Report on the Environment and Nature in Flanders in pocket-size

MIRA-T 2003 themes

If you have questions or suggestions, you can contact us at the following address:
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Introduction

MIRA-T 2003 in pocket-size is the little sister of the annual theme report of the Flemish Environment Agency (VMM). The pocket edition presents a selection of the 175 environmental indicators from MIRA-T 2003. The main facts and figures have been summarized per indicator, giving a clear overview. Some of the indicators have already featured in previous editions of the pocket edition but others are new.

MIRA-T 2003 contains three new chapters: impact on human health, nature and economy. Together with the sector and theme chapters, they provide a more complete analysis of the environmental disruptions in Flanders. The new theme chapters this year are on Non-ionising radiation, Use of GMOs and the Dispersion of brominated flame retardants. With this change in themes, MIRA responds to the current situation and keeps abreast of the state of the environment in Flanders.

We hope you will enjoy this VMM publication.

The MIRA-project team, *November 2003*

Table of contents

Sectors

Every indicator of the *environmental themes and impact* receives its own final assessment in the form of a smiley. The evaluation refers to the indicator change relative to the period.

☺	positive trend with achievable target
😐	trend either unclear or positive but limited, insufficient to reach target
☹	negative trend, wide of the mark
?	insufficient information available as yet

Themes

Impact on human health, nature and economy

List of abbreviations

AMINAL	Flemish Administration of Environment, Nature, Land and Water Management
APS	Flemish Administration for Planning and Statistics
Aquafin	Flanders' public/private waste water treatment company
ATF, KULeuven	Lab for Acoustics and Thermal Physics, Catholic University Leuven
AZF	General Affairs and Finance Department of the Ministry of the Flemish Community
AWV	Flemish Administration for Roads and Traffic
BIAC	Brussels International Airport Company
CDO, UGent	Centre for Sustainable Development, University Ghent
CLE	Flemish Centre for Research on Agricultural Economics
ECONOTEC	Environmental Consultancy
EHSAL	European Institute of Higher Education Brussels
EPAS	Eco Process Assistance, University Ghent
Eurostat	Statistical Office of the European Communities
FAAV	Belgian Food Agency
IBW	Flemish Institute for Forestry and Game Management
IN	Flemish Institute of Nature Conservation
INTEC, UGent	Department of Information Technology, University Ghent
IRCEL	Belgian Interregional Cell for the Environment
ISAAA	International Service for the Acquisition of Agri-biotech Applications
ISTIL	Italian Light Pollution Science and Technology Institute
KMI	Royal Meteorological Institute of Belgium
KULeuven	Catholic University Leuven
MINA-plan	Environmental policy plan of the Flemish government
MIRA	Report on the Environment and Nature in Flanders
MNZ	Technical Commission North Sea
NARA	Nature Report Flanders
NBB	National Bank of Belgium
NGI	Belgian National Geographic Institute
NIS	Belgian National Institute of Statistics
NIRAS	Belgian Agency for Radioactive Waste and Enriched Fissile Materials
ODE	Organisation for promotion of renewable energy in Flanders
OVAM	Public Waste Agency of Flanders
RIVO	Netherlands Institute for Fisheries Research
RIZIV	Belgian National Service for Medical and Disablement Insurance
RSZ	Belgian National Office for Social Security
UGent	University Ghent
VITO	Flemish Institute for Technological Research
VLM	Flemish Land Agency
VMM	Flemish Environment Agency
VRIND	Statistical publication from the Ministry of the Flemish Community
WIV	Belgian Scientific Institute of Public Health
WOUDC	World Ozone and Ultraviolet Radiation Data Centre

Flanders at a glance

Flanders is one of the three Belgian regions with its own government, parliament and administration. The other two are the Brussels-Capital Region and the Walloon Region. Comprised of the Dutch-speaking part of the country, the Flemish Region has the largest population of the three (58 %). As a result of various state structure reforms over the last 30 years, Belgium has been transformed into a federal state, giving the regions more and more responsibilities. Apart from the environment (the subject of this pocket edition), the Flemish government is also competent in other matters, such as the economy, employment, education and culture, agriculture, foreign trade, land planning, urban development, housing, public works ...

Flanders,
the heart of Europe

File on Flanders

	Flanders	Belgium	EU-15
Total population (2002):	5 972 781	10 309 725	379.6 million
Surface area:	13 522 km²	32 545 km²	3 246 462 km²
Capital:	Brussels	Brussels	Brussels
Highest point:	Voeren (288 m)	Botrange (694 m)	Mont Blanc (4 810 m)
Population density (2002):	442 inhabitants/km²	317 inhabitants/km²	117 inhabitants/km²
Number of private households (2002):	2 434 346	4 319 040	155.0 million (2000)
Population growth (1990-2002):	4.1 %	3.6 %	4.4 %
Growth in number of households (1991- 2002):	10.5 %	10.9 %	..
Average number of people per household (2002):	2.45	2.39	2.43 (2000)
Share of population 65 years and older in 2002:	17.1 %	16.9 %	16.3 %
Share of population younger than 15 years in 2002:	16.8 %	17.6 %	16.8 %
Gross Domestic Product* (GDP) (2002):	149.6 billion euro	261.7 billion euro	8 827 billion euro (2001)
GDP* per inhabitant (2002):	25 048 euro	25 385 euro	23 180 euro (2001)
Annual average real growth rate GDP between			
1996-2002:	2.3 %	2.1 %	2.3 %
1990-1995:	1.7 %	1.6 %	1.6 %
Export as percentage of GDP (2000):	104 %	81 %	11 %
Activity level** (2001):	63.4 %	59.9 %	63.8 %
Unemployment level*** (2001):	4.0 %	6.6 %	7.6 %

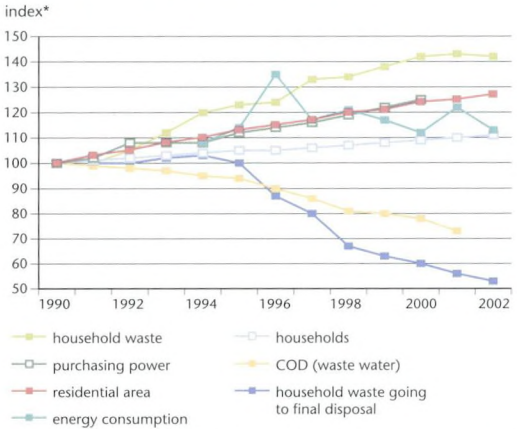
Number of municipalities:	308	589	..
Built-up area (2002):	2 266 km² (16.8 %)	3 547 km² (10.8 %)	..
Number of fatalities in traffic accidents per 100 000 inhabitants (2000):	14.6	14.4	10.9
Life expectancy (at birth) (2000)			
men:	76.0 years	74.4 years	75.3 years
women:	81.9 years	80.8 years	81.4 years

* figures expressed in current prices, ** number working (*** unemployed) as % of the population at work-active age (15-64 years)
.. = not available

Source: APS, Eurostat Yearbook 2003, Land Register, MIRA-T 2003, NIS, VRIND 2002.

1.1 Population

Eco-efficiency of the population



* The reference year for purchasing power, residential area, energy consumption, households and COD (chemical oxygen demand) is 1990, that for household waste and waste going to final disposal is 1991.

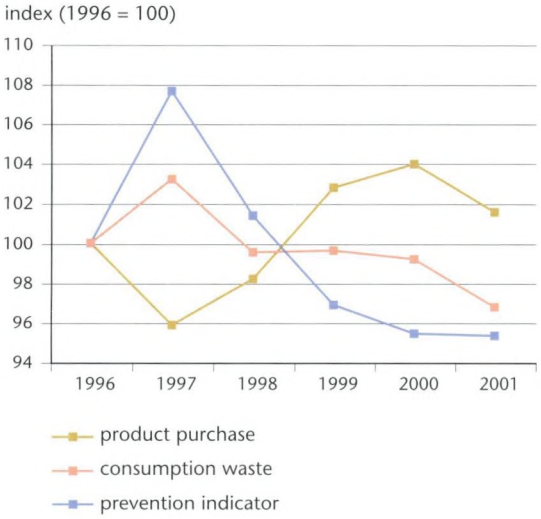
Source: NIS, VMM, VITO, OVAM.

The residential area is still increasing and is rising more rapidly than the increase in households. It seems that the quantity of household waste has been stagnating since 2000 and in recent years energy consumption has shown a falling trend. It is still to be seen whether this improvement will continue and whether the population will succeed in realising a decoupling. The household burden on surface water (COD) has clearly decreased since 1992 thanks to the water purification policy. The household waste going to final disposal has been dropping since 1996 because of the sharp growth in selective collection. Both pressure indicators show a total decoupling.

	households	purchasing power	total household waste	residential area	energy consumption	COD	waste going to final disposal
	x 1 000	euro/inh.	kg/inh.	m²/inh.	GJ/inh.	kg/inh.	kg/inh.
1990/1991	2 198	7 687	405	212	35.6	22.4	330
2001/2002	2 438	9 609	555	258	38.5	15.7	169

inh. = inhabitant

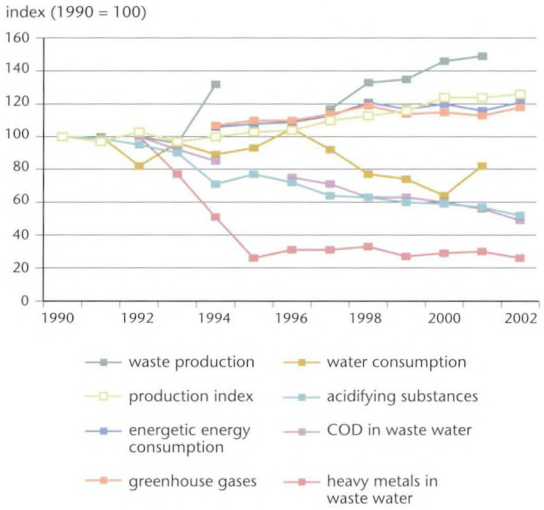
Prevention indicator: waste per consumption unit



Source: OVAM.

The consumption waste or waste produced by household consumption decreased in the period 1996-2001. The product purchases or a family's expenditure on waste-producing products showed a rise. The prevention indicator or the relationship between the two indicates decoupling: a falling waste-producing trend can be determined per euro consumed. Both the consumers (who heed the amount of waste when purchasing) and the producers (less packaging, more reusable packaging) can be the reason of this.

Eco-efficiency of industry



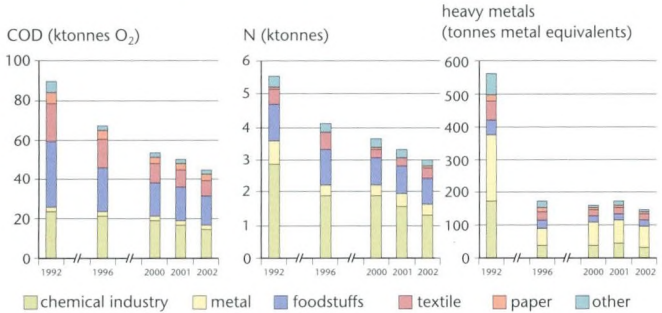
Source: NIS, OVAM, VITO, VMM.

Between 1990 and 2002, the production index (an economic indicator representing industrial production) rose by 26 %. The emissions of acidifying substances and NMVOC dropped as a result of, amongst others, process-integrated measures, use of DeNOx- and DeSOx-units, changeover to low-sulphur fuel, use of solvents with a lower NMVOC content (non-methane volatile organic compounds) ... The energetic energy consumption, the greenhouse gas emissions connected to it and the waste production rose. The discharge of, inter alia, COD, N and heavy metals in waste water showed a falling trend as a result of increased efficiency of purification processes, renewed processes ...

	production index	waste production ktonnes	energetic energy consumption PJ	emission acidifying substances 10^6 Aeq	COD in waste water tonnes
1990	100	9 283*	313	3 196	81 066*
1994	100	12 279	343	2 279	68 714
1998	113	12 444	389	2 026	50 715
2002	126	13 917**	386	1 663	40 120

* 1992, ** 2001; COD = chemical oxygen demand, Aeq = acid equivalents

Discharges of COD, N and heavy metals in industrial waste water

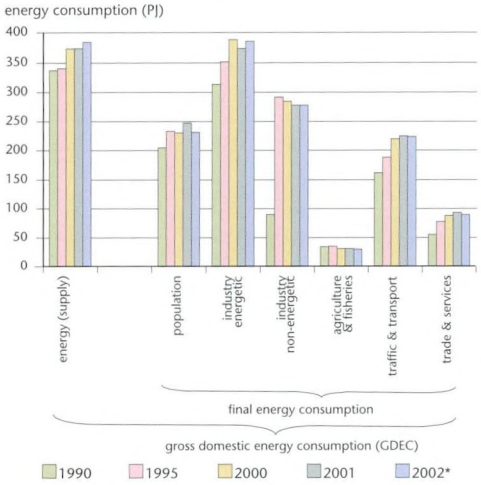


COD = chemical oxygen demand, BOD = biochemical oxygen demand
Source: VMM.

In the period 1992-2002 the industrial discharge of BOD and COD dropped markedly: by 57 % for BOD and by 51 % for COD. The most important reductions occurred in the food and textile industries, as well as in the 'other' industries. Between 1992 and 2002 the total emission of heavy metals dropped by 74 %, mainly in the period up to and including 1995. Those discharging the most were the metal (43 %) and chemistry (24 %) sectors. The discharges of nitrogen and phosphorous decreased continuously and were significantly lower in 2002 than in 1992 (-42 % and -60 % respectively).

The total quantity of industrial waste water discharged in 2002 amounted to 213 million m^3. A rise could be observed until the mid 90s but the discharged flow rate has dropped since 1999. This is due, amongst others, to the increased levies on groundwater collection and on waste water discharge, which causes an increasing number of companies to work more sparingly with water.

Energy consumption in Flanders



* preliminary figures

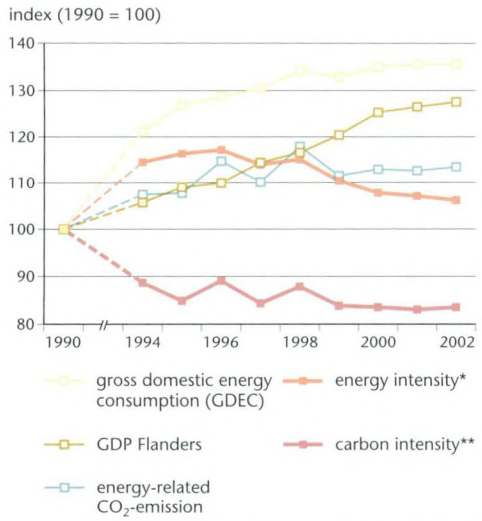
Source: VITO.

Between 1990 and 2002 Flanders' gross domestic energy consumption (GDEC) rose by 35.6 %. The rise is most significant for industry, trade & services and traffic & transport. Only agriculture & fisheries registered a drop. The industrial increase is mainly a result of an increase in the non-energetic final consumption (the application of energy carriers as raw material). Trade & services' energy consumption is partly climate-linked, but the increase is particularly due to the growing number of offices and trading places. In the case of traffic & transport, it seems that the technological improvements are still insufficient to compensate for the effect of an increased demand for mobility.

A quarter of the GDEC is lost in the energy sector through the conversion from one form of energy to another or by transporting and distributing energy to the final consumers.

(PJ)	*energy (supply)*	population	industry	agriculture & fisheries	traffic & transport	trade & services
1990	*337.4*	204.4	403.1	34.1	161.9	55.4
2002*	*383.7*	230.1	663.5	29.9	223.8	89.3

Flanders' energy and carbon intensity



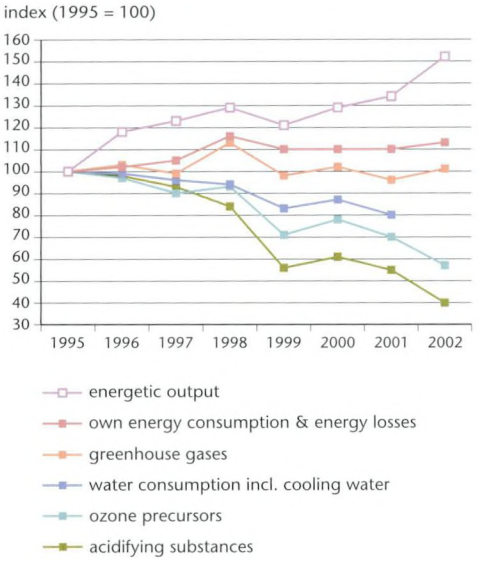
* energy intensity = amount of GDEC per unit of GDP expressed in constant 1990 prices
** carbon intensity = amount of energy-related CO_2 emission per GDEC unit

Source: VITO, APS.

The *energy intensity* - that represents Flanders' energy dependence - fell continuously since 1998, but it was still 6.2 % higher in 2002 than in 1990. The recent drop is mainly due to the increasing economic importance of the less energy-intensive trade & services sector as compared to industry.

The *carbon intensity* measures to what extent the policy is successful in limiting CO_2 emission resulting from the (energetic) use of carbon-intensive fuels. The drop in carbon intensity in the early 90s was not brought about so much by changing over to less carbon-intensive fuels or by the more efficient use of fossil fuels, but by the significant increase in industrial non-energetic energy consumption. Bearing the climate issue in mind, and to limit dependence on energy, the Flemish authority is presently following a policy of rational energy consumption (REC).

Eco-efficiency of the energy sector



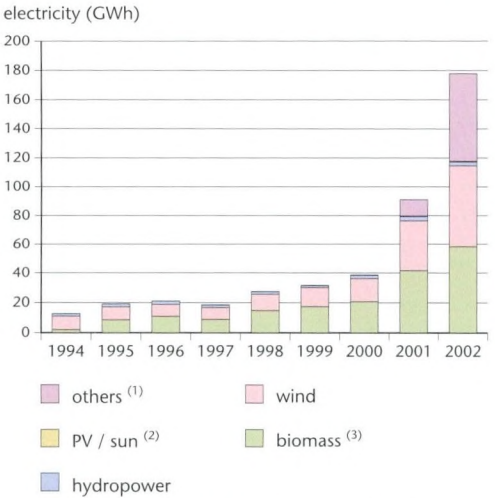
Source: VITO, VMM.

The energy sector's energetic output - that is, the total amount of the energy content of its end products such as different kinds of petrol or electricity - increased sharply in the period 1995-2002: +52 %. Notwithstanding this rise, the sector was able to decrease its pressure on the environment. The emission of greenhouse gases has for years fluctuated at the 1995 level, while the emissions of acidifying substances and ozone precursors have continued to fall. Water consumption (including significant quantities of cooling water) also shows a continuously falling trend. The sector's own energy consumption and energy losses increase less markedly than the energetic output.

	energetic output	own energy consumption and losses	water-consumption	greenhouse gases	emission ozone precursors	acidifying substances
	PJ	PJ	10^6 m^3	ktonnes CO_2-eq	tonnes TOFP	10^6 Aeq
1995	1 403	340	3 325	22 768	79 939	4 127
2002	2 136	384	2 657*	22 939	45 941	1 633

* 2001 instead of 2002; TOFP = Tropospheric Ozone Forming Potential, Aeq = acid equivalents

Electricity production from renewable energy sources



(1) co-combustion of wood, sludge and/or olive pips + organic waste fermentation, (2) annually taken into account but almost negligible, (3) water purification sludge, manure, fruit, vegetable and garden waste or FVG and landfill gas

Source: ODE.

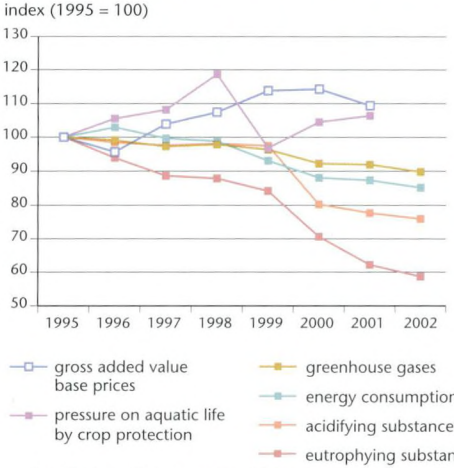
Of all the electricity produced in Flanders in 2002, renewable energy sources generated 177 859 MWh or 0.38 %. This is a rise of 95 % compared to 2001. In this respect, wind energy, biomass and 'others' seem to form equally important sources. The share of hydropower remains limited due to the limited differences in height. It is difficult to estimate power production by means of photovoltaic cells, but it probably amounts to less than 0.5 % of the electricity generation from renewable sources.

Since January 1st, 2002, each electricity supplier in Flanders is obliged to obtain a minimum share of its sales to end users from renewable energy sources. This minimum share amounted to 0.8 % in 2002 and it will further increase to 6 % in 2010. The suppliers only came to 0.38 % of electricity supplied via the distribution grid in 2002. They had to pay a 75-euro fine for each lacking MWh.

(MWh)	biomass(3)	wind	hydropower	PV / sun(2)	others(1)
1994	2 050	8 960	1 600	20	0
2002	58 205	56 267	2 712	572	60 103

1.4 Agriculture & fisheries

Eco-efficiency of agriculture & fisheries



* preliminary figures; gross added value in constant prices, Seq = dispersion equivalents, Meq = manure equivalents, Aeq = acid equivalents

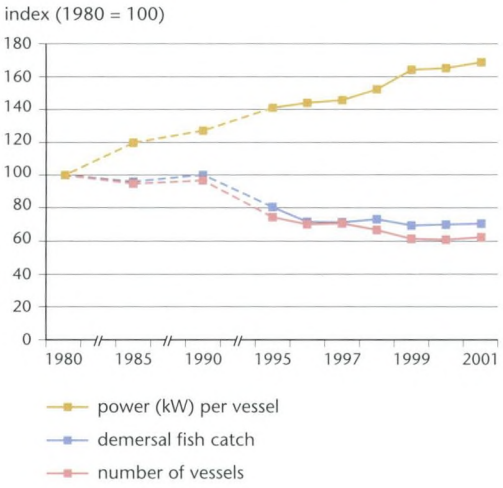
Source: CLE, VMM, NBB, VITO, UGent, VLM.

The environmental pressure of agriculture & fisheries is decreasing. The acidifying and eutrophying emission in particular fell sharply by more than 35 % since 1990. The driving forces behind the drop in 2001 were the shrinking numbers of livestock, the falling use of chemical fertilizer and the fodder's lower nutrient content. The drop in the livestock and greenhouse farming's lower energy consumption explains the falling greenhouse gas emission. In the period 1990-1995, crop protection's pressure on aquatic life dropped but since then it has again been slightly increasing.

	gross added value 10^6 euro	energy consumption PJ	crop protection 10^9 Seq	eutrophying substances Meq	emission acidifying substances 10^6 Aeq	greenhouse gases ktonnes CO_2-eq
1990	..	34.1	39.8	57.9	6 060	11 090
1995	2 049	35.1	31.1	51.6	4 998	11 279
2001	2 241	30.7	33.1	32.1	3 881	10 374
2002*	..	29.9	..	30.3	3 796	10 172

.. = not available

Size and catches of the Belgian offshore fishing



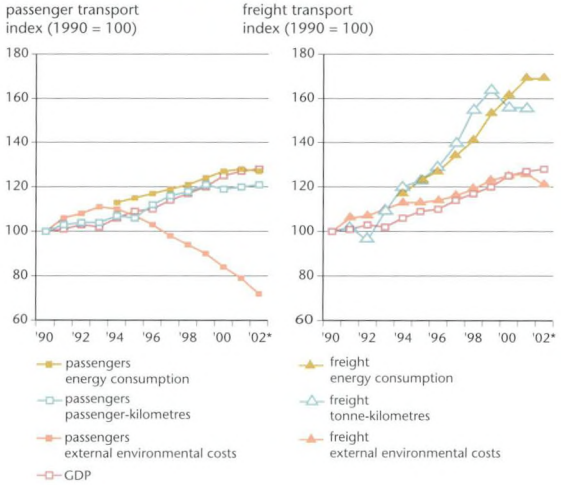
Demersal fish (living near the seabed): e.g. cod, plaice, sole, ray ...

Source: Ministry of Traffic and Infrastructure and Ministry of the Flemish Community, Office of Offshore Fishing.

The number of vessels and the average power (in kilowatt) per vessel gives an indication of the fisheries' effort. The number of vessels dropped by 37 % compared to 1980. The average power increased by about 70 % per vessel during the same period. This is an effect of the European fishing policy. The total Belgian fish supply dropped by 33 % compared to 1980. In the north east of the Atlantic Ocean, of which the North Sea forms part, and in the Baltic Sea, 27 % of the fish stocks fall outside the safe biological limits. That is why the European fishing policy was thoroughly reformed in 2003 (e.g. by putting a stop to government support for building new fishing vessels).

	1980	1990	1995	2001
catch demersal fish (tonnes)	35 053	35 088	28 197	24 737
number of vessels	208	201	155	130
power per vessel (kW)	302	384	426	510

Eco-efficiency of road traffic



* preliminary figures; Gross Domestic Product (GDP) in constant prices

Source: APS; Labeeuw, 2003; VITO; VMM.

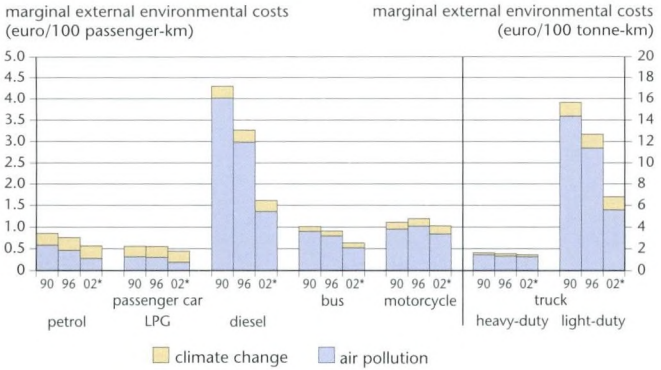
Except for the year 2000, the growth of *passenger road transport* coincided with GDP growth in the period 1990-2002. There is still no decoupling between energy consumption and passenger road transport. However, there is an absolute decoupling between external environmental costs (damage caused by air pollution and climate change) and passenger-kilometres. Due to the tightened European emission standards, the external environmental costs were approximately 30 % lower in 2002 than in 1990.

Between 1990 and 2001 the *freight road transport* grew much faster than the GDP. The energy consumption of the freight road transport increased more than the tonne-kilometres during this period. The external environmental costs grew slower and it was in 2002 that they dropped for the first time.

	GDP	passen-ger-km	tonne-km	energy consump-tion passengers	energy consump-tion freight	EEC passen-gers	EEC freight
	10^9 euro	10^9	10^9	PJ	PJ	10^6 euro	10^6 euro
1990	91.3	52.1	19.3	113.0	42.4	1 254	540
2002	116.5	63.5	30.0*	144.0	71.5	892	652

* figure for 2001; EEC = external environmental costs

Marginal external environmental costs (EEC) of road vehicles



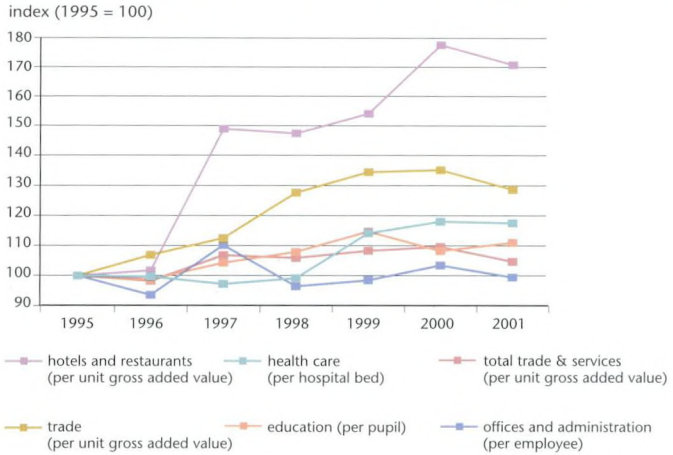
* preliminary figures; marginal EEC: EEC caused by an additional passenger-kilometre or tonne-kilometre

Source: VITO, VMM.

For all vehicle types, the marginal external environmental costs (damage caused by air pollution and climate change) per passenger or tonne-kilometre dropped in the period 1990-2002. This is a result of the decreased external costs related to air pollution due to the implementation of European directives to limit emission. Regarding *passenger transport*, the petrol car causes slightly more damage to the environment compared to the LPG car. Although the bus enjoys the benefit of scale, it is only third when it comes to costs per passenger kilometre in 2002. The motorcycle is twice as damaging to the environment as the LPG car. The diesel car has the highest external environmental costs due to its emission of particulates. Regarding *freight transport*, the light-duty trucks show the highest external environmental costs, as they do not have the benefit of scale (loading capacity) that the heavy-duty trucks have.

1.6 Trade & services

Eco-efficiency of trade & services: energy consumption per activity unit



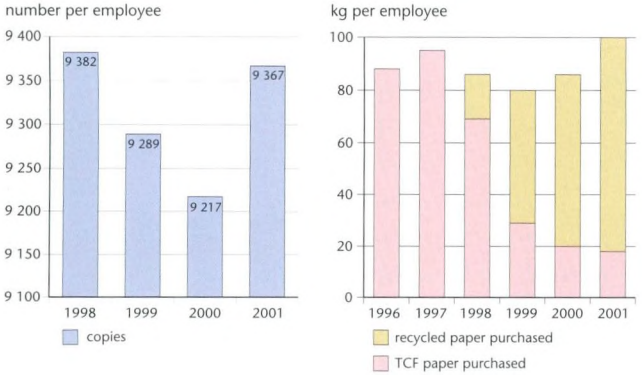
Gross added value in constant prices; energy consumption corrected according to the 'degree days method' in order to filter out the effect of temperature fluctuations.

Source: Health Care Administration, 2003; APS; NBB; RSZ, 2003; VITO.

The eco-efficiency of trade & services deteriorated in the period 1995-2001: in all subsectors – except for offices and administration – the energy consumption per activity unit was higher in 2001 than in 1995. However, an improvement is noticeable in most subsectors since 2000 or 2001. This also goes for the whole sector, although in 2001 still 5 % more energy per unit of gross added value was needed than in 1995. The hotels and restaurants subsector scored worst: their energy consumption rose by 62 % between 1995 and 2001, while the gross added value dropped by 5 %.

As regards offices and administration, the activity indicator rose (+23 %) more than the energy consumption (+22 %), which indicates a relative, though very limited, decoupling.

Internal environmental care: use of paper in the Ministry of the Flemish Community



TCF = totally chlorine free standard paper

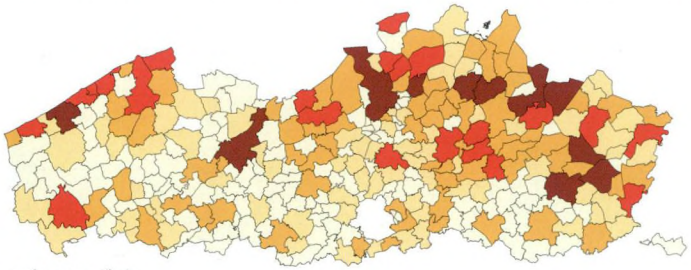
Source: AZF Department, Ministry of the Flemish Community.

Annually each employee makes an average of 9 300 copies (left) or approximately 44 copies per working day on photocopiers of the Ministry of the Flemish Community. Sensitizing actions have not yet resulted in a decrease in the number of copies. Moreover, *the purchase* of standard paper (right) - used in the photocopiers and in printers, as well as in the 4 copy centres – increased sharply. In 2001, almost 100 kg standard paper was purchased per employee, which is comparable to 20 000 A4 sheets. The number of prints rose sharply because of the massive installation of PCs and printers. While electronic communication is often seen as a means to save paper, it seems to have a reverse effect. Fortunately, there is a rise in the share of recycled paper.

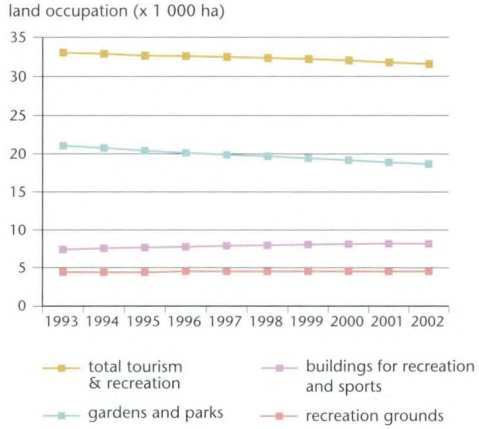
1.7 Tourism & recreation

Land use by tourism & recreation

Land use by recreation grounds and buildings for recreation and sports (2002)



Source: Tourism Flanders with reference to Land Register data.



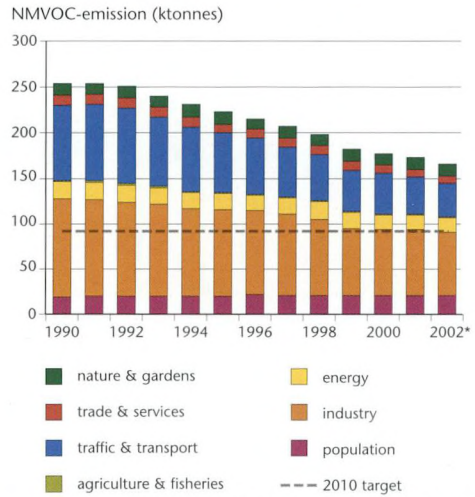
Source: NIS.

Space (preferably a lovely and green environment) is an important precondition for tourism & recreation. However, tourist activities compete with other applications such as living, nature, business, agriculture ... Tourism & recreation also causes pressure on the environment by treading and use of nature, consumption of energy and water, production of waste and waste water, nuisance, discharge of harmful substances by transport ...

Land use in Flanders by parks and gardens (with a relatively limited pressure on the environment) is falling, though land use by 'hard' tourist-recreational infrastructure (recreation grounds and buildings for recreation and sports) is on the increase. This infrastructure can cause fragmentation and disruption of natural habitats. In the major tourist areas such as the coast, the Kempen and the Art Cities, pressure on space availability by hard tourist-recreational infrastructure is higher, compared to other areas.

2.1 Dispersion of volatile organic compounds (VOC)

NMVOC emission in the air



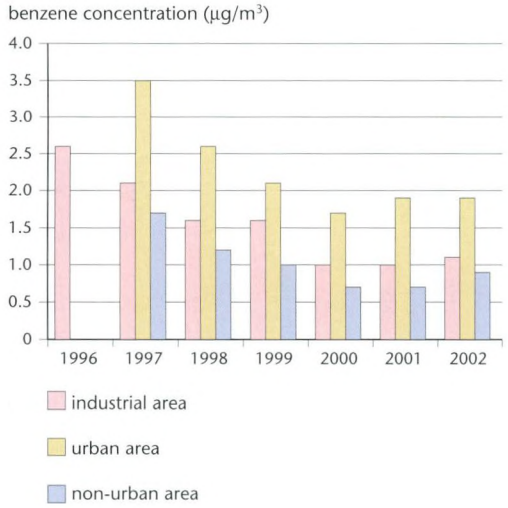
* preliminary figures; NMVOC = non-methane volatile organic compounds

Source: VMM.

The NMVOC-emission for Flanders was 36 % lower in 2002 than in 1990, mainly due to the efforts by industry and traffic & transport. The emissions were re-calculated with regard to previous years (e.g. adjustment of vehicle fleet data). Chemistry, metal processing and the graphics industry remain the major sources within the industry. These subsectors have already realized substantial emission reductions by implementing, inter alia, thermal or catalytic combustion, vapour recovery, water-based inks, less volatile solvents and closed systems. The emission drop in traffic & transport is the result of car standardization, regulations in respect of the volatility of petrol and benzene content and the vehicle fleet's changeover to diesel (diesel has a lower NMVOC content than petrol).

(tonnes)	population	industry	energy	traffic & transport	trade & services	nature & gardens
1990	19 197	109 290	19 127	81 879	11 352	13 108
1995	20 251	96 205	18 051	65 344	8 864	14 440
2002*	20 570	70 150	15 615	36 728	7 627	12 893

Benzene concentration in the ambient air



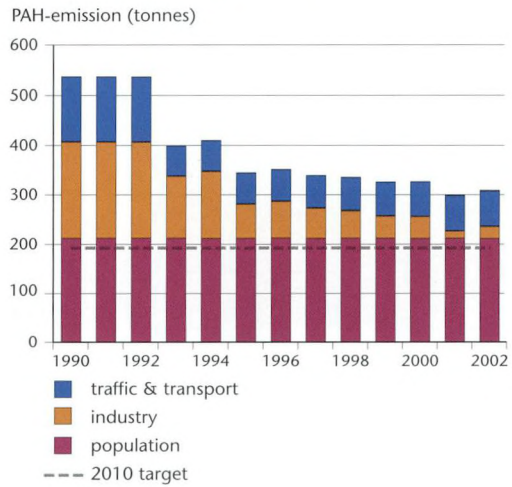
Source: VMM.

The average benzene concentration in the ambient air (at 8 measuring points) decreased by a factor of 2 between 1996 and 2002 and amounted to 1.1 µg/m³ in 2002. This is markedly below the target of 5 µg/m³ for 2010. Traffic & transport remains the chief source of benzene emission. Highly increased benzene concentrations are measured near busy roads, parking garages (magnitude: 100 µg/m³) and when filling up the car (magnitude: 1 000 µg/m³). Car drivers and passengers are exposed to benzene concentrations of a few dozen µg/m³.

People are also exposed to NMVOC when inside (residence, workplace). Concentrations inside seem to be double those in the open air. The main sources are the use of paints, glues and cleaning products, but also building materials, office materials and smoking. Concentrations measured in inner city residences were, on average, 2 to 4 times higher than those in residences outside the city.

2.2 Dispersion of products of incomplete combustion (PICs)

PAH emission in the air

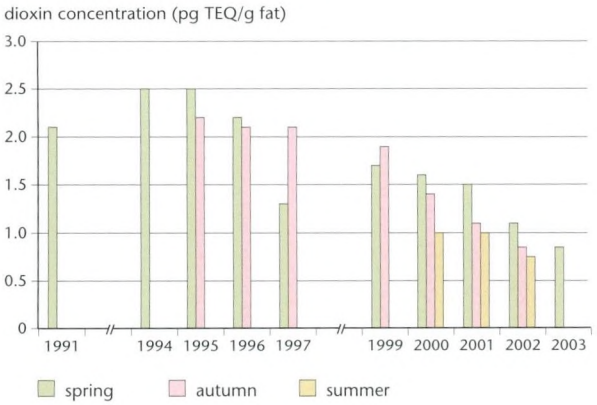


PAH: polyaromatic hydrocarbons
Source: VITO.

Since 1993, more than 50 % of the total PAH emissions have originated in the population sector as a result of heating buildings, particularly with coal and wood. This share even increased to 68.4 % in 2002. Significant contributions also originated from traffic & transport (22.6 %) and industry (7.9 %). In 2002 the wood and furniture sector had a total discharge of 18 945 kg or a share of 77 % of the total industrial discharge. However, this is a decrease of almost 50 % to 2000. The contribution of road buildings (still 35 % in 1990) has been negligible since 1995 due to the prohibition on the use of tarry asphalt and it dropped to 0 in 2002.

(tonnes)	population	industry	traffic & transport
1990	213	194	129
1994	213	135	61
2002	212	24	70

Dioxin concentration in cow's milk



Source: Ministry of Agriculture.

Dioxins in fat in cow's milk are a good indicator of local pollution. In Flanders, the average concentration in mixed samples has dropped from ± 2.5 pg TEQ/g fat in 1995 to less than 1 in 2002. This drop is a result of the decreased dioxin emission, particularly due to a drastic cleanup and use of clean technology when incinerating waste and in slag installations.

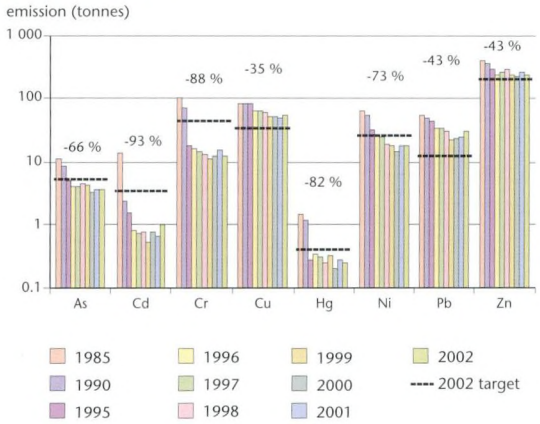
Since June 2002, the dioxin-like PCB content in the mixed milk is also determined. This analysis resulted in an average of 1.37 and 2.18 pg TEQ/g fat for the summer and winter of 2002 respectively, and 1.56 pg TEQ/g fat for the spring of 2003. These values must be added to the dioxin values before being tested in terms of standards. Since July 1st, 2002, the standard for dioxin content and dioxin-like PCBs is 3 pg TEQ/g fat. The mixed samples for 2002 and 2003 just do not exceed this limit value.

2.3 Dispersion of heavy metals

Emission of heavy metals into surface water

☺ As, Cd, Cr, Hg, Ni

☹ Cu, Pb, Zn



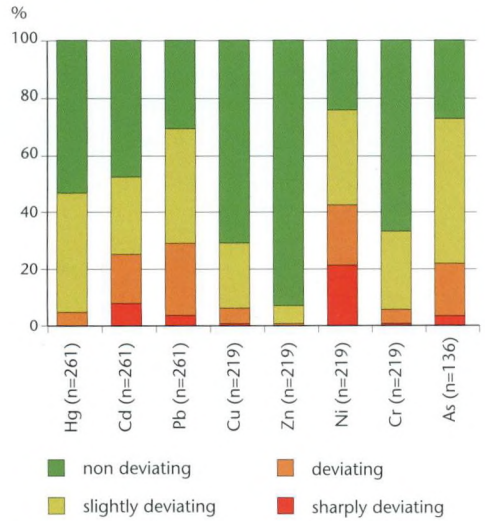
The discharges of all heavy metals in surface water were reduced sharply in the period 1985-2002, inter alia, because of improved processing techniques and more efficient waste water purification. Nevertheless, the Cu, Pb and Zn targets for 2002 were not achieved. As regards Cr and Cd, the 2010 target has already been satisfied.

The diffuse emissions make an important contribution to the total emission. As the purification of industrial and domestic waste water increases, the diffuse discharges increase their share. Relevant diffuse sources are, inter alia, soil erosion, wash-out and wash-away, deposition, chemical fertilizers, wood preserving agents and building material corrosion.

(kg)	As	Cd	Cr	Cu	Hg	Ni	Pb	Zn
1995	5 043	1 525	18 730	82 509	274	32 019	42 927	297 658
2000	3 299	774	11 949	52 029	204	14 630	23 546	236 315
2002	3 666	969	12 122	54 185	258	17 579	30 150	241 882

Source: MNZ, 1995; EPAS, 1995; Aquafin; VMM.

Bio-accumulation of heavy metals in eels in 1999-2002

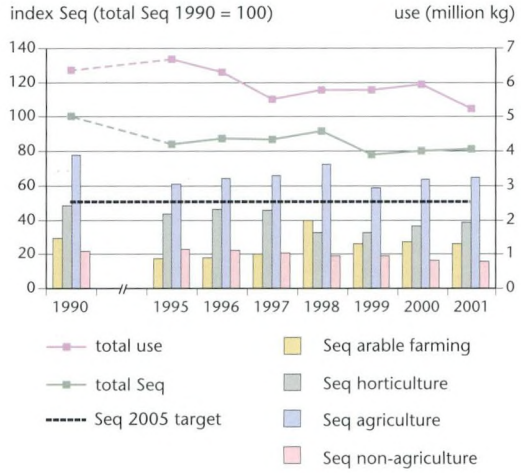


n = number of measuring points
Source: IBW.

Measurements of pollutants in eels' muscle tissue give an indication of the quality of the Flemish inland water. At present, the eel measuring network (IBW) consists of more than 300 measuring points spread across canals, rivers and streams, closed waters and polder watercourses. The results of the analysis are divided into quality classes in respect of the reference point for the various heavy metals. Measuring results that deviate sharply from the reference for Cd, Pb, As and Ni were found at various historically polluted sites (inter alia the Kempen canals). The consumption standards for Cd and Pb were exceeded only in the Beverlo canal.

2.4 Dispersion of pesticides

Pressure on aquatic life due to crop protection



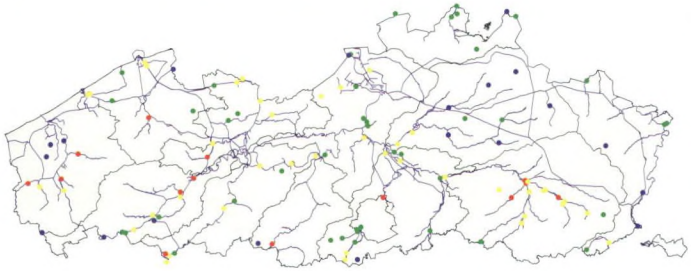
Source: Crop Protection Department, UGent.

Between 1990 and 2001, the use of crop protection agents decreased by 18 %. This conclusion was made based on sales figures inside and outside the agricultural sector. The use is weighed according to eco-toxicity and persistence in the environment because use in kg of active substances does not sufficiently represent the environmental risks. The pressure on the aquatic life, to be viewed as risk to aquatic life, is expressed as the sum of the dispersion equivalents (ΣSeq). The ΣSeq dropped by 19 % between 1990 and 2001, inter alia because of the decreasing use of the lindane insecticide and the herbicide paraquat. The target (50 % reduction of the ΣSeq in 2005 as compared to 1990) was not even half realised in 2001.

	1990	1995	2000	2001
use (10^6 kg active substance)	6.3	6.7	5.9	5.2
total ΣSeq	100	84	80	81
ΣSeq agriculture (arable farming and horticulture)	78	61	64	65
ΣSeq non-agriculture	22	23	17	16

Index with total ΣSeq 1990 = 100; ΣSeq = sum of the dispersion equivalents.

Pesticides in surface water in 2002



number of pesticides encountered

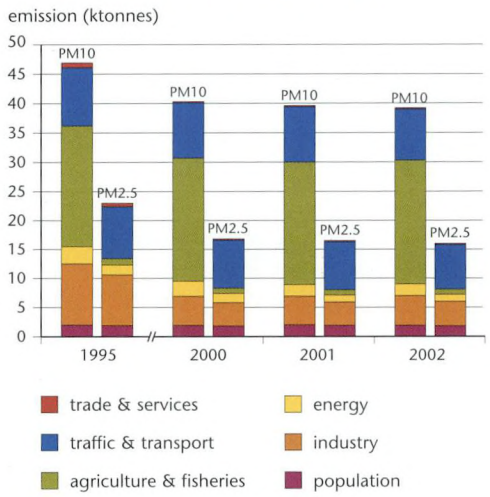
- 1 - 10
- 11 - 20
- 21 - 30
- 31 - 40

Source: VMM.

In 2002, VMM sampled the surface water in 134 locations. The package of measured pesticides consisted of 109 active substances, including a number of breakdown products. A large variety of pesticides was found, particularly in the Haspengouw fruit region and in the Yzer basin. Relatively many substances were also detected in the Leie basin. The herbicides diuron and glyphosate were found in more than 60 % of the measuring places. A general evaluation is not possible because no particular standards exist for these and many other substances. There is indeed an improvement to be seen in respect of the organochloro group of pesticides. In 2002, the standard was exceeded in only 13 % of measuring points as against a multiplicity in previous years.

2.5 Dispersion of particulate matter (PM)

Emission of PM10 and PM2.5

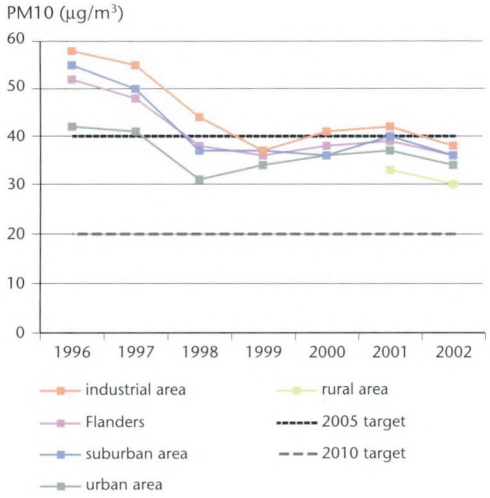


Source: VMM.

A new inventory of PM10 and PM2.5 emission was introduced in 2002. Bringing into account new sources and adjusting emission factors resulted in a rise of data previously published.

Since 1995, the PM10-emission dropped due to the use of new technology and the changeover to cleaner fuels. The sectors industry, energy and agriculture & fisheries experienced a slight rise in 2002. Agriculture & fisheries is the main source of PM10-emission, but this emission is uncertain. Moreover, this emission is presumably of less importance in health terms because it refers specifically to dust blown up by tilling agricultural lands. It seems that the exhaust emission of passenger traffic and freight transport causes 38.5 % of the PM2.5-emission.

Annual average PM10-concentration



Source: VMM.

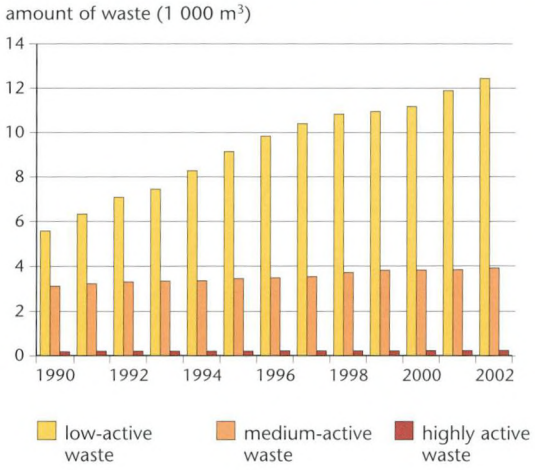
In 2002, the annual average PM10-concentration of industrial, suburban, urban and rural areas remained below 40 µg/m³ (target for 2005). However, excesses were still determined at 3 of the 16 measuring stations. Not a single measuring station reached the target for 2010.

PM10 and PM2.5 are regarded as some of the main air pollutants with adverse health effects. The *external health costs for PM10* are budgeted at 250 euro per person or about 1.5 billion euro for the whole of Flanders.

(µg/m³)	industrial	suburban	urban	rural	Flanders
1996	58	55	42	..	52
2002	38	36	34	30	36

Measuring results are higher than in previous editions due to adjustment to European method of reference.
.. = not available

Solid nuclear waste stored awaiting disposal

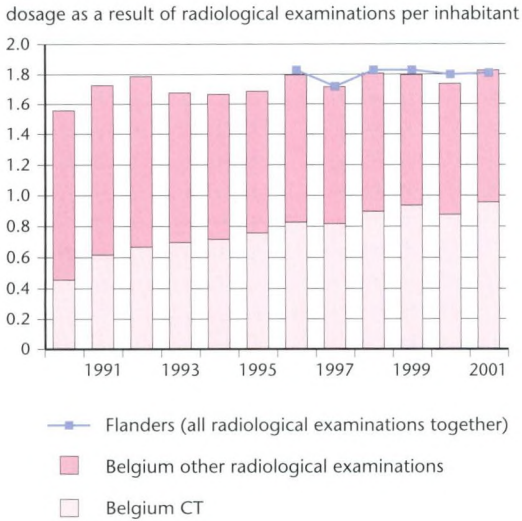


Source: NIRAS.

The amount of radioactive waste that is stored awaiting final disposal, increases annually. NIRAS estimates the waste volumes at 72 000 m³ low-active waste, 8 900 m³ medium-active waste and 2 100 to 5 000 m³ highly active waste by 2070. More than half of the low-active waste and a part of the medium-active waste will come from dismantling existing nuclear installations. The study to find suitable disposal methods is ongoing. At the end of 2002, it emerged that a few dozen drums with stored radioactive waste were defective (corroded or swollen). The drums came from the 1980s and they were to be dumped in the sea – which never happened. No radioactivity ended up in the environment, but new treatment and packaging of the waste in the drums are urgent because they do not satisfy present disposal acceptability criteria.

(m³)	low-active waste	medium-active waste	highly active waste
1990	5 565	3 124	173
2002	12 439	3 908	236

Medical exposure to ionising radiation



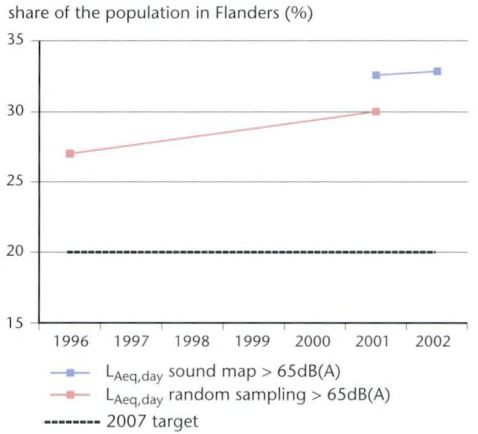
CT = Computed Tomography
Source: EHSAL based on RIZIV.

With the *radiological examinations* we see that the dosage due to the better performing but more charging CT examinations doubled in 11 years to approximately 1 mSv per annum. A decrease in conventional examinations partly compensates for the increase due to CT. In Flanders, the average exposure result from radiological examinations came to 1.81 mSv in 2001. From now on, radio-diagnostic apparatus will have to be provided with a system to determine the dosage sustained in order to be able to compile directive threshold values.

The average annual dosage resulting from *nuclear medicine* is estimated at 0.19 mSv per head of the inhabitants in Flanders. The sum of both brings the *average medical exposure* in Flanders to 2.0 mSv per annum. This is high, compared to other West European countries.

2.7 Noise

Percentage of the population exposed to road traffic noise exceeding 65 dB(A)



Source: measurements and sound map INTEC-UGent, traffic counts AWV.

The average sound level by road traffic, as measured at the house façade during the day, is stabilising, while the average traffic intensity is further increasing. This is the result of vehicles becoming more silent, decreased driving speed and improved road surface quality. However, traffic intensity growth is concentrated on busy locations where heavy traffic is concentrated too. As a result, the percentage of the population exposed to relatively high road traffic noise (> 65 dB(A)) does not drop. This applies both to calculations based on measurements ($L_{Aeq,day}$, random sampling) and to those based on traffic counts ($L_{Aeq,day}$, sound map). In order to reach the policy objective of the MINA-plan 3 (2003-2007) by 2007 (20 % of the population), measures for land use planning and to limit the use of vehicles and control traffic flows must be introduced.

? Monthly average of aeroplane-correlated nightly sound peaks exceeding 75 dB(A) in 2002

location	number/month
Tervuren*	3
Duisburg	4
Evere	5
Perk	12
Grimbergen	20
St. P.-Woluwe	43
Wemmel	80
Sterrebeek	109
Koningslo*	120
Grimbergen*	186
Nossegem	219
Kampenhout	241
N.O.-Heembeek	283
Veltem	291
Diegem	447
Kortenberg	500

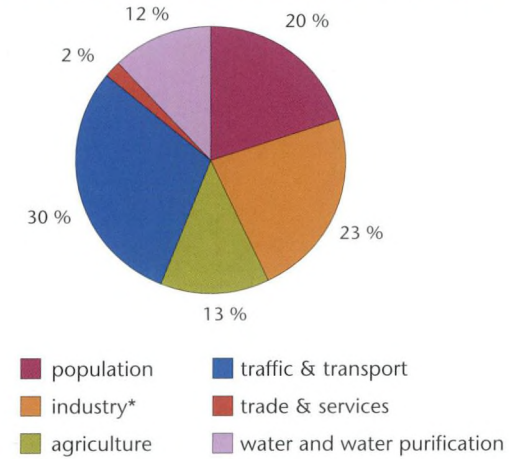
* average numer per month for the period November-December 2002

Source: ATF-KULeuven, BIAC, AMINAL.

There are indications that equivalent levels of sound pressure do not adequately represent the sound nuisance with respect to sleep disruption. In this case, the number and the intensity of the sound peaks are also important determining factors. The number of nightly aeroplane-correlated sound peaks exceeding 75 dB(A) around the Brussels National Airport differs sharply with reference to the measuring points and depends on the distance between the measuring point and the airport, as well as on the location of the flight routes. The uncertainty concerning the future policy on flight routes around the Brussels National Airport makes it, at this stage, impossible to further evaluate this indicator.

2.8 Odour annoyance

? Target groups as producers of severe to extreme odour annoyance in 2001



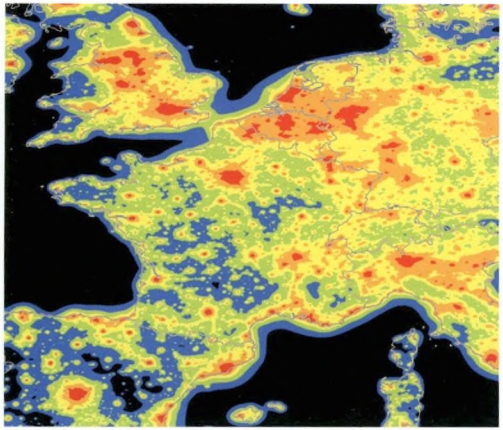
The most recent complete data on odour date back to the end of 2000 – beginning 2001. At that time a survey was conducted on behalf of AMINAL (Written Environmental Investigation) to examine to what extent the Flemish suffered annoyance due to odour. According to the response, 7 % suffered severe to extreme annoyance due to odour and 12 % suffered a certain extent of annoyance. Traffic & transport emerged as the greatest source of odour annoyance. Industry and the population were also indicated as significant sources. If only spontaneous complaints to the authorities are taken into account (records of 1997 and 2001), neighbours, agriculture and industry appear to be the main sources of odour annoyance.

* including activities forming part of waste collection and processing (trade & services in MIRA) and of the energy sector

Source: AMINAL.

2.9 Light pollution

Artificial sky luminance (sky glow) in 2000



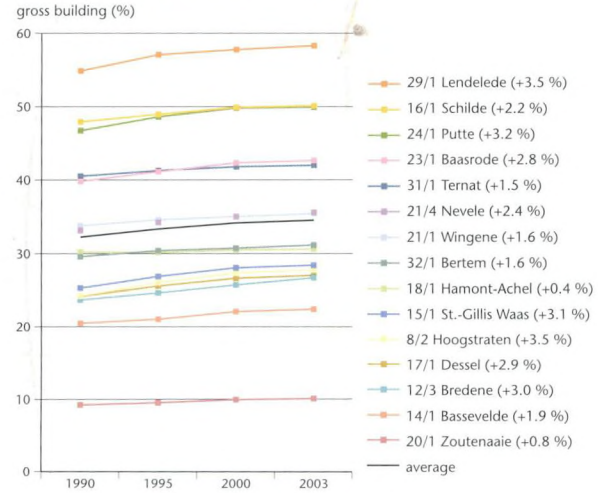
% of the natural sky luminance

< 11 %	33 % - 100 %	300 % - 900 %
11 % - 33 %	100 % - 300 %	> 900 %

Source: ISTIL, 2000.

Artificial light causes artificial sky luminance or sky glow and presents an image of the total light pollution. The relation between population density and light pollution is clearly visible. Accordingly, the artificial sky luminance is the highest in Flanders, the largest part of the Netherlands and the northwest of Germany. The lowest values occur in remote parts of France and Spain. According to the MINA-plan 3, by 2007 there may be no more regions in Flanders with a sky glow which is 9 times (> 900 %) higher than the natural sky luminance (between 00h30 and 05h00 at night).

Increase of the built-up area



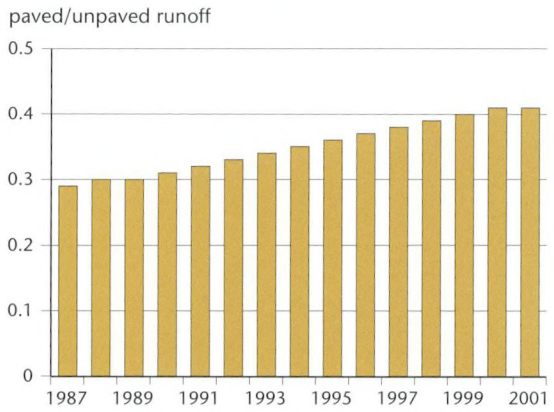
Source: NGI-orthophoto data analysed by the Laboratory for Forest, Nature and Landscape, KULeuven.

The main cause of fragmentation is the 'systematically irregular' presence of buildings: too many buildings, buildings spread out too much, ribbon building, etc. Moreover, an increase in building is still observed. The fragmentation of the open space causes various environmental problems such as more diffuse noise annoyance and air, water and soil pollution.

The analysis of the built-up area in 1990, 1995 and 2000 was done on the basis of digital ortho-photo series. In August 2003, the built-up area was registered in loco. 15 map pages of 80 km² each evenly spread across Flanders were analysed. Each map page name refers to a central place on the map. The building situation in 2003, shows that the map pages Lendelede, Schilde and Putte are significantly built-up (more than 50 % of the map page is built-up). Contrary to that, the map pages Zoutenaaie and Bassevelde show much open space (less than 25 % of the map page is built-up). The evolution of the built-up area for the period 1990-2003, constitutes a rise in building in respect of all map pages. Lendelede and Hoogstraten show the highest growth since 1990. The map pages with the lowest building growth are Zoutenaaie and Hamont-Achel.

2.11 Disturbance of the water balance

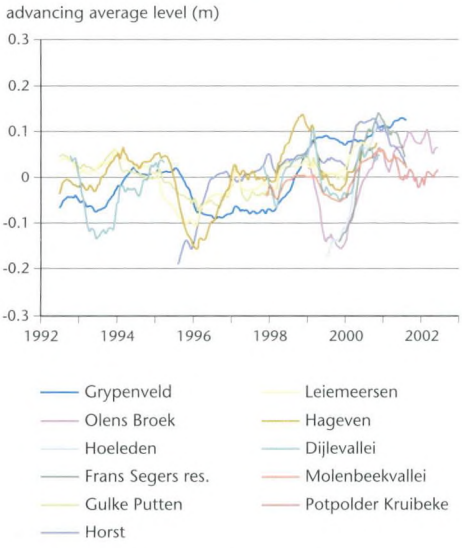
Runoff from paved and unpaved surfaces



Source: Water Department, AMINAL.

The increase of paved surfaces in Flanders causes both an increased runoff to the watercourses and a reduced infiltration to the soil. In addition to the total built-on surface in Flanders, the runoff from unpaved surfaces was taken into account. The total runoff (paved and unpaved) rose less than 4 % since 1987, whereas paved surfaces increased by 41 % relative to unpaved surfaces. This rise can significantly influence the occurrence of flooding.

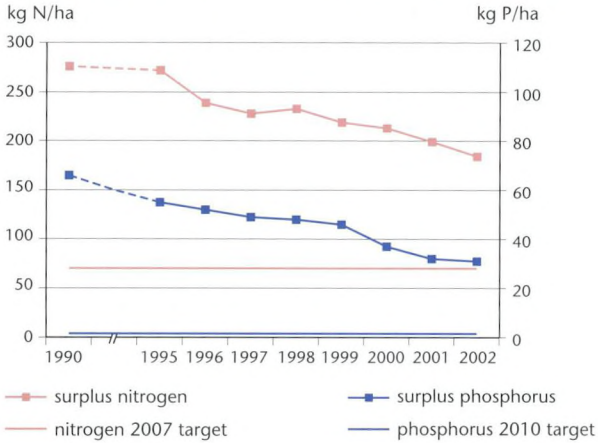
Shallow groundwater level in nature reserves



Source: Watina groundwater database, IN.

The shallow groundwater levels in 11 nature reserves show annual seasonal fluctuations. The levels dropped in all regions due to the extraordinarily dry period between July 1995 and July 1996. Since 1996, the level slowly rose and reached a maximum in 2001, a year with an extraordinarily high rainfall. The rising trend in groundwater levels in nature reserves is possibly the combined effect of a number of successive wet years and a change in the management of the nature reserves in favour of wet nature types. The smaller canals in many nature reserves are, for example, no longer maintained, resulting in a lower drainage.

Surplus on the soil surface balance of agriculture

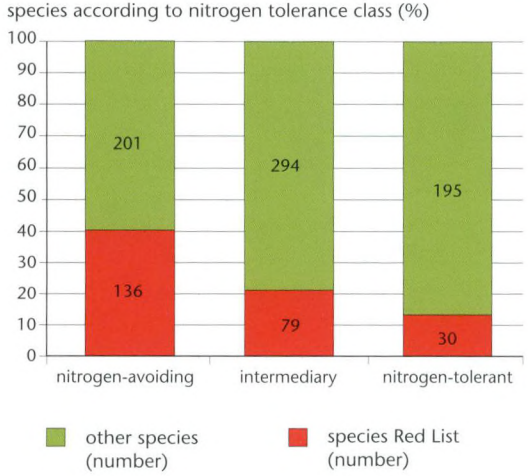


Source: CLE.

Agriculture's surplus on the soil surface balance is the difference between what ends up on the agricultural soil (manure, depositions) and the quantity that leaves the soil as harvestable product. This surplus eventually ends up in the air and the water or remains in the soil. In 2002, compared to 1990, the nitrogen surplus dropped by 33 % and phosphorus by 53 %. This marked drop was a specific result of reduced use of (chemical) fertilizer: -35 % in respect of nitrogen and -79 % in respect of phosphorus. In addition, the production of animal manure dropped because of shrinking livestock numbers and a lower nutritional content of the fodder. The 2007 nitrogen target is not in fact intended to avoid eutrophication, but as a general protection of drinking water collection.

	1990	1995	1997	1999	2000	2001	2002	*target*
surplus nitrogen (kg N/ha)	276	272	228	239	213	199	184	*70*
surplus phosphorus (kg P/ha)	66	55	49	52	37	32	31	*4*

Red List of higher plants classified according to nitrogen tolerance

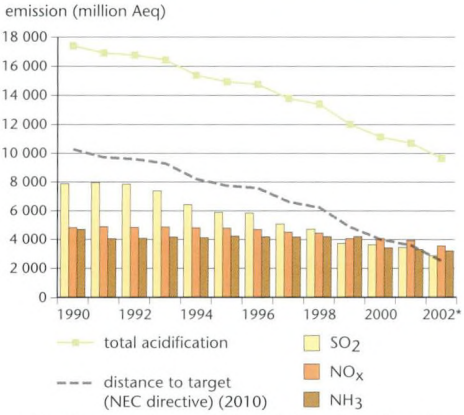


Source: NARA 2003.

The Red List of 'higher plants' indicates which plants are extinct, threatened with extinction, threatened or vulnerable. 40 % of the nitrogen-avoiding plants is on the Red List, while it is only 13 % of the nitrogen-tolerant species. Eutrophication is one of the factors causing this critical position. Not only oligotrophic ecosystems, but also eutrophic ecosystems suffer due to eutrophication, e.g. the Blankaart pond in West Flanders. In the polders, too, it is possible that the deterioration of water plants is due to eutrophication. Standards for manure application and atmospheric depositions take preconditions in respect of nature conservation into account to a limited extent, but this has not yet sufficiently resulted in the realization of a nature-oriented environmental quality. This quality is required to remove plants from the Red List.

2.13 Acidification

Potentially acidifying emission



* preliminary figures; NO_x emissions rising from the soil as a result of bacterial processes subsequent to the use of manure and chemical fertilizers are not taken into account when determining the NEC ceilings. This emission category was not taken into consideration when calculating the distance to target, but was taken into account in respect of the emission totals.

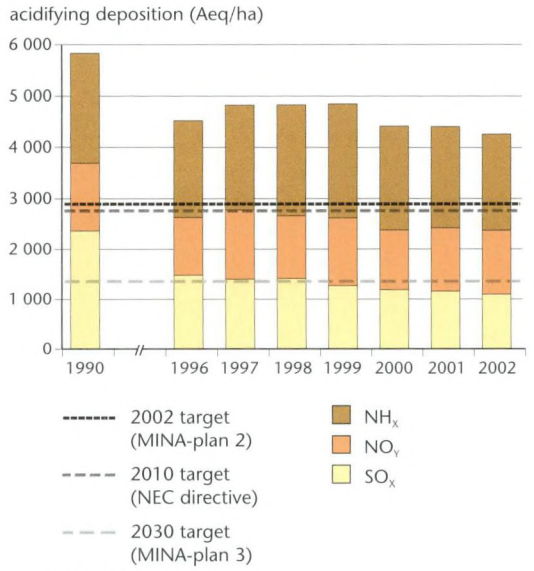
Source: VMM.

Flanders seems to be well on its way to reaching the 2010 target of the EU's National Emission Ceilings (NEC) directive due to the sharp drop in emissions between 1990 and 2002. Of the 60 % reduction that Flanders has to realize between 1990 and 2010, three-quarters was already realized by 2002. This is mainly thanks to the decrease of SO_2 emission due to the lower sulphur content of fuels. For the last couple of years the NO_x emission also shows a falling trend, particularly as a result of sharp emission reductions in the energy sector (-57 %) and traffic & transport (-25 %). The NH_3-emission has been falling since 2000 because of the decrease in livestock and the low emission application of manure. The NEC directive envisages an interim evaluation in 2004, with a possibility of adjusting the ceilings (making them stricter).

(million Aeq)	SO_2	NO_x	NH_3	*total*	distance to target
1990	7 881	4 827	4 699	*17 407*	10 283
2002*	2 880	3 564	3 215	*9 659*	2 582

Aeq = acid equivalents

Acidifying deposition



Source: VMM.

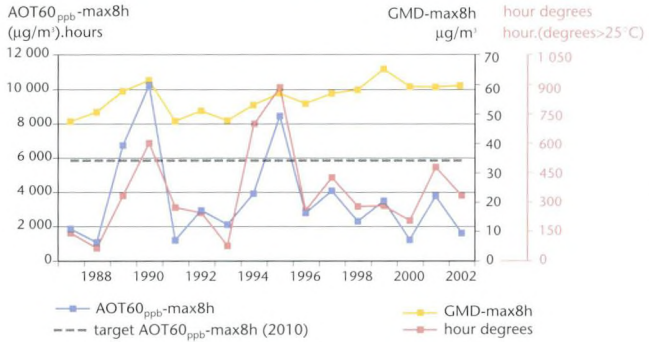
Between 1990 and 2002, the acidifying deposition in Flanders dropped by 27 %. This was not sufficient to reach the MINA-plan 2 target (2 900 Aeq/ha.a). Weather influences, transboundary emissions and emission reductions mainly in respect of high sources (chimneys) are responsible for the fall of depositions in Flanders being lower than that of its own emissions. In 2002, 77 %, 51 % and 52 % respectively of the forest, heathland and species rich grassland in Flanders was still exposed to depositions exceeding the applicable critical load (i.e. the maximum deposition allowed without damage occurring). Acidification therefore keeps on damaging our ecosystems. Therefore the general reduction of emission needs to be continued. It is only when the general deposition level is sufficiently low that a regional differentiated policy becomes cost-effective.

(Aeq/ha)	SO_x	NO_y	NH_x	*total*
1990	2 369	1 330	2 133	*5 832*
2002	1 096	1 278	1 882	*4 256*

Aeq = acid equivalents

2.14 Photochemical air pollution

Annual excess ($AOT60_{ppb}$-max8h) for health and annual average (GMD-max8h) of ozone

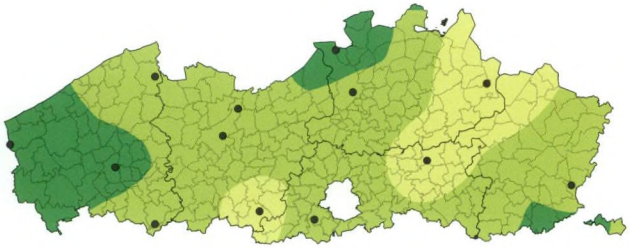


The outer scale on the right indicates – as characteristic of the summer's quality – the number of hour degrees with temperatures exceeding 25°C for every year (at Ukkel, Belgium according to KMI).

Source: Interregional databank air, IRCEL.

The annual ozone excess is the surplus above the European health threshold of 120 µg/m³ of the maximum daily 8-hour average, added together for all the days of the year ($AOT60_{ppb}$-max8h). The annual average of the daily maximum 8-hour averages (GMD-max8h) is also shown because harmful ozone effects may already occur below the threshold value. The development of the annual excess and the annual average are different. The *annual excess* fluctuates and follows the annual variation in sunshine and temperature. However, since 1994, the ozone peak values are lower than before for comparable hour degrees. Since 1996, the spatial averaged annual excess in Flanders has met the 2010 target. The summer's quality influences the *annual average* much less. This indicator is increasing, which indicates that the ozone concentrations increase during the year. Even in 2002, with very little peak excess, the background level rose.

Spatial distribution of the ozone excess for health in 2002



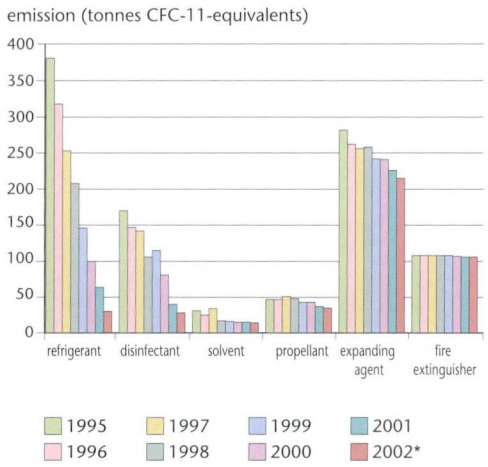
MTT: medium-term target

Source: Interregional databank air, IRCEL; VMM.

The map shows the distribution of ozone excess in respect of health across Flanders in 2002. The annual excess was small in 2002, never exceeding the MTT of 5 800 (µg/m³).hours. The smallest excess in Flanders amounted to 848 (µg/m³).hours, the biggest 2 664 (µg/m³).hours. In 2001, the MTT was still exceeded across 16 % of the surface area of Flanders. However, in 2002 the annual excess long-term target ($AOT60_{ppb}$-max8h = 0) was still exceeded all across Flanders. Even for a year with a relatively low ozone excess, the highest values were once again registered in the Kempen and in the north east of Flemish Brabant, due to the higher temperatures. The region around Geraardsbergen also became apparent in 2002.

2.15 Depletion of the ozone layer

Emission of ozone-depleting substances



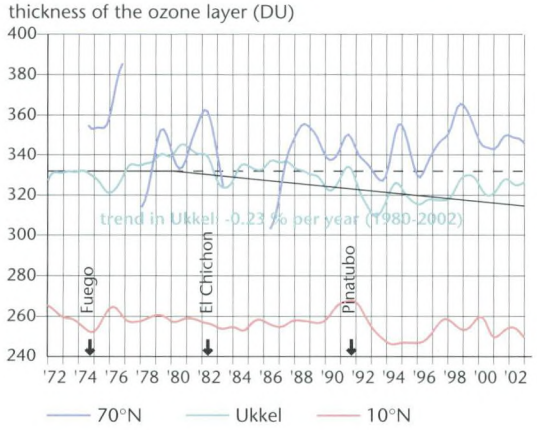
* preliminary figures based on extrapolations of the emission in previous years

Source: Econotec, 2002 revised by VITO and VMM.

With the Montreal protocol (1987) as impulse, measures were taken internationally to limit the use of ozone-depleting substances in order to protect the ozone layer, also in Flanders. In 2002, the total emission of 592 tonnes CFC-11-eq was lower than in 1995. The use and emission of ozone-depleting substances decreased sharply, particularly in the case of refrigerants and the disinfectants for soil and spaces. The target of the MINA-plan 3 (2003-2007) is to reduce the emission in Flanders by at least 70 % by 2007 as compared to 1999. In the coming 5 years, the emission must be reduced by 45 tonnes CFC-11-eq annually to reach the target. It is expected that this will work out.

(tonnes CFC-11-eq)	1995	1999	2001	2002*	*target 2007*
total emission	1 019	670	488	427	*201*

Thickness of the ozone layer above Ukkel (Belgium, 51° N), pole region (United States, 70° N) and the equator zone (India, 10° N)



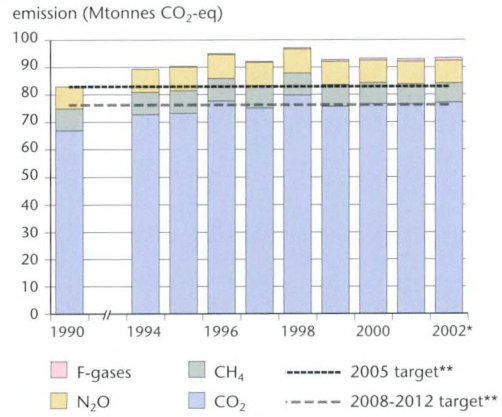
The unbroken black line represents the trend in Ukkel between 1980 and 2002. The broken line represents the level before 1980 (target). Little arrows indicate significant volcanic eruptions: Fuego in Guatamala, El Chichon in Mexico and the Pinatubo in the Philippines. DU = Dobson Units

Source: KMI, WOUDC.

Above Ukkel the ozone layer's thickness decreased by an average of 0.23 % per annum between 1980 and 2002. Keeping the sharp fluctuations in mind, it is still too early to interpret the increase of the past couple of years in Ukkel as a recovery. As can be seen in the graphic representation, besides human activities, the depletion of the ozone layer is enhanced by large volcanic eruptions. The ozone layer is thinner at the equator, but less subject to fluctuations; the layer is thicker at the poles, but more subject to variations and depletion. In 2003, the extent of the hole in the ozone at the South Pole was comparable to the record extent observed in 2000.

Presently, there is much uncertainty about the future development of the thickness of the ozone layer due to the possible link with climate change. There is a possibility that climate change may enhance the efficiency of the ozone-depleting substances.

Emission of greenhouse gases



* preliminary figures; ** for F-gases the reference year is 1995 instead of 1990. For the conversion of tonnages to CO_2-equivalents (CO_2-eq) the following GWP values were used: 1 for CO_2, 23 for CH_4, 296 for N_2O, 22 200 for SF_6 and 12 to 12 000 for the different HFCs. Insufficient data are available on the emission of PFCs in Flanders.

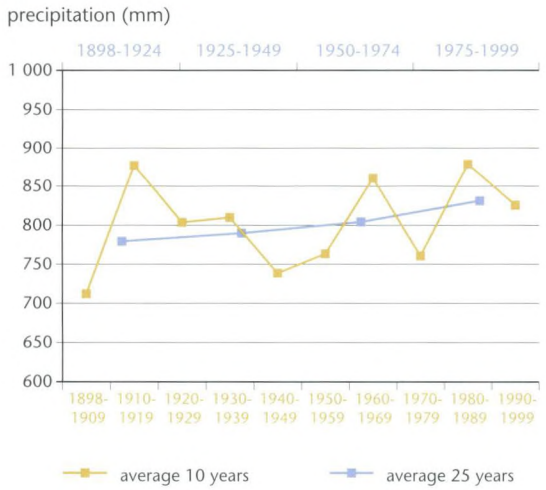
Source: VITO, VMM.

The rise of 12.7 % in greenhouse gas emission in Flanders between 1990 and 2002 is at odds with the Flemish commitment to stabilize the emission at the 1990 level in 2005. In order to be able to comply with this target, an annual drop of 3.4 Mtonnes, or 3.8 %, is necessary for the period 2003-2005. Should Flanders adopt the Belgian Kyoto target (-7.5 % in 2008-2012 as compared to 1990), it would require an annual decrease of 2.1 Mtonnes, or 2.4 %, of the emissions between 2003 and 2012. Seeing that greenhouse gas emissions linked with energy consumption represent 81.9 % of the total, a policy aimed at rational energy consumption (REC) is crucial to reach the set targets. The Belgian division of authority and the difficult cooperation between the regions and the federal authority are important obstacles in this regard.

(ktonnes CO_2-eq)	CO_2	CH_4	N_2O	F-gases	*total*
1990	66 929	7 974	7 982	..	*82 885*
1995	73 176	8 190	8 692	261	*90 319*
2002	77 103	7 004	8 281	1 021	*93 409*

.. = not available

Precipitation trends



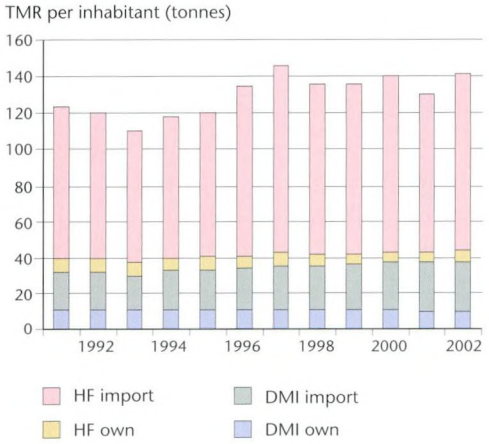
Source: AMINAL based on KMI-data.

Analysis of the 20th century's precipitation data show that the country's annual average precipitation is rising. If the data are divided into 25-year intervals, the rise between the first and the last interval amounts to 6.6 %. Considered in intervals of 10 years, the rise rather presents a wavy – but also rising – pattern. The annual average precipitation in the last decade was 16 % higher than in the first decade. On the other hand, the second decade of the relevant period is almost as wet as the penultimate decade.

Since the start of observations in Ukkel, 2001 and 2002 are absolute record years in precipitation of respectively 1 088.5 and 1 077.8 mm as compared to the normal 780.1 mm. The IPCC's (Intergovernmental Panel on Climate Change) model simulations indicate that precipitation will keep on rising in the 21st century and that the annual fluctuations will become sharper in many regions.

2.17 Use of raw materials

Total Material Requirement



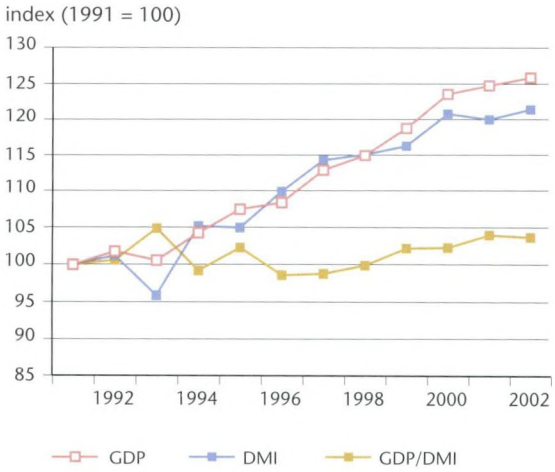
Total Material Requirement (TMR) = the quantity of primary raw materials, excluding water and air, which a region exploits in respect of its economic activities; DMI = Direct Material Input, HF = Hidden Flows

Source: calculations CDO, UGent.

The TMR increased from an average of 118 tonnes/inhabitant for the period 1991-1995 to an average of 138 tonnes/inhabitant for the period 1996-2002. One of the reasons for this increase is the rise in the import of diamonds. Because Flanders has few natural resources, only 14 % of the TMR in the period 1991-2002 came from own exploitation. In the same period only 27 % of the TMR was a direct input into the economy (DMI), the rest were hidden flows (HF). HF are raw materials not used, but still causing damage to the environment (e.g. agricultural erosion). There are significantly more HF connected to imported raw materials and goods (DMI import) than to own exploitation (DMI own).

(tonnes/inhabitant)	1991	2000	2001	2002
HF import	84	97	87	98
HF own	8	6	6	6
DMI import	21	26	27	27
DMI own	11	11	10	10
TMR	124	140	130	141

Direct Material Input in respect of the Flanders' GDP



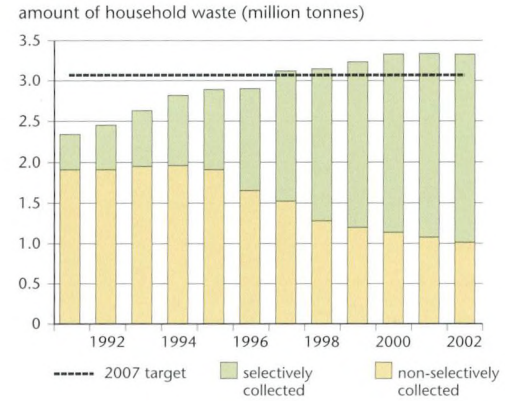
DMI = Direct Material Input, GDP = Gross Domestic Product in constant prices

Source: APS and calculations CDO, UGent.

One of the objectives of the EU strategy for sustainable development is the decoupling of economic growth and the use of natural resources, including primary raw materials. In 1992, 1995 and between 1997 and 2001, the input of primary raw materials into the economy (DMI) rose less rapidly than the GDP. During those years, the material productivity (GDP/DMI), that is the amount of economic prosperity realised with one unit of primary raw material, rose by 0.1 to 3.1 %. However, in 2002 the DMI once again rose more rapidly than the GDP. In order to realize a radical, permanent decoupling it is necessary to introduce an integrated raw material policy that employs a complete range of mutually supporting judicial (inter alia, product standardization), economic and social instruments.

2.18 Waste management

Amount of household waste collected:
😐 total
🙂 going to final disposal

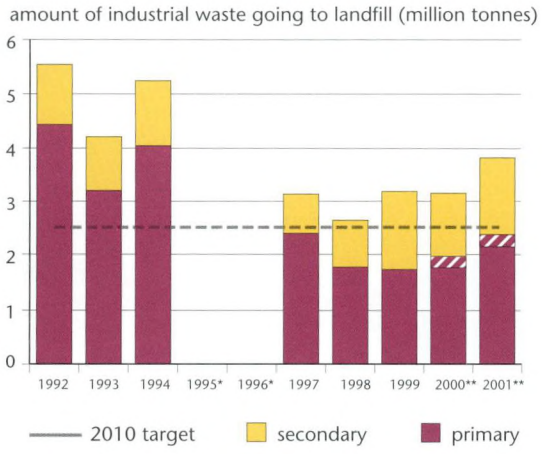


Waste going to final disposal = non-selectively collected waste
Source: OVAM.

In 2002 the household waste mountain stopped growing for the first time since 1991: 7 ktonnes (3 kg/inhabitant) less was collected than in 2001 (😐). This may indicate that the prevention policy is succeeding. A few examples of preventive actions are the introduction of differentiated tariffs whereby payment is made per volume or weight of waste presented; the support of outlets for reusable items and municipal prevention projects, as well as sensitizing campaigns, inter alia, about home composting. Just as the previous years, the amount of non-selectively collected waste also dropped: in 2002 169 kg/inhabitant non-selective waste was collected (2007 target: maximum 150 kg/inhabitant) (🙂).

(ktonnes)	1991	1995	2000	2001	2002	*target 2007*
selectively collected waste	429	979	2 194	2 260	2 316	
non-selectively collected waste	1 912	1 911	1 138	1 078	1 014	
total waste	2 341	2 890	3 332	3 338	3 331	*3 059*

Amount of industrial waste going to landfill



* no data available, ** additional subsectors brought into account (shaded block); primary waste comes into being at the moment when a product becomes waste for the first time, viz. with the first producer; secondary waste is the waste from the waste processing companies.

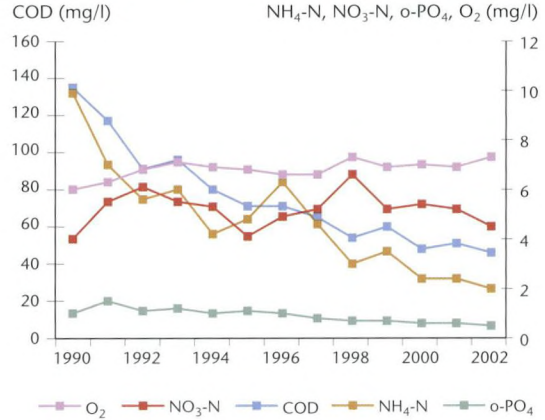
Source: OVAM.

The amount of industrial waste going to landfill decreased sharply between 1994 and 1997. The discontinuation of coal mining and of the production of gypsum, two activities that generated typical waste-flows to be landfilled, partly explains this fall. The amount of industrial waste going to landfill remained quite constant between 1997 and 2000, but in 2001, there was an increase of 21 % as compared to the previous year. In addition, increasingly more waste was landfilled (13 % of the industrial waste) than incinerated (5 %), inter alia, because landfilling of industrial waste is still cheaper than incineration. In order to reach the 2010 target, the levies, amongst others, are being adjusted: in the beginning of 2003, the levy for landfilling and incinerating recycling residues was increased.

(ktonnes)	1992	1997	2000	2001	*target 2010*
primary waste	4 426	2 398	1 972	2 373	
secondary waste	1 121	737	1 181	1 451	
total waste	5 547	3 135	3 153	3 824	*2 523*

2.19 Surface water quality

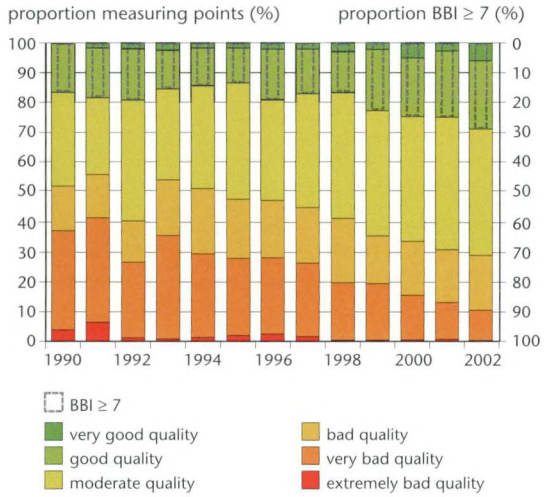
Average concentration NH_4-N, NO_3-N, o-PO_4, COD and O_2



COD = chemical oxygen demand
Source: VMM.

The oxygen condition of surface waters (O_2, COD) is improving and nutrient concentrations (except for NO_3-N) are falling. Several industrial sectors made a big effort to reduce their waste water loads, and the expansion of waste water treatment plants led to the reduction of waste water loading by households. However, many measuring points do not yet satisfy the basic quality standards and only about ten measuring points have a good physicochemical condition concerning all parameters. Industrial companies should be further disconnected from the sewage network and discharge permits should be adjusted to ecological standards. The additional connection of households to waste water treatment plants should also further decrease waste water loads. The nitrate concentration remains a sticking point, for which mainly agriculture will have to find a solution.

Belgian Biotic Index (BBI)

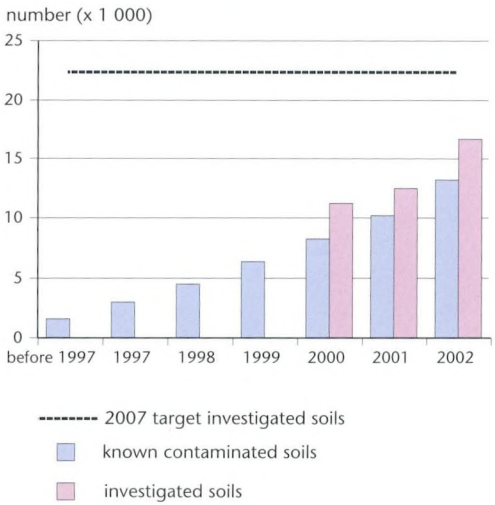


BBI ≥ 7: basic quality standard
Source: VMM.

The proportion of measuring points with extremely bad to very bad biological quality (BBI) is falling sharply and the proportion of measuring points with good to very good BBI is increasing (30 % in 2002). However, according to the VLAREM standards, all measuring points must have a BBI of at least 7. In addition, the *standstill-principle* (no deterioration of the present situation) is often not applicable. There is still much to be done to arrive at a good ecological situation in all watercourses by 2015 (European Water Framework Directive). Not only must the physicochemical quality of the water be improved, but the quality of the sediment and the natural morphology of the watercourses must also be restored.

2.20a Soil quality: pollution

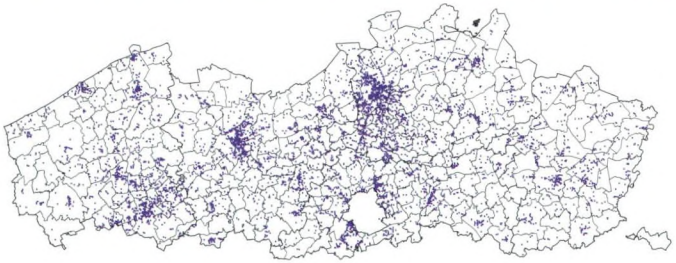
Change of known number of contaminated soils



Source: OVAM.

A soil on which an economic risk activity is or was practised, is classified as a risk ground. The number of risk grounds is estimated at 76 200. An orientating soil investigation of these soils must reveal whether they are contaminated or not. By the end of 2002 OVAM investigated 16 688 soils, of which 13 305 (80 %) were contaminated. Contaminated soils are registered in OVAM's contaminated soils register. They are no longer multifunctional but they do not necessarily need to be cleaned up. The necessity to clean up depends on how serious the contamination is, the characteristics and functions of the soil and the period during which the contamination occurred (i.e. new or historic soil contamination). A precondition of the MINA-plan 3 (2003-2007) is the investigation of 30 % of the total number of estimated risk grounds (22 500 sites) by 2007. This seems a realistic target.

? Known number of soils contaminated with mineral oil in 2002

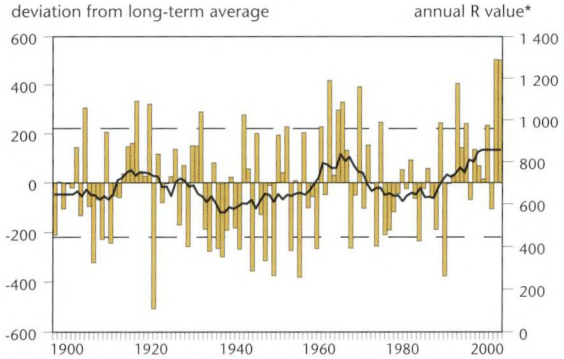


Source: OVAM.

In 2002 there were 6 266 soils in Flanders known to be contaminated with mineral oil. This is one of the commonest contaminating substances. Most of the contamination is the result of pollutants present in liquid fuels such as petrol, diesel, domestic fuel oil, kerosene ... The contamination is encountered both in industry and trade & services (storage places for fuel, service stations, companies that use those products as fuel or raw material) and in households through the use of fuel oil.

2.20b Soil quality: erosion

Precipitation erosivity



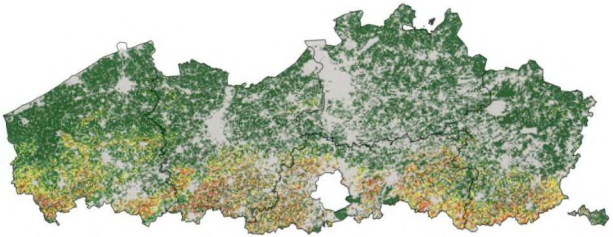
* R = average annual precipitation erosivity (MJ.mm/ha.h). There is a linear relationship between this value and the erosion risk. The black curve represents the 5-year sliding average of both the annual precipitation erosivity and the deviation from the average for the period 1898-2002 = 689 MJ.mm/ha.h. The broken lines represent the standard deviation from the long-term average.

Source: KMI and Laboratory for Experimental Geography, KULeuven.

Soil erosion by water mainly occurs during and following immediately upon intense rain showers. In this regard, both intensity and amount are determining. The more intense showers occur annually, the more volume of soil will be eroded annually. Climate changes can cause a higher frequency of such highly intense showers, with an increased risk of erosion as a result.

The annual precipitation erosivity shows a cyclical pattern of periods of 10-20 years with a lower precipitation erosivity average alternated with periods of a higher precipitation erosivity average. The last decade was characterised by higher precipitation erosivity values: 8 out of the last 10 years are characterized by values above the long-term average. Moreover, the two highest values since 1898 occurred in 2001 and 2002.

Soil erosion in Flanders in 2002



Source: Laboratory for Experimental Geography, KULeuven.

Soil erosion by water is the result of 4 main factors: rainfall, geographic relief, kind of soil and vegetation. In 2002, the total loss of soil due to water erosion amounted to 1.97 million tonnes. The geographical relief and the kind of soil are the main factors that determine the spatial pattern of this soil loss in Flanders. In the south of Flanders, the slope is relatively high with loam and sand loam soil, which is very sensitive to soil erosion. In the north, the slope is low with less erosion-sensitive sand soils. As a result, the annual loss of soil in the Polders, the Flemish sand region and the Kempen is very low (average < 0.5 tonnes per hectare per annum). The highest erosion values occur in the Weide region, the Loam region and the Sand loam region (average > 1.5 tonnes per hectare per annum).

Population exposed to average B-field of 0.4 µT in 2002

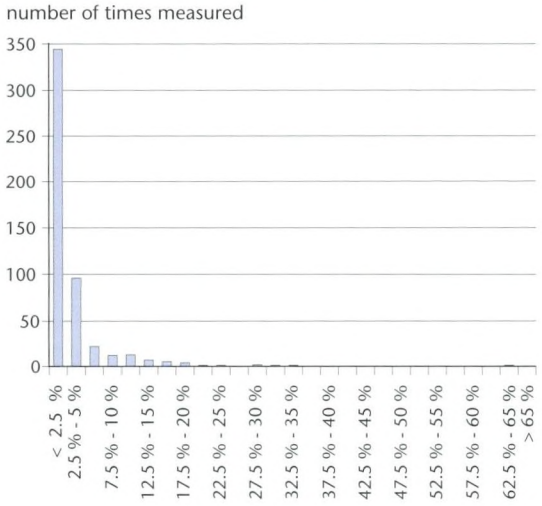
Distance (m) from the power lines on which 0.4 µT B-field is found at various performance capacities of the various types of air lines in Flanders.

(m) performance capacity	power line type 70 kV	150 kV	380 kV
25 %	9	15	33
50 %	18	30	66
75 %	27	43	98
100 %	36	58	130

Source: VITO.

The transport of electricity causes magnetic fields or B-fields. Epidemiological studies describe a slightly increased risk (relative risk = 2, as compared to the relative risk of lung cancer with smokers, which is at estimated 15) of children's leukaemia upon exposure to an average B-field of 0.4 µT. However, there is no proof that there is a connection between cause and effect. According to modelling results in Flanders, one can find an average B-field value of 0.4 µT between 9 and 130 m of power lines, depending on the type of cable and the performance capacity. According to this data, 1.4 % of the inhabitants of Flanders is exposed to an average B-field of 0.4 µT at maximum performance capacity of the power lines. Power lines have a performance of between 75 % and 100 % for only (4.5 ±3.5) % of the time. For Flanders, this can be converted to 1 additional case of children's leukaemia every two years.

Electrical field surrounding mobile phone masts in 1998-2003

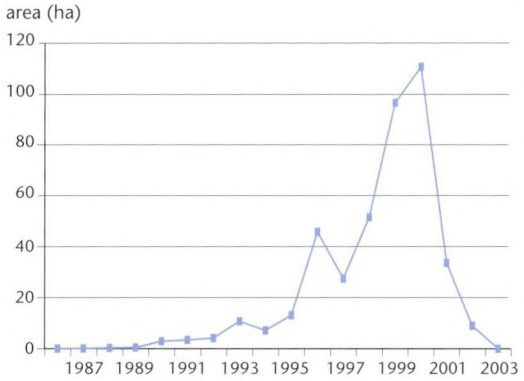


relationship between the measured E-field and the Belgian benchmark (%)

Source: UGent.

The electrical field or E-field radiated by mobile phone masts is subject to a Belgian standard (RD April 29th, 2001). This standard is twice as strict as the directive proposed by the ICNIRP (International Commission on Non-Ionising Radiation Protection) in 1998. During the period 1998-2003, measurements were conducted in 510 accessible places with maximum fields. 85 % of the measurements were 20 times below the Belgian standard. This is a worst-case scenario for Flanders. In addition to mobile phone masts, there are a number of other sources of radio frequency radiation such as TV masts and amateur radio. One must also consider these when compiling a complete exposure map.

? Area field experiments with transgenic crops in Belgium

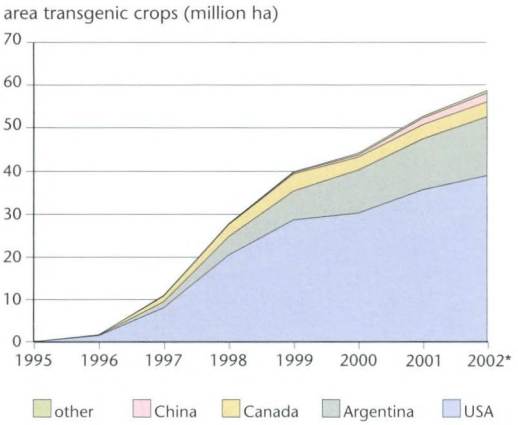


Source: Bio Safety and Bio Technology Section, WIV.

There is a prohibition on carrying out field experiments with transgenic crops in Belgium without a permit in advance. In addition to commercial biotechnology companies, universities are also initiators of field experiments. The area field experiments reached a peak in 2000. There were no more field experiments in 2003, mainly because the commercial biotechnology companies proposed no more experiments. After all, there has been a moratorium on the commercializing of transgenic crops in the European Union (EU) since 1998. No transgenic crops were cultivated for commercial purposes in Belgium until 2003. However, food in Belgium may contain ingredients of transgenic crops from outside the EU.

	1986	1990	1995	1998	2000	2001	2002	2003
(ha)	0.02	2.88	13.09	51.48	110.73	33.54	8.94	0

? Area transgenic crops worldwide



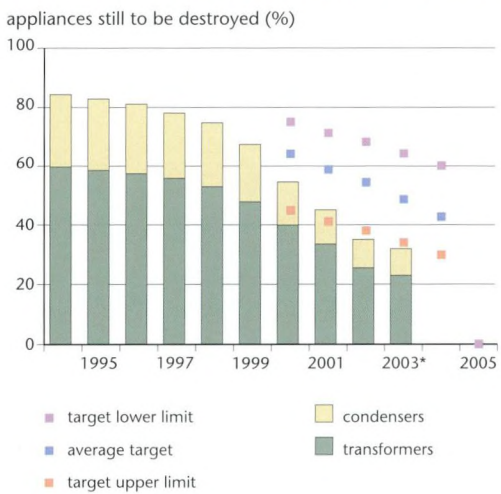
* prognosis
Source: ISAAA.

Since its commercial introduction in 1996, the cultivation of transgenic crops in the world has increased annually. In 2002, the world surface area under transgenic crops was estimated at 58.7 million hectares. The number of countries cultivating transgenic crops rose parallel to the acreage (6 in 1996 to 16 countries in 2002). Officially, four countries were responsible for 99 % of the acreage of transgenic crops: USA, Argentina, Canada and China. Despite the official ban, a large amount of 'illegal' soya is cultivated in Brazil, which is not shown in this figure. Spain is the only EU member state in which transgenic maize was cultivated in 2003.

(million ha)	1996	1998	2000	2001	2002*
United States	1.5	20.5	30.3	35.7	39
Argentina	0.1	4.3	10	11.8	13.5
Canada	0.1	2.8	3	3.2	3.5
China	0	0.1	0.5	1.5	2.1
other	0	0.1	0.4	0.4	0.6

2.23 Dispersion of PCBs

PCB-containing appliances still to be destroyed



* still to be destroyed on August 1st, 2003

Source: OVAM.

In 2000, OVAM started with a removal plan for the gradual destruction (based on year of manufacture) of PCB-containing appliances that contain more than 1 litre of liquid with more than 0.05 % PCBs by 2005.

On August 1st, 2003, there were still 4 884 transformers, 1 932 condensers and 39 other PCB-containing appliances in Flanders. Together, this represents 32 % of the original number (i.e. still present and already destroyed) appliances. The estimate is that the remaining appliances contain 4 500 tonnes PCB-containing liquids in total. Contrary to earlier data, it seems that the destruction has already surpassed the targets for the past number of years. That is due to the revision of the figures because of the continuous addition to the register and the late reports of appliances already destroyed. As a result, the total destruction of all PCB-containing appliances by 2005 seems a realistic target.

PCB concentration in food

foodstuff	year	PCBs measured in X/Y samples	average (ng/g fat)	maximum (ng/g fat)
fish	2000	16/16	307.8	709
cheese	2001	11/11	15.4	19
aquaculture	2002	25/27	4.7	19
consumer eggs	2002	50/261	2.4	64
raw milk	2002	40/173	1.5	44
beef	2002	21/305	1.7	103
poultry	2001	1/302	0.2	27

The Belgian Food Agency (FAVV) merely provides these data and expresses no opinion in this regard.

Source: FAVV.

The FAVV has measured the PCB concentration in foodstuffs since 2000. Of the 4 063 measurements (from 2000 up to and including 2002), only two samples (one of beef and one of fish oil supplement) exceeded the PCB standard. However, PCBs were measured in (almost) all samples of cheese, aquaculture (mussels and oysters) and fish (both sea and freshwater fish). PCBs were also measured in horse, sheep, ostrich, game, egg products, fish oil supplements and milk fats. Since PCB content is expressed per g fat, the fat content of each foodstuff contributes to the effective human PCB absorption. In addition, there are a large number of foodstuffs in which no PCBs are detected: inter alia, cooking and frying fat, animal fat, deep-frying fat, consumer milk and rabbit. The FAVV results are comparable to those in other European countries.

2.24 Dispersion of brominated flame retardants

Use of brominated flame retardants

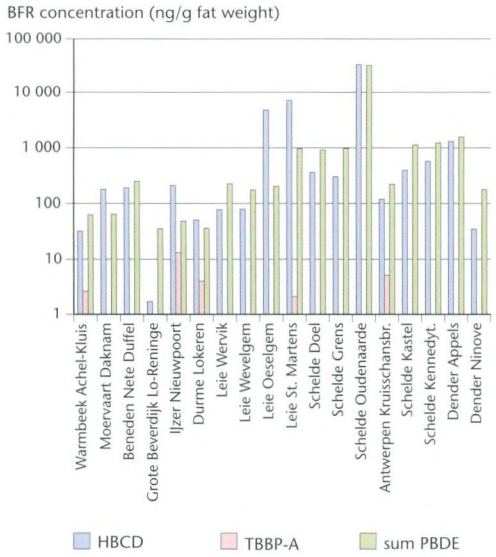
Brominated flame retardants are chemical substances that are added to plastic for use in computers, TVs, textiles and insulation material to reduce the plastic's inflammability. Absorption of these substances by man and animal can have all kinds of health effects (e.g. hormonal disturbances). Man comes into contact with these products via foodstuffs, but also by exposure to electronics and textile in the home and workplace.

Recent research abroad (Sweden) showed brominated flame retardants in the blood of office workers, cleaning staff in hospitals and labourers of an electronics dismantling company. The presence of brominated flame retardants in biota of the Arctic Sea and in the air of remote places indicates that these substances travel far. Recently, a number of flame retardants were also found in snow and fish in the Austrian Alpine regions. Its presence in sludge of waste water treatment plants indicates that these substances also come from households, traffic or other diffuse sources.

Studies illustrate increased concentrations of brominated flame retardants in the environment since the seventies. In the period 1981-2000, the presence of these substances in the eggs of the herring gull on the Canadian lakes doubled every 3 to 5 years. The concentration in mother's milk in Sweden shows an exponential rise from 1972 to about 1998 (a doubling every five years). The most recent data indicates stabilization, and even a drop. In Flanders, too, analyses of river sediments and eels from surface water indicate the presence of brominated flame retardants in sharply varying concentrations.

On European level, much attention is given to the regulation of the use of brominated flame retardants. A number of EU directives will restrain the production of these substances and their use in new electric and electronic material.

Concentration of brominated flame retardants in eels in surface water



Source: IBW, RIVO.

In 2000, brominated flame retardants (HBCD, TBBP-A and PBDE) were measured in eels at 18 Flemish measuring points. The concentration of HBCD in eels varies significantly and fluctuates from < 1.7 to 33 000 µg/kg fat weight, depending on the measuring point. The highest HBCD concentrations were encountered in the river Scheldt at Oudenaarde, the Leie at St.-Martens-Leerne and Oeselgem and the Dender at Appels (1 300 µg/kg). The PBDE contents also differed sharply. Low concentrations were measured in the IJzer basin, the Warmbeek, the Durme and the Moervaart, moderate concentrations in the old Leiearmen, the Dender, the Nete and the Leie upstream from Kortrijk. High values were encountered in the Leie and the Scheldt, which may be connected to the textile industries in the regions around Kortrijk and Ghent. The measured concentrations of TBBP-A are mostly low.

3.1 Impact on human health

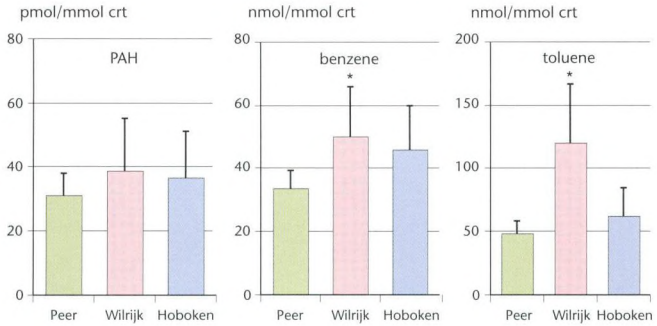
? Disability Adjusted Life Years (DALYs) in 2002

	Disability Adjusted Life Years (DALYs) number	%
total PM10	21 663	67 %
total ozone	727	2 %
total sound	6 531	20 %
total carcinogenic substances (excluding PM10)	1 947	6%
total Pb	1 588	5 %
total	*32 455*	*100 %*
DALYs / inhabitant / year	*0.005*	
DALYs / inhabitant / 70 years	*0.38*	

Source: VITO.

The DALYs indicator is used to make an estimate of the importance of environmental factors on health. The number of DALYs is a measure of the number of healthy years of life that a population loses due to illness or premature death. According to the data for Flanders, the effects caused by PM10 dominate. All things being equal in the future (same environmental pressure and demography for 70 years) the burden of illness on a single human life is 0.38 DALYs per person. Consequently, an inhabitant of Flanders, on average, loses approximately half a disability adjusted life year due to this set of environmental pollutants.

? Biomonitoring of genotoxic substances

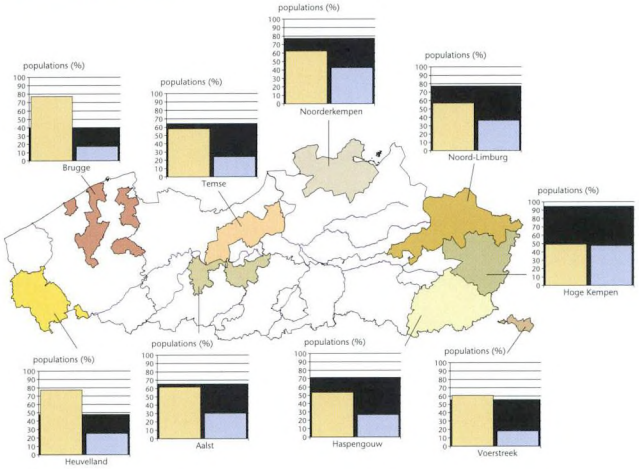


* significantly higher than other regions; crt: creatinine
Source: KULeuven.

An integrated image of exposure and individual damage can be obtained by measuring the dosage of pollutants and early reversible effects in humans (biomonitoring). In 1999, a pilot study 'Environment and Health' was conducted by order of the Flemish administration to examine the feasibility of a biomonitoring programme. As a result, measurements were taken from adolescents in Peer, Wilrijk and Hoboken for, inter alia, exposure to PAH, benzene and toluene (figure) and premature health effects such as chromosomal aberrations and chromatid breaks. Significant differences were found between the different regions, as well as relationships between exposure and effect. It emerged from the pilot study that it is possible to indicate significant differences in the adolescents. In 2001, the centre for Environment & Health was established, within which a biomonitoring programme was started. The first results are expected by 2005.

More information on nature in Flanders is available in the Nature Report 2003 (www.nara.be) of the Flemish Institute for Nature Conservation (IN).

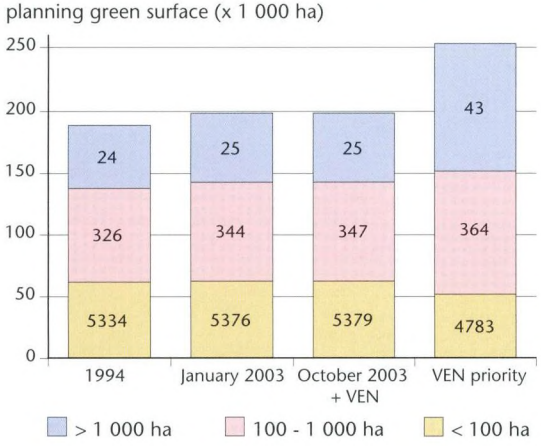
Amphibians



Source: NARA 2003.

The condition of amphibians in Flanders is deteriorating. At present amphibians are found in far fewer places than 10 to 30 years ago (black bar). The loss is greatest in West and East Flanders. In almost all regions, there were more locations of 10 to 30 years ago that were abandoned (yellow bar) than there were new-found locations (blue bar). The deterioration of the amphibians can be explained by the disappearance of their habitat (pools) and the disturbance of their environment. Since 1999, there is a possibility to subsidize the management of existing pools and the construction of new pools via management agreements with the Flemish government. The first results of this new policy are already apparent. Accordingly, in Limburg it appears that, in 2001, one or more species of amphibians already inhabited 95 % of the pools created in 2000.

Flemish Ecological Network (VEN)



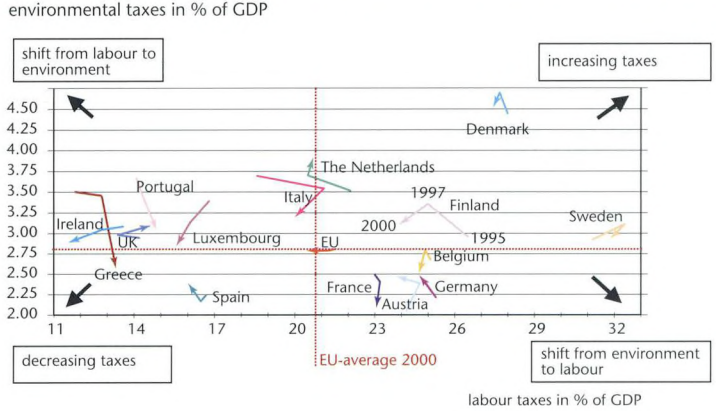
The number of green areas per surface category are noted in the segments. Zoning changes with respect to particular Building Plans and municipal and provincial Spatial Execution Plans are not included.

Source: NARA 2003.

Fragmented nature is much more sensitive to disturbance and causes the isolation of populations. As a result, fauna and flora become extinct. VEN, in combination with IVON (Integral Interrelating and Supporting Network), has the objective of bringing about large nature units in Flanders and preventing fragmentation. In October 2003, 85 000 ha of VEN was approved within the existing green planning area. However, this has not brought about defragmentation (second and third bars are almost equal). The defragmentation depends on the VEN's remaining 40 000 ha, which must still be designated to connect the existing nature areas. For this purpose, another 38 000 ha extra green area will have to be designated in the priority VEN (fourth bar).

3.3 Impact on economy

Shift from labour taxes to environmental taxes between 1995 and 2000



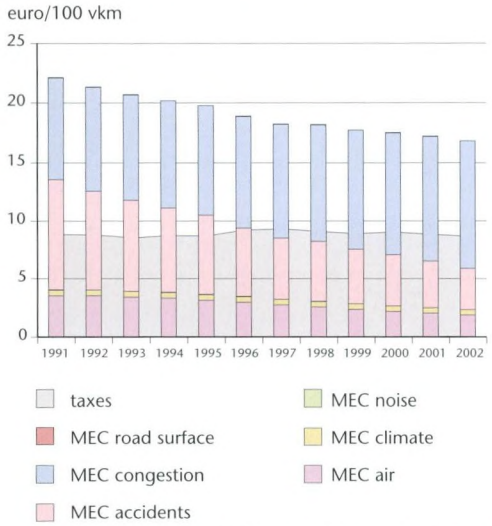
Sequence years according to direction of arrow; see Finland as example. Environmental taxes are taxes of which the tax base has a proven, negative impact on the environment (including energy and transport taxes).

Source: Eurostat, 2002, 2003; NBB.

For the various European Union member states, the revenue from environmentally related taxes (vertical axis) and from taxes and social contributions on labour (horizontal axis) can be expressed as a percentage of their Gross Domestic Product (GDP). The graph shows the large differences in the tax structures of the member states. However, in all member states labour is much higher taxed than environmentally harmful activities. In the EU labour taxes are seven times higher than environmental taxes, in Belgium even ten times.

The evolution of the tax structure also differs between the member states. In some countries – including Belgium – we perceive a decrease in both taxes between 1995 and 2000. In other countries, such as the Netherlands and Germany, a shift occurred from labour taxes to environmental taxes.

Internalisation of the external costs of road traffic



Road traffic in Flanders causes a number of unwanted side effects (*externalities*) such as air pollution and congestion. *'Internalisation of external costs'* means that the external costs (damage connected to these side effects) are charged to those who cause it. In this regard, the taxes on road traffic must be equal to the marginal external costs. However, in Flanders the marginal external costs – average for all road traffic – are twice as high as the taxes. The external costs are indeed more internalised than previously, mainly thanks to the decrease in the external costs for air pollution and accidents. Congestion costs clearly is the most important damage category. Because external costs of road traffic vary sharply according to time (rush hour, off-peak), place (urban, rural) and type of vehicle, taxes should vary as well. This is not the case in Flanders.

Marginal external costs (MEC) = external costs caused by an additional vehicle kilometre driven (vkm). MEC noise and MEC road surface damage are – on average across Flanders – negligible and not noticeable in the figure.

Source: Transport & Mobility Leuven , 2003; MEC climate and MEC air come from VITO.

Colophon

MIRA-T 2003 *in pocket-size* is published by the Flemish Environment Agency (VMM), Monitoring Network and Research Department (AMO) and was developed by the MIRA project team based upon the MIRA-T 2003 theme report.

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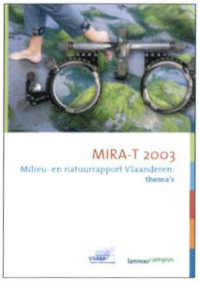

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The theme report MIRA-T 2003 is also available on www.milieurapport.be. Here you will also find MIRA's other products, such as the first policy evaluation report MIRA-PE 2003 (see below), the **background documents** (for each chapter of the theme report), the **Key Data on Environment** (extensive schedules with environmental figures) and the **research reports** on certain particular subjects.

Evaluation of the environmental policy in MIRA-PE

The VMM published the first environmental policy evaluation report, MIRA-PE 2003, in 2003. This policy evaluation report, MIRA-PE, together with the annual theme report, MIRA-T, and the five-yearly scenario report MIRA-S, provide the required scientific basis for the Flemish environmental policy.

In MIRA-PE 2003, four demarcated parts of the important policy areas Water and Waste are analysed and evaluated. This is preceded by an introductory chapter, with an introduction to policy evaluation concepts, as well as possible methods. The following four **chapters** are:

- Granting environmental permits in waste water dossiers
- Municipalities and the extension of the waste water treatment infrastructure
- Environmental policy agreements as implementation of the acceptance duty
- Implementation of the Plan Domestic Waste 1997-2001

MIRA-PE 2003 and the extended **research reports** on each chapter are available on www.milieurapport.be.

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The first introductory chapter and the summary are also available in English.

The **Flemish Environment Agency (VMM)** is a government institution, responsible for water and air issues and co-ordinating the Environment and Nature Report Flanders (MIRA). VMM monitors the water and air quality in Flanders, publishes reports on it and proposes policy measures to achieve the required water and air quality. VMM also imposes water pollution and water abstraction levy. The more people pollute or consume water, the more they have to pay. The VMM encourages citizens towards environmentally friendly behaviour via information, sensitization and environmental education projects.

VMM
Vlaamse Milieumaatschappij

The task of the **Report on the Environment and Nature in Flanders (MIRA)** is threefold:

- a description, analysis and evaluation of the current state of the environment;
- an evaluation of the environmental policy conducted up to that point in time;
- a description of the developments expected in the environment in case of unchanged as well as amended policy in terms of a number of scenarios that are thought to be relevant.

The state of the environment is presented in the annual MIRA-T reports. The first scenario report (MIRA-S) was published in 2000. The first policy evaluation report (MIRA-PE) was published in June 2003. MIRA takes the responsibility for the scientific basis of the environmental policy planning in Flanders. The most recent environmental policy plan MINA-plan 3 sets out a course for the environmental policy in Flanders for the period 2003-2007.

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