social class: PAHs were correlated with the level of education of young people with decreasing concentrations from general secondary education over technical secondary education to vocational secondary education. This was also associated with the use of care products. The concentration of dioxin-like compounds was inversely correlated with the youngsters' level of education.

For the flame retardants (BDEs, HBCD) which were measured for the first time on a large scale in serum samples we conclude that the levels of the brominated flame retardants are often under the quantification limit. And a yet a measurement technique was used with a quantification limit which is comparable with other major biomonitoring studies. In other countries too often high proportions of non-detectable values are reported. In this Flemish study only the levels for BDE153 and BDE47 were above the quantification limit in among 30% of the youngsters.

Perfluorinated compounds have special physical-chemical properties and are used for various applications in several consumer products. They are persistent and are stored in the human body. They are easily measured in the individual blood samples of new-borns and adults. PFOS was positively correlated with the consumption of locally produced eggs.

- **Comparison between hotspots** (*Genk-Zuid* and *Menen*) – reference monitoring on POPs

In comparison with youngsters from the general Flemish population, youngsters of the *Menen* region show less exposure to PCBs, dioxins, pp'-DDE (a metabolite from insecticide DDT) and persistent flame retardant BDE47, comparable concentrations of persistent pesticide HCB and flame retardant BDE153, but higher concentrations of PAH in urine.

In comparison with youngsters from whole Flanders, a higher exposition to PAH is observed among youngsters living in the vicinity of the industrial area *Genk-Zuid*. Besides, there is lower exposition to hardly biodegradable substances such as PCBs, DDT, dioxins and brominated flame retardants.

- **Others studies lead in Flanders, concerning human exposure to POPs**

- Bilau et al. 2008[57] used CALUX data from the Belgian Federal monitoring program in Belgium to estimate intake of dioxin and dioxin-like compounds of the Flemish population (see also Bilau et al. 2009[58]).
- From the PBDE content in meats, fish and milk products, Voorspoels et al 2007[59] estimated the quantity of PBDE absorbed by each person through food to be between 23 and 48 ng/day. Because of its high PBDE content, fish, although not common in the Belgian diet, is the principal dietary source of these compounds (approximately 40 %), meats supply approximately 30 % of the daily intake and milk products, including eggs a smaller proportion (less than 30 %). Of all foods analysed, fish had the highest average sum of PBDE levels (BDEs 28, 47, 99, 100, 153, 154, and 183; 460 pg/g wet weight-ww), followed by dairy

[57] Bilau, M., Matthys, C., Baeyens, W., Bruckers, L., Backer, G.D., Hond, E.D., Keune, H., Koppen, G., Nelen, V., Schoeters, G., Van Larebeke, N., Willems, J.L., De Henauw, S., 2008. Dietary exposure to dioxin-like compounds in three age groups: results from the Flemish environment and health study. Chemosphere 70, 584–592.

[58] Bilau M, De Henauw S, Schroijen C, Bruckers L, Hond ED, Koppen G, Matthys C, Van De Mieroop E, Keune H, Baeyens W, Nelen V, Van Larebeke N, Willems JL, Schoeters G. (2009) The relation between the estimated dietary intake of PCDD/Fs and levels in blood in a Flemish population (50-65 years). Environ Int. Jan;35(1):9-13.

[59] Voorspoels S, Covaci A, Neels H, Schepens P, 2007. Dietary PBDE intake: A market-basket study in Belgium. Environ. Inter. 33:93-97.

products and eggs (260 pg/g ww), fast food (86 pg/g ww) and meat products (70 pg/g ww). One fresh salmon filet had the highest total concentration of PBDEs (2360 pg/g ww), whereas levels in steak and chicken breast were the lowest of all foods analysed. BDE 209 was never found above LOQ in any food.

- D'Hollander et al 2010[60] focused on two groups of important indoor contaminants: Brominated flame retardants (BFRs) (including polybrominated diphenyl ethers (PBDEs)) and Perfluorinated compounds (PFCs) (including PFOS). Concentrations of both compound classes have been measured in Flemish indoor dust samples from homes and offices. Human exposure to BRFs and PCFs through dust ingestion, was also evaluated for the overall Flemish population (appendix XI part 1).
- Rossens et al 2010[61] assessed the exposure of the Flemish population to BFRs and PFCs by analysis of pooled cord blood, adolescent and adult serum, and human milk. Levels of PBDEs in blood (range 1.6-6.5 ng/g lipid weight, LW) and milk (range 2.0-6.4 ng/g LW) agreed with European data. PFOS dominated in blood and ranged between 1 and 171 ng/mL. A significant increase in PBDE concentrations was detected from new-borns (median 2.1) to the adolescents and adults (medians 3.8 and 4.6 ng/g LW, respectively). An identical trend was observed for PFOS~~,~~. Rossens et al 2010 estimated that new-born exposure to BFRs and PFCs occurs predominantly in the post-natal period, whereas placental transfer has a minor impact on the body burden.
- Cornelis et al 2012[62] measured PFOS in settled dust in homes and offices, in a selection of food items from local origin, in drinking-water and in human serum. The data were complemented with results from a literature survey. Based on this dataset, intake by children and adults from food, drinking-water, settled dust and soil, and air were calculated. Dietary exposure dominated overall intake. For adults, average dietary intake equalled 24.2 (P95 40.9) ng PFOS/kg day, whereas for children the dietary intake was about 3 times higher. Predicted intake is high when compared to assessments in other countries, and to serum levels from Flanders, but comparable to the intakes published by The European Food Safety Authority (EFSA) in 2008. Intake of PFOS and PFOA remained below the Tolerable Daily Intake (appendix XI part 2).
- On behalf of the LNE department, an “Estimation of indoor exposition to and development of human biomarkers for PAHs and derivatives in Flanders” was carried out in 2011[63]. Exposition to PAHs was estimated within a sample of 48 inhabitants of 25 Flemish houses in winter and summer times. PAHs are present in indoor air in the same ranges as can be met outdoors. Just like outdoors, concentrations of most PAHs are higher indoors in wintertime in comparison with summertime (use of stove, open hearth). The more volatile PAH – among which the possibly carcinogenic component naphthalene - were

[60] D'Hollander W, Roosens L, Covaci A, Cornelis C, Reynders H, Campenhout KV, Voogt P, Bervoets L. Chemosphere. (2010) Brominated flame retardants and perfluorinated compounds in indoor dust from homes and offices in Flanders, Belgium. Sep;81(4):478-87. Epub 2010 Aug 14.
[61] Roosens L, D'Hollander W, Bervoets L, Reynders H, Van Campenhout K, Cornelis C, Van Den Heuvel R, Koppen G, Covaci A. (2010) Brominated flame retardants and perfluorinated chemicals, two groups of persistent contaminants in Belgian human blood and milk. Environ Pollut. Aug; 158 (8):2546-52.
[62] Cornelis C, D'Hollander W, Roosens L, Covaci A, Smolders R, Van Den Heuvel R, Govarts E, Van Campenhout K, Reynders H, Bervoets L. (2012) First assessment of population exposure to perfluorinated compounds in Flanders, Belgium. Chemosphere. Jan; 86(3):308-14.
[63] http://www.lne.be/themas/milieu-en-gezondheid/onderzoek

quantitatively the most important components in indoor air. The heavier c-PAHs were clearly measurable in domestic dust, but since the quantity of dust in the houses was not known (and of course difficult to estimate), this was a less appropriate way of measuring exposition to and impact of PAHs. PAHs metabolites measured in urine proved to be poor indicators of exposition through air or domestic dust. Moreover, it appeared that repairable DNA damage and damage by oxidation measured in the blood of the inhabitants of the houses, were linked to PAHs measurements in indoor air. An exposition model, carried out using the measured values of PAHs indoor concentrations (within this project), revealed that inhalation through indoor air was the most important exposition way for adults apart from food.

- In 2010-2011, on behalf of the LNE department, a study was carried out on concentrations of chlorine bonds in breast milk of mothers (84) living in rural areas. Individual measurements were carried out as well as measurements on a mix-sample of all 84 mothers. Concentrations measured in the mix-sample were compared to the results of the Belgian mix-sample used in the WHO breast milk campaign of 2006 (see Picture 3, p. 58). Without taking variation into account, lower values were observed in rural areas for total heptachlor components, total chlordane components, HCB, beta-HCH, all PCB markers, mono-ortho PCBs, dioxins/furans and all polybrominated biphenyl ethers. For other substances, higher values than in 2006 were observed: dieldrin, trans-9-chloride, total HBCD and total DDT and DDT-metabolites. Results of individual samples revealed that several substances could be measured in all or in more than 50% of the samples (for instance: PFOS and PFOA, dioxin-type PCBs, dioxins and furans). Other substances were measured in less than 50% of the samples or were not measurable (for instance: trans-chlordane, cis-chlordane, α-HCH).

  From the comparison of the ratios trans-9-chloride/oxychlordane, historic exposition can be established as well in the present as in the WHO-study Belgian population, but exposition to trans-9-chloride in the rural area being taken into consideration is relatively more recent than that of the WHO-study Belgian population. Participants consuming every day milk or daily products showed significantly higher concentrations of DDT and oxychlordane in breast milk. Participants who did not eat self-grown vegetables showed significantly lower concentrations of HCB. HCB is a pesticide which was formerly used to protect plants, cereals and wood from mould. If HCB is still present in the soil, it can be absorbed by the body through eating self-grown vegetables (Croes et al 2012[64]).

[64] Croes K, Colles A, Koppen G, Govarts E, Bruckers L, Van de Mieroop E, Nelen V, Covaci A, Dirtu AC, Thomsen C, Haug LS, Becher G, Mampaey M, Schoeters G, Van Larebeke N, Baeyens W. Persistent organic pollutants (POPs) in human milk: a biomonitoring study in rural areas of Flanders (Belgium). Chemosphere. 2012. Nov;89(8):988-94

5.4.3 Biomonitoring - biota

- **Pollutant measurements in European eel**

The Flemish eel pollutant monitoring network is an area-wide monitoring network for Flanders to monitor bio-accumulating substances in eel. It was launched in 1994 and has over 350 monitoring stations in streams, canals, polder streams and stagnant water. Currently over 3000 eels are analysed for a set of ten PCB congeners, nine pesticides and nine heavy metals. Other substances (brominated flame retardants, volatile organic solvents, dioxins, perfluorinated compounds, endocrine disruptors, metallothionines, polycyclic organic hydrocarbons) are also monitored in a selection of locations.

<u>**Results for eel pollutants**</u>

All the above-mentioned substances have been shown to present in varying quantities in freshwater fish, depending on the monitoring station. In the majority of the cases the results are above the detection limit. These are also substances, which have been banned for several years.

In the last fourteen years we can see that there is a significant drop of the levels for all the PCB congeners that were measured (see table 28), almost all pesticides and four heavy metals (arsenic, nickel, lead and chrome). α-HCH and lindane also dropped significantly largely because these substances were banned in 2002. HCB, dieldrin and endrin concentrations were also seen to have dropped.

Table 28: Measurement results from the Flemish eel pollutant monitoring network

Pollutant	Min	Max	Mean	# localization	Period	# Analyses	% >DL
Aldrine	0,5	109,36	7,44	121	1994-2007	548	45,99
TNONA	0,2	305,66	12,33	371	1994-2007	2739	58,34
Dieldrine	0,27	1860,9	97,99	363	1994-	2638	200793,14
Endrine	0,5	1983,3	8,59	352	1994-2007	2447	19,94
PCB 28	0,34	2205,48	43,5	375	1994-2007	2808	94,62
PCB 31	0,06	1086	20,52	367	1994-2007	2665	92,31
PCB 52	0,17	4207,7	221,27	375	1994-2007	2821	97,87
PCB 101	0,14	10986,6	423,64	375	1994-2007	2823	99,93
PCB 105	0,5	6302,4	162,39	375	1994-2007	2826	99,29
PCB 118	1,29	14196,7	506,46	375	1994-2007	2826	100
PCB 138	1,53	65625,3	1398,16	375	1994-2007	2829	100
PCB 153	8,23	93853,3	1992,93	375	1994-2007	2829	100
PCB 156	0,11	4978,4	137,27	375	1994-2007	2820	99,47
PCB 180	0,5	41365,2	902,55	375	1994-2007	2827	99,96
TDE	0,07	3420,5	202,35	374	1994-2007	2776	96,58
pp DDT	0,18	4271,99	30,96	374	1994-2007	2760	56,16
pp DDE	0,5	12959,6	538,74	375	1994-2007	2829	99,96
Dioxines*	1,7	141,9	35,8	8	2001-2005	8	100

* Sum of dioxins, furans and dioxin-like PCBs, in pg/g ww

Generally speaking the concentrations of DDT and DDT derivate dropped but in some locations the figures point to recent pollution.

- **Others studies lead in Flanders, concerning biote exposure to POPs**

- Covaci et al 2005[65] investigated the levels and distribution of PBDEs in zebra mussels and several freshwater fish species (eel, carp and gibel carp) for different sites in Flanders. In parallel, other organohalogenated contaminants, such as PCBs, p,p'-DDE and HCB were also measured and their relationship with PBDEs was investigated (see table 29). With few exceptions, all correlations between PBDEs and organochlorine pollutants for each species were low ($r < 0.50$) and most were statistically not significant ($p > 0.05$). This suggests that the exposure to contaminants arises from local sources possessing different signatures of PBDEs and organochlorine pollutants.

Table 1 Mean concentrations (SD) of organic contaminants (ng g^{-1} wet weight) in zebra mussels, carp and gibel carp muscle and eel liver from lakes and canals in Flanders, Belgium

No. site	Location	N	Lipids (%)	ΣPBDEs	% BDE47	ΣPCBs	HCB	p,p'-DDE
	Mussels							
1	Weerde (Zemst)	3	0.9	0.46 (0.07)	31	67 (5)	0.25 (0.02)	2.2 (0.4)
2	Nekker (Mechelen)	3	0.9	0.22 (0.04)	45	12 (1)	<0.23	1.1 (0.1)
3	Walenhoek (Niel)	3	1.6	0.26 (0.20)	35	7 (1)	<0.23	1.5 (0.1)
4	E10 (Schoten)	3	0.9	1.2 (0.26)	31	6 (1)	<0.23	<0.6
5	Nete Canal (Nijlen)	2	0.5	0.48 (0.05)	22	45 (5)	0.34 (0.07)	0.7 (0.1)
6	Z-W Canal (Rekem/Lanaken)	4	0.8	1.8 (0.20)	36	50 (2)	0.58 (0.08)	1.4 (0.1)
7	H-Boch 1 (Kaulille)	2	0.8	0.35 (0.10)	43	46 (2)	0.47 (0.03)	1.3 (0.1)
8	H-Boch 2 (Dessel)	3	0.7	0.64 (0.14)	38	49 (5)	0.45 (0.04)	1.0 (0.2)
9	Beverlo (Lommel)	3	0.8	0.92 (0.21)	36	48 (6)	0.48 (0.01)	1.1 (0.1)
10	D-Schoten (Turnhout)	3	0.5	0.15 (0.04)	53	30 (2)	0.25 (0.01)	0.9 (0.1)
11	Mol-Dessel (Mol)	3	1.0	0.75 (0.03)	33	52 (1)	0.34 (0.04)	1.1 (1.1)
12	Zennegat (Walem)	3	1.4	1.5 (0.04)	36	102 (3)	<0.23	6.6 (0.5)
13	AWW (Duffel)	3	1.3	0.30 (0.03)	31	20 (1)	<0.23	<0.6
	Eel							
14	Canal Ieper-Ijzer (Boezinge)	9	n.a.	3.6 (2.4)	72	311 (152)	2.2 (0.78)	24 (37)
15	Oude Maas (Dilsen-Stokkem)	10	n.a.	2.5 (1.4	63	494 (329)	0.81 (0.37)	6.0 (5.0)
16	Zuun (Sint-Pieters-Leeuw)	11	n.a.	2.0 (1.1)	63	138 (95)	0.91 (0.22)	7.3 (2.9)
17	Watersportbaan (Ghent)	10	n.a.	14 (14)	72	393 (203)	0.71 (0.35)	11 (3.8)
	Carp							
14	Canal Ieper-Ijzer (Boezinge)	7	1.3	1.6 (0.87)	83	74 (52)	0.61 (0.42)	9.4 (8.7)
18	Blokkersdijk (Antwerp)	10	0.6	<0.10	n.a.	37 (6)	<0.23	2.0 (0.4)
19	Durme (Hamme)	6	2.4	6.0 (3.3)	78	52 (17)	0.28 (0.07)	41 (13)
	Gibel carp							
16	Zuun (Sint-Pieters-Leeuw)	8	1.3	0.62 (0.31)	73	25 (15)	0.44 (0.17)	5.9 (2.6)
20	Canal Willebroek (Willebroek)	4	0.9	3.8 (0.68)	76	210 (43)	0.55 (0.16)	7.9 (2.2)
21	Scheppelijke Nete (Balen)	5	0.4	0.97 (0.48)	82	132 (82)	0.33 (0.05)	9.5 (9.5)

n.a. = not available.

- Levels of PBDEs, and PCBs were also measured in several fish species originating from the river Scheldt by Rossens et al 2008[66]. Five sampling locations were chosen in a highly industrialized area along the river, while two ponds in the vicinity of the river served as reference sites. This study is a follow-up of a survey performed in 2000 which reported extremely high levels of PBDEs in eel (Anguilla anguilla) collected from the same region (Oudenaarde, Flanders). The sum of tri-BDE to hepta-BDE congeners (2270+/-2260 ng/g lipid weight, range 660-11500 ng/g LW) were one order of magnitude higher than levels usually reported from freshwater systems, indicating the presence of point sources. Although BFR levels were between the

[65] Covaci A, Bervoets L, Hoff P, Voorspoels S, Voets J, Van Campenhout K, Blust R, Schepens P. (2005) Polybrominated diphenyl ethers (PBDEs) in freshwater mussels and fish from Flanders, Belgium. J Environ Monit. 2005 Feb;7(2):132-6. Epub Jan 11.

[66] Roosens L, Dirtu AC, Goemans G, Belpaire C, Gheorghe A, Neels H, Blust R, Covaci A. (2008) Brominated flame retardants and polychlorinated biphenyls in fish from the river Scheldt, Belgium. Environ Int. Oct;34(7):976-83.

highest ever reported in freshwater ecosystems, PCBs could be detected at even higher concentrations (16000+/-14300 ng/g LW, range 3900-66600 ng/g LW), being among the highest levels recorded in Belgium. All locations presented similar PBDE congener profiles, with BDE 47 being the dominant congener, followed by BDE 100, BDE 99 and BDE 49, probably originating from the former use of the penta-BDE technical mixture. Rossens et al 2008 calculated that daily intake ranged from 3 ng to 330 ng PBDEs/day for normal eel consumers, but as high as 9800 ng PBDEs/day for anglers, which may be considered at risk.

- Rossens et al 2010[67] mentioned that no significant correlation could be found between concentrations of PBDEs in eel and sediment from the same location. Comparison with previous studies shows that PBDE levels in Flemish eels have decreased rapidly between 2000 and 2006 at particular sites, but alarming concentrations can still be found at industrialized hot spots.
- The western Scheldt estuary is subject to various suspected sources of PBDE, such as a manufacturing plant for brominated flame retardants, the port of Antwerp and the textile industry further upstream. PBDE concentrations in biota samples, including crabs, shrimps, starfish, groundfish (such as dab, goby, plaice and sole) and gadoid fish (such as pout and whiting) from the estuary were compared to samples from the Belgian North Sea beyond the mouth of the estuary (Voorspoels et al. 2003)[68]. Eight BDE congeners (BDE-28, BDE-47, BDE-99, BDE-100, BDE-153, BDE-154, BDE-183 and BDE-209) were measured. The concentrations observed in the estuary samples were up to 30 times higher than those in the Belgian North Sea samples, with an increasing gradient in the direction of Antwerp. The North Sea concentrations ranged from 0.02 to 1.5 µg/kg ww in benthic invertebrates and goby, from 0.06 to 0.94 µg/kg ww in fish muscle and from 0.84 to 128 µg/kg ww in fish liver. The corresponding intervals in the estuary samples, ranged from 0.2 to 30, 0.08 to 6.9 and 15 to 984 µg/kg ww respectively. The BDE-99/BDE-100 ratio proved to be highly dependent on location and species, probably due to differences in metabolism. In shrimps, the value of this ratio (4/1) was very similar to that observed in the Bromkal formulation and in the estuary sediments and was similar in both the North Sea shrimp and that from the estuary, meaning that these congeners are easily bioavailable and that shrimps cannot metabolise either one.

- Other fauna was also monitored. The studies by Jasper et al 2009[69] and Van den Steen et al 2007[70] are examples of this.

[67] Roosens L, Geeraerts C, Belpaire C, Van Pelt I, Neels H, Covaci A. (2010) Spatial variations in the levels and isomeric patterns of PBDEs and HBCDs in the European eel in Flanders. Environ Int. Jul;36(5):415-23.
[68] Voorspoels, S., Covaci, A. and Schepens, P. 2003. Polybrominated Diphenyl Ethers in Marine Species from the Belgian North Sea and the Western Scheldt Estuary: Levels, Profiles and Distribution. Environ. Sci. Technol. 37: 4348-4357.
[69] Jaspers VL, Covaci A, Deleu P, Eens M. Concentrations in bird feathers reflect regional contamination with organic pollutants. Sci Total Environ. 2009 Feb 1;407(4):1447-51. Epub 2008 Nov 25.

5.5 Assessment of the POPs issue in the Walloon Region

5.5.1 Environmental monitoring

Water

The European Framework Directive on water stipulates that substances that may have a local impact and judged relevant at sub-river basin level must be monitored. Furthermore, discharges and leaks of these substances into the water should be reduced or eliminated, so that their concentration levels comply with environmental quality standards.

While there have already been significant achievements in the Walloon Region, particularly in terms of establishing quality objectives and resource monitoring (adaptation of monitoring networks), the principal challenge concerns the practical application, monitoring and testing of the proposed measures in order to protect and restore the quality of Walloon waters. These measures are already part of several plans and should be included in the management plan monitoring programmes for each river basin district[71] (Source rapport analytique sur l'état de l'environnement wallon 2006-2007[72]).

- **Surface water**

The Walloon Region must ensure that quality standards are met, so that its waters can achieve the good status required by the European Framework Directive on water. The micropollutants considered when assessing the good chemical status of surface water bodies appear on the list of the 135 relevant hazardous substances monitored in the Walloon Region (Article R. 133 and appendix VII of the Water Code). This list includes micropollutants frequently detected in Walloon waterways(relevant substances identified within the framework of the Walloon Government Decree of 29 June 2000) together with the substances listed in appendix IX and X of Directive 2000/60/EC. A substance is deemed to be relevant if, over a minimum period of one year, at least one measurement of the concentration exceeds the previously defined limit of detection. This list was drafted for the first time in 2000, reviewed in 2002 and is updated every 3 years. For each relevant substance, there is therefore a quality objective established and measurement programmes implemented at a rate of 13 annual sampling operations across 7 monitoring sites. In the event that this objective is exceeded over a one-year period, a reduction programme is adopted, aimed at achieving this objective within 5 years.

[70] Van den Steen E, Jaspers VL, Covaci A, Dauwe T, Pinxten R, Neels H, Eens M.Variation, levels and profiles of organochlorines and brominated flame retardants in great tit (Parus major) eggs from different types of sampling locations in Flanders (Belgium). Environ Int. 2008 Feb;34(2):155-61. Epub 2007 Sep 4.
[71] Framework Directive on water – Walloon Region http://environnement.wallonie.be/directive_eau/homepage.asp
[72] http://etat.environnement.wallonie.be/

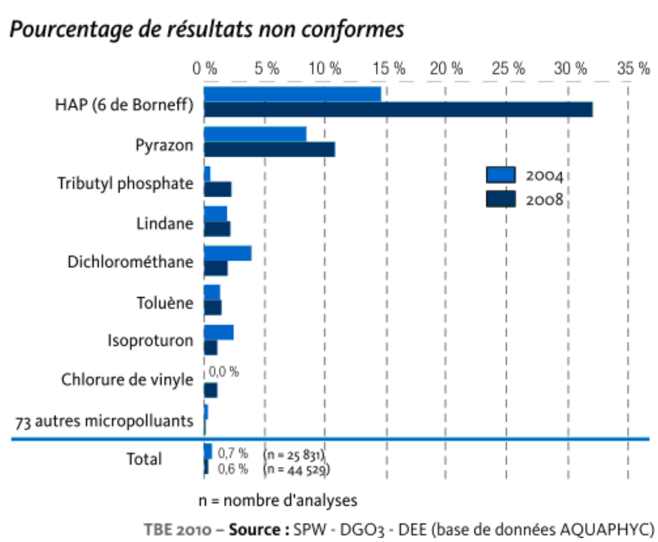
The following relevant substances are among those measured in surface water in Wallonia[73]: DDT, heptachlor, PCBs, hexachlorobenzene, HCH including lindane, endosulfan, HCBD, PCPs and PAHs. In addition to these substances, appendix X of the Framework Directive on water[74] which establishes the priority substances in the field of water, also identifies PeCBs and polybrominated diphenyl ethers.

Three of these substances are characterised because they significantly and frequently exceed the thresholds during the 1994 to 2004 period; these are lindane, PCBs and PAHs.

Substances	**Quality objective (ug/l)** (Walloon Government Decree of 12/09/2002)	**Frequency of exceeding the thresholds (1994-2004 period) (*)**
PAH	0.1	75.6 %
Lindane	0.01	25.8 %
PCB	0.007	16.8 %

(*) (Number of monitoring sites where there the threshold was exceeded during the 1994-2004 period)*100/ (number of monitoring sites sampled during the period 1994-2004) Source: MRW-DGRNE-DE (AQUAPHYC database) - Rapport analytique sur l'état de l'environnement wallon 2006-2007, p 408.

Figure 12 presents the non-compliance of samples (PAHs and lindane) taken in surface water in the Walloon Region between 2004 and 2008 (in %) compared with existing thresholds for micropollutants (source: 2010 Scoreboard)

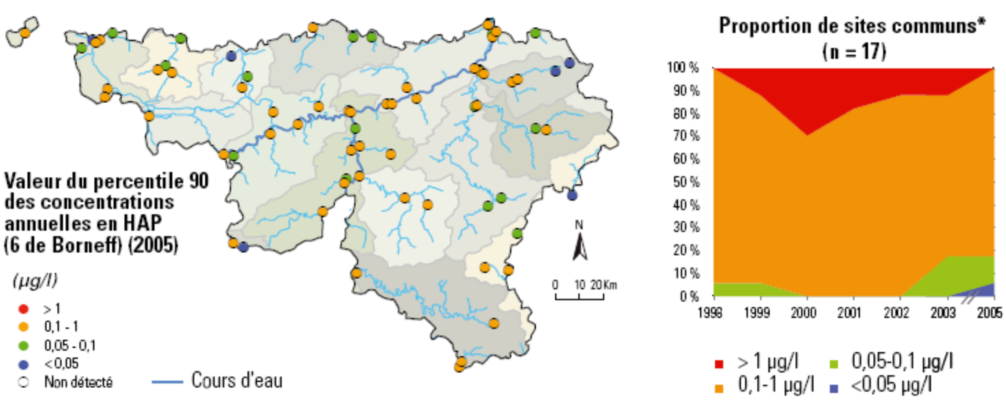


[73] http://environnement.wallonie.be/legis/eau/easur152.htm
[74] http://assainissement.developpement-durable.gouv.fr/recueil/01_TF/directive_2000-60_cadre_eau_consolidee.pdf

- PAHs

Currently, only PAHs have had to undergo a reduction programme, ongoing since 2002. The quality objectives for PAHs are far from being achieved. In 2005, over 65% of the monitoring sites recorded PAHs concentrations above the threshold (0.1 µg/l) (Figure 13 A). Furthermore, the situation changed little between 1998 and 2005, given that the percentage of sites not satisfying the quality objective for these micropollutants fell from 94 % to 82 % (Figure 13 B). In 2008, PAHs concentrations exceeded the thresholds[75] in 32 % of samples analysed. The non-compliance rate of the samples for these types of molecules doubled from 2004. This situation is notably explained by the particularly strict threshold (0.002 µg/l) applied to certain PAHs. There are multiple origins for this contamination, such as historical soil pollution, especially for derelict industrial sites, road system run-offs and atmospheric deposition. Low biodegradability and their frequent presence in sediments and suspended solids must also be taken into account.

Figure 13 : A) PAHs concentrations in Belgian waterways for 2005. B) Proportion of common sites not meeting quality standards
* The monitoring sites which were considered in the temporal analysis were only those for which data was available for the entire 1996-2005 period - Source: MRW-DGRNE-DE (AQUAPHYC database) - Rapport analytique sur l'état de l'environnement wallon 2006-2007, p 410.



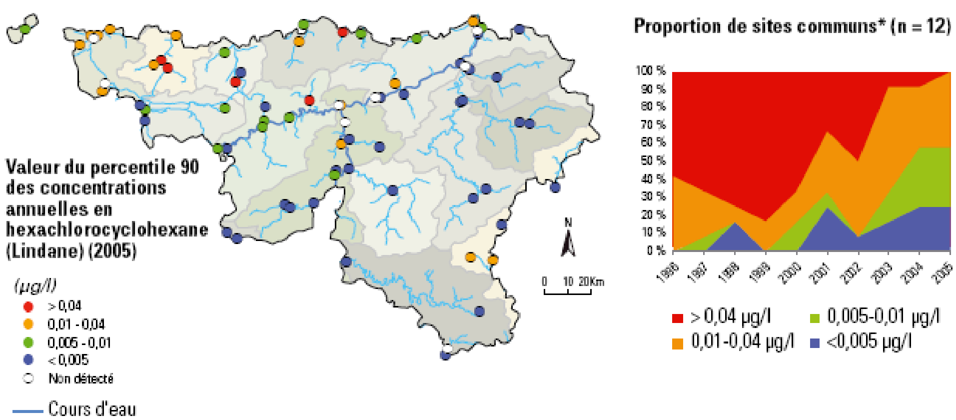
Given the expert opinions and the high number of non-compliant samples for PAHs, none of the Walloon bodies of water presented a good chemical status in 2008. However, if PAHs are excluded from the analysis, this is achieved in 61 % of cases. The bodies of water at risk are primarily located in the Scheldt district where there are significant pressures on waterways from domestic, industrial and agricultural activities.

[75] The current thresholds will be revised to correspond with the environmental quality standards (EQS) established by the Directive 2008/105/EC.

- **Lindane**

Although the use of lindane - widely used in the past for crop protection (maize in particular) - was also banned in 2001, certain monitoring sites still have concentrations above the quality objective (0.01 µg/l) (Figure 14 A), notably due to the high persistence of the active substance in the environment. This situation primarily affects waterways located to the north of the Sambre and Meuse rivers, in major crop-growing regions. Nevertheless, the quality of the waterways with regards this molecule is gradually improving and the proportion of common sites where the water does not meet the quality standards fell from 100 % in 1996 to 40 % in 2005 (Figure 14 B).

Figure 14: A) Lindane concentrations in Belgian waterways for 2005. B) Proportion of common sites not meeting quality standards (*) The monitoring sites which were considered in the temporal analysis were only those for which data was available for the entire 1996-2005 period. Source: MRW-DGRNE-DE (AQUAPHYC database) - Rapport analytique sur l'état de l'environnement wallon 2006-2007, p 409.

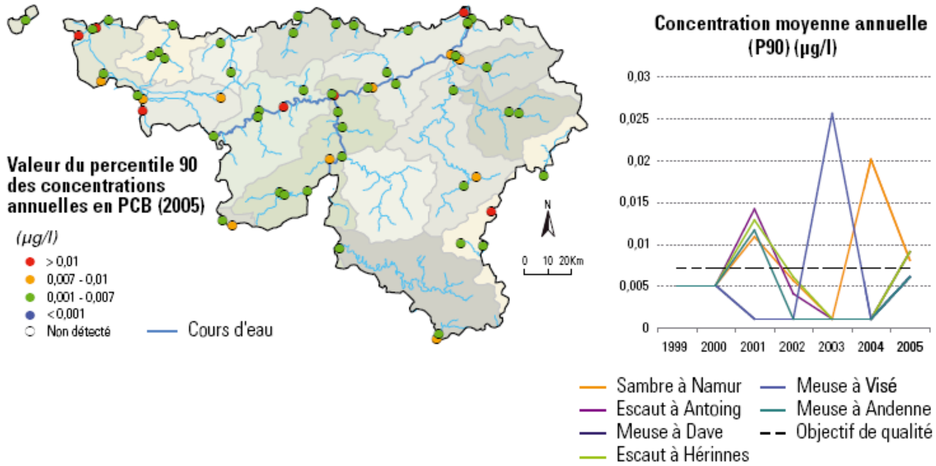


- **PCB**

In 2005, a third of the monitoring sites presented PCB concentrations above the quality objective (0.007 µg/l) (Figure 15 A) (method of analysis is presented in appendix XII). The majority of sub-river basins are affected by this type of pollution (historical and/or current), the source of which is mainly occasional (leakage of insulating oils contained in capacitors and electric transformers for example)[76]. It is also one of the principal reasons why peaks in concentrations are only observed some years (Figure 15 B). These situations should disappear, or at least reduce, notably because of the gradual decrease in the use of equipment containing PCBs and PCTs (Directive 96/59/EC). (see "Stock and inventory" chapter).

[76] Chalon, C., Leroy D., Thome, J-P. & Goffart, A. 2006. Les micropolluants dans les eaux de surface en Région wallonne: Dossier scientifique réalisé dans le cadre de l'élaboration du Rapport analytique 2006-2007 sur l'état de l'environnement wallon. Aquapole-Ulg. Liège. 137 p.

Figure 15: A) PCB concentrations in Belgian waterways for 2005. B) Average annual concentrations in waterways in the WR for the entire 1999-2005 period. Source: MRW-DGRNE-DE (AQUAPHYC database) - Rapport analytique sur l'état de l'environnement wallon 2006-2007, p 410.



- **Groundwater**

For around twenty years, groundwater intended for human consumption has been analysed for around one hundred pesticides, including certain substances whose use is now banned. In late 2006, the Walloon Region implemented a new monitoring network for its groundwater quality, more representative than that initially based on works by water producers.

In total, there are now 600 representative monitoring sites that make up the main monitoring network for the quantitative and qualitative status of groundwater.

Herbicides, both agricultural and non-agricultural are responsible for most of the issues suffered by drinking water producers. They involve specific and sometimes costly water purification treatments. Within the framework of the groundwater monitoring programme, none of the pesticides appearing in appendix A of the Convention causes any problem.

- **Suspended solids in waterways (SS)**

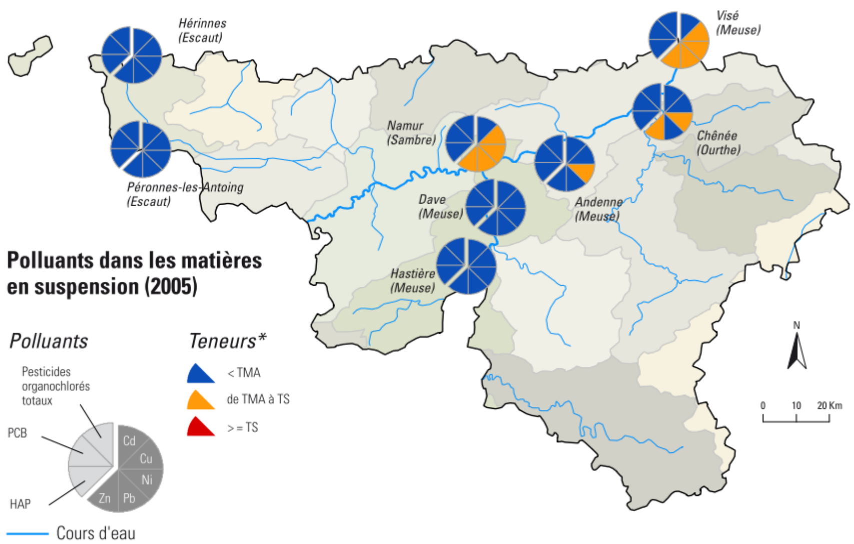
There is currently no legal obligation to monitor the quantitative and qualitative trends for SS in Walloon waterways.

However, SS concentrations have been measured and their composition analysed since 2000 as part of the surface water monitoring network, managed by the DGARNE (method of analysis is presented in appendix XII).

In qualitative terms, SS analyses focus on concentrations of pollutants generally monitored within the surface water quality monitoring network (see appendix XII).

Due to the current lack of interpretation criteria for this data in terms of water quality or ecotoxicity, comparisons are made with the standards in the Walloon Government Decree of 30/11/1995 on dredging spoils (Figure 16).

Figure 16 Pollutant levels in SS for 2005. * Maximum values across 2 to 4 measurements per station. : TS (safe level) and TMA (Maximum permissible level) Source: DGRNE-DE (AQUAPHYC database) - Rapport analytique sur l'état de l'environnement wallon 2006-2007, p 425.



Air

Dioxin emissions in the Walloon Region have been greatly reduced in recent years due to the modernisation of waste incinerators and improved emission standards for these facilities. Since 2001, there has been continuous monitoring of these dioxin and furan emissions with the results are available to the general public and regularly updated via the internet (http://environnement.wallonie.be/data/air/dioxines/index.htm).

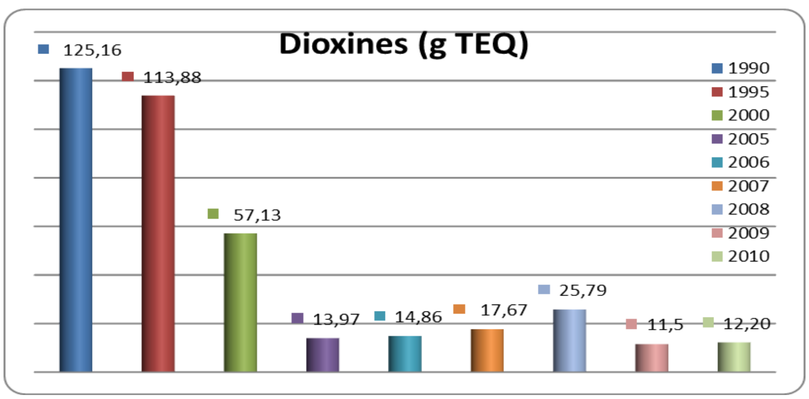
Similarly, a multi-year programme to monitor the emissions of a dozen waste recovery facilities covering PAHs, PCBs and dioxins in particular, has been set up. The results are also available on the internet (http://environnement.wallonie.be/data/air/valorisation/).

Emission measurements are used to determine the impact of emissions on air quality and verify compliance with Walloon and European emission standards.

- **Dioxins and furans**

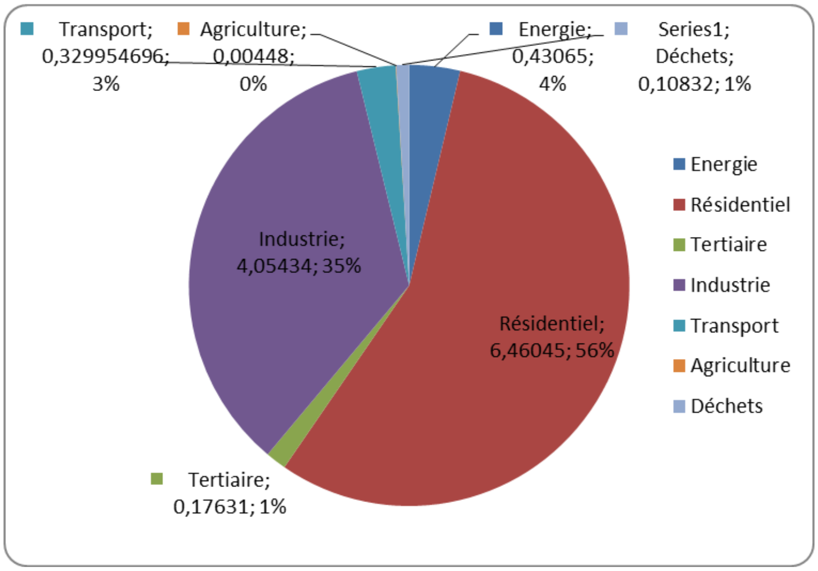
Between 1990 and 2010, the quantities of **dioxins and furans** emitted in the Walloon Region fell sharply. These results were primarily achieved by improving emission standards, through the measures taken by the metal industry and following investments made by the public authorities in waste incinerators (modernisation, combustion optimisation and improved processing systems for the fumes). Housing also contributed to the reduction in emissions through fuel substitution.
In addition to a marked reduction in annual dioxin emissions, the number of times the threshold of 0.1 ng TEQ.Nm was exceeded fell regularly from 2001, the year the standard came into force (Figure 17). In 2005, the threshold was not exceeded at all.

Figure 17: Estimated anthropic emissions of dioxin in the Walloon Region for the entire 1990-2010 period (provisional 2010 data). Source: SPW-AWAC inventaire LRTAP-February 2012. The emissions are expressed in grams TEQ (*Toxic Equivalent Quantity*). This unit is used to add up the quantities of 17 toxic dioxins and furans by weighting each by their mass by a factor determined in comparison to the most toxic dioxin.



In 2009, among the sources identified for dioxin and furan emissions, housing was the principal emitting source (Figure 18). These emissions represented 56% of those in Wallonia. These emissions were primarily related to the burning of wood. Industry was the second significant source, accounting for 35% of regional emissions.

Figure 18: Sector-specific breakdown of atmospheric dioxin/furan emissions in the Walloon Region in 2009. Source: SPW – AWAC (report conducted in February 2012)



- The metal sector is the primary emitter of dioxins and furans in industry. In 2009, it was responsible for 75% of emissions, which came from steel activities and particularly sinter production for blast furnaces. This facility was also the main source of a good number of atmospheric emissions, including dioxins and furans but also PAHs. Between 1990 and 2009, the emission of these substances fell sharply (-95%). The replacement of blast furnaces using coke by the direct injection of pulverised coal together with the gradual reduction in oxygen steel production has helped reduce these emissions. Finally, companies in the sector have also invested in smoke treatment systems that have helped to reduce dioxin and furan emissions. The economic crisis has also been a principal cause in this reduction.
- The nonmetallic mineral products sector is the source of 22% of industrial emissions of dioxins and furans. Cement kilns and all thermal processes can potentially generate this type of pollutants. The use of alternative, waste-based fuels containing chlorine or volatile organic compounds may lead to an increase in dioxin or furan emissions if their implementation is not optimal. However, the emission limits currently applicable to clinker kilns, identical to those for hazardous waste incinerators are being respected. The dioxins and furans emitted by the lime industry are formed during the combustion of raw materials and/or fuels that may contain chlorides. As facilities for the co-incineration of waste, cement works must satisfy the same emission limits as household waste incinerators (0.1 ng TEQ/Nm3). Their operators are committed to using a sampling device for continuous monitoring, similar to those for incinerators.
- In 2009, the electricity generation sector was the source of 4% of dioxin and furan emissions. Falling sharply until 2006, micropollutant emissions for the sector reversed their trend and increased significantly

in 2007 with the commissioning of the Awirs power plant, powered by biomass. These emissions are low under normal circumstances but may rise on startup or in abnormal conditions.

- Dioxin and furan emissions from the waste management industry represent 2% of total emissions. Municipal waste incinerators are those that process the most waste but are not the only combustion units active in the region. Until 2004, the Region had an active hospital waste incinerator, not forgetting the crematoria. The dioxin and furan emissions for the sector were generated by all these facilities. For household waste incinerators, from as early as 2000, their emissions were no longer detectable. This significant improvement was as a result of the threshold of 0.1 ng/Nm³ applied in the Walloon Region from 1 January 2001 (WGD of 3 December 1998 which came into force on 31 December 2000). The existence of a continuous monitoring network (referred to above), also contributed to the good results recorded by the Walloon incinerators through the introduction of better smoke control. In terms of the incinerators, in order to satisfy the new standard, they optimised combustion in the kilns and improved the performance of their smoke treatment, notably by using activated carbon injection.

- **PAHs**

With regards air quality, within the scope of implementing Directive 2004/107, a **PAH** measurement programme has been incorporated into the air quality monitoring network since 2004. Initial results for 2004 and 2005 are available on the Internet. The available data shows a continual decrease in industrial PAHs emissions since 1990. Between 1990 and 2009, PAHs emissions in the Walloon Region fell by 67 %. Industry and housing were primarily responsible for this. The results achieved by industry were basically due to the lowering of emissions from the metal industry and the economic crisis.

The breakdown for PAHs emissions in Wallonia in 2009 was as follows:

- Industry was the source of 27% of emissions with emissions from the metal industry representing almost all emissions. PAHs emissions result in particular from certain stages in industrial procedures but also depend on combustion conditions and are therefore emitted by all thermal processes, but in low quantities.
- 30% of emissions came from other activities and primarily the use of solvents;
- 19% of emissions came from housing. PAHs are formed in poorly controlled combustion conditions and when burning wood, which explains the importance of the residential sector.
- Road transport and particularly diesel vehicles are also sources of PAHs and represented 2% of emissions.

- **PCBs**

PCBs are emitted into the atmosphere through thermal processes when they are present in raw materials as a contaminant. PCBs are also present in some electric transformers and capacitors. In Belgium, there has been a disposal process for these products (see "inventory and stock" chapter).

- **Uncontrolled waste incineration**

The personal incineration of household waste, whether in the garden, an incinerator purchased in a store, a stove or an open fire is prohibited in the Walloon Region (Decree of 26/06/1996). The practice is however widespread, particularly in municipalities where containers with chips or refuse sacks that must be paid for are used.

Incomplete combustion at too-low temperatures leads to the release of many toxic pollutants in gaseous (CO, NO2 , SO2 , HCl…) or particle form (**dioxins and furans, PAHs**, metals, soot...), the highly local impact of which could cause significant soil pollution. Breathing in these substances or ingesting them by eating the eggs, fruits and vegetables from the garden has adverse effects on health. The problem is far from being marginal; for a same mass of waste, the dioxin and furan discharges would be 100 to 10,000 times higher for a garden incinerator than for a household waste incineration plant. The municipal authorities and local police are responsible for enforcing this ban. It should be noted that plant waste can be burnt in the garden under certain conditions, and particularly at a distance of more than 100 m from any dwelling.

In order to assess the prevention initiatives carried out in the INTERSUD and IPALLE vicinities by Espace Environnement, surveys conducted in 2003 and 2004 showed that domestic incineration took place in 25 % of households. To the question "Do you burn your waste?" 75 % of people questioned in 2003 answered "never", 20 % "sometimes", 3 % "often" and 3 % "always". Domestic incineration primarily concerns paper/card (60 %) and green waste (24 %), however plastics (6 %) and kitchen waste (4 %) are also disposed of in this way. When moving to a new waste collection method and especially when changing to taxation based on the polluter-pays principle, some municipalities have attributed part of the decrease in the waste collected to an increase in this type of behaviour, without being able to assess it accurately.

Soil

Pending comprehensive legislation that applies to all potentially contaminated sites and soils, the Walloon Region currently manages these sites based on waste legislation, and in the case of service stations, based on a decree dedicated specifically to them. The current administrative practice in the Walloon Region is to consider contaminated soils as waste.

5.5.2 Human monitoring

There have been studies in Wallonia to evaluate the health risks of dioxin and PCB emissions. More chronic exposures were observed in residents living near incinerators compared with the average population.

Fierens et al. 2007[77] evaluated the impact of two iron and steel plants and two municipal solid waste incinerators (MSWI) in Wallonia on the exposure of residents to dioxins and PCBs. Residents around the sinter plants and the MSWI located in the industrial area had concentrations of dioxins and PCBs in serum similar to that of referents. By contrast, subjects living in the vicinity of the MSWI in the rural area showed significantly higher serum levels of dioxins (geometric mean, 38 vs. 24 pg TEQ/g fat) and coplanar PCBs (geometric mean, 10.8 vs. 7.0 pg TEQ/g fat). Although age-adjusted dioxin levels in referents did not vary with local animal fat consumption, concentrations of dioxins in subjects living around the incinerators correlated positively with their intake of local animal fat, with almost a doubling in subjects with the highest fat intake. These results indicate that dioxins and coplanar PCBs emitted by MSWIs can indeed accumulate in the body of residents who regularly consume animal products of local origin.

Bernard et al. 2001[78] measured the mean blood values for a control population at 26.5 pg TEQ-WHO/g fat (TEQ-WHO) while values of 35.5 pg TEQ-WHO/g fat were recorded for a population of residents living near an incinerator, although these residents had regularly eaten local produce.

5.5.3 Biomonitoring

In order to evaluate the risk related to the consumption of fish from Walloon waters, the quantities of PCBs and dioxins/furans measured in the flesh of two indicator fish species (eel and chub) were compared to the applicable standards for the protection of human health. These are set at 75 ng/g ww for PCBs and 4 pg TEQ-WHO/g ww for dioxins and furans.

For the 2001-2004 period, the eels presented PCB concentrations between 40 and 1761 ng/g ww, while the concentrations measured in the chubs ranged between 3 and 635 ng/g ww (Figure 19). This difference is principally explained by the higher lipid content in the eel muscle (20 to 25 % ww) compared with that of the chub (0.5 to 3 %). Indeed, PCBs are lipophilic and persistent molecules that tend to accumulate in the fatty tissues.

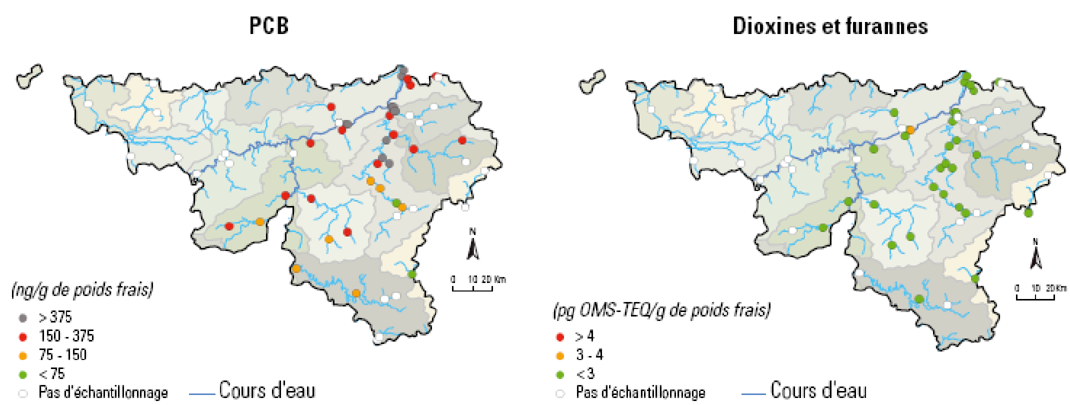
[77] Fierens S, Mairesse H, Heilier JF, Focant JF, Eppe G, De Pauw E, Bernard A. (2007) Impact of iron and steel industry and waste incinerators on human exposure to dioxins, PCBs, and heavy metals: results of a cross-sectional study in Belgium. J Toxicol Environ Health A. 70(3-4):222-6.

[78] Bernard A., Fierens S., Mairesse H., Hermans C., Broeckaert F., Focant J.-F., De Pauw E. Incinérateurs, crise dioxine et risques sanitaires pour la population belge. *Bulletin de la Classe des Sciences*, 2001, 1-6, 103-117. in [Focant et al 2002] http://www.facmv.ulg.ac.be/amv/articles/2002_146_6_01.pdf

The situation was less worrying with regards the dioxins and furans, given that the concentrations in eels and chubs never exceeded the threshold of 4 pg TEQ-WHO/g ww (Figure 19). The highest contamination levels in both the eels and chubs, were observed in the Lower Meuse, the Canal Albert and the Vesdre.

Figure 19. PCB and dioxin/furan content in eels in the Walloon Region 2001-2004

Source: *Ulg (LEAE)* - Rapport analytique sur l'état de l'environnement wallon 2006-2007, p 412



5.6 Phase-out and stock and waste management

5.6.1 Inspections carried out by the federal authorities: notified stockpiles

As mentioned in the "institution" chapter, the "Inspection" service of the FPS SPSCAE is responsible for ensuring compliance with the applicable regulations for pesticides, biocides and chemical substances. Its duties are extended to certain inspections carried out on vendors and users. The result of the inspections on POPs are given below.

- **2009 Inspection campaign**

Four stocks containing Lindane and one containing Heptachlor were found in Belgium.

The group Phytophar recover was contacted to undertake an ecological treatment.

- **2011 Inspection campaign**

A total of 140 inspections were carried out throughout Belgium.

Distribution per type of site inspected: Supermarket: 40, DIY stores: 55, Garden centres: 22, Pet stores: 4, Paint/decoration stores: 4, Dry-cleaner: 1, bathroom store: 2, Lumber trade:2, Other:10.

A total of 4,045 products were checked. No POPs were found.

- **Inspection campaign on HCB in fireworks and bonfires - 2010-2012**

    - History

Fireworks are those authorised for sale to individuals. In the past, too many accidents were caused by projectiles fitted with excessive loads freely available on the market. Since February 2000, the products sold in Belgium have been safer. At this time, the Federal government changed the regulations in this area in order to protect consumers and provide them with better information[79].

Between 2008 and 2010, a Danish study revealed a relatively high percentage of fireworks containing HCB (25%). There were similar results in Austria and Belgium in 2010 with a violation rate of 10%.
In late 2010, a mass inspection campaign on HCB in fireworks was launched at European level. 11 Member States, including Belgium, participated in a project called EUROPOP[80].

Several Belgian services worked together on this campaign including customs (excise duties, DMGC2, DMGC 3), FPS economy (explosive and gas regulations), the Royal Military School, FPS SPSCAE - DG Environment (risk management service, inspection).

    - Current legislation

The Royal Decree of 01/02/2000[81] amending the Royal Decree of 23 September 1958 regarding the general rules on the manufacture, storage, possession, sales, transport and use of explosives primarily focuses on the labelling requirements for fireworks and the Royal Decree of 03/03/2010 regarding the placing of pyrotechnic items on the market describes the technical requirements for obtaining a certificate (approval) for placing fireworks on the market in Belgium[82].

Directive 2007/23 requires the CE marking for placing on the market. Permits for storage/manufacture are issued by the provinces/municipalities/regions, the Federal government covers technical advice, placing on the market and transport permits.
Previously, approvals were granted for life, however since 2007, they have been valid for 10 years, the first renewals will therefore take place from 2017.

HCB is prohibited by Regulation 850/2004. The system of penalties under which we can act, is the law on product standards of 21 December 1998.

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[79] http://economie.fgov.be/fr/entreprises/securite_produits_et_services/Springstoffen_feestvuurwerk/#artifices_de_joie
[80] http://www.cleen-europe.eu/projects/europop.html

- In practice

In the event that an item is non-compliant, it must be permanently stored as waste under the responsibility of the regions, in an appropriate location and for as long as the HCB concentrations that it contains are between 50-5000 mg/kg. Above this concentration, the court must be informed and the fireworks destroyed by the FPS Justice.

- Monitoring and results

The 2011 campaign identified a violation rate of nearly 20% but the number of samples analysed was limited (11 samples). All inspected companies imported their products; none of the companies manufactured the fireworks themselves. In the cases where the samples were above the Limit Value of 50 mg/kg , legal action has been taken according to national legislation which is a warning according to the national law on product standards (sales stop + recall). A new Federal inspection campaign should take place to confirm these results, understanding that the violation rate identified in Europe within the framework of the EUROPOP project was 10% (from the 439 samples that were analysed, 45 contained HCB above the Limit value).

5.6.2 Inspections and phase-out processes conducted by the regions

- **PFOS inventory following the Directive 2006/12/EC**

In order to fulfil the Belgian duties for the PFOS inventory concerning the existing stocks of fire fighting foams containing PFOS and the processes – mist suppressants for non-decorative hard chromium plating and wetting agent for use in electroplating systems – including the amount of PFOS used and released from them, the Belgian authorities involved in this inventory took different actions.

- **Brussels Capital region**

The BCR took provisions for the PFOS inventory throughout a legislative act inviting a declaration of the industries or operators of PFOS for the derogations fire fighting foam, chromium plating or electroplating before the 21st October 2008.

No declarations have been received by the authorities of the Region.

- **Flemish Region**

The Flemish region took 2 legislative acts:

6 February 2009. - Ministerial decision establishing the PFOS inventory form.

16 January 2009. - Decision of the Government of Flanders of 1 June 1995 containing general and sectoral provisions regarding environmental hygiene.

Until now, 32 notifications of fire fighting foam containing PFOS have been received by the authorities of the Flemish Region.

- **Walloon Region**

The Walloon Region took contacts with the possible industries or operators of PFOS for the derogations fire fighting foam, chromium plating or electroplating.
No stocks of fire fighting foam containing PFOS or uses in chromium plating or electroplating have been identified.

- **Equipment containing PCBs/PCTs**

PCBs/PCTs have been regulated in Belgium since 1986 by the Royal Decree of 9 July 1986. They have also been subject to the implementation of European legislation (96/59/EC) including the obligation to dispose of the (dielectric) oils from transformers, capacitors, hydraulic devices, electric resistors and self-induction coils.

The federal authority made an inventory of equipment containing PCB in 1986. This list was updated in 1999. Since 1999 also, each owner had to report this kind of equipment to the competent authorities so the list of equipment could be updated. The directive 96/59/CE necessitates their elimination by the 31st of December 2010 the latest.

The disposal and treatment process for this type of equipment is the responsibility of the Regions.

- **Brussels Capital region**

The out-of-order of all equipment containing PBC/PCT before the 31st of December 2005 is described in the elimination plan of PCB and PCT the 4th of marsh 1999 (MB 04/08/1999).

Each holder of an equipment containing a volume of oil more than 1 dm³ (5 dm³ for the capacitors – sum of the different unit) and that the liquid contain more than 0,005 % weight of PCB/PCT, had to declare it before the 15th of May 2000. Derogation can be foreseen until end 2010 for specific applications. But, if the circumstances lay, the permits or the declaration could always fixes a closer deadline.

Moreover, the equipment containing between 0,005% and 0,05% PCB and not presenting a risk could be eliminated at the termination of their use. On the other hand, there is an strengthening of the legislation : all the equipment containing more than 1 dm³ PCB are subjected to a statement of class 3 environment permits (license).

Since the PCB part of the waste statement can be better extrapolated from the quantity destroyed annually, it is estimated that discharges from waste from equipment containing PCBs have fallen from almost 400 tons in 2001 to 160 tons in 2006. Despite everything, the expected discharges exceed all discharges from other source sectors by a factor of 10000.

The IBGE Inspection service checked whether the disposal of the products in question had been properly performed and whether this disposal had been conducted by an accredited "disposer". In 2006, the inspectors made 733 visits. As a result of these checks, 447 warnings, 636 formal notices and 9 statements of offence were drafted.

Since transformers are the principal source of PCBs/PCTs, askarel, pyralene and clophen, they were targeted as a priority by the Ministerial Decree of 20 December 1999 establishing a Regional disposal and decontamination plan for PCBs/PCTs (MB of 31/12/1999).

The disposal of oils containing PCBs/PCTs, askarel, pyralene or clophen or the disposal or decontamination of certain elements was carried out in accordance with a schedule related to the age of manufacture of the equipment. The disposal schedule was as follows:

Disposal prior to:	**All equipment manufactured prior to:**
31.12.2000	1970 or unknown date
30.06.2001	Before 1971
30.06.2002	Before 1972
30.06.2003	Before 1973
30.06.2004	Before 1974
30.06.2005	Before 1975
31.12.2005	Other devices

Several exemptions were made on the grounds of the manufacturers' delivery deadlines. These exemptions could not exceed 31 December 2008.

Result

In April 2007, the outcome of the PCB action in terms of the amount of electrical equipment was as follows:

	Dielectric type				**Total**
Equipment type:	***Askarel***	***Clophen***	***PCB***	***Pyralene***	
• **Hydraulic equipment**	4				*4*
• **Self-induction coil**			6		*6*
• **Capacitor**	82	7	556	1	*646*
• **Recipient for contaminated equipment**			1		*1*
• **Electric resistor**	3				*3*
• **Transformer**	2035	95	1581	116	*3827*
Total	*2124*	*102*	*2144*	*117*	***4487***

Estimated weights:

Estimate made using CLEEN report methodology					
number	**weight**	**dielec weight**	**tot weight**	**tot dielec weight**	
3	500	150	1500	450	kg
535	30	10	16050	5350	kg
1	500	150	500	150	kg
3	500	150	1500	450	kg
3230	1500.0	500.0	4845000.0	1615000.0	kg
			4864550.0	**1621400.0**	kg
			4864.6	**1621.4**	T

On November 2009 : 4051 equipments were identified ; 3977 equipments were eliminated ; 25 equipments are under treatment of elimination; 49 equipments are yet pro tempore in activity.

On December 2010: 4020 devices eliminated; 32 devices (transformers, capacitors) in use, tonnages are unknown.

- **Flemish Region**

The disposal of PCBs/PCTs - in accordance with Directive 96/59/EC and the Decree on waste - was transposed into Flemish law by the Flemish Government Decree of 17 March 2000. This Decree establishes a disposal plan for devices containing PCBs which regulates the phased and controlled disposal of equipment containing PCBs, such as transformers and capacitors. It also limits the use of devices containing PCBs until the end of 2005 (with some exemptions until 2010). In Flanders, the inventory of declared devices is kept updated by OVAM.

This database was used to invite systematically owners of such devices to dispose it.

In addition, the OVAM Administration called on inspectors of other departments (within OVAM, MI, the environmental inspectors) to inform it of any PCB-containing devices discovered in the course of other inspections.

Results

In 2000, were reported:

- Transformers: 14663 items with an estimated mass of 13000 t

- Condensors: 5596 items with an estimated mass of 400 t

- Other: 182 items with an estimated mass of 53 t

In 2010, were reported:

- Equipment with a PCB content > 500 ppm : estimated mass of 20,78 t (PCB quantity : 16,53 t)

- Equipment with a PCB content between 50 and 500ppm: estimated mass of 3262,76 t (PCB quantity : 985,6 t)

- Transformers (> 50 ppm): estimated mass of 3281,43 t (PCB quantity : 1000,4 t)

- Capacitors: estimated mass of 0.19 t (PCB quantity : 0,16 t)

- Rectifiers: estimated mass of 1.93 t (PCB quantity : 1,61 t)

- **Walloon Region**

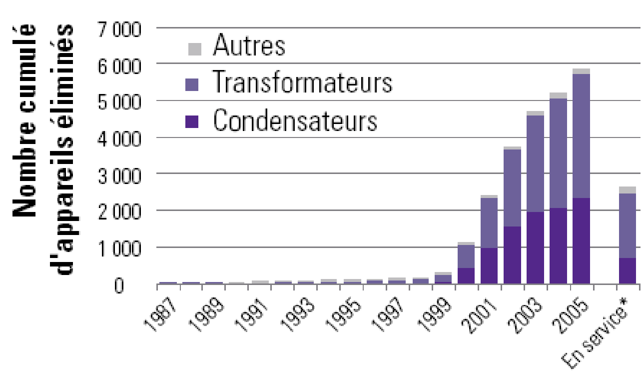
The disposal of PCBs/PCTs according to the specific industries established by the European Directive 96/59/EC was transposed into Walloon law by the Walloon Government Decree of 25 March 1999. The deadline for the disposal of devices varies with their age and their PCB/PCT levels. The oldest devices (manufacture date unknown or prior to 1972) should have been disposed of before 31 December 2001.

Holders of PCBs/PCTs (> 50ppm) or devices containing more than one dm^3 of PCB/PCT had to declare these before 21 November 2000 and either decontaminate or dispose of them before 31 December 2005, unless an exemption was granted by the Minister responsible for the environment until 31 December 2010 at the latest and subject to certain conditions (devices in good order and containing less than 1l of PCB/PCT). Devices containing less than one dm^3 of PCB/PCT would have to be disposed of prior to 31 December 2010.

Results: Despite some delays, the disposal of these devices has progressed well in the Walloon Region.

In 2005, 69 % of some 8,500 devices declared were disposed of and the disposal certificates sent to OWD (Waste Walloon Office) (Figure 20).

Figure 20. Disposal of devices containing PCBs/PCTs in the Walloon Region *Devices still in service when the inventory was produced in 1 March 2006. **Source:** MRW – DGRNE – OWD



At 1 March 2007, 8696 items of equipment in question had been counted, including 6740 already disposed of, in accordance with the provisions laid out within the scope of waste legislation.

On 1st March 2012: 8717 equipments are identified, 8301 of them are already disposed and 238 equipments actually contain no PCB.

5.6.3 Waste processing

- **Phytosanitary products (agricultural pesticides)**

Since 1997, the Phyotfar-Recover non-profit association, from the Belgian Federation of Chemical Industries, has been responsible for collecting and processing empty packages that have contained phytopharmaceutical and out-of-date products. There are regular campaigns targeting farmers, major crop-dusting companies and the affected industrial sites. Collection and processing rates exceed 90%.

- **Waste electrical and electronic equipment**

Since 1st July 2001, Belgium has had a collection and treatment system for Waste Electrical and Electronic Equipment. This system was developed as a result of the legal obligation called the 'take-back obligation'. Within this framework, in Belgium, the Recupel non-profit association (www.recupel.be) is responsible for the collection and treatment of used electrical and electronic equipment. Since 3 January 2007, Recupel has offered solutions for most professional electrical and electronic equipment together with domestic appliances.

5.7 Summary regarding production, uses and future release of POPs - conditions necessary for exemptions

In Belgium, no POP is currently produced or intentionally released nor will be in the future.

Although the end of PCB use in equipment was scheduled for December 2010 (Directive 96/59/EC), this objective has not yet been achieved in Belgium.

Regarding unintentional emission of dioxins, furans, HCB, PAHs and PCBs, most interventions will have to be carried out at the regional level. Federally, Belgian refineries have already organised the dismantling of tetra-ethyl lead assisted units, which caused dioxin and furan emissions during the combustion of leaded petrol (objective of the European Directive 99/32/EC). During the transposition of the European Directive 99/32/EC relating to a reduction in the sulphur content of certain liquid fuels (RD 7/03/01 – MB 23/03/01), a maximum PCB content was also established, although it is not found in this Directive. Regional authorities strictly control the emissions from these by-products through regular monitoring and supervision. There is also an objective to reduce these emissions.

6 Strategy and Action Plan Elements of the National Implementation Plan

6.1 Implementation strategy

The plan, which takes place within a European Framework, is largely inspired by the implementation plan of the European Communities[83], while adhering to Belgian guidelines/specifications.

Indeed, most of the existing measures at a regional/federal level are a result of the transposition and implementation of European legislation, notably the 850/2004/EC Regulation which concerns POPs. This legislation also respects obligations of international environmental conventions in which Belgium has taken part, and their additional protocols.

6.2 Action plans at federal level

- **Regarding Information exchange (article 9)**

<u>Objectives:</u>
Article 9 of the Stockholm Convention aims to make sure that each Party facilitates the exchange of information in order to reduce, minimize or eliminate, where feasible, the production, use and release of POPs. It also aims to use the information exchange as a means to finding alternative solutions, highlighting risks and the economical and social costs inherent to those solutions.

<u>Activities:</u>

- Belgium has a responsible Competent Authority to coordinate the implementation of the requirements of the Stockholm Convention and the European legislation. The Competent Authority is located at the Federal Public Service of Health, Food chain safety and Environment and serves as focal point for information exchange with stakeholders (including the industry). As the environment is a very specific issue, on 5 April 1995 the federal authority and the three regions concluded a cooperation agreement with regard to the international environmental policy. This agreement led to the creation of the CCIEP, in which all Belgian levels of government (federal and regional) in charge of the environment are represented. The CCIEP is responsible for,

[83] http://ec.europa.eu/environment/pops/pdf/sec_2007_341.pdf

among other things, monitoring the collection of data required to meet the international organisations' demands, and drawing up joint reports (federal state - regions);

- In 2012 Belgium joined the Global PFC Group, which was created jointly by the OECD and UNEP in 2011 to facilitate information exchange on long-chain perfluorinated chemicals, including PFOS[84].

- **Regarding public information, awareness and education (article 10)**

Objectives:

Article 10 of the Stockholm Convention aims to provide information to the general public about POPs (their use, their health and environmental effects) and their alternatives. Provision of advice on consumption is also to be considered, especially in the case of products that don't originate from traditional commercial production and are thus not subject to standardization (fish caught for personal consumption, eggs from a family farm).

In that sense, each Party, within its capabilities, encourages industry and professional users to promote and facilitate the provision of information at the national level.

Activities:

- Information on POPs is updated and transferred to the public by the Federal official website: http://www.health.belgium.be/eportal/Environment/Chemicalsubstances/Polluantsorganiquespersistants/index.htm?&fodnlang=en,
- The present NIP has been subjected to an open consultation with the civil society and individual citizens.

- **Regarding research, development and monitoring (article 11)**

Objectives:

Article 11 of the Stockholm Convention aims to make sure that the Parties encourage and/or undertake, within their capabilities and at the national and international levels, appropriate research, development, monitoring and cooperation activities pertaining to POPs and, where relevant, to their alternatives and to candidate POPs .

Activities:

- In 2012 Belgium joined an informal network of EU experts, set up at the initiative of the UK for compiling emission inventories of POPs under both the UNEP Stockholm Convention and UNECE Convention on Long Range Transboundary Air Pollution.

[84] http://www.oecd.org/ehs/pfc/

- Establishing an inspection programme for exportation, importation and the placing on the market of POPs. In order to make sure that the EU legislation on POPs is respected and to prevent fraudulent exportation, importation or exploitation of POPs listed in the Stockholm Convention, POPs that are candidates to be included in one of the appendix and POPs that present strong similarities to the above-mentioned substances, a collaboration was set up between the competent federal authority, its inspection service and the customs services. Now, this cooperation should be continued, as well as customs controls and inspection campaigns on consumer products that are brought to the market;
- Measuring the evolution of POPs residues in the food chain (foodstuffs and animal feeds) and the current standards[85]. In order to comply with Commission Recommendation 2006/794/EC of 16 November 2006 on the monitoring of background levels of dioxins, dioxin-like PCBs and non-dioxin-like PCBs in foodstuffs. This monitoring is carried out by the FASFC. Information about results and future plans will have to be exchanged. In order to follow up the problems that were encountered, the public services can set up a joint campaign to detect the source of the contamination, e.g. within the framework of Recommendation 2006/88/EC[86].
- Belgium should also go on measuring the evolution of POP remnants in the human body [87]. Studies on the concentration of POPs in blood are carried out by Belgian universities. The POPs in question are: dioxins, PCBs and pesticide POPs (HCB, HCH, DDT, chlordane). A particular attention should be paid to brominated flame retarders.

- **Regarding technical assistance (article 12), financial resources and mechanisms (article 13)**

Objectives:

Articles 12 and 13 of the Stockholm Convention aim to make sure that the Parties cooperate to provide timely and appropriate technical and financial assistance to developing countries or countries with economies in transition, in order to assist them, taking into account their particular needs, to develop and strengthen their capacity to implement their obligations.

Activities:

- The Directorate-General for Development Cooperation of the Federal Public Service for Foreign Affairs is in charge of examining this technical and financial assistance according to a specific timetable for countries in need of assistance and projects in need of financing, by means of the annual contributions to the Global Environment Facility.

[85] See also chapter 'federal monitoring', section food chain monitoring,
[86] Commission Recommendation of 6 February 2006 on the reduction of the presence of dioxins, furans and PCBs in feed and food
[87] See also chapter federal monitoring, section human monitoring,

6.3 Additional measures proposed for the Brussels Capital Region

In accordance with Convention articles 5 and 11

- Continue with the efforts on monitoring, surveillance and prevention of emissions from installations which are likely to be or to become the largest emitters of POPs:
  - Measures:
    - Monitoring the crematorium, which is a source of POPs emissions in Brussels Capital Region. A system to purify smoke (PCDD/PCDF, mercury,…) was introduced in 2009, leading to a substantial decrease in PCDD and PCDF emissions (maximum 0,012 ng/Nm²TEQ) ;
    - Monitoring the municipal waste incinerator with regard to PCDD/PCDF and HCB;
    - Monitoring FMM, a company producing secondary lead (measures for mercury, PCDD/PCDF, …).
  - Implementation: inspection services and environmental permit.

- Reduce PAHs emissions from urban and industrial heating:
  - Measures:
    - Application of the Rational Use of Energy and the Energy Performance Standards for Buildings and monitoring of the insulation of buildings;
    - New Decree of 3 June 2010: Decree of the Government of the Region of Metropolitan Brussels on the energy performance requirements for heating installations for buildings during their installation and their exploitation;
    - Continued monitoring of domestic urban heating and monitoring of heating engineers and their continuing training.
  - Implementation: inspection, authorisation and energy department.

- To promote the use of new technologies or products or processes designed to replace POP-generating processes:
  - Measure: tackle the target sectors, such as the degreasing of metals which generate HCHs.
- Continue to phase out PCB-containing equipment.

6.4 Brief overview of actions on POPs in Flanders

In accordance with Convention articles 3 and 5

- Implementing the river basin management plans for the Scheldt and the Meuse in order to achieve good status for surface water by 2015 (implementation of 2000/60/EC);

- Further optimising the application of the ‘Pesticides in public services’ decree;
- Elaborating an action plan for sustainable use of pesticides (in application of Directive 2009/128). The actions are aimed at, among other groups, pesticide dealers, professional and non-professional users (such as farmers, contract sprayers, park maintenance services, gardening services, public services and citizens). In order to achieve that, the plan also contains environment and health objectives;
- Continue to implement the programme of measures for the river basin management plans for the Scheldt and the Meuse contain measures to minimize the release of active substances into the water system (both surface and groundwater);
- By 1 January 2014 the basic principle of integrated plant protection will be obligatory for all crops in execution of Directive 2009/128.

<u>In accordance with Convention article 6</u>

- Study the improvements and bottlenecks in the Flemish waste and soil legislation regarding EU Regulation 850/2004 and inventory of waste streams containing POPs.

<u>In accordance with Convention article 11</u>

- Development of new measuring methods for the surveillance of ‘new’ POPs;
- Systematic addition of new substances in the surface water, aquatic soils, etc. surveillance networks;
- Continue to optimize the list of emissions into water and air. The VMM has commissioned a study to optimize the list of POPs emissions into air. The results are expected before the end of 2012;
- A second human biomonitoring campaign was organised as part of the second ‘Steunpunt Milieu & Gezondheid (2007- 2008)’. In addition to conventional POPs (dioxins, PCBs), attention was paid to new POPs suchs as phthlates and flame retardants;
- Carry out a joint research project (VMM) in order to determine the level of dioxins and DL-PCBs in eggs from free-roam chickens kept by private households living near a scrap processing company. The aim is to give advice on the consumption of eggs from free-roam chickens.

<u>In accordance with Convention article 10</u>

Communication aimed at the target groups

The Flemish government is communicating with the various target groups involved with POPs through various channels. The communication activities are in line with the political strategy. Explanations of two campaigns relating specifically to pesticides and dioxins are given below.

Specific communication on pesticides: ‘zonder is gezonder’ campaign, 2013-14

In the first quarter of 2013, a new regulation was adopted (Decree on the sustainable use of pesticides and its implementing orders). The Flemish Environment Agency (VMM) then launched another campaign, with a new campaign image and the slogan ‘Gebruik geen pesticiden – Zonder is gezonder’ (Avoid pesticides, it’s better for your health). Through this campaign the Agency wants to inform the target groups involved about this new regulation so that they can adapt the methods they use to manage their lands. This campaign focusses on providing information about the new regulation but also wants to make people aware of the impact of the pesticides they use. It wants to increase tolerance to weeds and promote pesticide-free management.

Information on this campaign is available on the following website: www.zonderisgezonder.be

Programme aimed at reducing the use of pesticides by public services in the Flanders Region

We have to point out that, in response to the ‘Decree on reducing the use of pesticides by public services in the Flanders Region’, many communes and other public services have been making efforts in order to reduce the use of pesticides since 2004. Public authorities have been reducing the use of pesticides since 2004. Since then, 13 municipalities have committed themselves to avoiding the use of pesticides (situation on 1 August 2013). This already led to significant environmental benefit. Research has shown that by 2004 public administration had already achieved a 57.4% environmental benefit compared to 2002. The main reason is that the products with the most risk (e.g. diuron) have been replaced by less harmful products (e.g. glyphosate).

The measuring results in surface and underground waters show that we have to pay attention to the possible effect of substitution products when forbidding specific plant protection products. The solution is, on the one hand, to substitute pesticides by non-chemical alternatives and, on the other hand, to sustainably transform the public domain in order to reduce the use of pesticides.

Campaigns specifically targeting dioxins

The Flemish Region is running awareness-raising campaigns on the illegal open-air incineration of household waste and the proper use of solid fuel stoves. The information is made available through brochures, websites and the Flemish hotline[88] (see also chapter environmental monitoring).

Public awareness

The first large-scale campaign, titled ‘25% of dioxin-emission results from small garden fires’ took place during the summer of 2002. The campaign pointed out that small garden fires damage health and the environment and,

[88] The Flemish hotline acts as a hub, providing people with information by telephone or e-mail.

therefore leading to a banning of illicit incineration. The campaign also pointed out the many alternatives to incineration: preventing, sorting or composting waste. The campaign was made in cooperation with the federation of the distribution sector and the VVSG.
The campaign brochure will also be distributed during the coming years, after an update in 2007. The campaign also featured a website: http://www.lne.be/themas/luchtverontreiniging/praktische-tips/sluikverbranden

In 2003 federations of producers, the distribution sector and the VVSG cooperated to launch a public-awareness campaign titled 'heating smarter with stoves and open fireplaces', using a brochure containing practical tips to keep heating safe and environment-friendly. The campaign will be continued in the coming years.

Municipal police regulations

The Flemish authorities and the Flemish municipalities will work out consistent municipal police regulations concerning this issue within the framework of a cooperation agreement. Those regulations allow for the establishment of further-reaching rules in addition to the existing legislation, in particular concerning the timing and weather conditions of incineration.

For the other sectors, focus will remain mainly on continued surveillance of dioxin-emission limit values.

The information is provided through brochures, websites and the Flemish hotline.
The Environment, Nature and Energy Department's research results with regard to dioxins are publicly available at http://www.lne.be/themas/luchtverontreiniging/informatie-studies.

Availability of the results

Monitoring in the environment: results of the measuring operations

The results of the measuring operations in the air and in water are available at http://www.vmm.be . The Vlaamse Milieumaatschappij also issues an annual publication on discharges into the air and the quality of surface waters and underground waters.

The results of the measuring operations on deposits of dioxins and PCBs are available online, and are actively communicated to the communes.
The Franco-Belgian border region around Menen has been coping with high dioxin and PCB levels for many years. Moreover, the milk from the French border community Bousbecque contained too much PCBs in 2010. Within the framework of the Interreg IV A project AEROPA, Belgian and French partners collaborated to find the cause of the dioxin and PCB contamination. The aim was to map out the sources of dioxin and PCBs in the border region of Menen – Wervik/Halluin – Bousbecque by conducting simultaneous measurements of the air quality.

This project allowed the partners to identify the main source of the contamination. Both Flanders and France have now imposed measures on the scrap processing company situated in the Franco-Belgian industrial area in order to reduce the spread of dust containing PCBs. The situation is being followed up closely.
In Bousbecque, the source of the dioxin and PCB contamination could not be determined. That is why the French government has set up an action plan in order to further investigate the cause. In 2013, the Flemish Environment Agency (VMM) started the above-mentioned study in order to examine the quality of free-range eggs in the region. In addition, municipalities have to strictly supervise the ban on the incineration of (green) waste in open air.

Biomonitoring: results of the measuring operations

The results of the Flemish biomonitoring programme established according to the region and the age group are available to the public on the "steunpunt Milieu en Gezondheid" website (www.milieu-en-gezondheid.be). Communication takes place via various channels :

- As part of the biomonitoring, communication took place with a wide, representative proportion of the population. This contact with the people who were analysed and the individual notification of the results have an awareness-raising effect;
- The basic information and the results of the biomonitoring campaign are shown on the "steunpunt Milieu en Gezondheid" website. Under the section "results", "adults", "results by group" and "basic information"; information is given about the various markers into which research was carried out. Information about POPs can be found under the markers of exposure (including DDTs and HCBs, PCBs and dioxins);
- Open communication is an important basic principle of the action plan. The communication with the population is done through the biomonitor [89];
- After the three campaigns targeting different age groups, a press event was held for the whole of the population, as well as a seminar for scientists.

Information for the target groups

There are easy-to-use websites (www.milieurapport.be , www.vmm.be , www.ovam.be) where members of the public can find the information they need. The main target groups are citizens, industry and agriculture.

The result of the aforementioned communication regarding actions on POPs:

- Setting up of the second "Zonder is gezonder" campaign
- Making the results of the measuring operations available
- Continuing with the dioxins campaign aimed at incineration (of waste) by private individuals.

[89] http://www.milieu-en-gezondheid.be/nieuwsbrief/biomonitor%2018/fijn%20stof.html

6.5 Additional measures proposed for the Walloon region

In accordance with Convention article 6

- Within the framework of the existing legislation, to redevelop sites of former economic activity and clean up any polluted sites, including those polluted by POPs substances, for which the cost of cleaning up the soil > 25% of the total redevelopment cost.
    - Measures: Priority action for the Programme Decree of 23 February 2006 relating to priority actions for the future of the Walloon region ("Marshall plan").
    - Implementation: simplification and speeding up of the procedures designed to help strengthen rehabilitation, cleaning up and the renovation of these sites to be redeveloped.

In accordance with Convention articles 3, 5, 6 and 10

- To reduce the impact of pesticides and biocides on human health and the environment.
- To promote sustainable use of pesticides and biocides:
    - Measures:
        - First Programme de Réduction des Pesticides à usage agricole et des Biocides (PRPB- Agricultural Pesticide and Biocide Reduction Programme), adopted in 2005 and updated every two years;
        - Programme of measures of the river basin management plans (in application of the Water Framework Directive);
        - Draft decree of the Walloon government on the transposition of the Pesticides Framework Directive 2009/128/EC (as far as the competences of the Walloon region are concerned);
        - Draft decrees of the Walloon government on the implementation of general and sectoral conditions for storing pesticides for professional use.
    - Implementation:
        - Promotion of organic farming and the biological fight against damaging organisms;
        - Promotion of agro-environmental measures (including grass verges along waterways);
        - Promotion of good phytosanitary practices and non-chemical alternative techniques (integrated pest management);
        - Promotion of equipment and accessories (rinsing tank, drum rinsing, low-drift nozzles, biofilters, …) ;
        - Split between permits for professional and non-professional users;
        - Professional licence;
        - Training, information and awareness-raising;

- Prohibition on the use of plant protection products in public spaces from 02/06/2019 onwards, with a transition period from 01/06/2014 till 01/06/2019;
- Protecting vulnerable groups and the general public against contamination by pesticides;
- Specific measures with regard to manipulation of PPP (before and after application);
- Creating minimal buffer zones in agricultural and non-agricultural areas

<u>In accordance with Convention article 11</u>

- Improve awareness on the presence of POPs and POPs candidates in the environment of the Walloon region:
  - Measures: select the substances which are relevant to the Walloon region and incorporate them into the measuring networks and the emission lists.
  - Implementation: for the measuring networks, follow the usual selection procedure (assessment of relevance, according to factors such as existing restrictions, known uses and the concerned sectors, where necessary screening in order to establish whether they are present in the environment).

<u>In accordance with Convention articles 3, 5, 6, 9, 10 and 11</u>

- Within the framework of the existing legislation, to continue with the reduction of industrial emissions of POPs and informing the public:
  - Measures: environmental permit, emission register.
  - Implementation: as part of the implementation of Directive 96/61 IPPC on industrial emissions, the setting of maximum emission values for the relevant facilities and substances and, as part of the implementation of Regulation 166/2006 E-PRTR, of the annual reporting of the emissions covered via the application of the decree on the environmental permit.

Appendix I: POPs listed in the Stockholm Convention

1) The initial 12 POPs

The initial 12 POPs

Annex A: Parties must take measures to **eliminate** the production and use of the chemicals listed under Annex A. Specific exemptions for use or production are listed in the Annex and apply only to Parties that register for them.

Annex B: Parties must take measures to **restrict** the production and use of the chemicals listed under Annex B in light of any applicable acceptable purposes and/or specific exemptions listed in the Annex.

Annex C: Parties must take measures to reduce the **unintentional release** of chemicals listed under Annex C with the goal of continuous minimization and, where feasible, ultimate elimination.

Annex A (Elimination)

●Aldrin ●Chlordane ●Dieldrin
●Endrin ●Heptachlor ●/▲Hexachlorobenzene
●Mirex ●Toxaphene ▲PCB

Annex B (Restriction)

●DDT

Annex C (Unintentional production)

■Polychlorinated dibenzo-*p*-dioxins and dibenzofurans
■Hexachlorobenzene ■PCB

●Pesticides / ▲Industrial chemicals / ■By-products

Source: "The 9 POPs: An introduction to the nine chemicals added to the Stockholm Convention by the Conference of the Parties at its fourth meeting"

2) The 9 new POPs

The 9 new POPs

At its fourth meeting in 2009, the COP decided to amend Annexes A, B and C of the Convention by adding the following chemicals:

Chemical	Annex	Specific exemptions / acceptable purposes
Alpha hexachlorocyclohexane ●/■	A	Production: none Use: none
Beta hexachlorocyclohexane ●/■	A	Production: none Use: none
Chlordecone ●	A	Production: none Use: none
Hexabromobiphenyl ▲	A	Production: none Use: none
Hexabromodiphenyl ether and heptabromodiphenyl ether (commercial octabromodiphenyl ether) ▲	A	Production: none Use: articles in accordance with the provisions of Part IV of Annex A
Lindane ●	A	Production: none Use: human health pharmaceutical for control of head lice and scabies as second line treatment
Pentachlorobenzene ●/▲/■	A and C	Production: none Use: none
Perfluorooctane sulfonic acid, its salts and perfluorooctane sulfonyl fluoride ▲	B	Production: for the use below Use: acceptable purposes and specific exemptions in accordance with Part III of Annex B (see the full list on page 7)
Tetrabromodiphenyl ether and pentabromodiphenyl ether (commercial pentabromodiphenyl ether) ▲	A	Production: none Use: articles in accordance with the provisions of Part IV of Annex A

●Pesticides / ▲Industrial chemicals / ■By-products

Source: "The 9 POPs: An introduction to the nine chemicals added to the Stockholm Convention by the Conference of the Parties at its fourth meeting" [90]

[90] Hexabromodiphenyl ether and heptabromodiphenyl ether refer to 2,2',4,4',5,5'-hexabromodiphenyl ether (BDE-153, CAS No. : 68631-49-2), to 2,2',4,4',5,6'-hexabromodiphenyl ether (BDE-154, CAS No.:207122-15-4), to 2,2',3,3',4,5',6-heptabromodiphenyl ether (BDE-175, CAS No.: 446255-22-7) and to 2,2',3,4,4',5',6-heptabromodiphenyl ether (BDE-183, CAS No. 207122-16-5) and to any other hexa and heptabromodiphenyl ethers present in commercial octabromodiphenyl ether.
Tetrabromodiphenyl ether and pentabromodipheny ether refer to 2,2',4,4'-tetrabromodiphenyl ether (BDE-47, CAS No.: 5436-43-1) and to 2,2',4,4',5-pentabromodiphenyl ether (BDE-99, CAS No.: 60348-60-9) and to any other tetra and pentabromodiphenyl ethers present in commercial pentabromodiphenyl ether.

Appendix II: New chemicals proposed for listing under the Stockholm Convention

Any Party may submit proposal for listing a new chemical in Anne appendix A, B, or C of the Convention. The POPs Review Committee evaluates the proposals and makes recommendations to the Conference of the Parties on such listing in accordance with Article 8 of the Convention. Currently, the following chemicals are under review:

- Hexabromocyclododecane
- Short-chained chlorinated paraffins
- Chlorinated naphthalenes
- Hexachlorobutadiene
- Pentachlorophenol

For more information, see:
http://chm.pops.int/Convention/ThePOPs/ChemicalsProposedforListing/tabid/2510/Default.aspx

Appendix III: The Dioxin Policy

- Limit and reference values for dioxin emissions

Based on the Flemish literary study 'Best Available Techniques (BAT), limiting dioxin emissions and possible emission limit values for industrial process installations', limit and reference values for dioxin emissions for a number of industrial sectors (the ferrous and non-ferrous sectors, refineries), waste incinerators and crematoriums were included in VLAREM II. As far as the other sectors are concerned, the main focus lies on the continuous monitoring of the prevailing dioxin emission limit values.

  - Iron and steel production

For plants classified in the first category in subsection 20.2 (table 1, Appendix IV) the sectoral dioxin emission conditions as described in art. 5.29.0.6. of VLAREM II apply (tables 2 and 3, Appendix IV).

The reference values must be aspired to by using the best available techniques in terms of the consumable materials and supplies used, by changing or optimising the process and by using efficient flue-gas treatment systems.

The BREF on the Production of Iron and Steel[91] lists both the process integrated and the end-of-pipe best available techniques.

- Waste incinerators

As regards waste incinerators (table 4, Appendix IV) the sectoral dioxin emission limit values as described in section 5.2.3. of VLAREM II (table 5, Appendix IV) apply. Co-incineration facilities are governed by the same dioxin emission limit values. On 1 January 2000, continuous dioxin sampling was linked to a two-weekly analysis obligation for these plants.

At EU Level, these emission values have also been regulated under Directive 2000/76/EC on the incineration of waste. BAT measures for dioxins have been included in the BREF for waste incineration[92].

- Production of non-ferrous metals

Non-ferrous plants classified in the first category under subsection 20.2 (table 6, Appendix IV) are regulated by the sectoral dioxin emission requirements described under art. 5.29.0.6. of Vlarem II (table 2, Appendix IV).

The reference values must be aspired to by using the best available techniques in terms of the consumable materials and supplies used, by changing or optimising the process and by using efficient flue-gas treatment systems.

These BATs have been included in a Flemish BAT study for the non-ferrous metals industry[93] which is based on the European BREF for the non-ferrous metal industries[94]. The BREF conclusions were adopted and tested against the specifically Flemish situation.

- Refineries

Refineries are classified in VLAREM I, subsections 20.1.2. and 1.1 as described in table 7, Appendix IV.

These plants are regulated by the sectoral dioxin-emission requirements described under art. 5.20.2.2. of VLAREM II (table 1, Appendix IV).

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[91] Integrated Pollution Prevention and Control (2001), Best Available Techniques Reference Document on the Production of Iron and Steel, http://ec.europa.eu/comm/environment/ippc/brefs/isp_bref_1201.pdf
[92] Integrated Pollution Prevention and Control (2006), Best Available Techniques Reference Document for Waste Incineration, http://ec.europa.eu/comm/environment/ippc/brefs/wi_bref_0806.pdf
[93] P. Vercaemst and R. Dijkmans, Best Available Techniques for Non-ferrous metals processes (2002), http://www.emis.vito.be/EMIS/Media/BAT_abstract_non_ferrous_metals.pdf
[94] Integrated Pollution Prevention and Control (2001), Best Available Techniques Reference Document in the non ferrous metals industries (2001), http://ec.europa.eu/comm/environment/ippc/brefs/nfm_bref_1201.pdf

Table 1: Emission limit and reference values for refineries

New plants			Existing plants		
Emission limit value (ng TEQ/Nm3)	Emission reference value (ng TEQ/Nm3)	as of	Emission limit value (ng TEQ/Nm3)	Emission reference value (ng TEQ/Nm3)	as of
0.5	0.1	1/5/1999	2.5	0.4	1/1/2002

The reference values must be aspired to by using the best available techniques in terms of the consumable materials and supplies used, by changing or optimising the process and by using efficient flue-gas treatment systems.

BAT measures on dioxins feature in the BREF for Mineral Oil and Gas Refineries[95].

- The illegal open burning of waste

Article 4.4.1.1 of VLAREM II imposes rigorous restrictions on open burning of waste. Only vegetable waste from gardening, deforestation, land reclamation or own agricultural activities can be burned and then only at a minimum distance of 100 m away from any constructions or vegetation.

- Solid-fuel heating

Under an exception in subsection 2.3.4 a) of VLAREM I, wood-burning stoves fuelled with untreated logs to heat dwellings and workshops, atmospheric water heaters and similar devices with a nominal thermal output of maximum 300 kW are not deemed to be waste-incineration devices and are therefore permitted. The use of various types of treated waste timber by private citizens is strictly prohibited in other words.

- The production of vinyl chloride

OSPAR Decision 98/4 contains a dioxin-emission limit value of 0.1 ng TEQ/Nm3 as regards the production of vinyl chloride monomer and 1,2-dichlorethane. It also mentions monitoring via annual measurements. The OSPAR Decision came into effect for new plants on 9 February 1999 and for existing plants on 1 January 2006.

As a signatory to the OSPAR Convention, Belgium is obliged to implement this Decision. This OSPAR Decision was translated into the Flemish Environmental Regulation during 2007-2008.

[95] Integrated Pollution Prevention and Control (2003), Best Available Techniques Reference Document for Mineral Oil and Gas Refineries, http://ec.europa.eu/comm/environment/ippc/brefs/ref_bref_0203.pdf

Appendix IV: Monitoring in the Flemish Region

Table 1: Classification of Flemish Iron and Steel Producers

Classification list Vlarem I	Description	Class
20.2.1.	Plants roasting, pelletizing or sintering ores, including sulphur-containing ores	1
20.2.2.	Iron or steel production plants (primary melting) including continuous-casting plants	1
20.2.3.	Ferrous metals smelting plants	1

Table 2: Limit and reference values for dioxin emissions in ferrous-metal smelting plants

New plants			Existing plants		
Emission limit value (ng TEQ/Nm3)	Emission reference value (ng TEQ/Nm3)	as of	Emission limit value (ng TEQ/Nm3)	Emission reference value (ng TEQ/Nm3)	as of
0.5	0.1	1/5/1999	1	0.4	1/1/2003

Table 3: Limit and reference values for dioxin emissions in sinter plants

New plants			Existing plants		
Emission limit value (ng TEQ/Nm3)	Emission reference value (ng TEQ/Nm3)	as of	Emission limit value (ng TEQ/Nm3)	Emission reference value (ng TEQ/Nm3)	as of
0.5	0.1	1/5/1999	2.5	0.4	1/1/2003

Table 4: Classification of waste incineration plants

Classification list Vlarem I	Description	Class
2.3.4.1 a)	1° Biomass waste: - vegetable waste from agriculture and silviculture - vegetable waste from the food industry - fibrous waste from the production of virgin pulp and from pulp-based paper production incinerated at the production site with recovery of the energy generated - waste cork	

	- untreated wood residues, with a rated thermal input of:	
	1) up to and including 5 MW	2
	2) more than 5 MW	1
	2° uncontaminated treated wood residues, with a rated thermal input of:	
	1) up to and including 5 MW	2
	2) more than 5 MW	1
2.3.4.1 b)	contaminated treated wood residues	1
2.3.4.1 c)	Waste oil	1
2.3.4.1 e)	Non-hazardous domestic waste	1
2.3.4.1 f)	Non-hazardous industrial waste comparable to domestic waste	1
2.3.4.1 g)	Solid non-hazardous medical waste	1
2.3.4.1 h)	Hazardous medical waste and liquid and pasty non-hazardous medical waste	1
2.3.4.1 i)	Cadavers from animal crematoriums	1
2.3.4.1 j)	Other types of non-hazardous waste	1
2.3.4.1 k)	Other types of hazardous waste	1
2.3.4.1 l)	Animal waste other than cadavers in animal crematoriums	1
2.3.4.1 m)	Sludge from water-purification systems	1
2.3.5.	Storing and cleaning of metal receptacles by burning them out	1

Table 5: Emission limit values for waste-incineration plants

Plant	Emission limit value (ng TEQ/Nm3)
Domestic waste incinerators (section 2.3.4.1 e, f, g, j, l, m)	0.1
Hazardous-waste incinerators (section 2.3.4.1 k)	0.1
Waste-oil Incinerators using the waste oil as fuel (section 2.3.4.1 c)	0.1
Incinerators for hazardous medical waste and for liquid and pasty non-hazardous medical waste (section 2.3.4.1 h)	0.1
Animal crematoriums (section 2.3.4.1 i)	0.1
Biomass-waste incinerators, with a rated thermal input of up to and including 5 MW (section 2.3.4.1 a)	-
Biomass-waste incinerators, with a rated thermal input of more than 5 MW (section 2.3.4.1 a)	0.1
Incinerators for uncontaminated treated wood residues, with a rated thermal input of up to and including 5 MW (section 2.3.4.1 a)	0.4
Incinerators for uncontaminated treated wood residues, with a rated thermal input of more than 5 MW (section 2.3.4.1 a)	0.1
Incinerators for contaminated treated wood residues (section 2.3.4.1 b)	0.1
Storage and cleaning of metal receptacles by burning them out (section 2.3.5)	0.1

Table 6: Classification of non-ferrous metal producers

Classification list Vlarem I	Description	Class
20.2.1.	Plants roasting, pelletizing or sintering ores, including sulphur-containing ores	1
20.2.4.	Plants producing and smelting non-ferrous metals, including alloying, including product recovery (refining, die casting) with a daily capacity of: a) for lead and cadmium: 1° 20 kg up to and including 1 ton 2° more than 1 ton up to and including 4 tons 3° more than 4 tons	2 1 1-IPPC 2 1 1-IPPC

	b) for other metals: 1° 20 kg up to and including 0.5 ton 2° more than 0.5 ton up to and including 20 tons 3° more than 20 tons	
20.2.5	Plants extracting non-ferrous raw materials from ores, concentrate or secondary raw materials by means of metallurgical, chemical or electrolytic processes	1

Table 7: Classification of refineries

Classification list Vlarem I	Description	Class
1.1.	Plants which have not been included in section 20.1.2. and which refine, distil, crack, gasify or process oil or oil products (Oil refineries with the exception of those exclusively manufacturing lubricants from crude oil: cf. section 20.1.2)	1
20.1.2.	Oil refineries with the exception of those exclusively manufacturing lubricants from crude oil (cf. also section 1.1.)	1

Appendix V: POP-containing waste

Relevant provisions from the Materials Decree stipulate as follows:

- It is forbidden to leave or manage waste in contravention to the provisions of the present Decree or its implementing orders.
- It is forbidden to use or consume materials in contravention to the provisions of the present Decree or its implementing orders.
- At the time of collection, during transport and temporary storage, hazardous waste shall be properly packaged and/or stored and marked in accordance with the prevailing international and European regulations. Natural persons or legal entities processing hazardous waste shall ensure that the various types of hazardous waste are separated and shall keep hazardous waste separate from all non-hazardous waste.

The Vlarem legislation (VLAREM) imposes the following conditions on the processing of hazardous waste:

- The operator shall prevent and combat smells and dust, gas, aerosols, smoke or unpleasant odours using appropriate means particular to the responsible operation of the plant. The operator shall take all possible measures to minimise polluting emissions.

- Waste materials may not be stored outside the treatment or storage space intended for this purpose. The quantity of waste materials stored at the establishment may not exceed that permitted in the environmental licence.
- Locations at the site where liquids that are harmful to the environment may be spilled are to be provided with an impervious floor in such a way that spilled liquids cannot contaminate the ground itself, groundwater or surface water. This floor shall be equipped with a leak-proof drainage system.
- The runoff of the buildings, plant and the drainage of the site shall be performed in such a way that pollution of the rainwater is prevented to the extent possible and that uncontaminated rainwater can run off or is pumped out. On no account shall uncontaminated rainwater be mixed with waste water that requires treatment. Contaminated rainwater must be collected and treated as the other waste water of the plant.
- Hazardous waste must be stored in a compartmentalised storage site, possibly complemented by fixed containers or tanks for liquid waste. The waste materials may only be stored in the compartments, containers or tanks designated for the purpose, in accordance with the approved work plan. Hidden pipes and/or connecting ducts between tanks or containers are prohibited.
- The spaces where liquid waste is treated and/or stored must be constructed in such a way that any liquids leaks from the receptacles or spilled accidentally are collected. The floors, receiving drains, sumps and bund are impermeable and chemically inert with respect to the liquids they may come into contact with. Unless specified otherwise in the environmental licence, the capacity of the sumps or the bund must at least be equal to the quantity of liquids stored in the compartment concerned.
- Exceptionally hazardous waste, in particular compressed gasses and substances that may ignite spontaneously shall be stored in a separate building, spatially separated from the other buildings, storage spaces and plants. Minimum distances for this spatial separation may be imposed in the environmental licence.
- Containers, drums, tanks and receptacles containing waste materials that should be stored spatially separated because of their nature and characteristics, may not be located together in one bund.
- The necessary emergency materials, such as absorbing material, outsized drums and protective equipment shall be available on site to facilitate prompt action in the event of leaks, defective packaging, spillages and other incidents with a view to limiting any harmful consequences as much as possible.
- The operator shall dispose of a sufficiently equipped water treatment plant to purify the waste water in order to be able to in all conditions meet the effluent limits for discharges to surface water. Waste water that cannot be treated in the waste water treatment plant shall be taken to a suitable treatment plant.

Non-reusable redundant electrical or electronic equipment shall be processed as follows:

- The various harmful components, in particular those containing hazardous substances or components, shall be removed from the devices
- The following substances, preparations and components shall be selectively disassembled and collected for recycling or disposal at an establishment licensed to this end:
- PCB/PCT-containing electrolytic capacitors
- The operator or his authorised representative must have an adequate command of chemistry and must have sufficient knowledge of the characteristics and dangers of the chemicals that may be accepted and of the relevant safety regulations.
- Upon delivery, the hazardous waste is stored and treated by the operator or his authorised representative in such a way that risks are avoided as much as possible.
- The hazardous waste is subdivided and sorted according to its chemical composition, nature or characteristics.
- The operators shall take the necessary measures to avoid that any waste products that can inter-react may lead to uncontrolled reactions or to the formation of harmful or hazardous gasses or vapours.
- If it is found that a receptacle containing hazardous waste is leaking, the receptacle or its contents shall forthwith be transferred to another suitable receptacle and any spilled liquid shall be cleared.
- The sumps and the separate collection facilities of the compartmentalised storage are to be emptied regularly and at least after each incident. The waste material flow obtained is to be processed in an appropriate fashion.
- Empty contaminated receptacles and contaminated absorbing material are stored and treated according to the nature of the substances with which they have been contaminated. Non-reusable receptacles are processed according to an adapted method.

Appendix VI: Monitoring of the POPs present in the food chain

Part 1: Year 2006 - Source: Pesticide Residue Monitoring in Food of Plant Origin Belgium 2006, Report of Monitoring Results Concerning Directives 90/642/EEC, 76/895/EEC and 86/362/EEC and Commission Recommendation 2006/26/EC - http://www.favv.be/publicationsthematiques/pesticide-residue-monitoring-food-plant-origin.asp

Summary table of pesticides sought and found in fruit and vegetables – surveillance sampling only (2006)

Pesticide (listed in alphabetical order of the English name of the pesticide)	Total number of samples analysed for specific pesticide	Number of samples with residues at or above reporting level	% samples with residues at or above reporting level
aldrin	220	0	0.0
chlordane, sum (cis+trans)	220	0	0.0
DDT, sum	1239	1	0.1
dieldrin, sum	220	0	0.0
endrin	220	0	0.0
HCH, sum (a-/b-/d-/e-)	512	0	0.0
heptachlor, sum	220	1	0.5
hexachlorobenzene	220	0	0.0
lindane	1239	0	0.0

Summary table of pesticides sought and found in cereals – surveillance sampling only (2006)

Pesticide (listed in alphabetical order of the English name of the pesticide)	Total number of samples analysed for specific pesticide	Number of samples with residues at or above reporting level	% samples with residues at or above reporting level
aldrin	24	0	0.0
chlordane, sum (cis+trans)	24	0	0.0
DDT, sum	24	0	0.0
dieldrin, sum	24	0	0.0
endrin	24	0	0.0
HCH, sum (a-/b-/d-/e-)	24	0	0.0
heptachlor, sum	24	0	0.0
hexachlorobenzene	24	0	0.0

Part 2: Year 2008 - Source: Pesticide Residue Monitoring in Food of Plant Origin Belgium 2008 - Results of the official controls in accordance to Regulation (CE) n° 396/2005 and Commission Recommendation 2008/103/EC - http://www.favv.be/publicationsthematiques/pesticide-residue-monitoring-food-plant-origin.asp

Main products showing MRL (Maximum residue levels) exceeding in 2008

Products as describes in annex 1 of Regulation (CE) N° 396/2005	> MRL (%)	Main pesticide residues detected	Countries of origin (with number of samples showing MRL exceeding[1])
Fruiting vegetables • Aubergines • Lauki • Chilli peppers • Okras's • Cucumbers • Melons • Tomatoes • Peppers	11,5%	Méthomyl, carbendazim, acetamiprid, endosulfan, captan, métalaxyl, fenvalerate, Profenofos, thiabendazole, oxamyl, diazinon, acephate, carbofuran ethion, méthamidophos, triforine, diméthoate	The Dominican Republic (14), Thaïland (3), Ouganda (3), Belgium (2), Brazil (1), Egypt (1), France (1), India (1), The Netherlands (1), Spain (1)
Miscellaneous fruit • Passion fruits • Figs • Mangoes • Kakis • Kiwis	9,2 %	Dithiocarbamates, iprodione, imidaclopride, lambda-cyhalothrin, thiacloprid, prochloraz, profenofos, endosulfan, cypermethrine, difenoconazole	Brazil (3), Colombia (2), Ouganda (2), Israël (2), Costa-Rica (1), New-Zealand (1)

RASFF message issued by Belgium in 2008

Produits	Pesticides	Origine
Cucumbers	Methomyl (0,157 mg/kg)	The Netherlands
Chili peppers	Carbofuran (0,127 mg/kg) Carbendazim (0,177 mg/kg) Diméthoate (somme) (0,1 mg/kg) Triforine (0,149 mg/kg	Thaïland
Tea / herbal infusion	HCH (0,98 mg/kg) Procymidone (0,43 mg/kg) HCB (0,3 mg/kg) Quintozene (2,3 mg/kg) Tecnazene (0,19 mg/kg)	China
Grapes	Methomyl (0,94 mg/kg)	India
Oranges	Carbaryl (0,1 mg/kg)	USA
Pineappels	Triadimenol (1,69 mg/kg) Triadimefon (4,02 mg/kg)	Ecuador
Mangoes	Prochloraz (10,34 mg/kg)	Costa-Rica
Aubergines	Oxamyl (0,12 mg/kg)	The Dominican Republic
Peppers	Methomyl (0,34 mg/kg)	Egypt
Chilli peppers	Carbofuran (0,17 mg/kg) Acephate (0,26 mg/kg) Carbendazim (1,54 mg/kg) Ethion (2 mg/kg) Hexaconazole (0,24 mg/kg)	India

Appendix VII: Methods of analysis for POPs

A range of techniques was used to analyse POPs in various environmental media. Below is a non-exhaustive list of the various methods and techniques used.

- The method for the quantitative measurement of a series of volatile aromatic and/or halogenated compounds (with boiling points ranging from -30°C to 218°C; cf. list of compounds is identical to that of EPA 502, 524.2 and 624) in surface and wastewater and in the sediment, entails a “purge and trap” or “headspace” pre-concentration, followed by thermal desorption and gas chromatography-mass spectrometry (GC-MS) analyse; the analysis of this group of compounds in ambient air is carried out by thermal desorption and GC-MS analysis;
- thermally stable pesticides such as organophosphorous pesticides (OPPs) and triazine-type herbicides in surface and wastewater were quantitatively measured using gas chromatography flame photometric detection and high pressure liquid chromatography mass spectrometry (LC-MS);
- The method for determining a series of organochlorine pesticides (OCPs) and polychlorinated biphenyl isomers (PCBs) (among others PCB 31, 49, 169 and 170) in surface and waste water and sediment, involves a solvent extraction and desulphurization pre-treatment step, followed by a quantitative analysis with GC-MS;
- The analysis of an extended group of phenols in surface and wastewater is based on prior specific derivatisation followed by the quantitative determination with GC-MS;

- The method for the quantitative determination of a series of organic nitrogen pesticides (ONPs) is based on membrane filtration followed by in-line sold phase extraction with LC-MC analysis;
- Within the water theme the application of combined HPCL-MS-TOF (Time of Flight) is a recently implemented development. This new technique allows for the unambiguous identification of polar compounds in water extracts with a wide spectrum of organic micropollutants (among others pesticides) with fast chromatography and a high separation resolution. Moreover this technique is used for target analysis (detection and quantification of known pollutants such as glyphosate / AMPA) as well as for screening for non-target components (the identification of unknown micropollutants in the water compartment: e.g., new / unknown pesticides ;
- One of the new developments in chromatography, i.e., the two-dimensional gas chromatography (2D GC) offers interesting perspectives for the detection of toxic substances that were hitherto unknown, a highly automated way of purifying the sample during the analysis (without the use of solvents), an extremely specific and sensitive detection by using mass spectrometry (MS) and a large analysis capacity. In combination with thermal desorption this yields a fast and environmentally-friendly technique for analysis for organic micropollutants such as polycyclic and nitro-polycyclic aromatic hydrocarbons ((N)PAHs, PCBs, phthalates, brominated flame retardants, which until now were difficult to determine, especially in ambient air.
- the determination of dioxins and PCB126 in deposition samples is done by high resolution GC/MS (external analyses).

Appendix VIII: Deposition of PCBs-Dioxins results and trends

In Flanders we have been using new threshold values since 2010 to determine the deposition of dioxins and DL-PCBs. In comparison with the previous years there are two changes.

It is thus impossible to make a comparison with previous years.

What is striking is that there is an especially large share of PCBs in the monitoring stations at shredding companies. In lumber companies and non-metalworking companies the share of dioxins is much greater.

Dioxin deposition measurements may be influenced by several sources in the vicinity. That is why companies need to be checked in case of elevated depositions so that the source can be determined with more certainty.

When the first deposition measurements were carried out in Flanders high dioxin depositions were found around waste incineration installations. A significant drop was detected after 1993-1994, not only in the average dioxin deposition but also in the maximum depositions. These sharp declines are a consequence of the remediations imposed by the environmental inspectorate of the Department of the Environment, Nature and Energy and the various ministers concerned. From 1993 onwards several waste incinerators, which did not function properly, were closed while others were equipped with a purification installation.

Currently incinerators have to meet very strict emission standards, i.e., 0.1 ng TEC/Nm³. That is why it is doubtful that they still make a major contribution to dioxin deposition if they are working properly.

The dioxin depositions which are currently being measured near household incineration installations are low.

The non-metalworking industry is also a source of dioxin pollution. The far-reaching remediation measures whereby stack emissions are prevented with filter installations and diffuse emissions with covering and the spraying of the sites have led to a major decline of depositions near non-metalworking installations. In 1998-2001 peak depositions of 50 pg TEQ/m².day were regularly measured. In 2005 the annual average dioxin deposition near a non-metalworking company was 7.8 pg TEQ/m².day and in 2006 6.6 pg TEQ/m².day. Currently we occasionally still measure higher dioxin values, such as a value of 86 pg TEQ/m².day in early 2012. These are the exception rather than the rule.

A metalworking installation was also subjected to a thorough remediation with the aim of curbing dioxin emissions. In recent years the dioxin depositions in a monitoring station in the immediate vicinity of the plant have significantly dropped. Yet, in 2012, a change set in at a measurement point near a ferrous metal company often recording higher dioxin depositions. The highest dioxin deposition was 40 pg TEQ/m² per day in 2012.

In the early naughtiest increased dioxin depositions were regularly measured near various chipboard companies of more than 100 pg TEQ/m².day. In the last three years these were significantly lower. In 2012 the highest dioxin deposition in a monitoring station near this sector was 17 pg TEQ/m².day.

High depositions of PCB126 are regularly measured near metal shredding companies. In 2003 the average deposition of PCB126 near the various shredder companies was between 45 and 137 pg TEQ/m².day. At all monitoring stations monthly peak values of over 100 pg TEQ/m².day were regularly measured. These values prompted the Environmental Inspectorate to impose various remediation measures in terms of dust control. However, to date, very high peak values have still been measured here. A thorough investigation revealed however that the pollution zone is limited. Within a radius of 800 metres from the confines of the company's site the PCB depositions tend to drop. In residential or agricultural areas which are in the immediate vicinity of such a company the deposition can be high however. A buffer zone should always be created between this type of company and residential or agricultural areas.

Deposition measurements for dioxins and PCB126 are also carried out in an urban area and in a rural area. Next to scattered sources which are at considerable distances domestic heating and traffic could play a role in the deposition. Only small quantitative differences are noted between the values measured in rural and industrial areas where no known industrial source is situated in the immediate vicinity. In these typical sites the average dioxin deposition and PCB126 deposition is 1- 3 pg TEQ/m².day.

Appendix IX: Specific information on monitoring in surface water and sediments

Surface water and sediment	Several PCB's are monitored in surface water and sediment: PCB 101 ; PCB 118 ; PCB 138; PCB 153; PCB 169; PCB 170; PCB 180; PCB 28; PCB 31;PCB 49; PCB 52)
Objective	Assessment of surface water and sediment quality
Type of measurements	Diverse
Analytical method	Diverse
Start of measurements	1991 surface water – 2000 sediment
Type of sampling points	Points that give an overview of the background situation and point that are "hot spots".
Measurement strategy	Since 2010 measurements in surface water are stopped at locations with repeatedly low values and taking into account environmental quality standards. Frequency and number of measurements are increased in regions with repeatedly high values and taking into account environmental quality standards.
Number of sampling points surface water	1995: surface water – 9; sediment: 71 2000: surface water - 109; sediment: 338 2005: surface water – 115; sediment: 457 2009: surface water – 46; sediment: 191
Values surface water for PCB 138 (ng/l)	Last 2 decades, PCB's were monitored intensively. Most important observation is the decreasing concentration in surface water with exception of one 'hot spot' which is influenced by historical pollution. 1995: mean: 4,6 - median: 2,0 – min: 1,0 – max: 61,0 2000: mean: 1,3 - median: 1,0 – min: 1,0 – max: 85,0 2005 mean: 1,1 - median: 1,0 – min: 1,0 – max: 52,0 2009: mean: 1,1 - median: 1,0 – min: 1,0 – max: 15,0
Values sediment for PCB 138 (µg/kg ds)	last decade PCB's were monitored intensively in sediments. 1995: mean: 4,29 - median: 1,0 – min: 0,01 – max: 27,0 2000: mean: 12,82 - median: 1,0 – min: 0,01 – max: 427,0 2005 mean: 4,87 - median: 1,0 – min: 0,01 – max: 430,0 2009: mean: 8,3 - median: 0,9 – min: ,0,01 – max: 519,0
Data	www.vmm.be www.vmm.be/geoview/ In specific annual reports which are publically accessible (in Dutch)

Appendix X: Method - Flemish Human Biomonitoring programme 2007-2011[96]

The target group for the reference biomonitoring was the general Flemish population.

Reference values for biomarkers of exposure to environmental pollutants and reference values for effect markers were determined in 650 inhabitants, who had lived in Flanders for over ten years. The participants in the biomonitoring study were recruited in the five provinces in proportion to the population of each province. Two hundred and fifty young mothers were asked to participate when they came to the hospital to have their babies. Two hundred youngsters in the third year of secondary education (14-15 years) were contacted through the schools. Two hundred adults (20-40 years) were recruited among the employees of the provincial governments.

[96] http://www.milieu-en-gezondheid.be/resultaten/referentiebiomonitoring/Eindrapport_referentiewaarden_finaal_met_voorblad.pdf

Two maternity hospitals and two schools were selected for every province, which were at least 20 km from each other. The studies were spread out over a whole year. The mothers agreed to provide a blood, hair and umbilical cord sample for the study and to request the baby's medical data.

Youngsters provided a blood, urine and hair sample and a neurological test was taken with the computer. The medical data of the youngsters could be requested from the CLB centres (Centres for Student Guidance). Adults provided a blood and a urine sample. All the participants were asked to fill out a questionnaire with information about their general health, exposure to traffic, nutritional habits, profession, social-economic data, household composition. A questionnaire also probed their perception of environmental pressure and the response to this.

The selection of biomarkers for measurement in these samples was done based on the following criteria: importance for health, knowledge about the prevention of the pollutant, reliability of the measurement, volume of the sample needed for a reliable measurement.

The reference values were corrected for known influence factors and indicate the value for an average participant in the current study.

The raw measurement values are also shown, possibly by subgroup (boys/girls, smokers/non-smokers). Differences between the geometric mean levels for the continuous markers were examined through a variance analysis (ANOVA). Differences of proportions of occurrence were checked with a chi-square test.

In addition to the individual samples mixed samples were also created to measure new biomarkers, which are potentially important but for which very little experience exists. Five mixed samples were made for young people and five for adults. Each mixed sample was composed based on the same volume of urine or blood of six individuals from the same province. In the case of the adults and the young people the six individuals were selected based on a proportional gender distribution (three men, three women). The age category was also taken into account for the adults (always two individuals of age category 20-26, 27-32, 33-40 yrs).

The programme was approved by an ethics committee and submitted for information to the Privacy Commission.

Appendix XI: Studies lead in Flanders, concerning human exposure to POPs

Part 1: D'Hollander W, Roosens L, Covaci A, Cornelis C, Reynders H, Campenhout KV, Voogt P, Bervoets L. Chemosphere. (2010) Brominated flame retardants and perfluorinated compounds in indoor dust from homes and offices in Flanders, Belgium. Sep;81(4):478-87. Epub 2010 Aug 14.

Descriptive statistics of ΣPBDEs (congeners 28, 47, 99, 100, 153, 154, 183, 197, 196 and 203) and BDE 209 concentrations in dust samples from the present and related studies (ng g^{-1} dw).

ng g^{-1} lw	Country	Compounds	Median	Average	Range	Reference
House dust	Belgium	ΣPBDEs[a]	27	104	4–1214	Present study
		BDE 209	313	590	<5–5295	
		ΣHBCDs	130	1735	5–42 692	
	Canada	ΣPBDEs[b]	620	1100	160–3600	Harrad et al. (2008a)
		BDE 209	560	670	290–1100	
		ΣHBCDs	640	670	64–1300	
	UK	ΣPBDEs[b]	59	98	6–610	
		BDE 209	2800	45 000	120–520 000	
		ΣHBCDs	730	6000	140–110 000	
	US	ΣPBDEs[b]	1600	3000	310–14 000	
		BDE 209	1300	1600	530–3300	
		ΣHBCDs	390	810	110–4000	
Office dust	Belgium	ΣPBDEs[a]	138	1256	59–10 880	Present study
		BDE 209	443	1513	69–11 574	
		ΣHBCDs	367	592	256–1153	
	UK	ΣPBDEs[b]	100	250	16–1100	Harrad et al. (2008b)
		BDE 209	6200	30 000	620–280 000	
	Japan	BDE 209	1100	2400	150–170 000	Suzuki et al. (2006)

[a] Sum of BDE 47, 99, 100, 153, 154, 183, 197, 196 and 203.
[b] BDE 15, 28, 47, 49, 66, 99, 100, 153 and 197.

BFR and PFC levels (P50–50th percentile or median concentration and P95–95th percentile) in Belgian dust (ng g^{-1} dw).

Conc (ng g^{-1} dw)	House dust (n = 45)		Office dust (n = 10)	
	P50	P95	P50	P95
BFRs				
BDE 28	0.4	0.9	2.1	5.3
BDE 47	8.1	62.4	21.1	61.5
BDE 100	1.1	12.1	6.8	20.3
BDE 99	8.9	110	45.4	133
BDE 154	0.9	4.7	5.5	87.1
BDE 153	2.2	43.9	12.1	663
BDE 183	1.4	9.5	23.8	3090
BDE 197	0.9	5.4	9.5	1200
BDE 196	2.3	8.3	6.6	633
BDE 203	1	8.2	4.7	453
ΣPBDEs[a]	26.8	265	138	6345
BDE 209	313	1513	443	6680
HBCD	130	4447	367	1092
TBBPA	11.7	141	70.4	212
PFCs				
PFOS	0.5	17.5	2.2	293
PFOA	0.7	11.5	2.9	56.9
PFNA	0.1	2.1	0.4	62
PFBS	0	1.1	0.2	2.5
PFBA	0.2	1.6	0.7	3.9
PFHxS	0.1	9	0.2	5.1
PFHxA	0.3	5.8	1.3	26.1
PFDA	0.2	2.6	0.9	30.8
ΣPFCs	3	34.9	10.1	449

[a] Sum of BDE 47, 99, 100, 153, 154, 183, 197, 196 and 203.

Descriptive statistics of PFOS, PFOA and ΣPFCs (PFBS, PFHxS, PFOS, PFBA, PFHxA, PFOA, PFNA and ΣPFCs (PFBS, PFHxS, PFOS, PFBA, PFHxA, PFOA, PFNA and PFDA) of samples from the present and related studies (ng g^{-1}).

ng g^{-1}	Country	*n*	Compounds	Median	Average	Range	Reference
House dust	Belgium	43	PFOS	0.5	9.4	<0.1–211	Present study
			PFOA	0.7	6.4	<0.05–109	
			ΣPFCs	2.9	19.3	0.1–406	
	Canada	67	PFOS	38	444	2.3–5065	Kubwabo et al. (2005)
			PFOA	20	106	1.2–1234	
			ΣPFCs[a]	917	2624	<8–52 900	
	Japan	16	PFOS	25	200	11–2500	Moriwaki et al. (2003)
			PFOA	165	380	69–3700	
	US	102	PFOS	201		<8.9–12 100	Strynar and Lindstrom (2008)
			PFOA	142		<10–1960	
	Germany	12	PFOS	16		3–342	Fromme et al. (2008)
			PFOA	11		2–141	
	Sweden	10	PFOS	39		15–120	Björklund et al. (2009)
			PFOA	54		15–98	
	Sweden	38[b]	PFOS	85		8–1100	Björklund et al. (2009)
			PFOA	93		17–850	
Office dust	Belgium	10	PFOS	2.2	55	0.4–526	Present study
			PFOA	2.9	14	0.7–61	
			ΣPFCs	10	100	2.2–647	
	Sweden	10	PFOS	110		29–490	Björklund et al. (2009)
			PFOA	70		14–510	

[a] Sum of 6:2; 8:2; 10:2 FTOH, PFHxA, PFHpA, PFOA, PFNA, PFDA, PFUA, PFDoA, PFOS, PFHxS and PFBS.
[b] Apartments.

Intake assessment for the Belgian population in ng d^{-1} for BFRs and PFCs through Belgian dust ingestion.

ng d^{-1}		Toddler		Non-working adult[f]		Working adult[g]	
		Average[b]	High[c]	Average[d]	High[e]	Average[d]	High[e]
ΣPBDE[a]	P50	1.4	5.8	0.2	0.5	0.5	1.3
	P95	13.5	57.0	2.0	5.2	17.1	47.8
BDE 209	P50	16.0	67.3	2.2	6.1	2.5	7.0
	P95	77.1	325.3	22.8	29.7	23.5	65.8
ΣHBCD	P50	6.6	28.0	0.9	2.5	1.5	4.2
	P95	226.6	956.1	9.5	87.2	22.7	63.7
PFOS	P50	0.03	0.1	<0.01	0.01	0.01	0.02
	P95	0.9	3.8	0.1	0.4	0.8	2.3
PFOA	P50	0.04	0.2	<0.01	0.01	0.01	0.03
	P95	0.6	2.5	0.08	0.2	0.2	0.5
ΣPFCs	P50	0.1	0.6	0.02	0.06	0.03	0.1
	P95	1.8	7.5	0.2	0.7	1.3	3.6

[a] Sum of BDE 47, 99, 100, 153, 154, 183, 197, 196 and 203.
[b] 50 mg d^{-1}.
[c] 215 mg d^{-1}.
[d] 7 mg d^{-1}.
[e] 20 mg d^{-1} (as described in Roosens et al. (2010).
[f] From exposure to house dust.
[g] From exposure to house dust and office dust.

Part 2 : Cornelis C, D'Hollander W, Roosens L, Covaci A, Smolders R, Van Den Heuvel R, Govarts E, Van Campenhout K, Reynders H, Bervoets L. (2012) <u>First assessment of population exposure to perfluorinated compounds in Flanders, Belgium.</u> Chemosphere. Jan; 86(3):308-14.

Concentrations of PFOS and PFOA in environmental compartments and food.

	PFOS				PFOA			
	P50	P95	*N*	Reference	P50	P95	*N*	Reference
Indoor dust (ng g^{-1})								
Homes	0.73	21.7	40	[1]	0.72	11.4	43	[1]
Offices	1.83	6.88	9	[1]	2.88	56.9	10	[1]
Soil (ng g^{-1})	5[a]		1	[2]	7.5		1	[2]
Air (pg m^{-3})								
Indoor air	1.6[b]		3	[3]	4.4[c]		4	[4]
Outdoor air	1.6	46	38	[4], [5], [6]	8.9	552	34	[4], [5], [6]
	Average (range)		*N*	Reference	Average (range)		*N*	Reference
Food and beverages (ng g^{-1})								
Potatoes	6.18 (<0.021–19)		6	[1]	0.67 (<0.57–2.0)		6	[1]
Vegetables	0.60 (<0.0057–10)		36	[1], [7]	0.65 (<0.027–4.1)		36	[1], [7]
Fruits	0.35 (<0.017–0.7)		11	[1], [7]	0.43 (<0.037–1.6)		11	[1], [7]
Eggs	6.86 (<0.12–22)		8	[1], [7]	0.86 (<0.055–5.0)		8	[1], [7]
Milk and dairy products	0.25 (<0.014–0.64)		9	[1], [7]	0.12 (<0.028–0.34)		9	[1], [7]
Cereals and rice	0.052 (<0.069- < 0.12)		3	[1], [7]	0.055 (<0.08- < 0.12)		3	[1], [7]
Pork meat	0.17 (0.045–0.47)		7	[1], [7]	0.055 (<0.053- < 0.12)		7	[1], [7]
Poultry meat	0.63 (0.02–2.1)		5	[1], [7]	0.055 (<0.067–0.06)		5	[1], [7]
other meat	0.055 (0.03–0.06)		7	[1], [7]	0.52 (<0.034–3.3)		7	[1], [7]
Seafish	12.0 (<0.12–62)		28	[1], [7], [8], [9], [10], [11]	0.59 (<0.065–5.4)		27	[1], [7], [8], [10], [11]
Freshwater fish	174 (1.3–551)		26	[1], [10]	0.78 (<0.6–9.13)		26	[1], [10]
Crustaceans, and molluscs	9.86 (0.148–80)		745	[7], [11], [12]	3.34 (<0.029- < 15)		652	[7], [11]
vegetable oil	0.033 (<0.034–<0.099)		2	[7]	0.091 (<0.115- < 0.25)		2	[7]
Drinking-water, coffee and tea	0.005 (0.004–0.01)		4	[1]	0.002 (0.001–0.005)		4	[1]
Beer	0.013 (<0.0013–0.04)		5	[1]	0.006 (<0.0008–0.02)		5	[1]

[1] This study, [2] Lisec (2004), [3] Jahnke et al. (2007a), [4] Barber et al. (2007), [7] Ericson et al. (2008), [8] Corsolini et al. (2008), [9] Haukas et al. (2007), [10] Kallenborn et al. (2004), [11] Nania et al. (2009), [12] Cunha et al. (2005).

[a] Half of the detection limit.

[b] Maximum value of given range.

[c] Reported average.

Estimated average and P95 intake of PFOS and PFOA (ng kg^{-1} d^{-1}) by the Flemish population from food and environmental sources (values between brackets represent P95 intake).

	Soil	Dust		Air		Food
PFOS						
Concentration level	Unsp.	P50	P95	P50[a]	P95[a]	Average
3–<6 yr	0.018 (0.024)	0.0008 (0.003)	0.024 (0.082)	0.00061 (0.0008)	0.003 (0.004)	57.1 (96.6)
⩾21 yr working	0.003 (0.0045)	0.0001 (0.0003)	0.0016 (0.0046)	0.0004 (0.00049)	0.0006 (0.0009)	24.2 (40.9)
⩾21 yr non-working	0.003 (0.0045)	0.00008 (0.0002)	0.0021 (0.006)	0.0004 (0.00049)	0.0008 (0.001)	24.2 (40.9)
PFOA						
Concentration level	Unsp.	P50	P95	P50	P95	Average
3–<6 yr	0.027 (0.036)	0.0008 (0.003)	0.012 (0.043)	0.0022 (0.0026)	0.035 (0.04)	20.1 (31.5)
⩾21 yr working	0.005 (0.007)	0.00015 (0.0004)	0.0027 (0.0074)	0.0011 (0.0014)	0.005 (0.006)	6.10 (9.6)
⩾21 yr non-working	0.005 (0.007)	0.00008 (0.0002)	0.0013 (0.0035)	0.0011 (0.0014)	0.006 (0.008)	6.10 (9.6)

Unsp.: unspecified.

[a] P50 and P95 concentrations could only be calculated for the outdoor air concentrations.

Appendix XII: Monitoring PCBs, dioxins and furans in the water in the Walloon Region

Method of analysis for PCBs

Water matrix

The sample is collected in a glass flask and kept in the refrigerator at between 2 and 5°C out of direct light until its analysis.

The entire sample (≅ 1 litre), buffered to pH 7, containing 200g of NaCl is extracted once with 10 ml of toluene. The organic phase is dried on anhydrous sodium sulphate. The extracted analytes are separated and measured using capillary gas chromatography-electron capture detection (ECD). Their content is calibrated using a standard curve (external calibration).

Gas chromatography, ECD detection (Electron Capture Detector)

References: U.S. EPA Method 2005: Analysis of Organohalide and commercial Polychlorinated Biphenyl (PCB) products in water by microextraction and gas chromatography and ISO 6468 (1996): Determination of certain organochlorine insecticides, polychlorinated biphenyls and chlorobenzenes -- Gas chromatographic method after liquid-liquid extraction.

Limits of detection: 0.001 to 0.002 µg/l for each congener

"Suspended solids" matrix

The suspended solids (SS) are sampled in situ by centrifugation.

The SS are kept in the refrigerator at between 2 and 5°C until analysis.

Chemical drying (sulphates), manual grinding.

ASE extraction using hexane/acetone, drying and desulfurization.

Purification on Florisil, concentration of the organic phase with Turbovap.

Analysis by gas chromatography with electron capture detection (ECD) and confirmation using mass spectrometry.

Reference: ISO 10382 (2002, Soil Quality): Determination of organochlorine pesticides and polychlorinated biphenyls -- Gas-chromatographic method with electron capture detection.

Limits of detection: from 2 to 10 µg/kg MS (µg/kg dry matter) depending on the congener

Surface water quality monitoring network in the Walloon Region - 2006

Substances/Parameters	**Monitoring sites - Water matrix**	**Monitoring sites - SS matrix**
Polychlorobiphenyls (PCBs) (nos. 28, 52, 101, 118, 138, 153, 180)	89 sites	22 sites
Dioxins (PCDD)	-	-
Furans (PCDF)	-	-

Proposed surface water quality monitoring network in the Walloon Region as part of the implementation of the Framework Directive on water (FDW) - 2007

Substances/Parameters	**Monitoring sites - Water matrix**	**Monitoring sites - SS matrix**
Polychlorobiphenyls (PCBs)	25 sites (13x/year)	23 sites (4x/year)
Dioxins (PCDD)	-	23 sites (Max 4x/year)
Furans (PCDF)	-	23 sites (Max 4x/year)

Polychlorodibenzodioxins (PCDDs) and polychlorodibenzofurans (PCDFs) will be monitored a maximum of 4x/year across 23 sites including 7 specific monitoring sites for hazardous substances (Walloon Government Decree 12.09.2002) and this only in the "suspended solids" matrix.

Among the 210 dioxin and furan congeners, 17 are considered toxic and will be subject to monitoring.

Congeners monitored at the 7 specific monitoring sites for hazardous substances	
Dioxins	2,3,7,8-tetraCDD
	1,2,3,7,8-pentaCDD
	1,2,3,4,7,8-hexaCDD
	1,2,3,6,7,8-hexaCDD
	1,2,3,7,8,9-hexaCDD
	1,2,3,4,6,7,8-heptaCDD
	OCDD
Furans	2,3,7,8-TCDF
	1,2,3,7,8-pentaCDF
	2,3,4,7,8-penta-CDF
	1,2,3,4,7,8-hexaCDF
	1,2,3,6,7,8-hexaCDF
	1,2,3,7,8,9-hexaCDF
	2,3,4,6,7,8-hexaCDF
	1,2,3,4,6,7,8-heptaCDF
	1,2,3,4,7,8,9-heptaCDF
	OCDF