Environmental Outlook for Wallonia

2008

RÉGION WALLONNE

Service Public de Wallonie
Direction générale opérationnelle Agriculture, Ressources naturelles et Environnement

EOW 2008 – **Source :** ESRIDATA (produced by CEEW)

PRODUCTION TEAM

General coordination

Catherine HALLET (Dr.) (in charge of the framework convention at DGARNE) (until 30/04/08)
Vincent BRAHY (Dr.), assisted by François GOOR (Dr.)

Scientific team

Vincent BRAHY (Dr.)
François GOOR (Dr.)
Emmanuel MAES (Dr.)
Catherine HALLET (Dr.)
Marie-Céline GODIN (Lic.) (until 30/06/08)
Joël DOZZI (Lic.) (until 31/05/08)
Isabelle CALLENS (Dr.) (until 31/03/08)
in collaboration with Stéphanie LANGE (Lic.),
Vincent GUISSARD (Ir.), Atheyatte BELLAYACHI (Lic.),
Isabelle BUCCELLA (Ing.), Violaine THIRY (Lic.)
Edwin ZACCAI (Prof.) (in charge of the framework convention at ULB-IGEAT-CEDD)

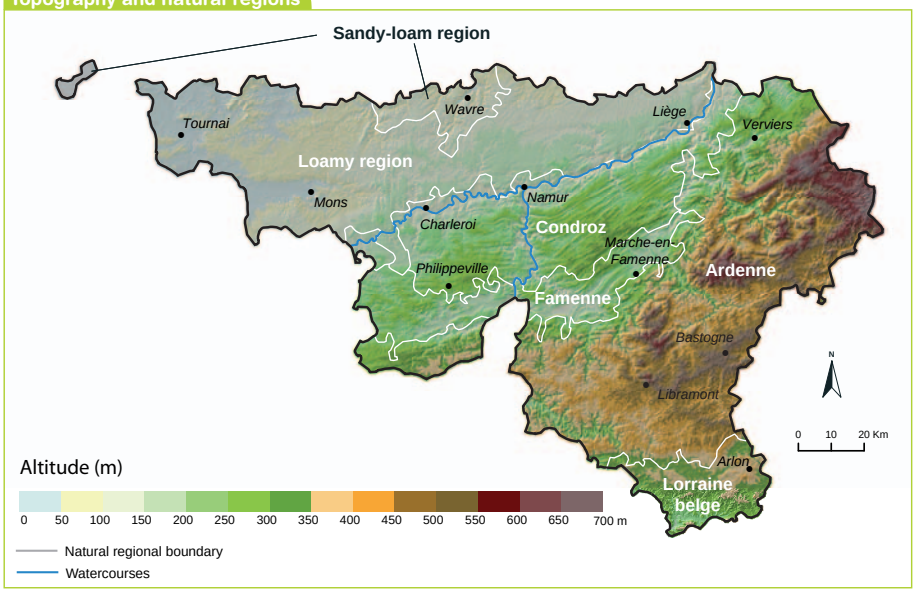
IT team

Vincent GUISSARD (Ir.)
Christophe BOULANGER (Grad.)

Administration

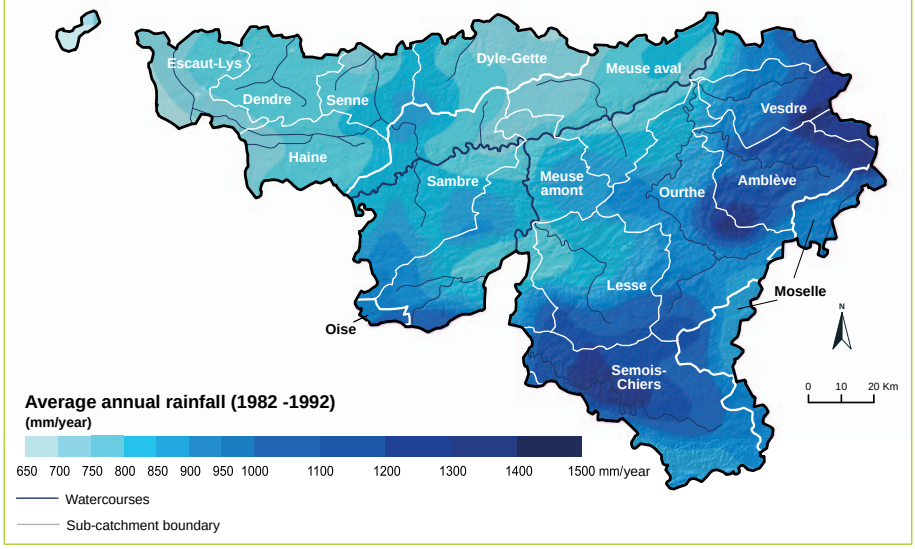
Céline CURVERS
Brigitte DOYEN

Topography and natural regions



EOW 2008 – **Sources :** NASA (SRTM) ; SPW - DGO3 - DNF (produced by CEEW)

Rainfall and hydrography



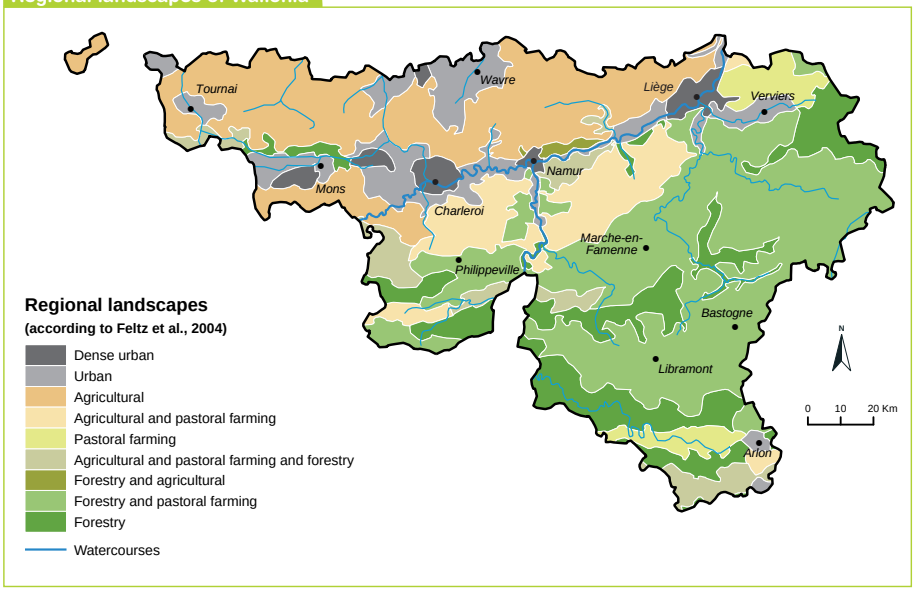
EOW 2008 – **Sources :** IRM ; SPW - DGO3 (produced by CEEW)

→ **The subsoil** in Wallonia is made up of sedimentary rocks (sandstone, shale, limestone, etc.) which mainly come to the surface in the south of the Sambre-and-Meuse river line. In the north, more recent marine sediments frequently appear in the form of loose rocks. Most of these are covered with a layer of Quaternary silt, which gets thinner as you move from north to south. This silt, whether or not it is combined with the underlying substrate, constitutes the parent material from which many soils are formed.

→ **The climate** is typically maritime and temperate (average annual temperature of 9.7°C and average annual rainfall of 805 mm). Climatic conditions vary according to altitude, and the Ardennes region is characterised by a rather colder, more humid climate. Rainfall is generally distributed fairly consistently throughout the year.

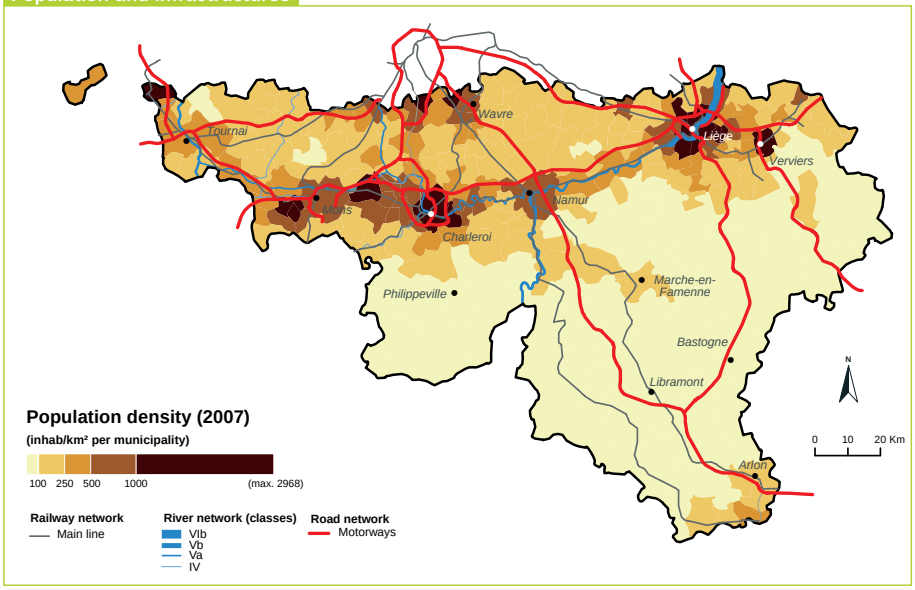
→ **The landscape** of Wallonia is inherited from its rural society. There are agricultural regions in Hesbaye, Condroz and on the Brabant and Hainaut plateau. Forestry and pastoral farming are more common in the regions of Famenne and Ardennes.

Regional landscapes of Wallonia



EOW 2008 – **Source :** CPDT (produced by CEEW)

Population and infrastructures



EOW 2008 – **Sources :** SPF ; SPW - DGO1 ; SNCB (produced by CEEW)

→ **Human activities** and the development of industry in particular (metal, steel, chemicals, etc.), combined with an increasing demand for coal and transport infrastructures for goods, have resulted in a concentration of industrial activities and populations in areas where the density of waterway networks and the richness of the subsoil have permitted it (the Sambre-and-Meuse river line). With the dawn of the post-industrial society, and the development of mobility, came a rise in the urbanisation of the region, including in traditionally rural regions.

Foreword

The 2008 edition of the Environmental Outlook for Wallonia brings together more than 140 updated key indicators which give us a better understanding of the current environmental status of Wallonia, and help us draw up a targeted action plan. This Outlook is also a great tool for helping people understand and learn more about the environment.

Over the past few months, I have been taking various measures to improve the living environment of our citizens: a new forestry code, the implementation of the Plan Air Climat *and of the action plans for pollution peaks, a decree relating to environmental offences, set-up of the* Unité de Répression des Pollutions*, an end to dumping household waste in landfills, LIFE-nature projects, support for family farms, to name but a few.*

There are several new features in this progress report. The indicators are presented in standardised datasheets, which makes them easier to read, and highlights the most important points.

Some themes have been analysed in more detail, such as the links between the environment and health, and sustainable consumption.

These changes illustrate the new direction that I wanted the progress report and reports on the state of our environment to take. My aim was to offer readers broad analyses, which focus more on sustainable development, to develop tools for evaluating the policies that we adopt, in particular by using eco-efficiency indicators.

This forward-thinking, comparative dimension is the result of all of the hard work of a multi-disciplinary team, along with external experts. For which we would like to thank them profusely.

We hope that this new progress report lives up to the expectations of citizens, the community, society, businesses, and political decision-makers.

A sound basis for some sound policies.

Benoît LUTGEN
Walloon Minister of Agriculture, Rural Affairs, Environment and Tourism

Contents

Introduction

Every year, the Environmental Outlook for Wallonia (EOW) provides an update on Wallonia's environmental situation, based on a collection of environmental, social, health and other indicators which may be able to shed some light on the pressure put on the different elements of the environment (air, water, soils, fauna, flora, natural habitats, etc.) and their impact. By looking at the responses that have already been implemented, it also is a valuable part of an evaluation of environmental policies.

The 2008 edition of the EOW follows on from the publication of the *Rapport analytique sur l'état de l'environnement wallon 2006-2007*, which provides a more comprehensive and details analysis of environmental issues. This detailed report is produced every five years.

A valuable tool to help safeguard the environment in the long term

It has been a requirement, by decree, since 12th February 1987 that there is an annual report on the state of the environment in Wallonia. This obligation has been a part of the environmental planning process since the decree of 21st April 1994, and is detailed book one of the Environment Code (decree of 27th May 2004).

The reports on the state of the environment in Wallonia are subject to discussion. The Walloon government has given the *Conseil wallon de l'environnement pour le développement durable (CWEDD)* the task of organising a consultation process for *Conseils consultatifs* and a round-table discussion with the *Conseil économique et social de la Région wallonne* (CESRW). The CWEDD then draws up a summary of the results of this consultation, as well as a forward-looking memo containing suggestions for protecting and safeguarding the environment. These ideas are then passed on to the Parliament of Wallonia, which will come to a decision in the form of a resolution. The reports on the state of the environment in Wallonia are thus part of an ongoing improvement process based on information and consultation.

An Outlook based on indicators

An indicator is a concise, practical and visual way of presenting a collection of data. It makes complex phenomena easier to understand, highlights the factors at stake and, where appropriate, provides a useful decision-making tool. This approach does mean that the indicators sometimes only provide one aspect of the phenomena in question which may hide some local or occasional dimensions.

Most of the indicators provided in the EOW 2008 incorporate a very large amount of information. This is the latest data available at the time the documents are written, in this case, September 2008. In some cases, there is a gap of a year or two between this date and the time that the data was actually produced because of the time needed to collect, process and validate some kinds of information. This is particularly the case for data taken from surveys, models or tax forms and/or returns.

The quality of the information provided by the indicators is always dependent on the quality of the data which was used to calculate it. Extra effort is made every year by data managers with a view to improve the comprehensiveness, the validity and the reliability of the information used to put together the EOW indicators.

A new approach to "Production and consumption"

The *Rapport analytique sur l'état de l'environnement wallon 2006-2007* resulted in a review of the structure of past publications (EOW 2003, 2004 and 2005). The analysis of the activities of different sectors (households, agriculture, business, transport, leisure and tourism) and the use of resources (water, subsoil, forests, materials and energy) have been put before that looking at the state of the different components of the environment (air, water, soils, fauna, flora and habitats). This approach, based on a preliminary, detailed analysis of the socio-economic context, and the pressure put on the environment, is closer to the DPSIR approach (Driving forces - Pressures - State - Impacts - Responses).

In the EOW 2008, this structure has been further developed, with the indicators relating to consumption and production methods being given their own section. The approaches developed have helped to highlight the changes in levels of consumption, as well as progress in terms of eco-efficiency, which constitute the key elements of the European sustainable development strategy.

The "Production and consumption" section is preceded by a section concentrating on land use, which provides both a geographical framework for the analysis, and a physical aid to understanding the different components of the environment and human activities.

Focusing on management indicators

Some indicators relate to the managerial steps taken or supported by the government. We thought that it would be useful to highlight them in this 2008 edition, to provide a clearer, yet not exhaustive, overview, of the measures currently in place to reduce the impact of human activities on the environment. These measures may be legal (an obligation to collect certain categories of waste, for example), economic (grants for planting hedges, for example), or technical (water treatment, for example). They may be preventative (agro-environmental, for example), or curative (treating polluted areas, for example). The EOW 2008 also includes management indicators relating to the control of some activities, and preventative actions, two themes which have not been addressed in previous publications.

Getting the most out of EOW 2008

The EOW is intended for everyone: decision-makers, those working with the environment, businesses, teachers, researchers and members of the public. While it presents technical information, it is also accompanied by explanations which anyone can understand.

The indicators in the EOW 2008 are presented in the form of datasheets (1 page per datasheet). Each datasheet deals with a specific environmental issue, based on facts (in figures, where possible) that are analysed in terms of trends, explanatory factors and responses. The template is the same for all datasheets, with some distinguishing features in some cases:

- a "management indicator" tab (at the bottom) identifies the datasheets which deal with environmental management measures;
- a grey background marks "Lighting datasheets", which present the results of more localised studies (which do not cover the whole of Wallonia), or more occasional (not updated annually).

The datasheets are divided into 6 main sections (Land use, Production and consumption, State of environmental components, Environmental -health relationships, Environmental breaches and controls, International framework), which in turn cover different themes, indicated by a line of colour and an illustration. Each part begins and ends with an introduction and a conclusion which are intended to summarise the environmental issues for now and the future. Some key references relating to the physical and human context of Wallonia are also provided in the Background Information section.

Find out more about the EOW 2008 online

The three previous editions of the EOW (2003, 2004, 2005), the *Rapport analytique sur l'état de l'environnement wallon 2006-2007* and the EOW 2008 (available in French and English) can be viewed online at: **http://environnement.wallonie.be/eew**

As well as providing an electronic version of the reports, the website also offers a range of further information, including: the source data which was used to put together the indicators, the methods used, maps and diagrams that you can download, themed reports on various environmental issues, an environmental assessment of businesses and access to environmental information for every municipality in Wallonia.

The translation in English of the Tableau de bord de l'environnement wallon 2008 *(original version in French) was performed in collaboration with Right Ink SPRL (www.right-ink.com). In case of any difference (text or illustrations) between the English and French versions, the original document (in French) remains the only reference.*

→ **PART** [1]

Land use

introduction

Changes in land use have been occurring over long periods of time, and mainly depend on structural (demographics, industrialisation, economics, etc.) and behavioural (individual choices, lifestyles, changes in people's outlook, etc.) developments. Since the post-war period, towns and transport networks have been evolving constantly, and often dramatically. According to the European Environment Agency, the area of built-on land per inhabitant has more than doubled in the last fifty years, most often to the detriment of agricultural land.

With 204 inhab/km² (or 2 inhab/ha), the Walloon Region is one of the most densely populated areas in Europe. Nearly 14 % of the land is built on: houses and other buildings, sites of economic activity, infrastructures, public facilities, etc. In terms of the environment, urbanisation exerts different pressures on natural, agricultural and forest resources: an almost irreversible mobilisation of available space, sealing of the soil and changes to water cycles, fragmentation of the area, degradation of natural habitats and the natural landscape and pollution. Land is a finite resource, so it must be managed sparingly and carefully.

This section introduces the general physiognomy of the use of land in the Walloon Region and its development. Our attention then turns to the environmental pressures that the urbanisation and fragmentation of the land represent. Lastly, an analysis of the occupation levels of the land use zones and occasional changes to the *plans de secteur* will help assess the usefulness of this tool, which is one of the most important in terms of managing the land use.

So, the approach taken essentially involves looking at the relationships between the different land uses. The environmental effects of agriculture (types of crops, methods and practices, etc.) and forest management (types of forests, management methods, etc.) are dealt with elsewhere, in the sections discussing production methods.

land 1

Main land uses

Half of Wallonia is agricultural land, while a third is forest. Urban areas (buildings, public facilities, transport infrastructures etc.) constitute 14 % of the region. The remaining areas are uncultivated, mostly damaged land (brownfields) or naturally inhospitable and non-productive land (bogs and marshland).

More noticeable urbanisation in the north of the Region

Urbanised land is mainly to be found along the Sambre-and-Meuse river line, as well as in the north-west of the Region and in the municipalities near Brussels. Agricultural land can be found on both sides of the Sambre-and-Meuse river line, and forests are mainly in Ardennes and Gaume. According to land registry information, agricultural land has been reduced by 44,830 ha (- 4.8 %) in 20 years. As for urban land, this has increased by 37,700 ha (+ 19.2 %), and other built-on land has risen by 8,570 ha (+ 13.9 %). On the other hand, woodland has not changed much at all (- 0.3 %).

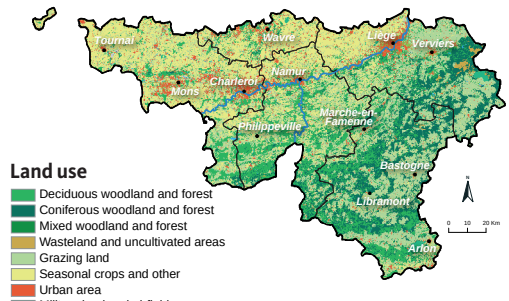
Living environment and land pressure

The development of towns and communication channels along the Sambre-and-Meuse river line is closely connected to the Region's industrial past, while the extensive urbanisation of rural zones near Brussels and surrounding the main towns can be explained by the need for cheaper and more spacious accommodation than that found in towns, as well as by inhabitants' desire to live in a more pleasant setting (less pollution, less noise, more green spaces, etc.).

Sparing use of land

Article 1 of the *Code wallon de l'aménagement du territoire, de l'urbanisme, du patrimoine et de l'énergie* (CWATUPE) put forward the need to use land sparingly, given the fact that this resource is not renewable and the Region's geographical restrictions. The *Schéma de développement de l'espace régional* (SDER) sets out the best ways to optimise the structure of the land, taking into consideration both socio-economic and environmental criteria. Lastly, the *plans de secteur* (PDS) were drawn up to regulate land use according to predetermined allocations, specifically to manage building development. While they did help reduce urbanisation in some cases, the PDSs were subject to various modifications which generally led to increased building work or potential urbanisation.

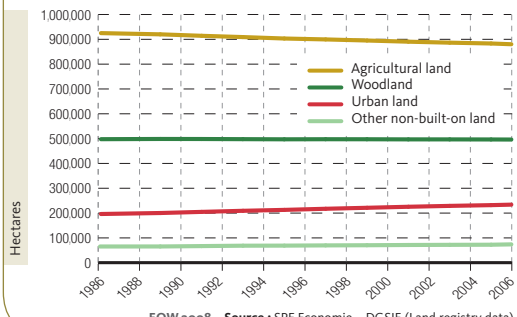
map LAND 1-1



EOW 2008 – **Source :** SPW - DGO3 - DEMNA (SIG unit)

fig LAND 1-1

Changes to the main land uses in the Walloon Region



EOW 2008 – **Source :** SPF Economie – DGSIE (Land registry data)

Land urbanisation

The construction of buildings, infrastructures and facilities is often extensive on land which is sometimes completely isolated from urban networks. Urbanisation has different effects on the environment: a loss of natural and agricultural resources, fragmentation of natural habitats, damage to the landscape, sealing of land, etc.

The never-ending onward march of urbanisation

Urbanisation is most noticeable in the provinces of Walloon Brabant, Liège, and in the neighbouring municipalities of the Grand Duchy of Luxembourg. In 38 Walloon municipalities (out of 262), urban land has more than doubled compared with 1980. The number of building permits issued, as well as permits for home renovations has been on the rise since 2001, demonstrating renewed interest in this kind of work.

A combination of factors

Since the post-war period, urbanisation has been fuelled by economic and demographic growth as well as in the rise in the number of households. The development of road infrastructures has facilitated the distribution of land uses and vice-versa. The ideal of a detached house with a garden, the desire of some municipalities to attract new residents (for tax income) and often better real estate prices per square metre, have led to towns spreading out, and extensive urbanisation of the countryside(1).

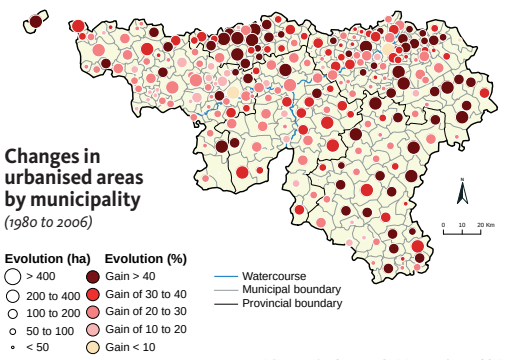
Concentration of activities

The renovation and regeneration of urban centres constitutes a particularly appropriate response to the objectives of sparing use of land and of reducing the pressure that building exerts on the environment. This policy involves using existing buildings in order to reduce the need to resort to using new land. It has been in place for several years now, and has been reiterated in the *Déclaration de politique régionale 2004-2009*. The "return to the towns" will depend, among other things, on a mixture of services being made available, as well as the price and quality of housing(1).

Is urbanisation slowing down?

Given its direct relationship with economic activities and demographic changes, urbanisation should continue, but less rapidly. The effects of certain measures, such as relocating activities and inhabitants in towns and the integration of environmental constraints into land development processes should help slow down the extension of urbanised areas. Furthermore, the sustained rise in oil prices could also result in more people living in urban areas so as to reduce their journeys.

map LAND 2-1

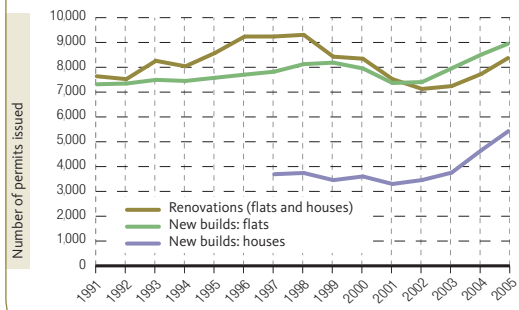


EOW 2008 – **Source :** SPF Economie – DGSIE

fig LAND 2-1

Construction and renovation of housing in Wallonia

based on moving averages over three years



EOW 2008 – **Source :** SPF Economie – DGSIE

(1) http://cpdt.wallonie.be

land L1

Land fragmentation

Although the proportion of rural areas remains fairly high (86 % of agricultural land, woodland and uncultivated land), widespread urbanisation and transport infrastructures are breaking up the land into a larger number of subdivided areas. This urban sprawl puts pressure on ecosystems by breaking up natural habitats, reducing contact between populations and disturbing the life of wildlife.

The whole region is affected

With urbanisation on the rise since the post-war period and a Belgian road network which has grown by 64 % in 40 years (92,945 km in 1966 compared with 152,255 km in 2006), the fragmentation of the land is a phenomenon which has shown no signs of slowing down over the last few decades. The most fragmented areas can be seen around towns and in rural regions near built-up zones, influenced by dense transport networks and extensive urbanisation. More rural areas are also affected, mainly due to the road links between towns and villages.

Appropriation of rural spaces

The land fragmentation can be put down to urban spread and the increase in transport infrastructures. While current legislation (*plans de secteur*, permits, controls, etc.) mean (and have meant in the past) that building can been regulated, large areas have been allocated to economic development and residential use.

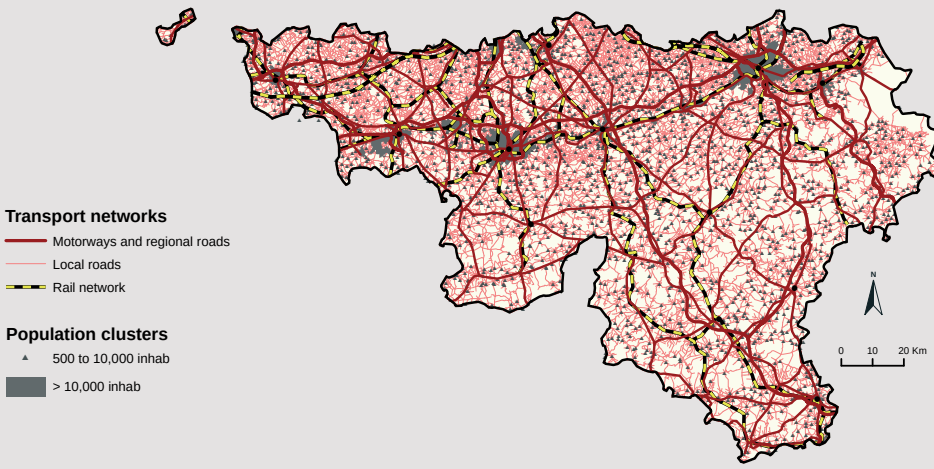
Different catalysts

Various legislation relating to urbanisation controls building work, and consequently, the fragmentation of natural habitats, including:

- ➜ respect for zones not to be urbanised set out in the *plans de secteur*;
- ➜ the adoption of new permit and control procedures, including, in particular, studies on the effects on the environment;
- ➜ measures taken to revitalise urban centres and convert deserted industrial areas to avoid using new land.

Getting the community involved can also thwart some urbanisation projects (buildings, infrastructures, facilities, etc.) by calling upon the legislation in force.

map LAND L1-1



EOW 2008 – **Sources :** SPW - DGO1 ; SNCB ; SPW - DGO3 - DEMNA (SIG unit)

land 3

Occupation of land use zones as set out in the *plans de secteur*

Wallonia's 23 plans de secteur *(PDS) mainly aim to manage the pressure that urbanisation puts on the area by defining zones which can be built on (270,000 ha) and zones to be used for agriculture, forests, or wildlife (1,400,000 ha). The study of the levels of occupation of the zones in the* plans de secteur *means that an analysis can be made of how different activities and uses correspond to the areas defined.*

Current situation

The areas defined in the PDSs largely corresponds to actual use for agricultural land (91 % of agricultural land in agricultural zones) and forest land (88 % of forests in forest zones). However, 27 % of the wildlife areas defined in the PDSs are built on. Between 35 and 45 % of zones intended for urbanisation (economic activities, public services, residential) have not been built on. Lastly, the *zones d'aménagement communal concerté* (ZACC), which potentially account for 22,000ha mainly intended for urbanisation, are still essentially not built on (80 %).

Potential for urbanisation

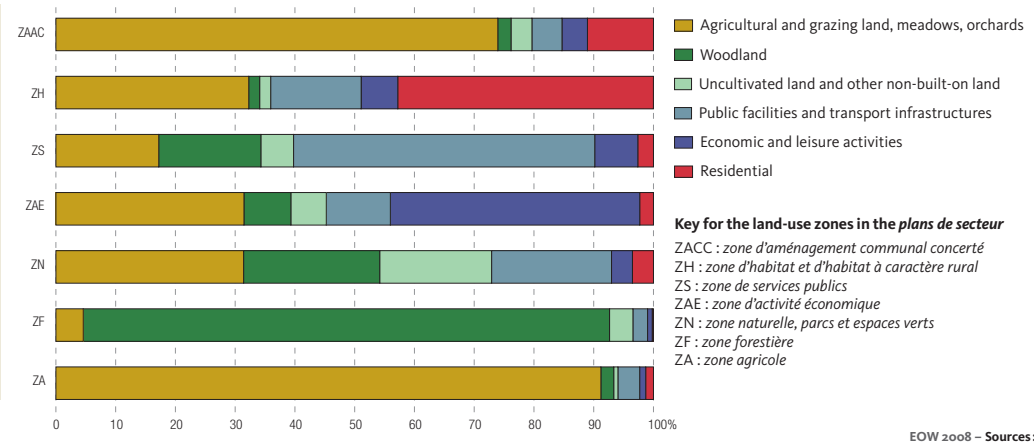
Estimates available indicate that during the adoption of the PDSs in the 1970s and 1980s, around 45 % of the 253,000 ha intended for urbanisation were non-urbanised areas, mainly used for agriculture. The zoning plans drawn up initially suggested the potential urbanisation of 114,000 ha (so at the time, the forecasts suggested almost doubling the land to be urbanised). Good quality land were in theory allocated to be used for agriculture.

Modifications of the CWATUP

The PDSs are governed by the *Code wallon de l'aménagement du territoire, de l'urbanisme, du patrimoine et de l'énergie* (CWATUPE), who submitted numerous revisions, some of which dealt with changes to the definition and use of zones covered by the *plans de secteur*. Furthermore, since they were adopted, the PDSs have undergone 158 local modifications.

fig LAND 3-1

Occupancy rate of land use as laid out in the *plans de secteur* for the Walloon Region *(2006)*



EOW 2008 – Sources :
SPW - DGO3 - DEMNA (SIG unit) ; SPW - DGO4 - DATU

land 4

Partial revisions to the *plans de secteur*

Since they were adopted, the plans de secteur *(PDSs) have undergone many modifications and occasional exemptions, most of which consisted of adding new zones to be urbanised (mainly areas of economic activity) to replace zones not to be urbanised (mainly agricultural zones).*

6,670 more ha of zones to be urbanised

Between 1986 and 2007, the PDSs were the subject of 158 modification dossiers, dealing with areas of between 10 and several hundred ha. The total area for all the new allocations comes to 6,670 ha for zones to be urbanised, and 2,250 ha for zones not to be urbanised.

Different modification processes

Initially, the PDSs were reviewed as part of the process defined by legislation. The allocation of certain areas was changed for projects which had not been foreseen at the planning stage. Next, the conditions for the use of some areas were reviewed. This included:

- 9,000 ha of land intended to be urbanised at a later date were changed to areas to be urbanised immediately;
- 22,000 ha of *zones d'aménagement communal concerté* (ZACC), 17,500 ha of which have not yet been urbanised, and for which conditions have been considerably relaxed.

Some minor exemptions were granted to build, among other things, roads, public facilities, agricultural buildings and extensions for existing buildings, etc.

The principle of compensation

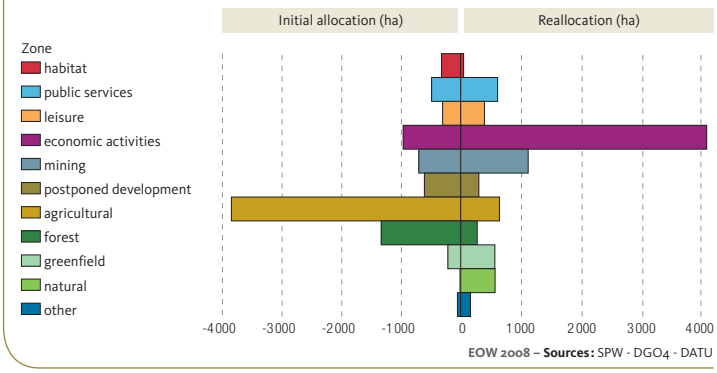
Since 2005, the any new zone to be urbanised must be compensated either by a modification going in the other direction, for a similar-sized area not to be urbanised (agricultural, forest, natural, etc.), or by "alternative compensation defined by the Government". Furthermore, the implementation of urbanisation projects within the framework of the ZACCs depends on an urban and environmental report which must look at the impact that the projects may have.

Heading towards an overhaul of the *plans de secteur*?

Land use needs have changed a lot since the first PDSs were adopted in the 1970s. The issues associated with energy and climate change in particular will have a major influence on land use policies. So various experts are pushing for a complete overhaul of the *plans de secteur*, in particular by revising the composition and location of residential districts and economic activity zones, while respecting the principle of using the land sparingly, as expressed by the CWATUPE. The project has been held up by the fear of real estate speculation and the danger that such changes will result in a considerable rise in the number of zones to be urbanised which will not be compensated by new zones which are not to be urbanised.

fig LAND 4-1

Partial revisions to the *plans de secteur* *(1986-2007)*



EOW 2008 – **Sources:** SPW - DGO4 - DATU

land L2

Tools for land use management

There are many different tools in place relating to the land use management of the Walloon Region. They vary depending on the geographical scale involved (regional or municipal), the objective (planning, regulation, authorisation), as well as on the intended use (development, infrastructure, urbanisation, activities, etc.). Some of them, to a greater or lesser extent, take environmental aspects into consideration.

	Tools	Comments
Regional level		
SDER	*Schéma de développement de l'espace régional.*	Guidance document (1999).
CWATUPE	*Code wallon de l'aménagement du territoire, de l'urbanisme, du patrimoine et de l'énergie.*	This has been changed many times since it was first drawn up (1962).
Plans de secteur	These define how land is to be used.	They were implanted between 1977 and 1987.
RRU	*Règlement régional d'urbanisme.*	There are six types of urban, aesthetic and technical regulation.
Municipal level		
SSC	*Schéma de structure communal:* guidance, management and programming document for sustainable municipal land development.	This also includes the idea of environmental quality.
RCU	*Règlement communal d'urbanisme:* relating to the construction of buildings, road networks and public spaces.	These must comply with the provisions of the RRUs.
RUE	*Rapport urbanistique et environnemental:* to be drawn up as part of the ZACC urban development projects.	
PCA	*Plan communal d'aménagement:* to organise municipal land use.	
PCM	*Plan communal de mobilité:* to define the organisation and management of transport, parking and accessibility at a municipal level.	For large towns, municipalities may draw up a *Plan urbain de mobilité* (PUM).
PCDN	*Plan communal de développement de la nature:* to organise and structure a range of actions to support natural heritage.	
PCDR	*Programme communal de développement rural:* including urban development plans, the development of public areas, etc.	Municipalities which draw up a PCDR with the help of the FRW are encouraged to implement a local 21 agenda.
Permits		
Permis d'urbanisme	Permit required for work intended, in particular, to build or convert a building or a road and to change the landscape.	
Permis de lotir	Permit required when a landowner would like to subdivide the land into lots and sell them as building plots.	If the surface area of the plots is more than 2 hectares, en environmental impact study is compulsory.
Permis d'environnement	Permit required for most industrial, crafts, agricultural and commercial activities.	The procedure and obligations vary depending on the activity (class 1 or 2).
Permis unique	If a project requires both a *Permis d'urbanisme* and a *Permis d'environnement*, the applicant can submit a request for a combined permit.	

EOW 2008 – **Sources :** SPW - DGO4 ; UVCW ; SPW - DGO2 - DSM (Walloon Mobility Portal)

conclusion

The Walloon Region is a land with a mixture of characteristics. A large part of it is made up of agricultural land and woods, and it is extensively broken up by urbanised areas. The development of transport networks (mainly roads) has connected the towns and villages of Wallonia and facilitated the gradual urbanisation of rural areas. It is generally the regions close to towns and cities which have experienced these pressures, and continue to do so. Overall, built-up land mainly puts pressure on agricultural land, and, to a lesser extent, on forests and uncultivated land. Urbanisation disrupts water cycles, breaks up natural habitats, and can have a detrimental effect on the quality of the landscape. Furthermore, extensive urbanisation increases transport needs because it increases the distances between homes and workplaces, public services, businesses, cultural sites, etc.

Overall, the relationship between the environment and the land use management involves managing the needs of society, the economy, culture and local heritage, as well as the preservation of natural resources and the environment. In theory, different land use managing tools help regulate the structuring of the land and ensure that it is used sparingly. The *Schéma de développement de l'espace regional* (SDER) defines the measures to be taken to ensure sustainable land development, while the *Code wallon de l'aménagement du territoire, de l'urbanisme, du patrimoine et de l'énergie* (CWATUPE) lays down regulations and procedures for land use management at a regional level, some of which relate to the *plans de secteur*. The aim of these plans is to restrict urbanisation to specifically allocated areas. However, regular changes to these plans have meant, and will continue to mean, (following the definition of *zones d'aménagement communal concerté* (ZACC) for example) that land initially exempt from any form of building work may be urbanised.

Taking the environment into consideration when looking at changes to the land use is as reliant on the nature and effectiveness of existing measures as on how appropriate future measures are in terms of the economic and social changes in our society. Socio-demographic changes (increases in the population and number of households, the aging population, migration, etc.), the desire of some people to live closer to nature (the urbanisation of rural areas), and the pursuit of economic activities (businesses exchanges, the mobility of workers, etc.) will inevitably increase the need for land to be built on. There are however some factors which may hold back this trend, or at least keep it in check: the gradual inclusion of environmental concerns in land use management policies, the price of oil which has a direct effect on the cost of transport and on the construction market, the aging of the population and the increasing number of smaller households which may encourage the relocation of housing and services to towns and cities.

PART [2]

Production – consumption

production

agriculture
forestry
industry
services
energy
transport
tourism

household consumption

energy
transport (people)
water
eco-consumption
generation of household waste

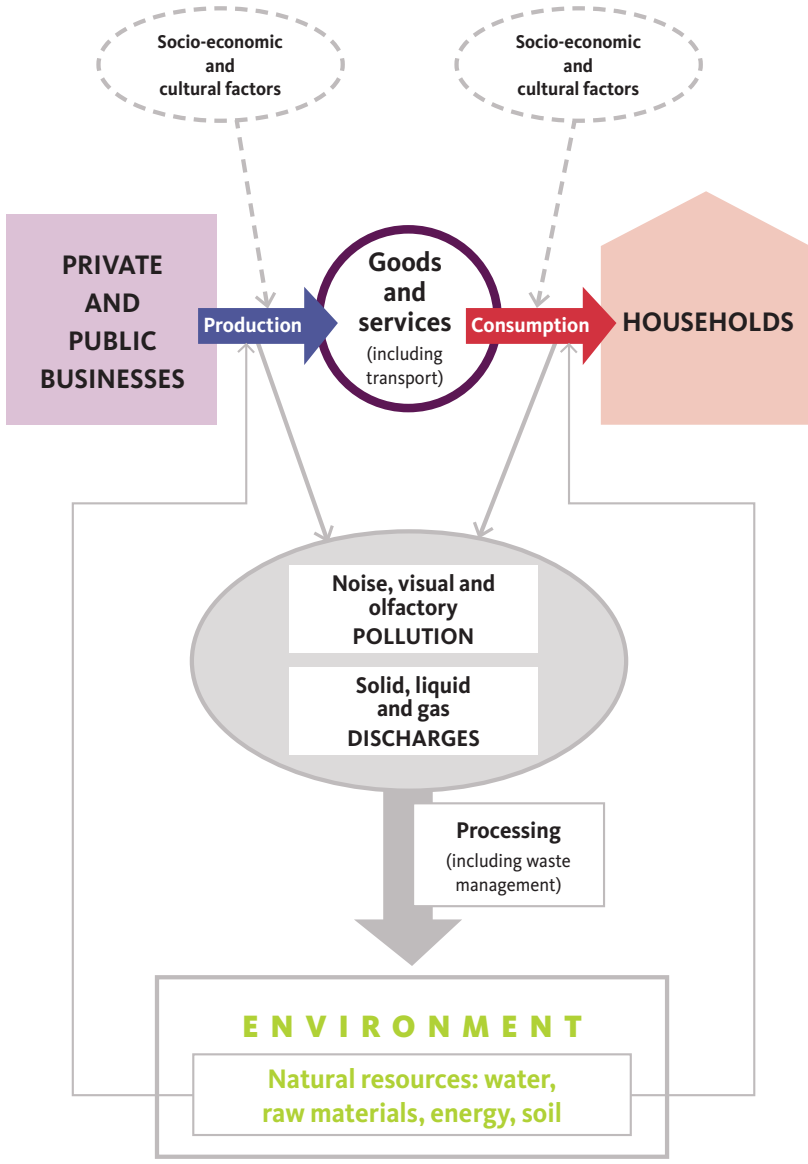
waste management

PART [2]
Production – consumption

introduction

Much work has already been done on the issues associated with the environmental impact of the production and consumption of goods and services. Significantly, this has made it possible to assess the "durability" of economic systems in terms of pressure on natural resources and on the quality of the environment, particularly by using indicators such as carbon footprints and material flows. These indicators have highlighted the existence of imbalances between the production and consumption methods in most industrialised regions and the natural resources available in the medium and long term. On a national or regional scale, the implementation of policies aiming to correct this situation nevertheless still requires more a more detailed approaches in order to assess the relative contributions of different protagonists and their development over time.

From an environmental point of view, as well as the impact on natural resources, production and consumption by companies and households are the source of polluting emissions and other kinds of pollution, and in some cases, of a loss of biodiversity. It is a complex system which can be looked at from different angles. We have chosen to describe it simply, using a combination of indicators relating to demand (materials, energy, goods, services), environmental efficiency, management and implementation of environmental policies. These indicators have been grouped into 3 areas : production of goods and services by businesses, household consumption and waste management. This is a hybrid approach, a compromise between a division by areas of activity (as has been done in previous EOWs) and a comprehensive, exhaustive and multi-disciplinary analysis of the environmental impacts linked to production and consumption methods. Nevertheless, the environmental efficiency indicators presented here, which compare demand (for materials, services, etc.) with the associated environmental indicators, as well as various socio-economic parameters (wealth creation, employment, production trends), do constitute an integrated approach. For their part, the indicators relating to management and the implementation of sectoral policies provide the foundations for an assessment of the efficiency of environmental policies.



EOW 2008 – **Source :** SPW - DGO3 - DEMNA (CEEW)

Economic activity : main trends by sector

The production and marketing of goods and services by companies involves the consumption of natural resources and creates various types of waste (atmospheric pollutants, waste products), which may be damaging to the environment and to health.

Historical importance of industry, growth of the services sector

In the Walloon Region, the services sector and industry are the most important sectors in terms of wealth creation (gross value added - GVA) and employment. The services sector, where the GVA increased by almost 30 % between 1995 and 2006 (excluding inflation), is currently the main driver behind economic growth. Growth in the industrial sector is weaker, though the situation varies among sub-sectors. Manufacturing industry has restructured over the last few decades, with the development of businesses with high value added (biotechnology, chemicals, aeronautics) alongside branches of heavy industry (metals, cement, glass, machinery and equipment industries, etc.). It should be noted that in 2006, the GVA per employee was 1.5 times higher in industry than in the services sector.

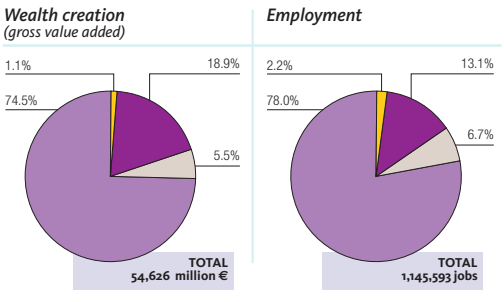
The use of gross domestic product (or gross value added) as an indicator of wealth creation has been the subject of some criticism[1]. Our aim here is not to analyse growth or progress as such, but to use an indicator of economic activity, calculated uniformly for the different sub-sectors, which serves as a point of reference for assessing the pressures on the environment.

Environmental impact depends on a large number of factors

By definition, industrial production, which requires large quantities of raw materials and energy, creates much more pressure on the environment than the services (tertiary) sector. The trend in the Walloon Region towards the services sector should, therefore, be positive in terms of environmental impact. In reality, other parameters need to be taken into account, such as advances in production methods, progress in the treatment and control of industrial pollution and even the high energy demand from the services sector for transport and infrastructure operation (buildings). Moreover, explicit consideration of the environmental dimension in decision-making, whether or not the company is accredited, helps to limit the pressures.

fig PROD 1-1

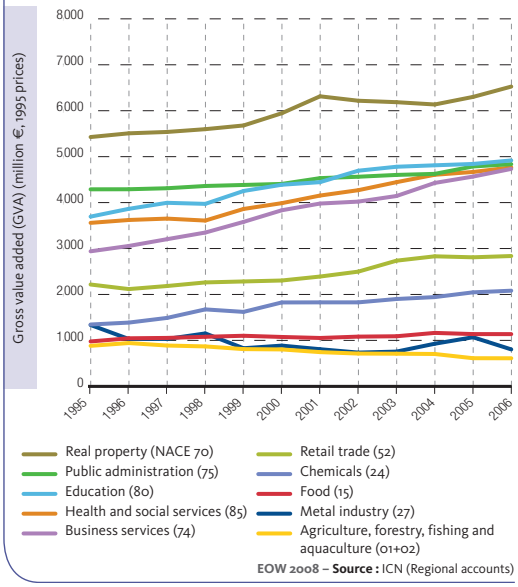
Economic activity in the Walloon Region *(2006)*



EOW 2008 – **Source :** ICN (Regional accounts)

fig PROD 1-2

Wealth creation by various business sectors in the Walloon Region



EOW 2008 – **Source :** ICN (Regional accounts)

[1] See for example in this context : http://users.skynet.be/idd/documents/divers/indicalt.pdf

Energy intensity of economic activity

Economic activity involves the consumption of energy (infrastructure, processes, transport, etc.), in larger or smaller quantities depending on the type (industry, services, etc.) and level of activity. The overall energy intensity of a given region is defined as the energy required to produce one unit of wealth across all sectors combined.

Overall energy intensity is high, but decreasing

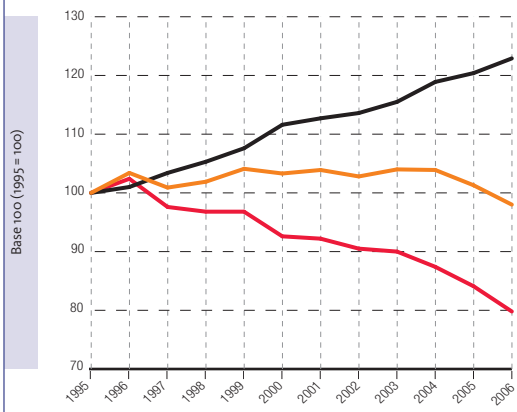
In the Walloon Region, the overall energy intensity in 2006 was 296 toe/million €, which was significantly above the European average (202.5 toe/million €, EU-27). This figure reflects the proportion of heavy industry (metal, non-metallic minerals industries) in the Walloon economy, and also the high energy demand from the transport sector. The level did, however, decline by over 20% between 1997 and 2006. Up to 2004, this fall was associated with the increase in GDP (growth in the services sector), while energy consumption remained more or less stable (relative decoupling). From 2005 onwards, energy demand decreased, especially in the metals industry (reduction in activity), accentuating the decline in energy intensity. It should be noted that the increase in energy intensity in 1996 was attributable above all to weather conditions (increase in energy demand associated with an extremely cold winter).

Trends by sector

The overall energy intensity in the Walloon Region is the product of different trends in different sectors. In the metals industry, which has the highest energy intensity, the increases between 1999 and 2002 and in 2006 were linked to a fall in the price of steel (and therefore in gross value added – GVA), while the falls in 2004 and 2005 result from the combined effect of a reduction in activity (decrease in energy demand) and an increase in GVA. The downward trend in the chemicals sector is largely due to the increase in GVA (up 55 % between 1995 and 2006), with the peaks (1999, 2001) resulting from an individual increase in the end consumption (EC) of energy. In the case of the services sector, both the EC of energy and the GVA are rising, but the latter is growing more rapidly, to give a slight reduction in energy intensity (5.6 %) between 1995 and 2006.

fig PROD 2-1

Energy intensity* of economic activity in the Walloon Region



** defined as the ratio: GDC of energy / GDP*

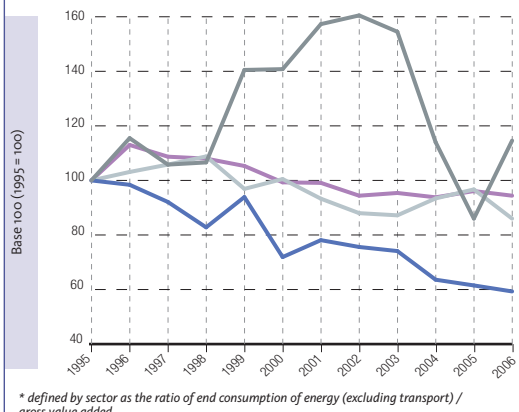
2006 figures

Gross domestic product (GDP)	61,353 million €
Gross domestic consumption of (GDC) of energy	211.2 TWh (18,165 ktoe)
Energy intensity	296 toe/million €

EOW 2008 – Sources : ICN (Regional accounts); SPW - DGO4 - DEBD

fig PROD 2-2

Energy intensity* of economic activity in the Walloon Region: trend in certain key sectors



** defined by sector as the ratio of end consumption of energy (excluding transport) / gross value added*

Energy intensity 2006 (toe/million €)

Industry (metal industry)	2,471
Services sector	26
Industry (non-metallic minerals)	1,492
Industry (chemicals)	483

EOW 2008 – Sources : ICN (Regional accounts); SPW - DGO4 - DEBD

production/prod 3

Environmental management of businesses and accreditation

Companies can aid the reduction in the environmental impact of economic activity by adopting structured approaches, such as an environmental management system (EMS) for example.

Objectives

The aim of an EMS is both to ensure compliance with the regulations and to improve the performance of the company (energy efficiency, reduction in costs and pollutant discharge, etc.). It enables positioning in terms of image and improves communication internally and externally (consumers, local residents).

Total number of accreditations (ISO 14001 and EMAS) reaches a plateau

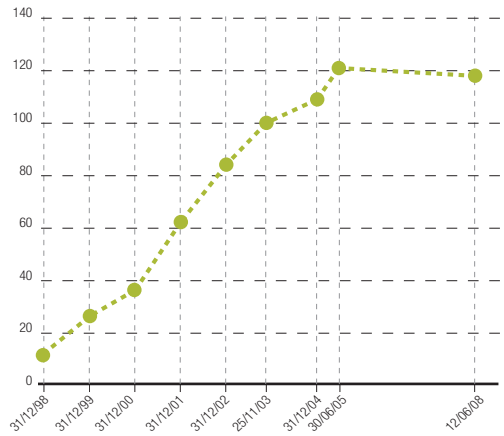
Commitments can be formalised through official recognition. As of June 2008, a total of 118 companies in the Walloon Region have ISO 14001 accreditation and/or EMAS registration, currently the main standards. This represents a slight drop by comparison with 2005, though the general trend since 1998 has been upward. The recent decline relates mainly to the ISO 14001 standard and the same trend is evident elsewhere in Europe. It can be attributed primarily to the cost of the procedure, which has resulted in some accreditations not being renewed, and the access problems encountered by small and medium-sized enterprises, despite the fact that in the latter case special assistance has been made available (e.g. grant for consultancy services). Other accreditation systems have also been developed in parallel in some sectors (such as Responsible Care in the chemicals industry) or within multinationals.

Implementation of an EMS without accreditation

EMS principles can also be adopted without official recognition (accreditation). Various tools have been developed in the Walloon Region to assist in this. The aim of the RISE[1] project is to inform workers about and heighten their awareness of the environment. While the *Cellule des conseillers en environnement*[2] of the *Union wallonne des entreprises* (UWE) offers a detailed environmental analysis, leading in particular to recommendations. This type of analysis has already been used by over 750 companies.

fig PROD 3-1

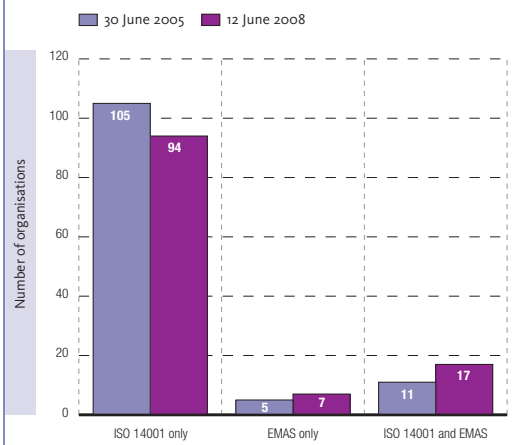
Total number of organisations accredited to ISO 14001 and/or registered to EMAS in the Walloon Region



EOW 2008 – **Sources:** UWE; MWQ

fig PROD 3-2

Recent trends in ISO 14001 accreditations and EMAS registrations in the Walloon Region



EOW 2008 – **Sources:** UWE; MWQ

[1] Framework agreement for the Walloon Region involving a range of social partners (www.rise.be) [2] www.uwe.be/conseillersenvironnement

Use of agricultural land and production methods

The utilised agricultural area (UAA) represents 45 % of the land in Wallonia. So agriculture has a very important role to play in terms of managing the environment and rural areas. Extensive agricultural schemes have facilitated the creation and upkeep of open and semi-open areas which are home to specific flora and fauna.

Pressure of profitability

In the Walloon Region, agriculture accounts for 1 % of wealth creation (gross value added, GVA) and represents 2 % of all jobs. The reduction in the number of farms, combined with an increase in their average size and greater specialisation can largely be explained by the pressure of profitability (economies of scale). The relative stability of the GVA per farm since 1995 does not mean that there are not significant discrepancies between agricultural regions and technical and economic approaches(1). Increasing mechanisation of agricultural processes is also a major factor. Furthermore, the size of agricultural land plots has increased, particularly in regions producing arable crops.

Arable crops in the north, grassland and forests in the south

In terms of UAA, we can see that the land used for agriculture goes down as you move from the north to the south of the Walloon Region, mainly in favour of forest.

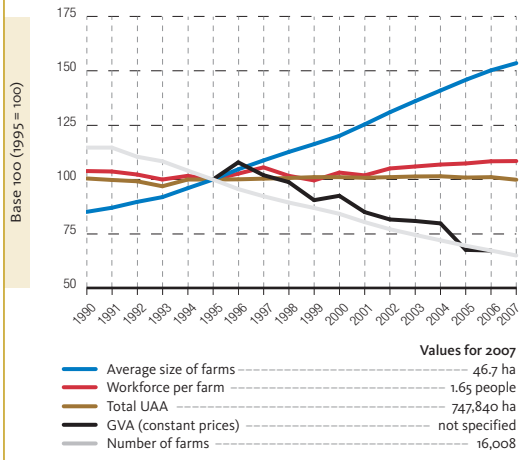
The proportion of grassland, mainly permanent, is higher to the south of the Sambre-and-Meuse river line, while spring crops occupy a third of agricultural land in loamy and sandy-loamy regions. Livestock farming is present in the different agricultural regions, with more specialised zones such as the *Pays de Herve* or the Comines region.

Consideration of the environment in production processes

Some more intensive agricultural production methods are the reason behind the pressure on natural resources (earth, water, biodiversity, air). A series of regulatory (such as environmental cross-compliance of CAP aids) or voluntary (such as the agri-environmental programme) measures have consequently been put in place in such a way as to reduce the environmental impact of the agricultural sector while keeping in mind the importance of profitability of a whole sector of economic activity.

fig AGR 1-1

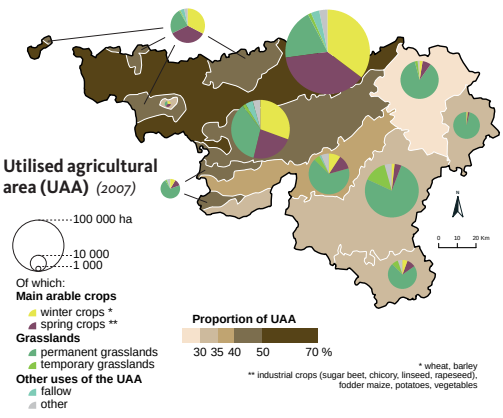
Production methods and wealth creation of the agricultural sector in the Walloon Region



EOW 2008 – **Sources :** SPF Economie – DGSIE (INS) (Annual agricultural and horticultural surveys); ICN (Regional accounts) (CEEW calculations)

map AGR 1-1

Use of agricultural land in the Walloon Region



EOW 2008 – **Source :** SPF Economie – DGSIE (INS) (Annual agricultural and horticultural surveys) (CEEW calculations)

(1) MRW - DGA (2008)

Trends in agricultural production: plant products

In any given agricultural region, the choice of crops depends on the soil and climate conditions, the type of farm (arable, livestock, mixed), or the profitability forecasts for the procedures used. The management of crops (soil preparation, nutrients, protection against weeds and crop-destroying insects, etc.) can affect the quality of the environment and the protection of natural resources.

Spread of spring crops

In the Walloon Region, land allocated to winter crops has been reduced, and maize crops have increased since 1990, but these trends have been reversed recently. The amount of land planted with sugar beet has been going down since 2003, which is connected to the uncertainty surrounding the sugar market. Potato crops are rising steadily (contracts with the food industry); year-on-year variations are mainly linked to fluctuations in prices.

Importance of plant cover

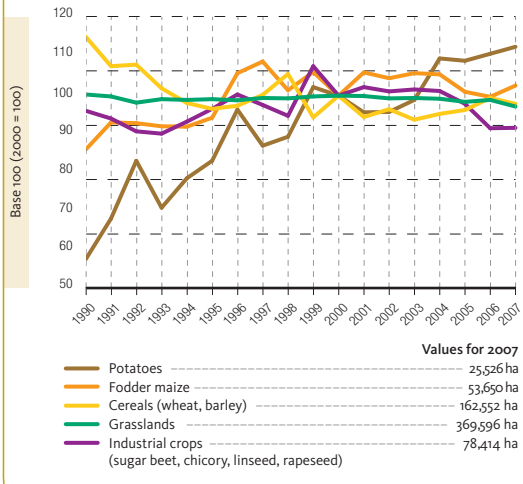
The potential environmental consequences of agriculture include soil erosion, nitrogen leaching, risks associated with the use of plant protection products, or the reduction in biodiversity. In most cases, the persistence of plant cover is a determining factor, the risk rises as follows: grassland ➜ crops planted in the autumn ➜ crops planted in the spring. The trends observed in the Walloon Region since 1990 are therefore not favourable (crops sown in spring on the rise). The impact can however be reduced by taking a specific agri-environmental measure (action 4: winter coverage of the soil before a spring crop). This measure was applied to around 1 in 5 hectares of spring crops in 2006.

Fallow land and non-food crops

In 2007, fallow land represented just over 11,500 ha in the Walloon Region, 30 % of which were used for non-food crops including biofuels (rapeseed essentially). However, this situation runs the risk of changing, with compulsory fallow land being cut because of the tense status of the cereal market. Farmers can however choose to keep fallow land voluntarily, especially as part of environmental programmes (encouraging wildlife, for example).

fig AGR 2-1

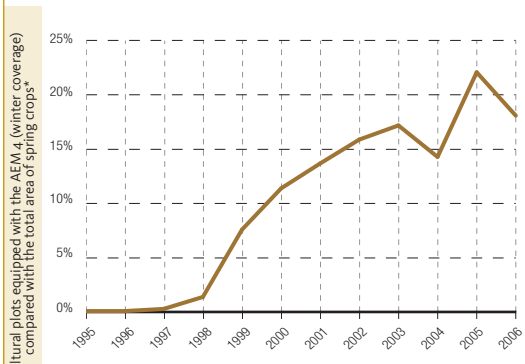
Utilised agricultural area (UAA) for the main crops in the Walloon Region



EOW 2008 – **Source :** SPF Economie – DGSIE (INS) (Annual agricultural and horticultural surveys) (CEEW calculations)

fig AGR 2-2

Winter cover before a spring crop in the Walloon Region



* industrial crops, fodder maize, potatoes

EOW 2008 – **Sources :** SPF Economie – DGSIE (INS) (Annual agricultural and horticultural surveys); SPW – DGO3 – DEMNA (GIREA) (CEEW calculations)

Trends in agricultural production: animal sector

Livestock has a relatively large role in the agricultural landscape of Wallonia. The environmental pressures associated with it (the production of organic manure, wastewater, greenhouse gas emissions and smells, etc.) depend significantly on how intensive the production methods are, and the managerial measures taken.

Livestock farming is present in all the agricultural regions

Different kinds of livestock farming coexist in the Walloon Region(1). Overall, dairy farming is most common in the grazing region of Liège and Haute Ardenne, while meat production is more likely to be found in the Condroz, Famenne and Ardenne. The loamy region, concentrating mainly on arable crops, also includes a large number of mixed (crops and livestock) and pig farms.

Cattle numbers are going down, poultry and pigs are on the increase

Compared to 1990, poultry has shown the biggest growth. Pig breeding has also been becoming more popular since the 1990s, but not in such a dramatic way. At the same time, cattle is on the decrease. The reduction in the number of dairy cows is connected to the introduction of milk quotas, combined with the increase in animals' productivity (selection). Raising cattle for meet, which was increasing until 1996, was then damaged by the dioxin crisis (1999), and mad cow disease (BSE) (2001), which led to a massive drop in sales, as well as a (slight) preference for pork and poultry. It should be noted that these two crises led to an increase in the demand for meat produced organically (15 times more animals were slaughtered in 2001 than in 1998)(2). The number of organic cattle reared then went down by 25 % between 2001 and 2006, while pigs doubled and poultry increased by 3.5 times(1).

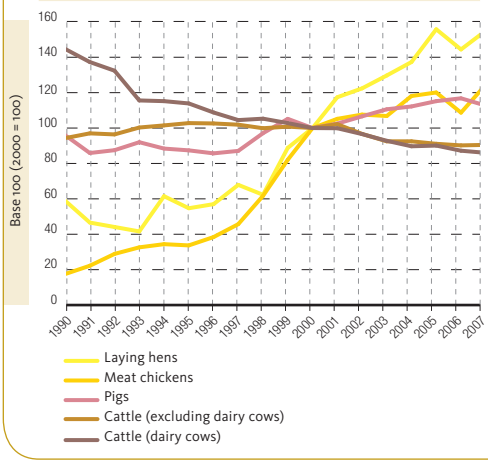
The production of organic nitrogen mainly caused by cattle farming

In the Walloon Region, 92 % of organic nitrogen from livestock comes from cattle (in 2007), in spite of a four-fold increase in the production of nitrogen from poultry since 1990. The reduction in cattle numbers has also led to a decrease of 10 % of the total production of organic nitrogen associated with livestock compared to 2001.

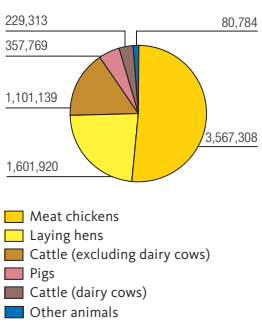
fig AGR 3-1

Livestock in the Walloon Region

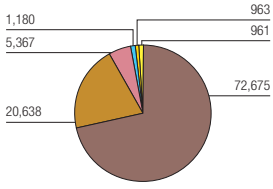
Changes in livestock (number of animals)



Main livestock holdings (number of animals, 2007)



Production of organic nitrogen by livestock (tonnes, 2007)



EOW 2008 – Sources: SPF Economie – DGSIE (INS) (Annual agricultural and horticultural surveys); SPW – DGO3 – DEMNA (CEEW calculations)

(1) http://agriculture.wallonie.be (2) Bioforum Wallonie (2005)

Use of fertilizers

The purpose of using fertilizers in agriculture is to optimise the growth and yield of crops. Excessive use, or use at inappropriate times with reference to the needs of the crops can however have negative effects on the quality of the environment.

Reduction in the use of inorganic fertilizers

The main fertilizers used in agriculture are nitrogen and phosphorous; they can be organic or mineral. If used excessively, there is an increased risk of eutrophication of continental surface water (phosphorous) and contamination of underground drinking water (nitrogen).

The use of inorganic fertilizers, and particularly phosphorous has been going down since 1995 in the Walloon Region. The progress made in the sensible use of synthetic fertilizers reflects environmental concerns as well as changing costs (the price index for fertilizers went up by a factor of 2.7 between January 1995 and January 2008[1]). The quantities used throughout the Walloon Region are nevertheless a lot higher than the European average (around 40 % for nitrogen and 50 % for phosphorous[2]).

It should be noted that the production of organic nitrogen (waste from livestock rearing) has also been going down since 2001, largely because of the decline in cattle farming.

The sources of nitrogen vary according to the agricultural region

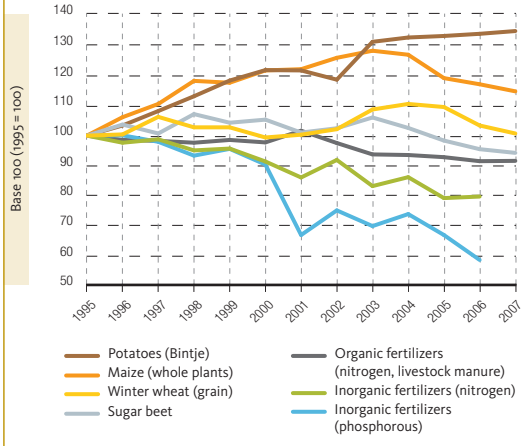
As a percentage of the UAA, the total amount of nitrogen (organic and inorganic fertilizers) varies on average from 190 kg/ha to nearly 240 kg/ha, according to the agricultural regions. This value, which is below recommended amounts (250 kg/ha for crops and 350 kg/ha for grassland), does not exclude the existence of local problems. Sales of fertilizers are also lower in regions where livestock farming prevails, given the availability of organic nitrogen (effluent) and the smaller proportion of arable land (dominance of grasslands).

Improvement in the environmental-efficiency of using fertilizers

Comparing the changes in the use of fertilizers with the production of the main arable crops in the Walloon region reveals a correlation since 1995 (reduction in quantities of fertilizers used per tonne harvested), in spite of decreased production for most crops from 2003 onwards.

fig AGR 4-1

Production indices for the main arable crops (tonnes) and fertilizer use (kg) in the Walloon Region



EOW 2008 – **Sources :** SPF Economie – DGSIE (INS) (Annual agricultural and horticultural surveys); SPW – DGO3 – DEMNA (CEEW calculations)

tab AGR 4-1

Consumption of nitrogen and phosphorous fertilizers by agricultural region in the Walloon Region *(2006)*

Agricultural region	Nitrogen fertilizers			Phosphorous fertilizers
	Sales of inorganic fertilizers (kg N/ha)	Sales of organic fertilizers (livestock) (kg N/ha)	Total nitrogen (kg N/ha)	Sales of inorganic fertilizers (kg P_2O_5/ha)
Loamy region	119.1	70.8	189.9	24.7
Sandy-loam region	115.2	90.1	205.3	24.5
Campine (Hainaut)	110.1	111.5	221.6	25.0
Condroz	108.8	89.7	198.4	25.4
Grassland region (Fagne)	90.1	148.3	238.5	25.4
Haute Ardenne	86.8	127.1	213.9	23.0
Famenne	84.6	117.8	202.4	26.3
Grassland region of Liège	82.9	148.8	231.7	20.9
Jurassic region	69.9	132.8	202.7	24.2
Ardenne	67.9	127.3	195.2	26.2

EOW 2008 – **Sources :** SPF Economie – DGSIE (INS) (Annual agricultural and horticultural surveys); SPW – DGO3 – DEMNA; SPW – DGO3 - DSD (CEEW calculations)

[1] Source: http://ecodata.mineco.fgov.be [2] EUR-15, 2004 data. Source: www.unifa.fr

production/agr 5

Production and valorisation of organic nitrogen

Manure from livestock rearing is the main source of fertilizers for crops and grasslands. It can also be a source of organic matter. However, there is a risk of pollution to groundwater and surface water if there is excessive supply compared to the needs of the crops or if the manure is spread inadequately.

Reduction in the total production of organic nitrogen from livestock

In the Walloon Region, the total amount of organic nitrogen produced by animals (all livestock together) was around 75,000 tonnes in 2007. The fall observed (more than 10 % compared to 2001) is connected to the reduction in cattle farming, as cattle are the main producers of organic nitrogen (92 % in 2007), as pig and poultry farming has been rising.

Programme de gestion durable de l'azote (PGDA)

Nitrate levels in groundwater have been rising in the Walloon Region for several decades which might cause problems for drinking water. Different sectors are responsible (agriculture, industry, households, etc.), to a greater or lesser extent, requiring specific remedial measures. In the case of agriculture, the 91/676/EEC (nitrates) directive was introduced to protect water resources. It was applied in the Walloon Region by the PGDA.

In practice, the PGDA requires balanced levels of organic nitrogen for farms. This balance is measured by the *taux de liaison au sol* (LS), which must not exceed 1 (excluding exemptions)[1].

Further conditions apply to farms located in particularly vulnerable areas (norms relating to manure spreading, ground cover after harvest, soil analyses, etc.). The PGDA also includes a series of conditions for manure spreading (period, slope of fields, distance from watercourses) as well as for manure storage.

90 % of farms comply with manure spreading levels (LS ≤ 1)

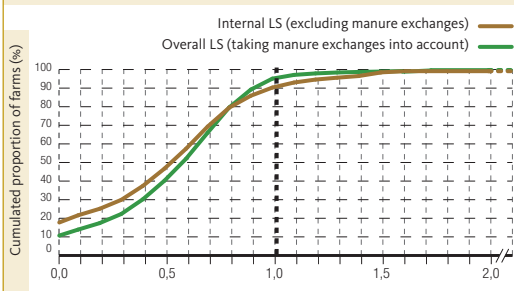
This value even rises to 95 % if we take into account exchanges of manure between farms, which are authorised by the PGDA to maintain a good balance if necessary, and to make the best use of nitrogen resources. In 2007, around 7,500 tonnes of organic nitrogen, or 10 % of total production, were exchanged between farms in the Walloon Region.

Manure spreading facilities available and local excess

Looking at farm balances, calculated according to PGDA norms, 49,000 more tonnes of organic nitrogen could be used on agricultural land. Some farms nevertheless already show excessive spreading, for a total of 1,700 tonnes of organic nitrogen.

fig AGR 5-1

Distribution of farms* according to their LS rates in the Walloon Region *(2007)*

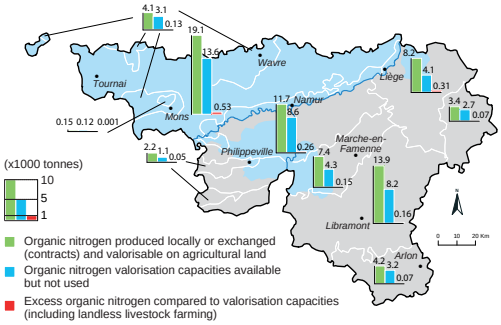


* farms subject to the LS calculation because they produce and/or use organic nitrogen (excluding marginal producers)

EOW 2008 – **Source:** SPW - DGO3 - DSD (CEEW calculations)

map AGR 5-1

Production and recovery of organic nitrogen, according to PGDA norms *(2007)*



EOW 2008 – **Source :** SPW - DGO3 - DSD (CEEW calculations)

[1] A detailed description of the PGDA, as well as the norms and indicators used can be found at www.nitrawal.be

Use of plant protection products

Plant protection products ("pesticides") are used to combat disease and crop-destroying insects, roundworm, etc.). The introduction of these products on to the market is governed by the 91/414/EEC directive. The assessment of their environmental impact means that we need to know, among other things, the quantities of active substances applied by different users(1). Other factors, such as the toxicity of the products and their residues, are assessed during the authorisation procedure.

Predominantly agricultural use

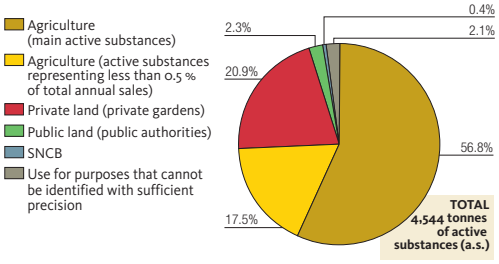
Nearly 4,550 tonnes of active substances (a.s.) were sold in the Walloon Region in 2004, 3/4 of which were intended for use in agriculture, which is equivalent to an average of 4 kg/ha of agricultural land. At European level, the Walloon Region is one of the biggest consumers, alongside France and the Netherlands, ahead of Germany and the United Kingdom (1.5 to 3 kg/ha) and Scandinavian countries (0.5 to 1 kg/ha).

Aside from agricultural use, consumption is not insignificant, especially in terms of the land areas involved (10.2 kg/ha on average). Non-agricultural use is also more difficult to control.

fig AGR 6-1

Distribution of use of pesticides

Percentage per sector in the Walloon Region (2004)



EOW 2008 – **Source:** UCL - AGRO - CRP (SPW – DGO3 – DEMNA convention)

Heavier and more frequent use for potatoes and beet

The distribution of active substances for arable crops shows the relative inclination towards treatments for potato (fungicides, especially to prevent mildew) and beet (herbicides), both in terms of active substances used and the frequency of applications.

tab AGR 6-1

Frequency of application for the 44 main active substances (agricultural use) in the Walloon Region *((number of treatments/(ha.yr)) (2004)*

	Potato	Beet Chicory	Barley	Wheat	Vegetables
Fungicides	10.0	0.1	0.3	1.0	0.9
Herbicides	0.8	6.7	2.3	0.9	0.4

EOW 2008 – **Source:** UCL - AGRO - CRP (SPW – DGO3 – DEMNA convention)

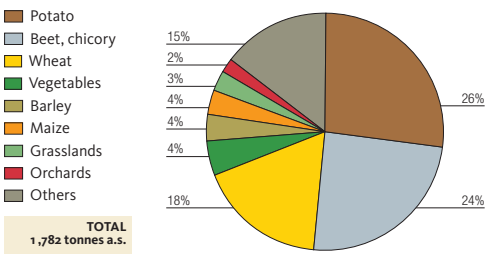
Evaluation of the risks and objectives of reduction

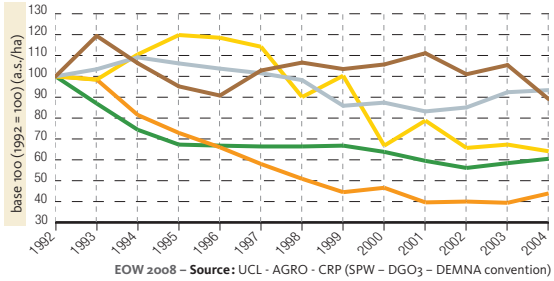
In order to minimise the risks for the environment, a "Thematic strategy on the sustainable use of pesticides" was drawn up on a European level(2). In Belgium, a *Programme de réduction des pesticides à usage agricole et des biocides* (PRPB) has also been put in place at the federal level(3). For the agricultural sector, the aim is to reduce the risks of negative impacts by 25 % in 2010 (compared to 2001). A series of measures have been suggested which must be reviewed every 2 years(4).

fig AGR 6-2

Use of pesticides

Active substances (a.s.) used on main crops in the Walloon Region (2004)





EOW 2008 – **Source:** UCL - AGRO - CRP (SPW – DGO3 – DEMNA convention)

(1) Marot *et al.* (2008) (2) COM(2006) 373 final (3) Moniteur Belge, 11th March 2005
(4) http://www.staatsbladclip.be/lois/2007/04/20/loi-2007022516.html

Atmospheric pollutants emissions

Agriculture is the source of different kinds of pollution. These are connected to production methods (consumption of fertilizers and food for livestock, management of manure), different biological processes, or energy consumption.

Reduction in greenhouse gas emissions (GHGs)

Agriculture produces 9 % of all the Walloon Region's GHGs. Agricultural emissions mainly come from the volatilisation of the nitrogen present in soil (nitrous oxide, N_2O) and cattle digestion (methane, CH_4). The 9.3 % reduction in total emissions from agriculture between 1990 and 2006 can be attributed to a reduction in the use of inorganic fertilizers, a decrease in cattle numbers and the proportion of dairy cows, as well as better management of manure.

Acidifying emissions are 90 % ammonia

Agriculture is responsible for a third of all acidifying emissions in the Walloon Region. This proportion goes up to 96 % for ammonia (NH_3), which mainly comes from manure, as well as the transformation of nitrogen fertilizers in the soil. NH_3 emissions nevertheless went down by 8.1 % between 1990 and 2005, for reasons similar to those explaining the reduction in greenhouse gas emissions.

Relatively low emissions associated with energy consumption

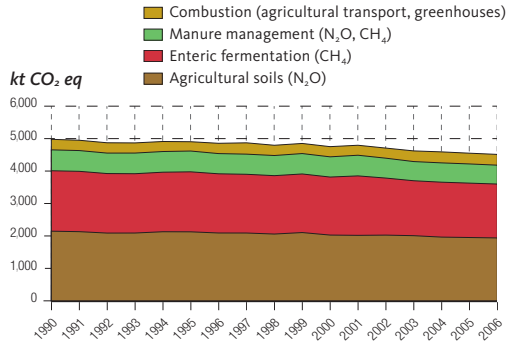
Emissions from combustion (agricultural transport, heating greenhouses) only represent 7.3 % and 6.9 % of agricultural GHG and acidifying pollutants emissions, respectively. These emissions correlate with energy consumption while in other sectors, a decrease in acidifying emissions (sulphur) can be observed, connected to the trend of using natural gas instead.

Forecasts and incentives

According to the *Plan Air Climat* of the Walloon Region(1), the reduction in emissions should continue, resulting in reductions of 10 % for GHGs (N_2O and CH_4) and 2.5 % for NH_3 (in 2020, compared to 2005). The Plan also contains a specific measure for NH_3 emissions from livestock buildings (measure 25), as well as a measure aiming to grant subsidies with a view to encouraging the development of agricultural biomethanisation (measure 26).

fig AGR 7-1

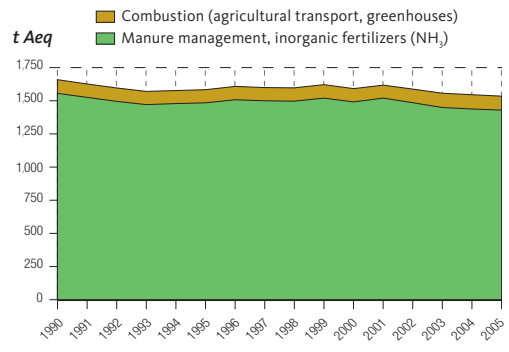
Greenhouse gas (GHG) emissions from agriculture in the Walloon Region



EOW 2008 – **Source:** SPW - AWAC

fig AGR 7-2

Acidifying pollutants produced by agriculture in the Walloon Region



EOW 2008 – **Source:** SPW - AWAC

(1) http://air.wallonie.be

Wastewater produced by agriculture

The contamination of surface waters by agriculture comes from the leaching of agricultural soil, direct input from cattle, as well as wastewater from buildings where animals are kept or reared. The latter are subject to a tax which is calculated according to the number of animals, and storage and spreading capacities for the manure produced.

Decrease in pollution of wastewater from livestock buildings

According to data from the tax office, the total level of pollution of wastewater from buildings where animals are kept or reared is going down in the Walloon Region (- 7 % between 1999 and 2004), with the volumes exempt from the tax rising by 18 % over the same period. This trend is connected to the reduction in livestock, and also suggests better effluent management (changes in storage capacities, improvement in infrastructure waterproofing, etc.).

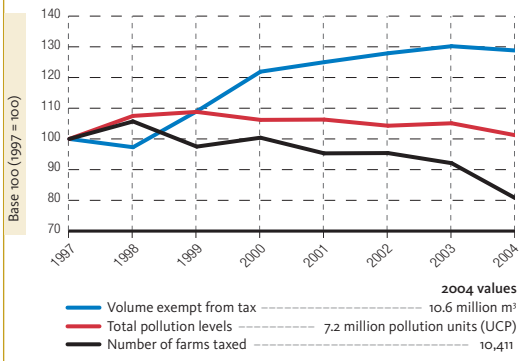
The total number of farms subject to the tax has also gone down, at a rate comparable to that observed for agriculture overall, which suggests an increase in the average size of livestock holdings.

Other types of discharges

According to the PEGASE model(1), direct waste from cattle (excluding grazing) only represented less than 10 % of the total agricultural nitrogen waste in surface water in 2005, the remaining proportion coming from the leaching of agricultural land. Furthermore, animals' access to watercourses when grazing can lead to extra pressure, with the waste combining with the effects of grass being trampled on. In this context, the beneficial effect of building enclosures and drinking troughs has been clearly demonstrated(2). This is also a measure set out as part of project of River basin district management plan in the Walloon Region, which is currently the subject of a public consultation(3).

fig AGR 8-1

Agricultural waste water (from livestock buildings) in the Walloon Region



EOW 2008 – **Source:** SPW - DGO3 - DEE (Taxes and Revenue)

(1) http://aquapole.ulg.ac.be (2) Rosillon *et al.* (2005) (3) http://eau.wallonie.be

Agri-environmental measures

The aim of agri-environmental programmes is to encourage voluntary implementation of actions to conserve and improve the quality of the environment and the landscape in agricultural zones.

More farmers getting involved

In the Walloon Region, involvement from farmers has been increasing since the first year that agri-environmental measures (AEM) were put forward (1995). Subsidies are awarded to farmers who commit to one or more AEM for 5 years. The dramatic increases between 1999 and 2005 are connected to the implementation of more attractive programmes (remuneration, supervision). The slow-down in 2004 can be explained by the choice not to renew commitments just before the review of the programme underway.

The AEMs available since 1st January 2005 and the corresponding subsidies were published in the AGW of 28th October 2004[1]. These measures largely relate to biodiversity, the landscape and protection of surface and underground waters. At the end of 2006, nearly half of farmers were involved in one or more MAE. The most successful measures were those for hedges, isolated items (trees, ponds) and winter coverage of the ground before a spring crop. More than 9,600 km of hedges were subsidised as AEMs in 2006, while nearly 25,000 hectares of fields were given winter coverage (just under 20 % of the land covered by the main arable spring crops).

Higher density of AEMs in grazing regions

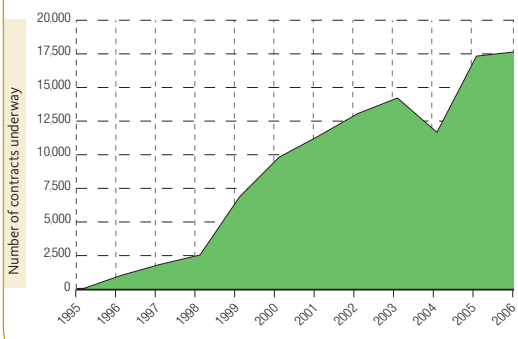
Zones with the largest density of AEMs are the grazing region of Liège, the Famenne and the Haute Ardenne. As well as hedges around grazing land, these regions contain a large proportion of grasslands and low-input cover strips subsidised as AEMs. There has been growing success too for measures taken to protect surface waters (watercourses) in arable crops areas.

Development of the programmes

The agri-enviromental programmes are reviewed regularly in order to target the most effective measures and priority zones from an environmental perspective. Comparing the situation in the Walloon Region at the end of 2006 with the aims of the *Plan wallon de Développement Rural* (PDR) 2000-2006[2] shows that apart from the lengths of hedges and maintenance of low livestock densities, which have been very successful, the aims of the PDR have generally only been 50 to 80 % successful. It should also be observed that the budget allocated to the AEMs was 14.2 million € in 2007, which was five times the 2004 budget.

fig AGR 9-1

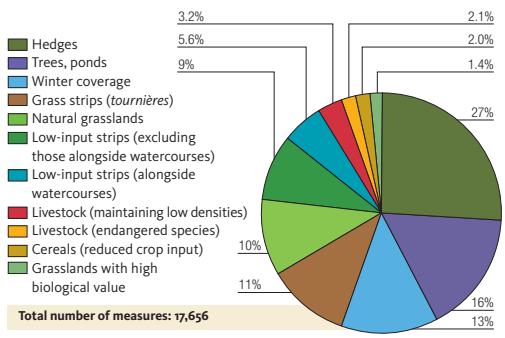
Involvement in the agri-environmental programme in the Walloon Region



EOW 2008 – **Source:** SPW - DGO3 - DRC (GIREA, CEEW calculations)

fig AGR 9-2

Agri-environmental measures (AEMs) implemented in the Walloon Region *(2006)*



EOW 2008 – **Source:** SPW - DGO3 - DRC (GIREA, CEEW calculations)

[1] A detailed description of the MAE programme is available at http://agriculture.wallonie.be
[2] MRW-DGA (2006)

production/agr 10

Extensification of agricultural production

When practised intensively, agricultural production can cause specific pressures on the environment (water pollution, soil erosion, etc.). As well as legal requirements and voluntary measures like the agri-environmental programmes, alternative production methods which exert less pressure on the environment can be introduced.

Reduction in the use of synthetic products: organic farming and integrated production

Organic farming precludes the use of synthetic inorganic fertilizers and pesticides, while integrated production aims to reduce their use as much as possible, by combining different methods (organic, mechanical, chemical).

The number of organic farms and their cultivated areas are on the rise in the Walloon Region. At the end of 2007, organic plots covered just over 29,200 hectares (mainly grazing land), or 3.9 % of the agricultural land used. The recent increase (2006 and 2007) can be explained by the implementation of a more generous regional support scheme (subsidies) and a more encouraging context (increased awareness of producers and consumers). At a European level (EU-15), organic farming represented 4.1 % of agricultural land used in 2005, with significant variations between countries (11 % for Austria, 8 % for Italy and 0.8 % for Ireland, for example).

On the other hand, there are technical specifications for the low-input production (*production intégrée*) of apples and pears(1), including different requirements for weeding, combating harmful plants and insects, etc. The main label (Fruitnet) brings together 25 % of producers, representing 45 % of the production in Wallonia.

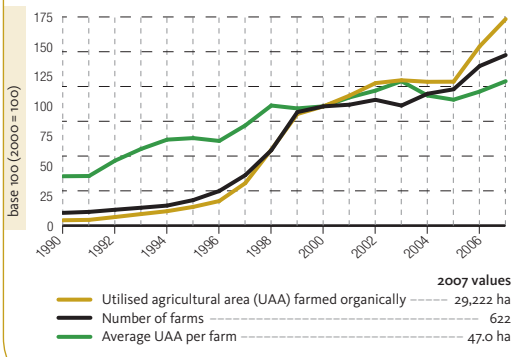
There are similar guidelines for producers of vegetables and dairy products.

Development of extensive crop production methods

Extensive crop production methods can also be used as part of traditional farming. So, minimum tillage can help fight effectively against the soil erosion by water, while the aim of precision farming is to take into account the spatial diversity of cultivated plots by adapting methods and treatments.

fig AGR 10-1

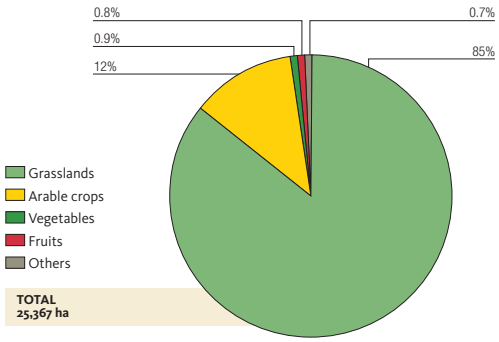
Organic farming in the Walloon Region



EOW 2008 – **Source:** SPW - DGO3 - DEMNA (CEEW calculations)

fig AGR 10-2

Utilised agricultural area (UAA) for organic farming in the Walloon Region *(2006)*



EOW 2008 – **Source:** Bioforum

(1) Specifications published in the Ministerial Decree, 10/01/2005, specifications developed by GAWI asbl (www.asblgawi.com)

Forest ressources

Covering nearly a third of the territory, forests are a major component of the rural landscape of the Walloon Region. The forester's choices in terms of which species to cultivate and which methods to use determine the development of the physiognomy of forests and their ability to fulfil the various roles that are assigned to them.

Rise in productive plantations

Since the end of the 19th century, uncultivated land has been planted with trees, so that productive forest areas have risen by just over 80,000 hectares, equivalent to 21 %. At the same time, coppices and coppice-with-standards have been converted to deciduous or conifer seedling forests. At the moment, forests cover just over 550,000 hectares, 86 % of which are productive plantations. A slight decrease in productive forest land area (- 4 %) can be seen in comparison to 1980.

Spruce plantations, predominant in Ardenne, are the most common. All deciduous plantations combined nevertheless represent 52 % of productive land. Oak and beech cover 34 % and 18 % respectively. The most diversified plantations can be found in the Condroz, the loamy region and the Lorraine belge.

A combination of natural and financial factors determine forest management choices

The development of forests and opportunities to diversify depend on several factors, including:

- the soil fertility and the climate;
- the intensity of competition for other uses of the land (agriculture, urbanisation);
- the demand for forest products;
- the pressure of large hoofed animals.

Whether land is publicly or privately owned does not really affect the choice of the forester when it comes to which species to grow. The most noticeable differences between woodland covered or not covered by forestry regulations (Forestry code) are for beeches, spruces and non-productive plantations, the latter two being more common in properties not covered by the regulations.

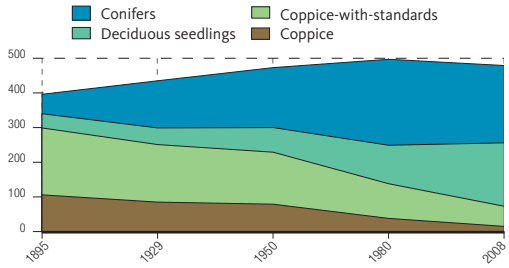
A new Forestry code, voted in on 15th July 2008

The aim of the new Forestry code is to safeguard the regeneration and sustainability of forests, as well as an optimum dynamic balance between its economic, ecological and social roles. While certain objectives are imposed on both public and private land owners (choice of species appropriate to local conditions, diversification, measures favouring biodiversity, restricting clearcutting, drainage and input, reasonable opening up to the public, etc.), to compensate this the Code does away with management charges for public owners and estate taxes which penalise private owners.

fig FOR 1-1

Land used for the different sylvicultural systems in the Walloon Region

Area of productive forest (x 1000 ha)

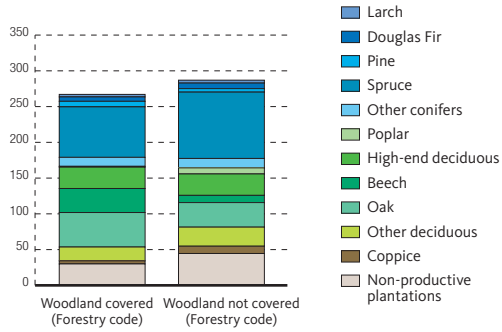


EOW 2008 – **Source:** SPW - DGO3 - DNF (IPRFW)

fig FOR 1-2

Land used for the different forest stands in the Walloon Region *(1994-2008)*

Area per type of owner (x 1000 ha)



EOW 2008 – **Source:** SPW - DGO3 - DNF (IPRFW)

Tree felling

The main source of income from forests, wood is a renewable, ecological material whose technical properties are remarkable. To guarantee sustainable forest management, felling must be maintained at the same rate as tree growth over the long term.

Capitalising on volumes of standing trees

Since the last inventory was taken, twenty or so years ago, volumes of standing trees in the Walloon Region have increased by 26 % for land subject to forest regulations and 36 % for land not subject to these regulations. In 2008, the total volume of wood came to more than 112 million m³.

This capitalisation was followed by an increase in volumes felled. In 2007, 1.65 million m³ were felled from regulated land (volume to upper growth limit of 22 cm). The majority of felling (58 %) involved spruces. While volumes of standing trees are higher for oak than for beech, more felling is carried out on beech trees. The data relating to felling on non-regulated land is not available.

Belgium is one of the countries in the OECD where levels of felling are highest. The increase in volumes of standing trees nevertheless shows that they are not endangering the sustainability of forests.

Circumstances and natural factors combine

For conifers, the increase in the volume of growing stocks comes from the ageing of so many plantations of the 1980's. The increase in the volume of deciduous trees is mainly down to the conversion of coppices and coppice-with-standards to seedling forests, as well as to the fact that the volumes of felled wood are lower than the increase. Among the factors which influence tree felling are the following economic issues:

- ➜ the demand for forest products (timber, pulpwood, wood for fuel);
- ➜ changes in the price of wood;
- ➜ the development and organisation of the wood industry.

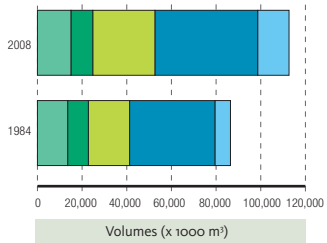
As well as the age of plantations, natural factors sometimes affect exploitation. The 1990 storms and the plagues of 2001 and 2002 mark the changes in felled volumes in regulated woods. At the same time, the reduction in felling in 2000 can be explained by the saturation of the market following the storms which occurred in France in 1999.

Reducing capitalisation

New directives for regulated forests aim to reduce capitalisation by intensifying lighting in deciduous and conifer plantations as well as by reducing the levels of exploitability of oak and beech trees. These measures will be adapted depending on the priority given to biodiversity on some sites.

fig FOR 2-1

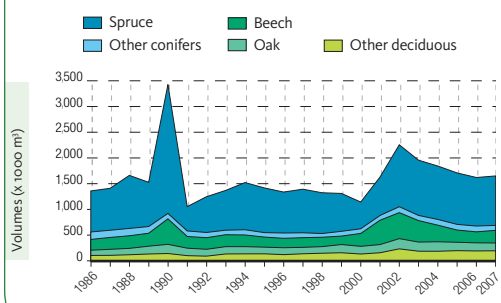
Volumes of growing stocks in the Walloon Region



EOW 2008 – **Source:** SPW - DGO3 - DNF (IPRFW)

fig FOR 2-2

Felled wood in regulated forests in the Walloon Region



EOW 2008 – **Source:** SPW - DGO3 - DNF

production/for L1

Certification of forests

Certification systems for forests are the result of research into finding a balance between the social, production and environmental roles of forests, as well as from the desire to make the most of what they produce commercially. In Belgium, there are two internationally recognised certification systems: PEFC and FSC. Only the former is used in the Walloon Region.

A voluntary move towards progress

The Programme for the Endorsement of Forest Certification schemes (PEFC) is a tool to improve forest management in the long term, as well as to educate forest owners and managers.

In 2006, a new *Plan de progrès pour la gestion forestière wallonne*[1] was drawn up for 2007-2011 by a task group which included all stakeholders. It contains 11 objectives organised into 27 actions to undertake at regional level.

By signing a charter[1], land owners voluntarily agreed to aim towards more restrictive management standards than those stipulated by legislation. These standards are based on certain criteria and indicators, but most of all on management recommendations made by the Ministerial Conferences on the Protection of Forests in Europe.

Criteria of the Ministerial Conference at Helsinki (1993)

1 > Conservation and appropriate improvement of forestry resources and their contribution to global carbon cycles

2 > Maintenance of the health and vitality of forest ecosystems

3 > Maintenance and encouragement of the production roles of forests

4 > Maintenance, conservation and appropriate improvement of the biological diversity of forest ecosystems

5 > Maintenance and improvement of protective measures in forest management (soil and water especially)

6 > Maintenance of other benefits and socio-economic conditions

Nearly 268,000 ha of certified forests

In the Walloon Region, PEFC certified forests cover nearly 268,000 ha, or 49 % of the Region's forest areas. Nearly 90 % of certified forest land belongs to public landowners.

Internal and external controls

To make sure management complies with the charter, internal and external audits are carried out annually at a sample of certified properties.

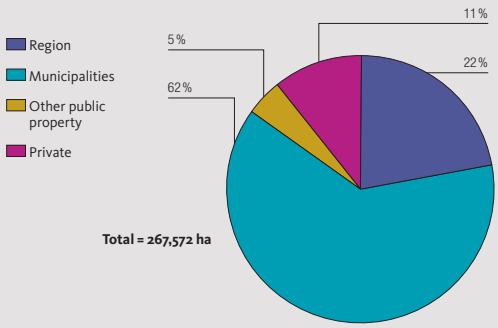
Furthermore, a chain of control is implemented in order to monitor the journey of the certified wood through the different stages: exploitation, transformation and sale. This chain of control is verified annually by independent auditors.

At the end of 2006, an external audit renewing the regional certificate was carried out. Administrative and field checks resulted in its renewal until 26th June 2009.

fig FOR L1-1

PEFC forest land in the Walloon Region

by type of owner



EOW 2008 – **Source:** SPW - DGO3 - DNF

[1] To view official documents, go to http://www.pefc.be

Forest management plans

Forest management plans are guidelines for foresters. It helps avoid over-exploitation, and safeguards the different roles of forests. Stipulated by the Forestry code for all regulated woodland, it is also one aspect of the Plan de progrès pour une gestion durable des forêts wallonnes.

Reclaiming and planning the forests of the future

Forest reclamation determines the main actions to be taken for the forests of the future, and defines the respective importance of forests' different roles in space and time. The organisation and planning of work to be carried out has been carefully studied in order to reach objectives, given the current situation.

At the end of 2007, 52,000 of the 250,000 ha to be reclaimed has already been approved following a procedure involving several stages.

Each plot with its own objective

Each plot included in a reclamation plan is given one or more objectives. These might be:

- multifunctional wood production;
- the conservation of natural species or habitats (with the possibility of management within integral natural reserves);
- the protection of water or soil;
- the preservation of game;
- opening up to the general public.

Diversification of species and structure

In general, reclamation requires a diversification of species and an increase in the proportion of deciduous trees by replacing conifer stands located in inadequate sites.

The development of companion species, such as fruit trees and grazed trees is also encouraged. At the beginning of 2008, these species represented just over 10 % of deciduous species.

At the beginning of 2008, a structure of different ages was preferred for 67 % of deciduous plantations compared with just 3 % for conifers. In the future, these proportions should increase.

Adaptation of species to their site

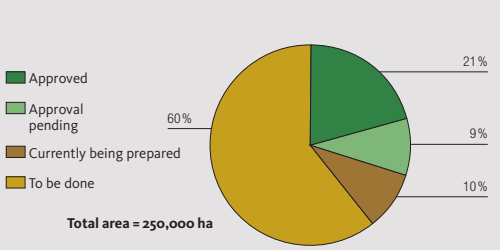
The regeneration of forests will take place by using site-adapted species, and potential natural associations will be preferred. For conifers, Douglas firs and, to a lesser extent, larch will be planted, instead of spruce.

More light at ground level thanks to dynamic forestry

In order to encourage light penetration, reclamation work will favour dynamic forestry methods: plantations with generous spacing, early thinning, high pruning, new forestry methods or reduced exploitability periods. More attention is paid to the development of mixed-age forests.

fig FOR L2-1

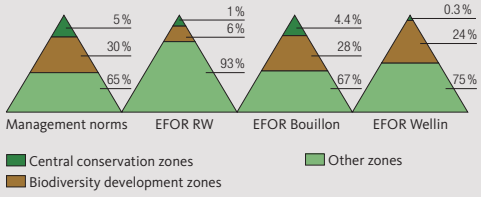
Forest reclamation review in the Walloon Region
(situation in february 2008)



EOW 2008 – **Source:** SPW - DGO3 - DNF

fig FOR L2-2

Forest zones in the Walloon Region *(March 2008)*



EFOR data has not yet been updated for all forest blocks (many non-productive zones given multi-purpose objectives). Bouillon and Wellin are two areas for which there is up-to-date information.

EOW 2008 – **Source:** SPW - DGO3 - DNF

Energy consumption by manufacturing industry

Manufacturing industry(1) is the Walloon Region's most energy-intensive sector. In 2006 it accounted for 44 % of final energy use (excluding transport), which is significantly above the European average (35 %).

Importance of heavy industry

This is largely attributable to the high level of energy demand from heavy industry, which has historically been well established in the Walloon Region, despite major restructuring in the sector in recent decades. The largest consumers are located primarily in the industrial zone along the Sambre-and-Meuse river line.

Decoupling between energy consumption and industrial production

The fall in final energy consumption since 2001 is mainly attributable to the iron and steel sector (plant closures) and the chemicals sector (respectively 28 % and 36 % drop in energy requirements between 2001 and 2006). This fall has resulted in a decoupling between energy consumption and industrial activity (indices of production and wealth creation – GVA). By sector, however, the steel industry still accounted for over 35 % of the total consumption of energy by industry in the Walloon Region in 2006, ahead of chemicals and non-metallic minerals (cement and glass). Non-energy uses (6.3 % of total consumption) is mainly in the chemicals sector, which alone accounts for 60 % of demand.

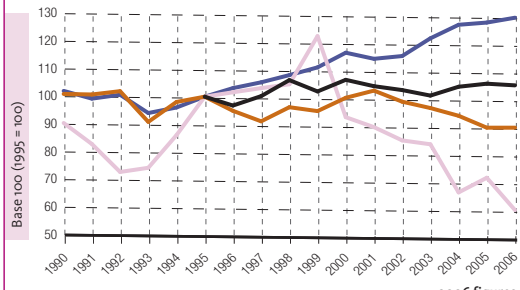
Also worth noting are the branch agreements in place between the Walloon Region and various branches of industry, aimed at reducing greenhouse gas emissions and/or improving energy efficiency. By the end of 2007, 162 companies from 15 sectors and sub-sectors of industry had signed up to such agreements(2).

Solid fuel declining, natural gas and electricity on the increase

Solid fuel consumption is declining (restructuring and plant closures in the steel industry), though still relatively high compared with the European average. The use of natural gas increased through to 2000, especially in the chemicals sector (doubling of consumption between 1990 and 2000) and also in the iron and steel sector. Electricity demand also increased through to 2000, with industry accounting for half of all electricity consumption in the Walloon Region (in 2006). This trend can be explained in particular by the boom in electric steel (trebling of production between 1985 and 2005) and by growth in the chemicals sector.

fig INDUS 1-1

End consumption (EC) of energy by manufacturing industry in the Walloon Region (excluding transport)

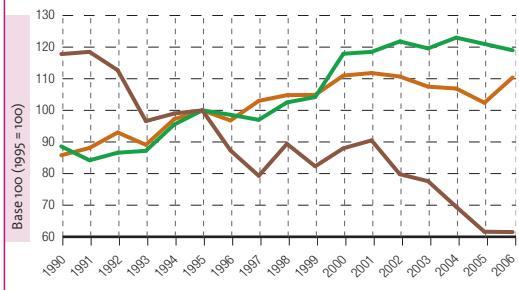


*Including energy sector (NACE 10-41)

EOW 2008 – Sources : SPW – DGO4 - DEBD; ICN (Regional accounts); IWEPS

fig INDUS 1-2

Main sources of energy used by manufacturing industry in the Walloon Region (excluding non-energy uses and transport)



EOW 2008 – Source : SPW - DGO4 – DEBD

(1) Excluding the energy sector (NACE 14-37) (2) Details on current agreements are available at http://energie.wallonie.be

Emissions into the atmosphere by manufacturing industry

Manufacturing industry(1), in particular heavy industry (iron and steel, non-metallic minerals and chemicals especially), contributes significantly to the emission of pollutants into the atmosphere in the Walloon Region.

Emission levels high, but declining

Emissions into the atmosphere by industry result from the use of energy sources (as energy or material) and from certain production processes (use of natural gas for fertiliser production, calcination of limestone material in cement manufacture, production of ammonia, etc.). These latter processes account for a significant proportion of total industrial emissions (38 % of greenhouse gases in 2006; 45 % of acidifying substances, 81 % of VOCs and 76 % of heavy metals in 2005).

Sector differences

The downward trend in emissions over the last 15 years is the result of efforts by industry but also of plant closures and restructuring. There are moreover significant differences between sub-sectors of industry, depending on production levels, energy intensity and processes used(2).

Decoupling of emissions and industrial production

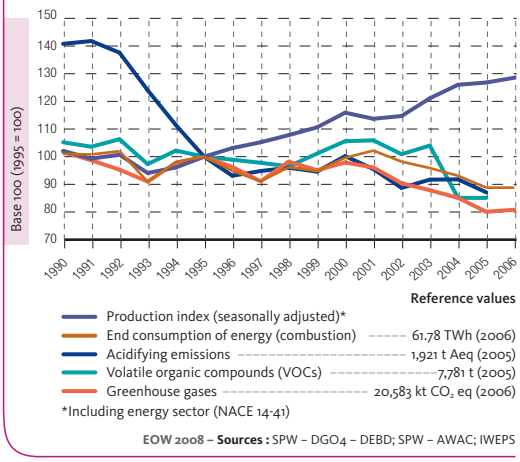
Overall, the levels of the different types of emissions are decoupled of the industrial production, which has been increasing since 1993. Emissions of acidifying substances fell steeply between 1990 and 1995, owing inter alia to the use of fuels with a lower sulphur content (replacement of coal by natural gas) and advances in waste gas cleaning (filters). In the case of greenhouse gases, the downward trend in recent years is attributable to the increase in the share of natural gas and the development of processes which release less CO_2 (e.g. electric steel or dry-process clinker). In the case of VOCs, the net reduction in 2004 occurred when directive 2004/42/EC on the limitation of emissions of VOCs due to the use of organic solvents came into force.

Inventory and tracking of emissions

Given their importance, industrial emissions into the atmosphere are subject to tracking within the framework of various regulatory provisions, such as the IPPC directive in particular. An inventory of the main industrial emissions is also available on a European level(3).

fig INDUS 2-1

Emissions into the atmosphere by manufacturing industry in the Walloon Region



*Including energy sector (NACE 14-41)

EOW 2008 – **Sources :** SPW – DGO4 – DEBD; SPW – AWAC; IWEPS

tab INDUS 2-1

Emissions of pollutants to the atmosphere by manufacturing industry in the Walloon Region

	Value (year)	Percentage change from 1990	Part (%) in Walloon Region
Greenhouse gases	20,583 kt CO_2 eq (2006)	- 20.5 %	43.1 %
Acidifying substances	1,921 t Aeq (2005)	- 38.2 %	35.4 %
Volatile organic compounds (VOCs)*	7,781 t (2005)	- 19.1 %	14.4 %
Heavy metals	135.3 t (2005)	- 29.0 %	85.1 %
Dust (TSP)	23,258 t (2005)	na	53.9 %

* excluding non-anthropic emissions

EOW 2008 – **Source :** SPW - AWAC

(1) Excluding the energy sector (NACE 14-37) (2) http://environnement.wallonie.be/enviroentreprises (3) http://eper.eea.europa.eu/eper

Water consumption and waste water discharge by manufacturing industry

Manufacturing industry[1] is a major consumer of water in the Walloon Region. A large proportion of the water used is discharged into the environment after use and may contain various types of pollutant.

Use of surface water for cooling purposes

Over 90 % of the water required by manufacturing industry come from surface water. The sectors with the highest demand are the metal industry (56 % of the total volumes, over 70 % of which is for cooling) and, to a lesser extent, the chemicals and paper manufacturing industries. It should be noted, however, that the total amount of cooling water used by manufacturing industry is 8 times less than that used in the energy sector alone (power stations). Public drinking water, on the other hand, accounts for less than 6 % of the water required by industry.

Reduction in water requirements and waste water volumes

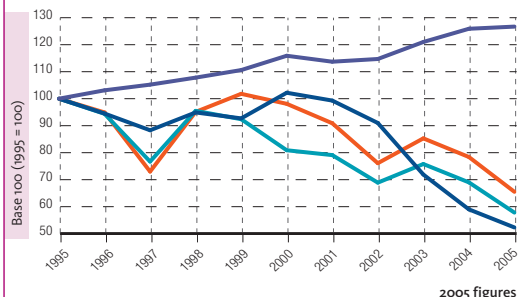
The volume of water used and discharged by industry in Wallonia has been decoupled from the index of industrial production since the end of the 1990's. This downward trend (volumes used and discharged) is the result mainly of the downturn in activity in the metal industry (restructuring and plant closures). The peak in water consumption in 2003 is related to increased demand for cooling water in that year (very hot weather).

Reduction in levels of pollutants in waste water, except phosphorus

Data on the tax levied on the discharge of industrial waste water show that discharges of nitrogen, suspended solids and heavy metals were halved between 1995 and 2005. This positive trend is the result of efforts by industry (installation of treatment plants, recycling of water in closed systems), in particular following the introduction of the tax on waste water discharges (DRW of 30 April 1990). The increase in the levels of heavy metals in 2003 and 2004 is due to an almost doubling of discharges of zinc (which accounts for approximately 85 % of industrial heavy metal discharges) by the metal industry (one-off discharges related to a factory closure). The increase in phosphorus discharges is largely attributable to a factory manufacturing fertilisers.

fig INDUS 3-1

Water consumption and waste water discharge by manufacturing industry in the Walloon Region



2005 figures

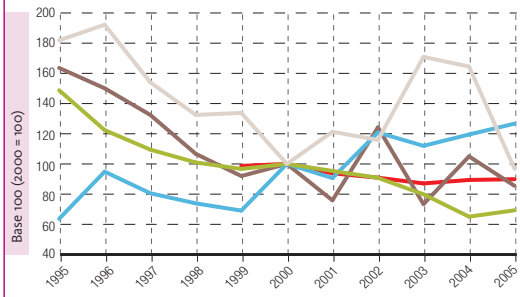
Production index (seasonally adjusted)*	
Waste water discharges (all industrial sectors)	373.2 Mm³
Water consumption (all industrial sectors)	389.2 Mm³
Production index (seasonally adjusted) (metal industry)	

*Including energy sector (NACE 14-41)

EOW 2008 – **Sources :** SPW – DGO3 – DEE (Taxes and Revenue); IWEPS

fig INDUS 3-2

Pollutant levels in waste water discharged* by manufacturing industry in the Walloon Region



2005 figures (tonnes)

Phosphorus	580.1
Heavy metals	58.8
COD	31,360.6
Suspended solids	6,984.3
Nitrogen	1,582.9

* All receptor media

EOW 2008 – **Source :** SPW – DGO3 – DEE (Taxes and Revenue)

[1] Excluding the energy sector (NACE 14-37)

Generation of industrial waste and hazardous waste

The production of goods and provision of services cause waste to be generated. While the majority of this waste results from industrial manufacturing processes, associated activities (plant maintenance, office systems, packaging, etc.) also generate waste. In addition to limits on actual quantities, there is a need to decouple wealth creation from waste generation.

Over 6 million tonnes generated annually

The generation of waste by manufacturing industry, electricity production and waste treatment, in the Walloon Region increased sharply between 1997 and 2000, then fell again between 2000 and 2002. Since then waste disposal has hovered around 6,400 kt.

In descending order, the sectors producing the largest quantities of waste in 2006 were:

- metal and metal-working industries (2,584 kt)
- agri-food industry (1,258 kt)
- chemical, rubber and plastics industry (990 kt)
- timber industry and manufacture of items in wood (660 kt).

Although the percentage of hazardous waste declined between 1995 and 2000, it has been increasing again since 2001. In 2006, it rose to 7.5 %, exceeding the 1995 level. The hazardous waste generated by industry in 2005 (482 kt) accounted for 86 % of the hazardous waste notified to the OWD in the same year (560 kt) under the framework of the specific procedure for this type of waste.

The size of the industrial sectors within the economy is a determining factor

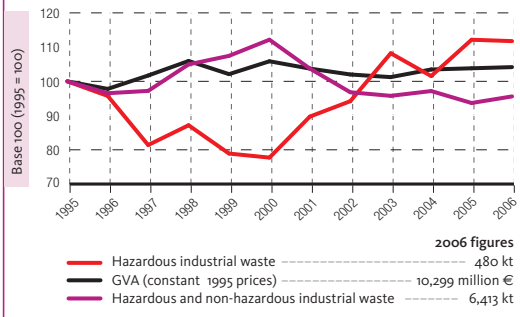
The amounts of waste generated reflect the relative sizes of the different industrial sectors within the Walloon economy, and are strongly linked to production volumes. A proportion of this waste is, moreover, considered to be unavoidable waste, that is waste which is inevitably generated by current industrial processes. Changes in manufacturing processes and improvements of resources productivity, owing to the use of integrated technologies, are, however, enabling progress to be made in decoupling economic growth from the generation of waste.

Statistics can no longer be compared to targets

Some waste fluxes included in the statistics today were not regarded as such at the time the waste prevention targets of the *Plan wallon des déchets* (PWD) were set. This plan relates indeed to a concept no longer applied as it is considered incompatible with European law: that of "materials which can be considered as products". Consequently the available statistics can no longer be compared to these targets.

fig INDUS 4-1

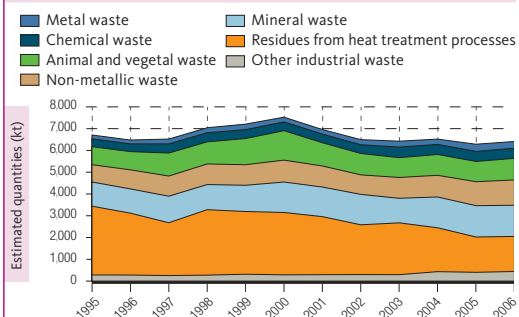
Evolution of industrial waste generation in the Walloon Region



EOW 2008 – Sources : SPW – DGO3 – DEMNA (*Bilan environnemental des entreprises*); ICN (Regional accounts)

fig INDUS 4-2

Waste from manufacturing, electricity generation and waste treatment industries in the Walloon Region



EOW 2008 – Source: SPW – DGO3 – DEMNA (*Bilan environnemental des entreprises*)

Industrial hazards

The consequences of an accidental discharge of pollutants into the environment are, in certain cases, potentially very serious. Consequently hazardous industrial sites (sites at risk of a major accident, nuclear sites) are subject to specific legislation.

Few incidents at major accident hazard sites (Seveso sites)

Major accident hazard sites are identified on the basis of the processes implemented and/or the storage of hazardous materials. They are subject to the Seveso directive (2003/105/EC), adopted into Belgian law and applied in the 3 Regions on the basis of a co-operation agreement (MB of 26 April 2007).

The sites in question are classified in 2 groups, based on hazard level (high threshold or low threshold). The operators are required to comply with certain obligations (preparation of an emergency plan and hazard prevention policy, incident reporting, etc.).

As at mid-April 2008, there were 92 Seveso sites in the Walloon Region (40 "high threshold" and 52 "low threshold"). Most of these sites are located along the Sambre-and-Meuse river line, close to population centres (towns of Liège, Charleroi, Mons and Tournai). The proximity of Seveso sites has implications particularly for land use management (building permits). The precise mapping of the vulnerable areas around the Seveso sites is currently being finalised.

Some ten incidents occurred at Seveso sites between 1 January 2006 and the end of June 2008. These caused material damage, quite significant in some cases, but no injuries. Apart from the release of pesticides into the Meuse, which killed large numbers of fish in August 2007, the impact on the environment was generally limited.

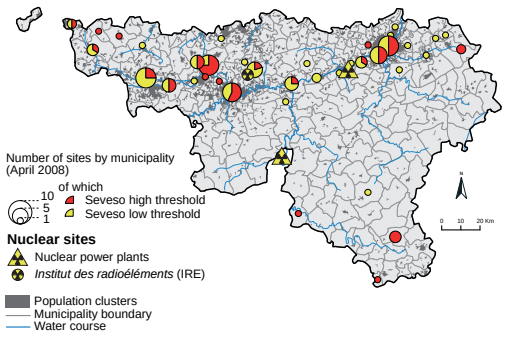
Radiation monitoring

The risks of exposure to ionising radiation are outside the scope of the Seveso directive and are covered by specific legislation. Apart from natural radiation (associated particularly with radon), the potential sources of exposure in the Walloon Region (or the immediate vicinity) are the Tihange and Chooz nuclear power plants, and the *Institut des radioéléments* (IRE) in Fleurus.

The level of radioactivity in Belgium is measured continuously by the TELERAD network set up by the *Agence fédérale de contrôle nucléaire* (AFCN). Since it was established in 1998, this network has not identified any significant problems. Specifically, the accidental release of radioactive iodine by the IRE on 22 August 2008 was not detected by the beacons. One of the explanations suggested was that the pollutant dispersed rapidly in the atmosphere.

map INDUS 5-1

Major accident hazard sites (Seveso sites) and nuclear sites



EOW 2008 – **Source :** SPW - DGO3 - DPA

Environment-related investment and expenditure

A proportion of investment by industry is spent on environmental protection. The objective of this expenditure is generally compliance with environmental legislation, but other aspects such as health and safety at work or improvement of the public image, also come into the equation.

Reduction in the relative share of investment in curative measures

Investment in environmental protection to some extent reflects the "polluter pays" principle, even if there is no direct link between the effectiveness of the equipment in environmental terms and its cost. In the Walloon Region, the corresponding amounts represent approximately 10 % of total industry investments. This share varies from year to year and from sector to sector. In 2006, the chemicals, non-metallic minerals, waste management and food sectors made the largest investments[1]. Otherwise, between 1997 and 2006, there was an overall reduction in investment in curative measures (exhaust gas filtration, waste water treatment, etc.) and an increase in expenditure on site remediation. Integrated investments, which involve more fundamental modifications to processes in order to reduce the causes of pollution at source, have remained relatively stable. In such cases, however, it is not always easy to identify the share of the investment which is strictly environment related.

Relatively high operating costs

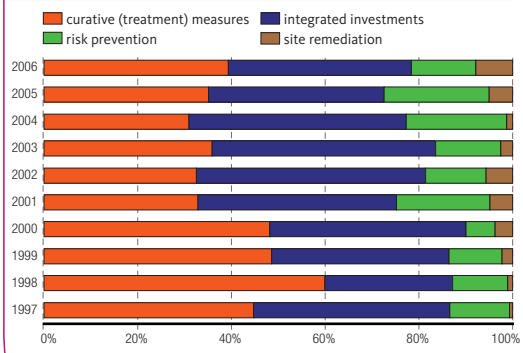
Apart from the capital expenditure, environmental protection also brings with it operating costs (inspection and maintenance of specific items of equipment) and various on-going expenses (costs of studies, taxes and fees, insurance premiums, etc.). Overall in 2006, operating costs and on-going expenses amounted to more than double the capital expenditure on environmental protection measures.

Treatment of discharges into the air and into water

The distribution of capital expenditure on environmental curative measures, according to the different media affected or type of pollution, shows that a significant proportion is spent on the treatment of waste water and exhaust gases (almost 80 % on average between 1997 and 2006). This can be seen in the downward trend in the level of pollution in waste water discharges by industry. The large variations between years can be attributed in particular to the fact that some expenditure extends over several years, or to the difficulty in assigning some expenditure unequivocally to a specific environmental compartment. The small proportion of expenditure allocated to waste products can among others be attributed to the importance of sub-contractors in this sector.

fig INDUS 6-1

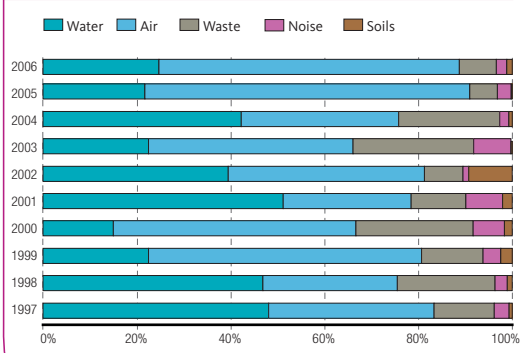
Relative distribution of investments in environmental measures by industry in the Walloon Region, by investment type[1]



EOW 2008 – **Source :** SPW - DGO3 - DEMNA (*Bilan environnemental des entreprises*)

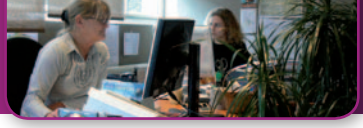
fig INDUS 6-2

Relative distribution of investments in curative (treatment) measures by industry in the Walloon Region, by media affected and type of pollution[1]



EOW 2008 – **Source :** SPW – DGO3 – DEMNA (*Bilan environnemental des entreprises*)

[1] Based on a non-representative sample of the extractive, manufacturing, energy production and waste management industries in the Walloon Region (sample size : 177 companies in 2006)



production/tert 1

Energy consumption and discharges into the atmosphere by the services sector

In absolute terms the consumption of energy by the services sector is significantly below that of industry or households in the Walloon Region. The sector is, however, growing, as is its demand for energy, particularly for electrical equipment and transport uses.

Residential sector consumption increasing

The residential sector energy consumption (excluding transport) of the services sector increased overall by 43 % between 1990 and 2006, with growth slowing down from 1997 onwards. In the case of fuels (heating), the demand pattern is linked above all to the evolution of the number of buildings and weather conditions (cold winter in 1996), and to advances in thermal insulation and heating systems. On the other hand, electricity consumption increased by an average of 3.2 % a year between 1990 and 2006, due primarily to the growth in the number of electrical appliances (office systems, lighting, air conditioning).

Since 2000, there has been no evidence of a decoupling between total residential energy consumption and the number of jobs. On the other hand, electricity demand has increased from an average of 5.1 MWh per employee in 1995 to 5.8 MWh in 2006. There is still potential for energy saving in services sector buildings. In this context, the public authorities have put in place various tools and incentives aimed at improving the management of energy consumption[1].

Slight gain in eco-efficiency

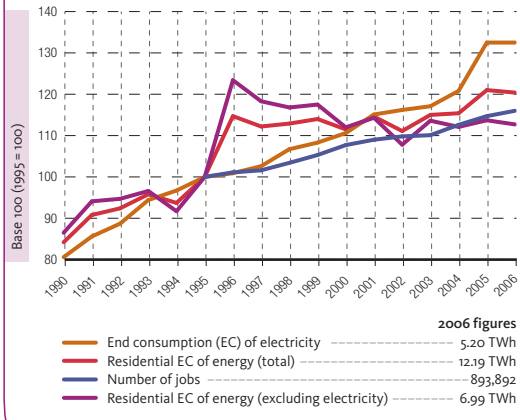
From the environmental point of view, energy consumption is mainly a source of pollutant discharge into the atmosphere. In the case of the services sector, emissions of the different types of pollutants vary largely in line with residential energy consumption. There has, however, been a slight gain in eco-efficiency, with the amounts released per unit of consumption falling by 9 % to 16 % between 1990 and 2006, depending on the type of pollutant.

Transport-related share of energy demand

According to a distribution pattern determined for the Walloon Region, 43 % of the total energy consumption for transport is attributable to the services sector. On this basis, transport accounts for 56 % of the total energy consumption of the services sector. This proportion, which is much higher than for the industrial sector, is among others a consequence of the type of activity (services).

fig TERT 1-1

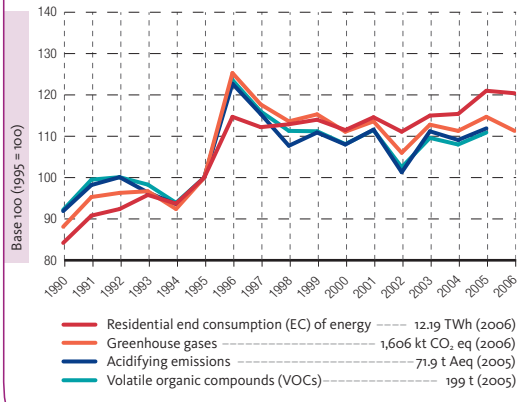
Residential energy consumption of the services sector in the Walloon Region



EOW 2008 – **Sources :** ICN (Regional accounts); SPW – DGO4 – DEBD

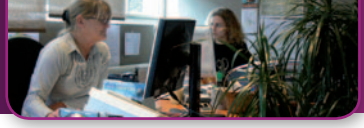
fig TERT 1-2

Residential energy consumption and discharge of pollutants into the atmosphere by the services sector in the Walloon Region



EOW 2008 – **Sources :** ICN (Regional accounts); SPW – DGO4 – DEBD

[1] See in this context http://energie.wallonie.be



Water consumption and discharge of waste water by the services sector

Like the other sectors, the services sector uses water and discharges waste water. Some of the ways in which water is used are similar to domestic usage and therefore difficult to separate out, making it hard to assess the impact of the services sector on the environment.

Public drinking water consumption

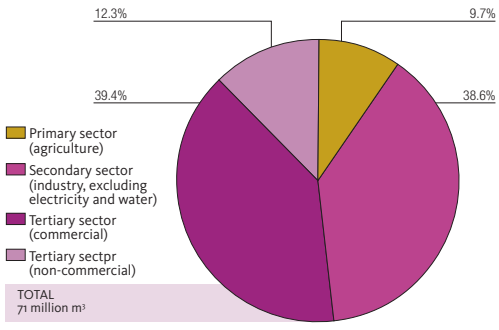
The water consumed by the services sector comes largely from the public drinking water network. Based on a study[1] relating to 2002, approximately 18 % of the total volume of public drinking water is consumed by non-domestic users (i.e. non-household users), with the services sector (commercial and non-commercial) accounting for just over half of this percentage. Within the services sector, the main consumers are shops, the HORECA sector and the health and social services sector. Any comparison of the volume of public drinking water consumed by the services sector with that consumed by industry or agriculture must take into account the fact that these latter sectors mainly use water from other sources (surface water or groundwater). Moreover, the value for the services sector includes a significant proportion of domestic-like consumption, which cannot easily be separated out.

The pollution load in waste water is mainly domestic-like

Given the type of activity (services), there are relatively few sub-sectors of the services sector which are subject to the tax on industrial waste water discharge (laundries, laboratories, vehicles repair workshops, etc.), and the pollution load is small by comparison with industry. The position is reversed, however, in the case of domestic-like pollution, which for the services sector is estimated[2] at a population equivalent (p.e.) of just under 340,000, i.e. 8 times that of the industrial sector.

fig TERT 2-1

Consumption of public drinking water by non-domestic users in the Walloon Region, by sector
(estimates for 2002)



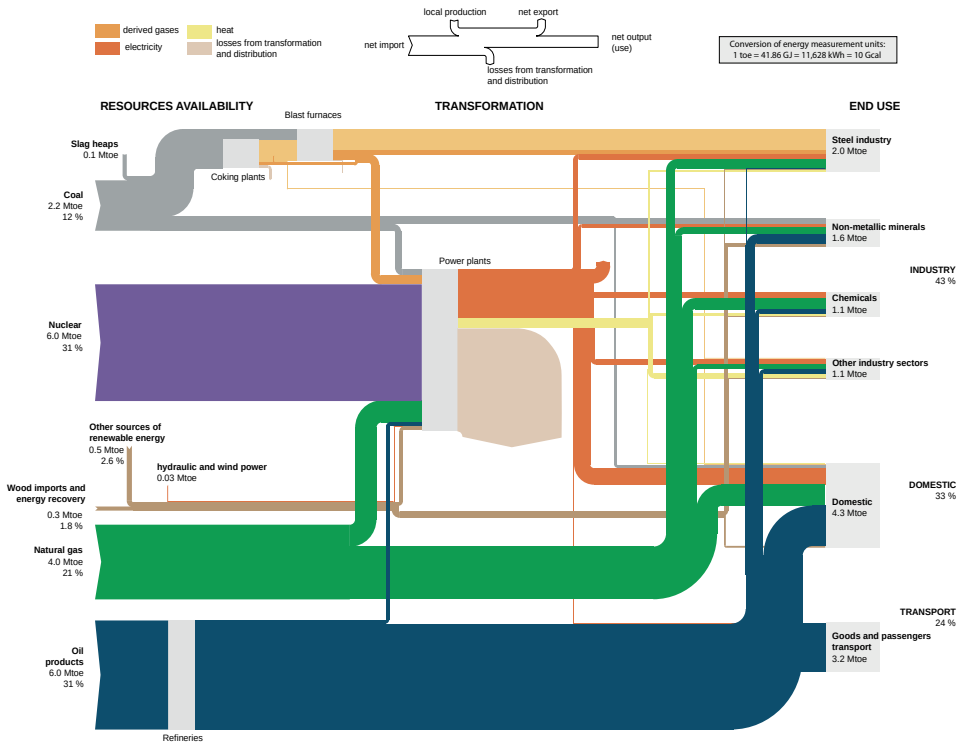
EOW 2008 – **Source :** Aquawal S.A.

[1] Aquawal S.A. (2004) [2] ICEDD (2007)

Energy balance in the Walloon Region

Energy balance comprehensively illustrate the sources of energy used, in some cases their transformation (electricity production), and end use by different sectors.

Energy flows *(2005)*



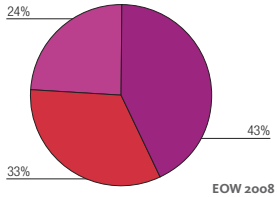
EOW 2008 – **Source :** SPW - DGO4 - DEBD

In the case of the Walloon Region, the balance sheet clearly shows the almost total dependence on foreign energy resources, the low contribution of renewable energy, the high proportion of nuclear in electricity production, and major losses from transformation, as well as the significant contribution of industry to the end use of energy.

On the other hand, energy consumption associated with transport has been rising consistently for years. Based on different hypotheses, it can be distributed between the different sectors[1]. Taking this distribution pattern into account, the overall contribution of industry (including transport) to end use of energy is close to 50 %. It should be noted that the service sector and households together represent more than ¾ of energy use associated with transport.

fig ENER 1-1

Distribution by sector of energy consumption associated with transport in the Walloon Region



EOW 2008 – **Source :** SPW - DGO4 - DEBD

[1] ICEDD (2008)

Primary energy sources for electricity production

In the Walloon Region, electricity is mainly produced in a centralised way, from imported fossil and fissile fuels. Net production of electricity was 31 TWh in 2006 (+ 8.2 % compared to 1990). The regional balance of production-consumption is leaning towards a surplus, in spite of the increase in demand in all sectors.

Core production from nuclear fuel and natural gas

Nuclear fuel represents nearly three quarters of primary energy resources used in power plants (in 2006). This value is relatively consistent with 1990. Natural gas (13 % of the total in 2006) is the only fossil fuel that has seen a rise since 1990, largely because of the introduction of new combined gas and steam turbines.

Progress of renewable energy, decline of coal

The most noticeable changes between 1990 and 2006 involve renewable energy (on the rise) and coal (on the decline). The progress of renewable energy is largely linked to the growth in the use of biomass (wood). The relative proportion of renewable energy in total electricity production is however still low compared to other European countries. As for coal, from which specific emissions of atmospheric pollutants are high, is actually hardly used any more in power plants.

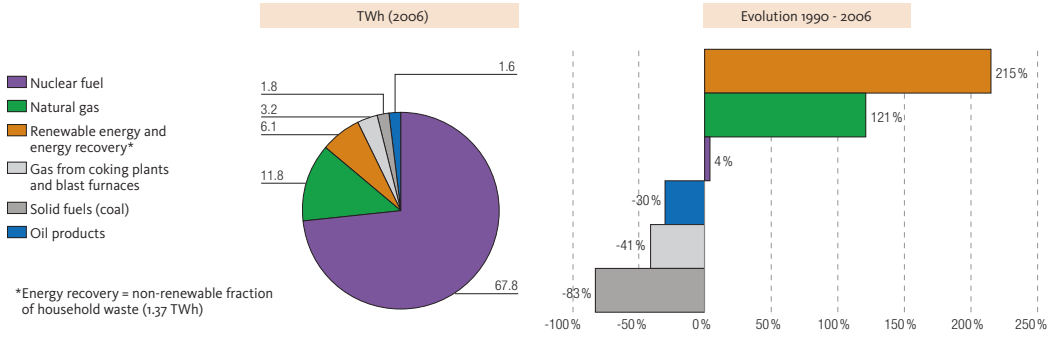
The issues: availability of resources and environmental impacts

The choice of energy sources for electricity production should ideally take into account the availability of local resources, the reliability of supplies (for the imported resources) and the environmental impacts (climate change in particular).

Nuclear energy hardly emits any greenhouse gases (GHGs), but the transformation efficiency is low, and the long-term management of radioactive waste is still an issue. The consequences of the gradual shutting down of nuclear power plants in Belgium should also become known from 2015. Fossil fuels, which are the source of GHG emissions, are limited and must be imported. Furthermore, the centralised production of electricity in high power units (nuclear reactors, combined gas and steam turbines) has local implications (thermal discharges, effects related to transporting electricity). On the other hand, potential for renewable energy exists, but in some cases renewable resources are already well developed (hydroelectricity), or can sometimes cause a problem in terms of land use management (wind power) or competition with other possible uses (for forests and agricultural resources).

fig ENER 2-1

Primary energy resources for electricity production in the Walloon Region



EOW 2008 – **Source:** SPW - DGO4 - DEBD

Electricity and heat from renewable sources and cogeneration

In the Walloon Region, the development of renewable energy sources and cogeneration for the production of heat and electricity is one of the goals of the Plan pour la maîtrise durable de l'énergie à l'horizon 2010 *(PMDE). This aspect is also an element in several measures of the* Plan Air Climat[1].

Importance of biomass

If we look at all processes, biomass resources represent 93.5 % of primary renewable energy used in the Walloon Region (in 2006). Industry uses a range of vegetal- (wood, peelings, sawdust, black liquor, etc.) and animal-based by-products, especially in the wood industry and for the production of electricity (*Les Awirs* power plant), and different substitute fuels (tyres, cardboard, plastic, animal flours, etc.) in the cement industry. These kinds of use are on the rise, in parallel with the rise in fossil fuel prices. A similar trend can be seen for the use of wood for dwellings heating by private individuals.

Aside from biomass, only hydroelectricity and wind power represent a significant proportion of renewable energy.

Renewable energy sources on the rise, cogeneration on the decline

The PMDE sets out a series of objectives for renewable energy sources and cogeneration.

The proportion of renewable energy in electricity and heat consumption, which is rising, has exceeded the intermediary objectives for 2006.

As far as electricity is concerned, the dip observed in 2003 can be attributed to a reduction in hydroelectricity production (low rainfall). Wind power only really began to "take off" in 2003, with the multiplication of high-power wind turbines. The production of electricity hasn't stopped growing since then. The situation is less favourable for cogeneration, in spite of a rise in cogeneration units based on renewable energy.

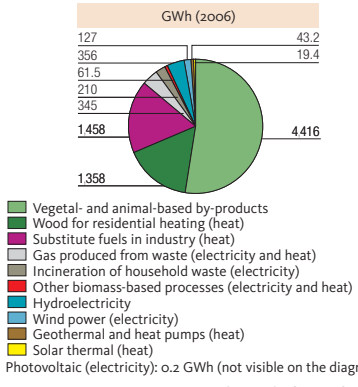
Overall respect of the objectives of the PMDE should nevertheless not disguise the fact that Belgium is well below the European average for renewable energy production (2.8 % of energy consumption, compared to 14.0 % for the EU-27 in 2005).

Issues

The main issues concern the energy efficiency of buildings (2002/01/EC directive, applicable in the Walloon Region since 01/09/08) and the management of transport energy needs. As far as renewable energy is concerned, some sources are already well exploited (hydroelectricity) or are in full growth (wood for energy, wind power), while others (like solar or biogas) have yet to be developed, in spite of the subsidies available.

fig ENER 3-1

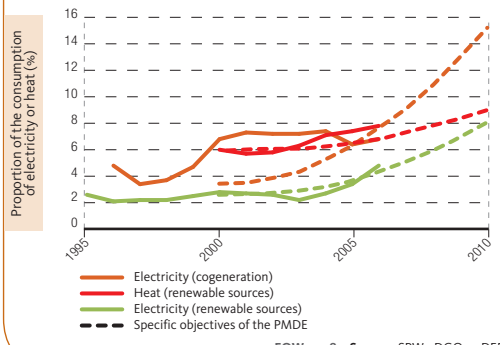
Sources of renewable energy for electricity and heat production in the Walloon Region



EOW 2008 – **Source:** SPW - DGO4 - DEBD

fig ENER 3-2

Production of electricity and heat from renewable energy sources and cogeneration in the Walloon Region



EOW 2008 – **Source:** SPW - DGO4 - DEBD

[1] The PMDE can be downloaded from http: //energie.wallonie.be and the *Plan Air Climat* from http://air.wallonie.be

Eco-efficiency of electricity production

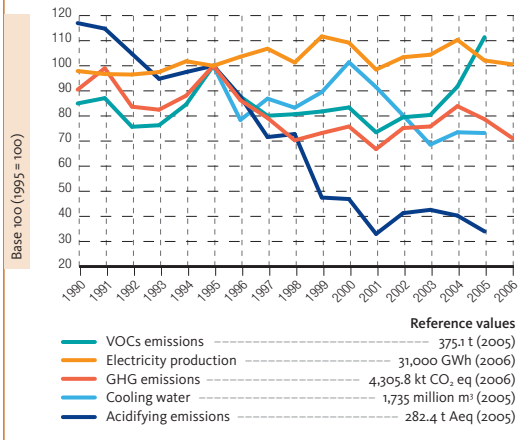
The production of electricity is a source of environmental pressures which largely depend on the production methods implemented(type of power plant, fuels). In the Walloon Region, the main pressures are air pollution, demand for cooling water and the generation of radioactive waste.

Management of atmospheric pollutants emissions

The use of fossil fuels is at the origin of net emissions of atmospheric pollutants. The effect of annual variations in electricity production can be seen between 1994 and 2000, for all kinds of emissions. In the long term, the reduction (decoupling) of acidifying emissions compared to electricity production (since 1990) can be explained by progress in the treatment of gaseous emissions and the gradual substitution of coal (which produces a lot of pollution) with natural gas. Greenhouse gas (GHG) emissions also went down between 1990 and 2006, in absolute values and compared to electricity production. The peak in 1995 can be explained by a fall in electricity production of nuclear power plants, combined with the commissioning of a high power combined gas and steam turbine. The drop between 1996 and 1990 is linked to the closure of traditional thermal power plants (coal). A similar trend to that for GHGs can be seen for volatile organic compounds (VOCs), apart from 2005 onwards, when the rise in VOCs emissions is largely due to the commissioning of the power plant *Les Awirs* (Liège), which was converted to use wood as fuel.

fig ENER 4-1

Eco-efficiency of electricity production in the Walloon Region



EOW 2008 – Sources: SPW – DGO4 – DEBD; SPW – AWAC; SPW – DGO3 – DEE (Taxes and Revenue)

Significant variations from year to year in the consumption of cooling water

In the Walloon Region, nearly 80 % of surface water consumption is used to cool power plants, which can lead to ecosystems disruptions (thermal discharges). The water volumes required depend on the quantity of electricity produced as well as on the climate and the hydraulic regime of the watercourses. So, the drops between 1996 and 2003 are connected to the reduced production of power plants (water use in closed circuit) because of the low water levels in the Meuse.

Storage of radioactive waste

Nuclear power plants generate radioactive waste which must be isolated from the environment (risks associated with exposure to radiation), sometimes for very long periods. As far as Belgium is concerned, 80 % of radioactive waste comes from businesses involved in electricity production[1]. This waste is packaged and stored according to the danger it presents. The total volume of radioactive waste stored was 17,714 m³ at the end of 2005. According to current forecasts[1], this volume will be multiplied by 5 between now and 2070.

[1] Source : www.nirond.be

Energy consumption and atmospheric pollutants emissions from transport

The transport of people and goods is a major consumer of energy and the source of the emission of various types of atmospheric pollutants. These emissions have implications for climate change and contribute to damage to the environment, biodiversity and human health.

Recent slight drop in energy consumption

The demand for transport is growing constantly. In 2006, energy consumption in this sector (excluding air transport) amounted to 33.6 TWh, 61 % of which for passenger transport, i.e. almost a quarter of the total end consumption of energy in the Walloon Region. The recent drop (7 % between 2004 and 2006) can be explained in particular by advances in technology (engines) and a shift away from road haulage in favour of other means of transport. The efficiency gains are, however, partly offset by the increase in vehicles weight and the widespread use of energy-consuming equipment, such as air conditioning systems.

Ambitious targets for biofuels

In order to meet European targets, biofuels must account for 5.75 % of road fuel in 2010 and 10 % in 2020. In the Walloon Region, the Neochim factory at Feluy (capacity: 200,000 t/year of biodiesel) has been in operation since 2007, while Biowanze (capacity: 300,000 m³ of bioethanol) should be fully operational by the beginning of 2009. Biofuels can currently be incorporated into traditional fuels, up to a maximum of 5 %.

Decoupling of emissions, except greenhouse gases

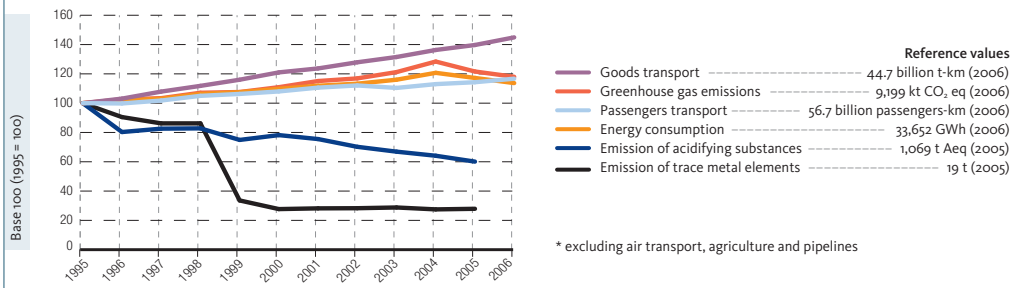
Emission of greenhouse gases by the transport sector has followed a similar pattern to that of energy consumption (little substitution between energy sources). On the other hand, there has been a reduction in acidifying emissions (fuel desulphurisation, catalytic converters) and heavy metals since 1995, particularly following directive 98/70/EC (unleaded petrol).

Various improvement routes

Transport is a key element in meeting the targets for the reduction in atmospheric emissions contained in the *Plan Air Climat*[1] of the Walloon Region. To this end, the Plan contains various proposals (measures 74 to 90) aimed at reducing transport demand, improving the efficiency in transport and promoting a shift towards transport means with lower environmental impact. The development of the EURO standards and the progressive renewal of the vehicle fleet are also helping to reduce emissions.

fig TRANS 1-1

Eco-efficiency of transports* in the Walloon Region



* excluding air transport, agriculture and pipelines

EOW 2008 – **Sources :** SPF Mobilité et Transports; SPW – DGO1 – DSTTR; SNCB; SPW – AWAC (CEEW calculations)

[1] http://air.wallonie.be

Demand for goods transport

The evolution of goods transport demand is an indicator of the pressure exerted on the environment by economic activity. A comparison of the flow of goods against wealth creation (gross domestic product – GDP) also enables an assessment of the economic efficiency of goods transport.

Demand for goods transport growing faster than GDP

Goods transport (by road, rail and waterway) in the Walloon Region increased by almost 45 % between 1995 and 2006, i.e. twice as fast as GDP. The continuous growth in transport can be explained in particular by the globalisation of trade, the increasingly wide range of goods available and ever-shorter delivery times, as well as the diffuse location of distribution chains (industrial zones, storage parks, wholesale and retail businesses). Road transport still predominates and has even increased by almost 50 % since 1995.

There is little mention of the management of goods transport demand in regional and federal policy targets, where the accent is more on inter-modal transport. The White Paper "European transport policy for 2010" (2001) does, however, recommend that goods transport demand should be decoupled from economic growth, i.e. the opposite of what is currently happening in the Walloon Region. Nor is it happening on a European level(1).

Importance of international transit

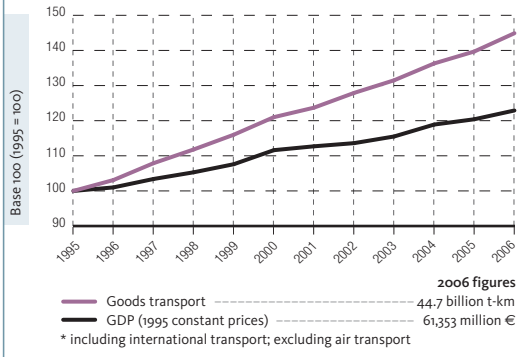
The geographical situation of the Walloon Region makes it a transit zone to and from the major North Sea ports (in Flanders and the Netherlands). The amount of transit traffic (by road, rail and waterway) is growing. According to some estimates, the proportion of foreign lorries (in vehicles-km) has risen from 37 % in 1990 to 48 % in 2006, though this alone is not enough to explain the overall rise in road transport.

Continued growth?

According to the European Commission, goods transport is expected to increase by 50 % between 2000 and 2020. The world economic slow-down combined with the increase in fuel prices could, however, reorientate this trend.

fig TRANS 2-1

Goods transport demand* in the Walloon Region

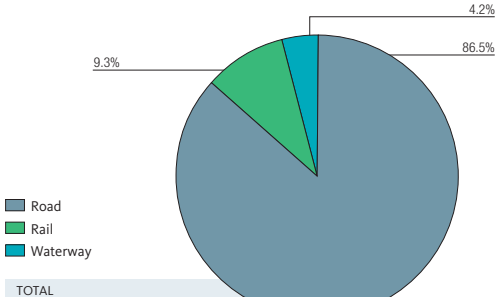


* including international transport; excluding air transport

EOW 2008 – **Sources :** SPF Mobilité et Transports; SPW – DGO1 – DSTTR; IWEPS; SNCB; ICN (Regional accounts) (CEEW calculations)

fig TRANS 2-2

Distribution of goods transport demand by transport mode* in the Walloon Region *(2006)*



* including international transport; excluding air transport

EOW 2008 – **Sources :** SPF Mobilité et Transports; SPW – DGO1 - DSTTR; SNCB

(1) EEA (2008) (2) SPF Mobilité et Transports (2007)

Distribution of regional goods transport by transport mode

The main modes of goods transport in the region are boat, train and lorry. Each has its own advantages and disadvantages in terms of use (speed, flexibility, costs, accessibility, etc.) and of impacts on the environment and human health.

Road transport predominates

In 2006, goods transport in the Walloon Region amounted to 44.7 billion t km, 86.5 % of which was by road (including international transit). This figure is slightly higher than in 1995, at the expense of rail transport. The large predominance of road transport can among others be explained by its high level of flexibility and a well-developed infrastructure (road network).

Environmental costs underestimated

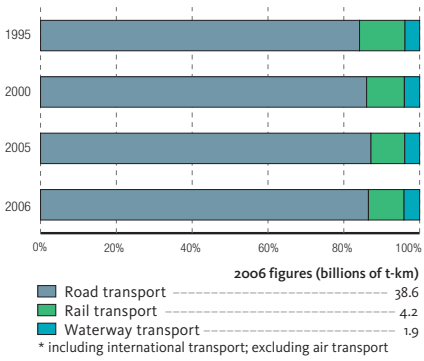
In addition to mobility problems (congestion of main roads), the specific atmospheric emissions are higher for road transport than for rail or waterway transport. In the case of CO_2, emissions per km covered by rail are 2 to 10 times lower than for lorries. Until recently, road transport benefited from relatively low energy costs. The external costs incurred (impacts on the environment and on health) are not, however, allocated to their source, but borne by the whole community.

Development of multimodal platforms

Given this situation and the continued growth in goods transport, one solution to exploit the advantages of different modes of transport is the creation of multimodal platforms, which make it easier to transfer from one mode of transport to another. There are currently 8 such platforms in the Walloon Region and a further 3 are planned or under construction. Several "multimodal zones" are also located around the various autonomous ports. Although there is no specific target figure, the Walloon Government has included the support of combined transport initiatives in its regional policy statement 2004-2009.

fig TRANS 3-1

Distribution of goods transport by transport mode* in the Walloon Region



* including international transport; excluding air transport

EOW 2008 – **Sources :** SPF Mobilité et Transports; SPW – DGO1 - DSTTR; SNCB

map TRANS 3-1

Transport networks and multimodal platforms

EOW 2008 – **Sources :** www.wallonie.be (Walloon infrastructures); www:portdeliege.be; www.focus-on-logistics.be (infrastructures in Hainaut). Web pages consulted on 31/07/08

Goods transport by air

Air transport is one of the pillars of the international goods trade. It does, however, use large amounts of energy (kerosene) per tonne transported compared with other modes of transport and is, therefore, the source of emissions of atmospheric pollutants which contribute in particular to climate change.

A business which has been growing for over 10 years

In the Walloon Region, almost all goods transported by air pass through Liège Airport. The volume of goods loaded and unloaded increased by a factor of 70 between 1996 and 2007. With 490,000 tonnes transported in 2007, Liège Airport is one of the 10 largest cargo airports in Europe. Charleroi Brussels South airport, on the other hand, specialises more in passenger transport.

Increase in trade and regional investments

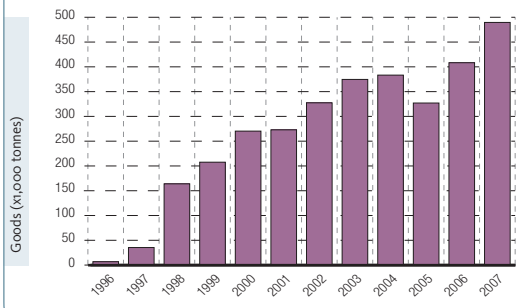
The growth in air freight can be explained in particular by the globalisation of trade, the increasingly wide range of goods available and the requirements of ever-shorter delivery times. The regional authorities have made significant investments in airports infrastructures. Logistics operations (especially airport related) and the consolidation of multimodal platforms are indeed regarded as priorities for economic redeployment in the Walloon Region (regional policy statement 2004-2009).

A sector destined to grow, despite the rise in oil prices

There have been many studies of the expected development of air transport (passengers and goods). To date, most of these have concluded that the sector will continue to grow over the coming decades, at a rate of 5 % a year on a global scale. Compared with other modes of transport, air transport has the advantage that there is no tax on kerosene and also that the sector is not currently included in emission reduction targets. There are, however, a number of uncertainties, in particular in relation to the availability and cost of oil and to the effect of environmental damages being explicitly taken into account (costs internalisation).

fig TRANS 4-1

Goods transport by air (freight) in the Walloon Region (Liège Airport)



EOW 2008 – **Source:** SPW – DGO2 – DET (Walloon Airport Portal)

Tourism capacity

The pressures of tourism on the environment mainly depends on the journeys, type of accommodation and tourist behaviour (consumption, waste, noise, etc.). A review of tourist accommodation indicates inter alia the level of development of the sector and the potential tourism capacity of the Walloon Region.

9 % drop in total accommodation capacity

After growing steadily between 2000 and 2005 (+ 7 % for hotels and campsites, + 53 % for gîtes, bed and breakfast and furnished apartments), the total accommodation available in the Walloon Region fell by almost 9 % in 2006, to levels comparable with those of 2002. Rural accommodation (*tourisme de terroir*) accounts for approximately 24 % of total availability. The provinces able to accommodate the largest numbers of tourists are, in descending order, Luxembourg, Liège and Namur.

Demand effect and the new decree governing accommodation

Up to 2005, the availability of tourist accommodation kept pace with the growing demand. The decline in 2005 and 2006 is attributable to changes in the criteria for classifying holiday accommodation, following the adoption of a new decree[1], aimed globally at improving quality and safety standards. As a result some certificates have been withdrawn and some accommodation has been classified in the category not recognised by the *Commissariat général au tourisme de la Région wallonne.*

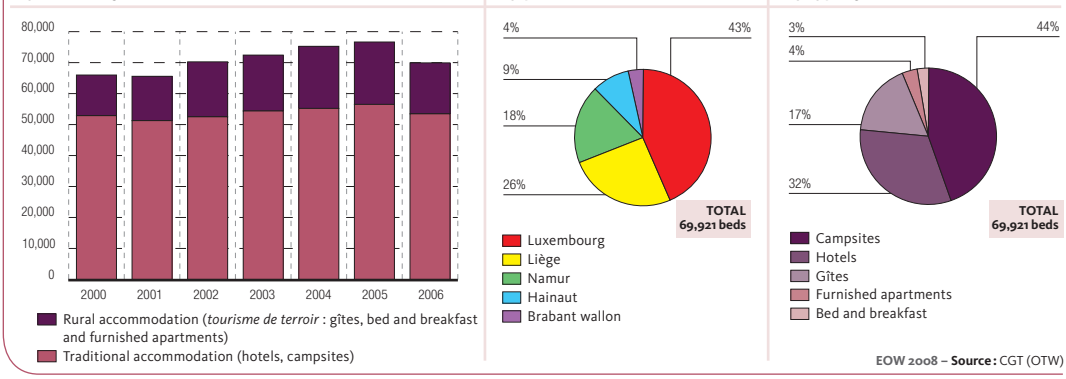
Decree governing tourist accommodation

The decree[1] governing the terms under which tourist accommodation is run sets out criteria relating in particular to the quality of the premises and facilities (comfort, service, convenience, accessibility, etc.) and to safety standards (fire prevention, etc.). This new legislation includes a number of environmental aspects, such as land use, waste management, tranquillity of the neighbourhood and grants (for the selective sorting of waste, the installation of renewable energy-based systems, etc.). As with housing, environmental considerations in relation to tourist accommodation are covered by different legislation governing the management of:

- → land and town planning (location, architecture, accessibility, etc.);
- → water (compliance with the obligations under the 2000/06/EC directive);
- → waste (implications for the municipalities and municipalities associations (*intercommunales*));
- → energy (buildings design, energy sources, etc.).

fig TOUR 1-1

Distribution of total tourist accommodation capacity across the Walloon Region



EOW 2008 – **Source:** CGT (OTW)

[1] Walloon decree of 18 December 2003 governing tourist accommodation establishments

Tourist accommodation occupancy

A review of tourist numbers in terms of accommodation occupancy indicates, more accurately than accommodation availability, the global level of pressure on the environment. Without preventive and management measures, the increase in tourists will cause pollution and damages resulting from the occupancy of accommodation, transport and attendance at tourist sites and environmentally valued spots.

Continuing increase in tourist numbers

While the number of people arriving at "standard" accommodation (hotels, campsites and holliday villages) in the Walloon Region grew by 16 % between 1995 and 2006, the number of nights of occupancy fell by 3.5 %. Stays are, therefore, becoming shorter (- 17 %). Visitors to rural accommodation (*tourisme de terroir* : gîtes, bed and breakfast, furnished apartments, etc.) increased, with a 12 % rise in the number of nights of occupancy between 2003 and 2006 (1,963,000 nights in 2006).

Consumer goods

The tourism sector accounts for approximately 5 % of the GDP of the Walloon Region, compared with 4 % for Europe as a whole (10 % if associated sectors are included). Leisure and tourism are consumer goods, synonymous with relaxation, discovery and enjoyment for a large number of people. For some years, Europeans have been travelling more frequently but for shorter stays. This can be explained by a combination of different factors, including:

- widespread car ownership and improved locations access;
- progressive increase in leisure time in different countries;
- a desire to escape from daily routine (work, stress, urban pollution, etc.).

Measures by sectors

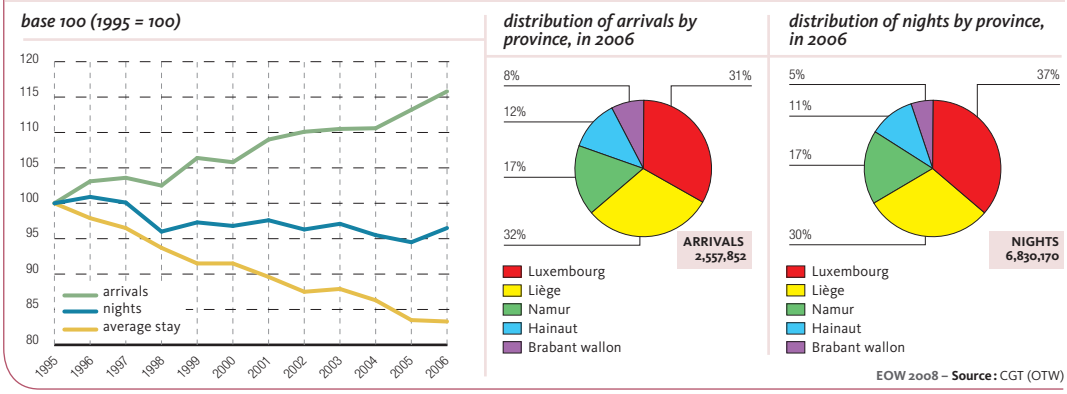
Various measures more consistent with tourist behaviour have been put in place in relation to the management of resources and of pollution (water, energy, woodlands, flora and fauna, waste, etc.) and mobility (locations accessibility, combined transport modes, etc.). Regarding the accommodation, certain steps have been taken in different sectors (land use management, energy, water, etc.). Tools such as ecological certification (follow-up, labelling, etc.) can be of benefit on both the supply and the demand side. The process of labelling accommodation and tourist attractions, implemented in the Walloon Region since 2006, includes a series of environmental criteria. Some of these are selective and failure to comply prohibits the applicant from registering in the labelling process. Management of pressures on the environment also depends on raising tourist awareness in relation to their stay and their activities.

Increase in numbers is likely to continue

According to the World Tourism Organization, the number of tourists arrivals in Europe in 2020 is likely to be more than double the 1995 figure, representing an average annual growth of 3 %. Experts expect similar growth in Belgium.

fig TOUR 2-1

Number of nights, arrivals and average stays in the Walloon Region (excluding rural accommodation – *tourisme de terroir*)



EOW 2008 – **Source :** CGT (OTW)

production/tour 3

Attendance to tourist attractions

Attendance to tourist attractions may be part of a longer stay (with overnight accommodation) or only a day trip (excursion). In addition to the number of arrivals in tourist accommodation, the number of visitors is an indicator of the pressures on the environment from transport to attractions and from the activities pursued there (energy consumption, waste water discharges, waste, noise nuisance, etc.).

Higher number of visitors in the province of Namur

Available data suggest that numbers of visitors in 2006 were comparable with those in 2000. The attractions in the province of Namur draw the highest numbers of visitors. They also appear to be among the most popular, with a visitor rate (total number of visitors / number of sites) 50 % higher than in Hainaut and in the province of Liège, twice as high as in the province of Luxembourg, but three time lower than in Brabant wallon. Leisure centres and parks, museums and environmentally-valued sites (caves, nature reserves, animal parks, etc.) account for almost three quarters of tourist and day-trip visitors.

Types of activities in demand

The high number of visitors in the province of Namur may be explained by the large variety of attractions. Whereas the number of visitors in Brabant wallon must be attributed to the fact that it has the most visited site in the Walloon Region (a leisure park) which draws over a million visitors a year. The provinces of Liège and Luxembourg, which have higher accommodation occupancy than elsewhere, attract tourists in search of nature and relaxation, and therefore less focused on visits to attractions. It is likely, too, that there are more day excursions in the provinces of Namur, Hainaut and the Brabant wallon.

To count on the attractiveness of the Region and its tourist sites

In its regional policy statement 2004-2007, the Walloon Government focussed on the need to develop the tourism sector further:

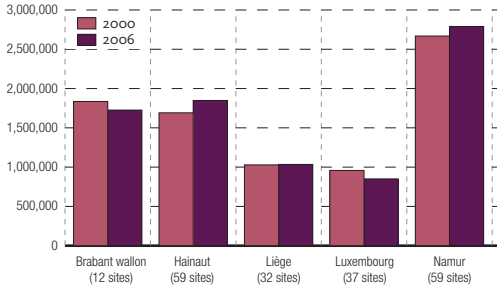
- ➜ by highlighting the assets of the territory (accessibility, proximity, nature, etc.);
- ➜ by improving the quality of services for tourists (infrastructures, quality-price ratio, etc.);
- ➜ by developing cultural and leisure activities.

On the other hand, there is virtually no mention of the environment. Travel, for example, is nevertheless critical. While some attractions can be accessed by different means of transport (towns, leisure parks, etc.), 80 to 85 % of visitors travel by car for reasons of convenience (accessibility, independence, comfort, local mobility, part of a longer trip, etc.). An integrated view of tourist mobility covering all aspects of the problem at regional level could probably be very beneficial in terms of managing the resulting environmental pressures.

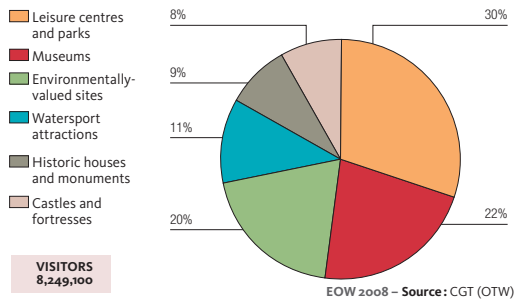
fig TOUR 3-1

Attendance to tourist attractions in the Walloon Region

by province and by number of visitors



distribution of visitors by type of attraction, in 2006



EOW 2008 – **Source:** CGT (OTW)


PROMO
2,89
PROMO
2,89
SALADE POMMEE
KROPSLA
PIECES
STUKS
1 40

Population and households

Households are key elements in the dynamic of production and consumption. By using accommodation, travelling and consuming goods and services, they exert pressures on the environment and fossil fuel, raw materials and water resources. Their activities generate waste and cause discharges (waste water, atmospheric emissions, etc.).

Population growth

In 2007, the population of the Walloon Region was 3,435,879. The annual growth rate has been increasing since 1996 and this is expected to continue through to 2014, according to population forecasts 2007-2060 from the *Bureau fédéral du Plan*[1]. The Walloon population is, therefore, expected to grow more over the next ten years (+ 7.1 % from 2007 to 2017) than over the last ten (+ 3.5 % from 1997 to 2007). Three quarters of the increase in population since 2001 is attributable to net migration, i.e. the difference between immigration and emigration.

Decline in the size of private households

In 2007 the Walloon Region had 1,473,054 private households (as opposed to "collective" households such as residential homes for the elderly, prisons, etc.). The number of private households is growing faster than the population: + 10.7 % compared with + 3.7 % between 1995 and 2007. The average size of private households is, therefore, progressively declining: over the same period it fell by 6.4 %, from 2.49 to 2.33 persons living under the same roof.

As in most industrialised countries, the reduction in average households size is the result of:

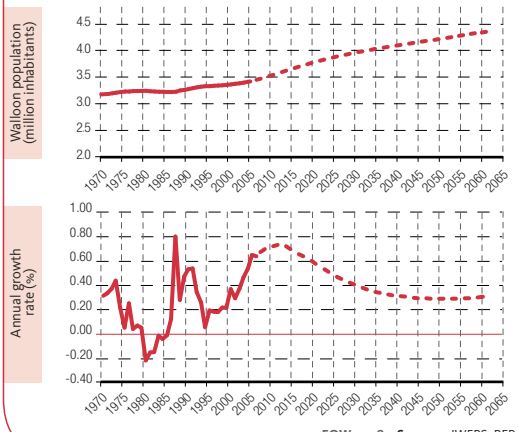
- ➜ an increase in the number of single person households and single parent families (lifestyle choice, late marriage, separation, divorce, etc.);
- ➜ an ageing population (more elderly people living alone);
- ➜ fewer children per family.

Greater environmental impacts

The increase in the number of households combined with a decline in their average size results in an increase in the number of dwellings, private cars, domestic appliances and consumer goods in single portions. This trend exacerbates the impacts on the environment, particularly in terms of space required, energy consumption, atmospheric emissions and waste management.

fig HOUSEH 1-1

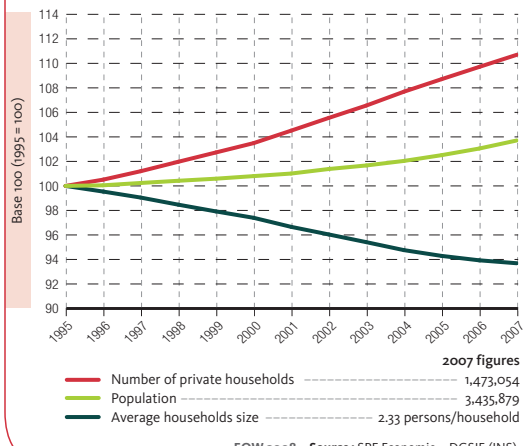
Walloon population: evolution from 1970 to 2007 and forecasts from 2007 to 2060



EOW 2008 – **Sources:** IWEPS; BFP

fig HOUSEH 1-2

Population and private households in the Walloon Region



EOW 2008 – **Source:** SPF Economie – DGSIE (INS)

[1] Bureau Fédéral du Plan (2008)

Incomes and expenditure

Incomes and expenditure are essential elements in analysing household consumption patterns. Incomes have a direct influence on choices and levels of consumption, of which expenditure is one indicator. Consumption patterns are responsible for a range of pressures on the environment: use of raw materials, water, energy, generation of waste, atmospheric emissions, etc.

Expenditure is growing faster than incomes

Between 1996 and 2005, the average disposable income (average budget after tax) of a Walloon household increased from 29,395 to 33,840 € a year (increase of 15 %). Over the same period, the average expenditures per household increased from 23,890 to 29,450 € a year (increase of 23 %).

The four main items of expenditure are: accommodation (rent, heating, water and electricity), food (including drinks and tobacco), transport and travel, and telecommunications, culture and leisure. Between 1997 and 2006, the share of total expenditure allocated to accommodation and clothing fell (- 3.2 % and - 1 % respectively) in favour of the share allocated to transport and travel and telecommunications (+ 4.1 %), and to tourism and HORECA (+ 1.3 %).

Incomes and environmental impacts

High-incomes households are generally those more aware of environmental concerns and also those with higher consumption (energy, transport, etc.). The links between households characteristics and their environmental impacts are complex and make it difficult to implement policies aimed at this sector. It is essential that such policies are adapted to those at whom they are aimed, taking into account their socio-economic and cultural status.

Decline in purchasing power

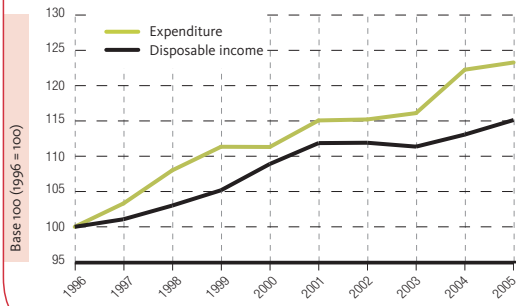
The increase in the prices of basic products (food, energy, etc.) on the international markets has resulted since the end of 2007 in a decline in purchasing power. According to a survey conducted by CRIOC in Belgium in July 2008[1], one consumer in three has reduced his expenditure (energy, car costs, clothing) and many consumers have been economising (less travel, less frequenting to restaurants and cafes, replacement of some products by others, shopping at a different shop, etc.). Executives and those in the professions were less likely to have changed their behaviour than those with low incomes.

Regional and community measures

At the end of August 2008, the Walloon Government and the Government of the French Community put in place twelve measures, worth a total of around 75 million euros, to combat the decline in purchasing power. These relate to energy efficiency in housing (loans and advice), public transport costs, childcare costs for the under threes, study costs (educational trips, student bursaries), family support costs, or removal of the radio licence fee.

fig HOUSEH 2-1

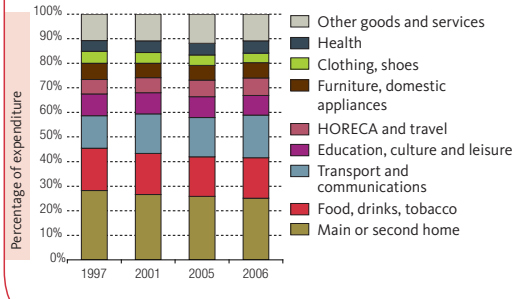
Disposable income and expenditure of households in the Walloon Region



EOW 2008 – **Sources:** SPF Economie – DGSIE; ICN – BNB

fig HOUSEH 2-2

Pattern of households average expenditure in the Walloon Region



EOW 2008 – **Source:** SPF Economie – DGSIE

[1] CRIOC (2008)

households consumption/househ 3

Residential energy consumption by households

In 2006, household residential energy demand amounted to 23% of total energy demand in the Walloon Region. Households are a key sector in terms of energy consumption, given the housing stock, the low average level of buildings insulation and the vast increase in electrical equipment.

Downward trend in consumption per household, except in the case of electricity

Compared with the (increasing) number of households, the total energy consumption at standard weather conditions (normalised figures) has been decreasing since 2002. This trend is linked in particular to energy bills, which are rising faster than incomes. Heating requirements (approximately 80 % of the total consumption) are a function of the number of dwellings, behaviour aspects, and also weather conditions which are responsible for a large proportion of the variations between years (very cold winter in 1996 for example). Electricity consumption per household, on the other hand, shows an average increase of 1.1 % a year between 1995 and 2005. This trend is linked above all to the vast increase in electrical equipments (domestic appliances, information and communication technologies, etc.), which are also used more intensively.

Slight gain in eco-efficiency

From the environmental point of view, energy consumption is in particular a source of greenhouse gas emissions. In the case of dwellings, there has been a slight gain in eco-efficiency, with the amounts of greenhouse gas emissions per unit of energy consumption falling by 12 % between 1995 and 2006. This trend is in particular the result of increased use of natural gas and electricity, compared with other forms of energy.

Further progress to be made

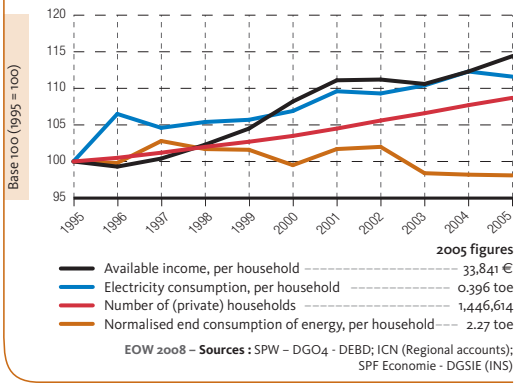
In addition to bringing the increase in electricity demand under control, there is still progress to be made in buildings insulation. The performances of the Walloon Region in this area are indeed below the European average. This situation should, however, improve because the directive 2002/91/EC on the Energy Performance of Buildings (PEB) has come into force. Various grants and premiums are also offered by the Region in order to achieve the targets which have been set(1).

Transport-related share of energy demand

In addition to the demand associated with accommodation, households also consume energy for transport. According to a distribution pattern specific to the Walloon Region, 33 % of the total energy consumption for transport is attributable to the households. On this basis, households are in second place in terms of energy consumption (all uses combined), behind industry and ahead of the services sector.

fig HOUSEH 3-1

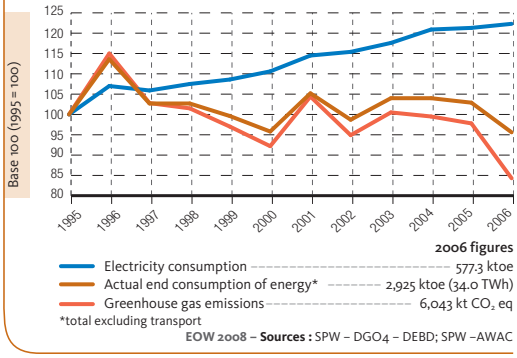
Normalised residential energy consumption by households in the Walloon Region



EOW 2008 – **Sources :** SPW – DGO4 - DEBD; ICN (Regional accounts); SPF Economie - DGSIE (INS)

fig HOUSEH 3-2

Actual residential energy consumption and greenhouse gas emissions by households in the Walloon Region



*total excluding transport

EOW 2008 – **Sources :** SPW – DGO4 – DEBD; SPW –AWAC

(1) See in this context http://energie.wallonie.be

Passengers transport demand

The evolution of passengers transport demand is the result of individual behaviours in terms of mobility for both business and private purposes. In addition to traffic-related problems, such trips create pressures on the environment and on health (use of space and energy, emission of atmospheric pollutants).

Increase in distances travelled

Since 1995, there has been an almost continuous rise in the total and average distances travelled each year per inhabitant in the Walloon Region. The travel increase is the result in particular of a diffuse location of dwellings, an increase in average leisure time (culture, tourism, etc.) and changes in lifestyle. Some of the traffic (not yet quantified) is attributable to international transit, but this alone cannot explain the increase observed.

There is little mention of the management of passenger transport demand in regional and federal policy targets, where the accent is more on intermodal transport. The White Paper "European transport policy for 2010" (2001) does, however, recommend that passenger transport demand should be decoupled from economic growth, which is not currently happening in the Walloon Region. Nor is it happening on a European level[1]. Requirements for mobility should ideally be assessed in conjunction with the problem of land use management (re-establishing homes and businesses in town centres, multi-purpose facilities, etc.).

Private and business travels

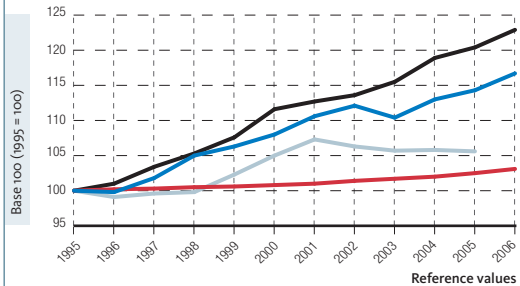
Passenger transport demand includes both private and business travel. From an economic point of view, the fact that this demand is rising more slowly than wealth creation (gross domestic product - GDP) can be attributed, on the one hand, to a decline in households available income (which affects particularly private travels) and, on the other, to a shift towards public transport, even though the latter still represents a small fraction of the distances travelled.

Continued growth?

According to the European Commission, passenger transport is expected to increase by 35 % between 2000 and 2020. The world economic slow-down combined with the recent and sustained increase in fuel prices could, however, reorientate this trend.

fig TRANS 5-1

Passenger transport demand* in the Walloon Region



Reference values

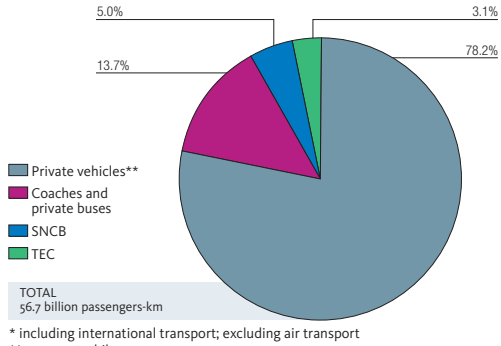
- GDP (1995 constant prices) — 61,353 million € (2006)
- Passengers transport — 56.7 billion passengers-km (2006)
- Available income — 41,562 million € (excluding inflation) (2005)
- Population — 3.41 million inhabitants (2006)

* including international transport; excluding air transport

EOW 2008 – **Sources :** SPF Mobilité et Transports; SNCB; IWEPS; ICN (Regional accounts) (CEEW calculations)

fig TRANS 5-2

Distribution of passenger transport demand by transport mode* in the Walloon Region *(2006)*



* including international transport; excluding air transport
** cars, motorbikes, vans

EOW 2008 – **Sources :** SPF Mobilité et Transports; SNCB; IWEPS (CEEW calculations)

[1] EEA (2008)

Distribution of regional passengers transport by transport mode

The main modes of regional passengers transport are private cars and public transport. Each has its own advantages and disadvantages in terms of use (rapidity, flexibility, cost, accessibility, etc.) and of impacts on the environment and on human health.

The private car predominates

In 2006, almost 80 % of passengers transport (passengers-km) in the Walloon Region was by road, by private car. The figure for travel between home and work was similar. The number of cars on the road in Belgium increased by a factor of 2.5 between 1970 and 2006, to a total of 5 million vehicles, or 1 car for every 2 inhabitants. The preference for using private cars can be attributed in particular to:

- a diffuse spatial distribution of the habitat and the limited availability of public transport in rural areas;
- the advantages of car in terms of autonomy, flexibility, accessibility, combined with a highly developed road network;
- a beneficial tax regime for company cars (which are estimated to make up 10 % of the vehicles on the road in Belgium);
- a strong emotional dimension (social status).

The share accounted for by public transport has, however, increased slightly (+ 2.3 % between 1995 and 2006), due particularly to the rise in fuel prices.

Environmental costs underestimated

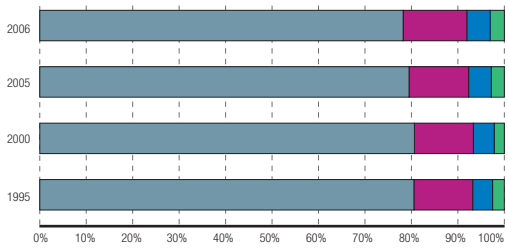
In addition to mobility problems (congestion of main roads), travel costs do not cover all the external costs related to environmental damages or the impacts on human health, which are higher in the case of private car. If these external costs were taken into account to a larger extent, this would provide an incentive for greater use of public transport.

Support for intermodal transport

In this context, the Walloon Government set out in its 2004-2009 regional policy statement a range of measures designed to limit private car use: promotion of car sharing and car pooling, introduction of a single train/tram/bus ticket, adoption of municipal travel plans and of travel plans within companies and schools.

fig TRANS 6-1

Distribution of passengers transport by transport mode* in the Walloon Region



2006 figures (billion passengers-km)

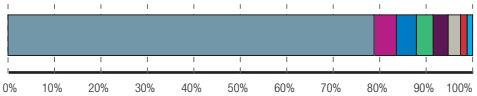
Road transport (private vehicles)	44.4
Shared transport (private buses and cars)	7.8
Public transport (train SNCB)	2.9
Public transport (TEC)	1.7

* including international transport; excluding air transport and non-motorised travel (bicycle, walking)

EOW 2008 – **Sources:** SPF Mobilité et Transports; SNCB; IWEPS (CEEW calculations)

fig TRANS 6-2

Distribution of travel between home and work by transport mode in the Walloon Region *(2005)*



- Car (alone or with family)
- Car pooling
- Public transport (train SNCB)
- Public transport (TEC)
- Walking
- Others
- Motorbike
- Bicycle

EOW 2008 – **Source:** SPF Mobilité et Transports
(diagnostic des déplacements domicile-travail au 30 juin 2005)

Composition of vehicle stock

In 2006, almost 80 % of passengers travel (passengers-km) in the Walloon Region was by road, by private cars. The composition of the vehicles fleet (number of vehicles, engine types, age, etc.) is, therefore, an important parameter in assessing the impact of passengers travel on the environment and on human health.

Increase in the number of vehicles and trend in favour of diesel engines

Private cars make up almost 80 % of the vehicles fleet in the Walloon Region and their number increased by 30 % between 1996 and 2006. The largest increase was in diesel vehicles, while the number of LPG vehicles remains anecdotal. There has also been an increase in the average age of the vehicles on the road in Belgium (7.9 years in 2006, compared with 6.4 years in 1993) and an increase in the number of people carriers and 4x4's.

The trends identified are mainly related to the evolution in the market for diesel vehicles. Significant progress has been made in diesel engine technology in recent years (reduction in noise, improvements in driving comfort, performances, lifespan, etc.) which has made the purchase of diesel vehicles more attractive, especially as the price of diesel at the pump has so far been lower than that of petrol.

Atmospheric emissions and offsetting effect

At the same power rating, diesel engines generally emit less CO_2. This benefit may, however, be partly offset by the increase in vehicle weight and equipment. Moreover, diesel engines emit more particulate matter, requiring filters to be fitted, and nitrogen oxides (NO_x), which are partly responsible for acidification. The increase in the age of the vehicles fleet also limits the effect of the emissions standards (EURO) which apply to new vehicles.

Incentives favouring less polluting vehicles

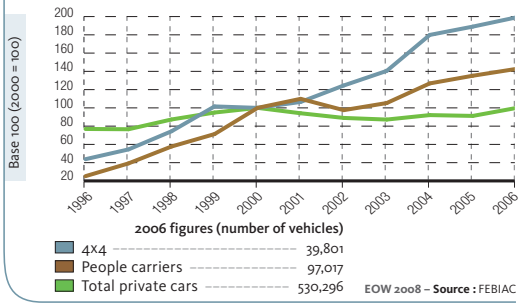
Various financial incentives exist depending on a vehicle's CO_2 emissions:

- → at federal level: tax reductions on the purchase of less polluting vehicles and partial modulation of company car tax;
- → at regional level: eco-bonus and eco-malus system (from 100 to 1,000 €) in the Walloon Region (since 1 January 2008).

Various types of hybrid and electric vehicles are also available on the market, but their numbers are currently very low.

fig TRANS 7-2

New vehicle (private cars) registrations in Belgium

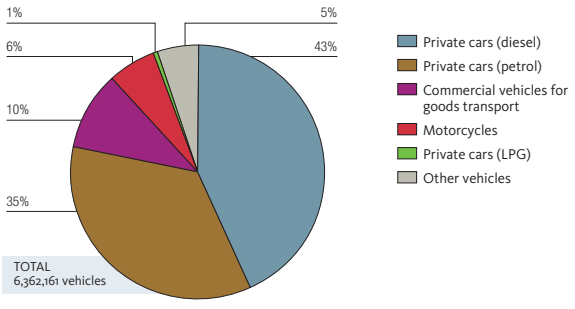


EOW 2008 – **Source :** FEBIAC

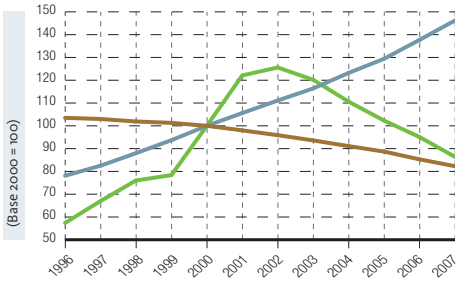
fig TRANS 7-1

Vehicles fleet in Belgium

Composition of vehicles fleet (2007)



Trends in engine type (private cars)



EOW 2008 – **Source :** SPF Economie – DGSIE (INS)

Passenger transport by air

Air passenger transport has achieved unprecedented success over the last few years, due inter alia to the growth of low cost airlines. Compared with other modes of transport, however, it does use large amounts of energy (kerosene) per person carried and is, therefore, the source of emissions of atmospheric pollutants, which contribute to climate change in particular.

Major increase in passengers number

The number of passengers using Wallonia's two airports (Charleroi Brussels South and Liège Airport) has been rising sharply for about ten years. The increase in numbers at Charleroi was greatest from 2001 onwards with the opening of Ryanair's first base on the European mainland. At that time, the airline flew to 6 destinations; now the airport is one of the busiest in Europe with some 40 destinations and a tenfold increase in traffic between 2000 and 2007. In comparison, the passenger traffic at Liège Airport is considerably less, but has been growing steadily since 2002, particularly following the opening of a new terminal in 2005.

The low cost phenomenon

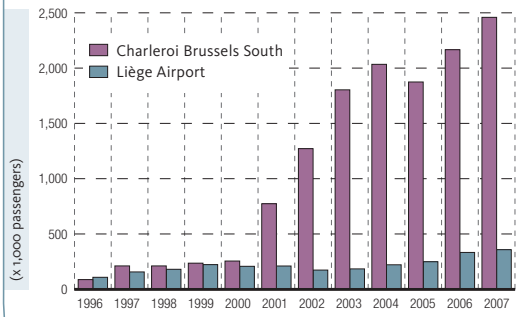
The growth in low cost airlines has been of particular benefit to regional airports, which are less congested and where operating costs are lower. This development has opened the market to a much larger number of passengers and has radically changed both private and business travel habits.

A sector destined to grow, despite the rise in oil prices

There have been many studies of the expected development of air transport (passengers and goods). To date, most of these have concluded that the sector will continue to grow over the coming decades, at a rate of 5 % a year on a global scale. Compared with other modes of transport, air transport has the advantage that there is no tax on kerosene and also that the sector is not currently included in emission reduction targets. There are, however, a number of uncertainties, in particular in relation to the availability and cost of oil and to the effect of environmental damages being explicitly taken into account (costs internalisation).

fig TRANS 8-1

Passenger air transport in the Walloon Region



EOW 2008 – Source : SPW - DGO2 - DET (*Portail Aéroportuaire Wallon*)

Economic and environmental impacts of traffic jams

The increase in the number of vehicles on the road and the preferred use of the road for goods transport and passenger travel result in a progressive saturation of the road network, resulting in particular in more frequent and longer traffic jams. In addition to the immediate impacts on drivers (time wasted, stress, aggressiveness), congestion of the road network also has significant economic and environmental costs.

Formation of traffic jams

Traffic jams occur when the road capacity is saturated owing to a high number of vehicles passing the same point at the same time. They generally occur in the morning and evening ("structural" queues) and sometimes during the day (incident-related queues, due to road works, accidents, severe weather conditions, etc.).

Location and extent of disruptions

In the Walloon Region, traffic jams mainly occur in and around the large conurbations (Mons, Charleroi, Liège) and on the main roads leading to Brussels. The urbanisation of rural areas close to towns has increased the need for travel, in particular between home and work. According to a recent survey of commuters[1], 126,500 Walloons go to Brussels to work each day.

The extent of the disruptions can be assessed on the basis of the proportion of road sections which are saturated. In 2006, 700 km of motorways in Belgium (out of a total of 1,763 km) were over 75 % saturated[2]. The distances in question are increasing[3]: 521 km in 2000, 178 km in 1990 and only 85 km in 1985.

Impacts on the environment and on health

Uneven driving in slow traffic leads to increases in fuel consumption (repeated accelerations at low speed) and pollutant emissions. In traffic jams, in addition to the stress, the poorer air circulation around the vehicles increases the pollutants concentrations inside. In town, traffic jams reduce the commercial speed of public transport, making it less efficient and thus less attractive.

Cost of traffic jams

A full assessment of the cost of traffic jams would require the impacts on the economy, the environment and health all to be taken into account, which is not yet possible with current data and models. There are, however, a number of estimates, based inter alia on the loss of productivity resulting from employees arriving late, obtained by multiplying the hours of jams by the average hourly wage. The main information currently available is presented in the table hereunder :

SOURCE	INDICATOR	VALUE	YEAR	LEVEL
European Environment Agency	Average cost of traffic jams	1 to 2 € / km		Europe
European Environment Agency	Cost of road congestion as a percentage of GDP	2 %		Europe
SPF Mobilité et Transports	Total cost of traffic jams	154 million €	2003	Belgium
KUL (Transport & Mobility research department)	Total cost of traffic jams (motorways only)	114 million €		Belgium
Verkeercentrum Vlaanderen (cited by www.trends.be)	Total cost of traffic jams	250 million €		Flanders Region
Transport Mobility Leuven (KUL)	Hours wasted in queues	9 million/year		Belgium
VRIND (statistics for Flanders Region)	Hours wasted in queues	6 to 9 million	2007	Flanders Region
Institut Transport routier et Logistique Belgique (formerly ITR)	Cost of one hour wasted per lorry stuck in traffic jams	43 €		Belgium
Verkeercentrum Vlaanderen (cited by www.trends.be)	Cost of one hour wasted per lorry stuck in traffic jams	45 €		Flanders Region
Verkeercentrum Vlaanderen (cited by www.trends.be)	Cost of one hour wasted per car stuck in traffic jams	8.25 €		Flanders Region

[1] SPF Economie, PME, Classes moyennes et Energie (2007) [2] This level of saturation corresponds to a traffic density greater than 2,000 vehicles per hour per carriageway, for an average working day outside July and August. [3] SPF Mobilité et Transports (2007)

Public drinking water consumption

Households and most economic sectors regularly use public drinking water for various purposes (domestic or others). The use of tap water is a concern not only of public health, but also of sustainable development, insofar as it has implications for the environment, the economy (consumer good) and society (essential good).

Levels of consumption are low in the Walloon Region

In 2006, the consumption of drinking water for domestic and non-domestic use in the Walloon Region was ± 163 million m³, which is the equivalent of 130.4 litres per inhabitant and per day. This is one of the lowest levels of water consumption in Europe, where it varies from 150 to 550 l/inhabitant/day(1) depending on the country.

Total per capita consumption of public drinking water has changed little since 1990 (- 1.3 %), while the consumption per connection has fallen by 24 %. This evolution can be explained primarily by the decrease in households size and, to a lesser extent, by the economic growth in the services sector.

Does cost influence consumption?

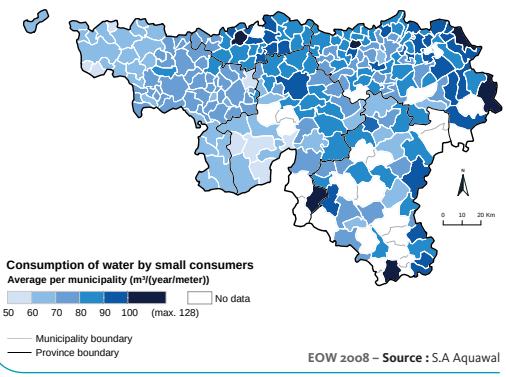
According to the annual report of the *Société wallonne des eaux* (SWDE, 2007), the average consumption of public drinking water for domestic use is estimated at ± 79 l/inhabitant/day. This level of consumption is not uniform across the Walloon region as a whole: consumption in the municipalities of Hainaut and Sud-Namurois is below the regional average, while the highest levels of consumption are in the east of the province of Liège and in Brabant wallon. According to a study conducted in 2006(2), these disparities are a function primarily of households income and the use of rainwater tanks (more common in the region of Tournai for example). Other factors to be taken into account are the penetration of water-saving appliances (dual-flush WCs, dishwashers, showers, etc.), the increasing use of rainwater and the general willingness of citizens to waste less water. The cost of water would have little effect given the low price elasticity of water demand in the Walloon Region (- 0.21 in 2003).

This situation could, however, change following the scheduled consideration of the real cost price waste water treatment. According to forecasts, this is likely to increase the current average water bill (2.93 €/m³ as at 01/01/07)(3) by 54 % between now and 2025.

The volumes of public drinking water used for domestic purposes are included in the volumes used by "small consumers". These are generally users whose consumption (measured at a water meter) is below 250 m³/year. This definition includes households consumption and that linked to certain professional activities (dentists, HORECA, small shops, etc.).

map HOUSEH 4-1

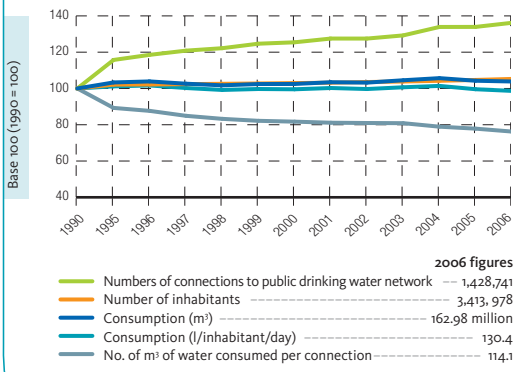
Estimated domestic consumption of public drinking water (2004)



EOW 2008 – **Source :** S.A Aquawal

fig HOUSEH 4-1

Total public drinking water consumption (for domestic and non-domestic uses) in the Walloon Region, per capita and per connection



2006 figures

Numbers of connections to public drinking water network	1,428,741
Number of inhabitants	3,413, 978
Consumption (m³)	162.98 million
Consumption (l/inhabitant/day)	130.4
No. of m³ of water consumed per connection	114.1

EOW 2008 – **Sources :** S.A Aquawal; Belgaqua

(1) Estimates from Eurostat data (for 2004 and 2005) (2) Prevedello (2006) (3) htpp://www.aquawal.be

households consumption/househ 5

Market share of organically produced foods

Organic foods are a response to the demand for environment- and animal-friendly production methods, and for healthy, good quality foods (taste, nutritional value, pesticides-free, etc.). Originally stemming from ecological convictions, the consumption of organic products has led to the development of a separate new market.

A market influenced by confidence in food safety

Estimates vary as to the size of the market for organic products and its growth. According to a survey by GfK Panel Services[1], Belgian households spent 242.5 million € on organic products (food, toiletries and household products, non-food) in 2007, which is equivalent to 1.1 % of total households expenditures on food and cleaning products. This is 0.4 % higher than in 2006, but less than in the period 2001 to 2005. The decline is the result of a lower demand for organic meat, which had been growing up to 2002 as a result of various problems affecting the meat sector (dioxins, BSE, etc.).

According to Bioforum, the turnover in the distribution sector of organic products for domestic use was 283 million euros in 2007 in Belgium, which is 10 % up on the 2006 figure.

The number of consumers opting for organic products is slowly increasing

In 2007, 37 % of the Walloon consumers proclaimed they had bought organic foodstuffs during the previous four weeks[2], compared with 35 % in 2003 and 2004. According to consumer surveys of Belgian households (GfK), the spending on organic foods divides up as follows: 56 % on fruit and vegetables, 29 % on meat and 16 % on dairy products. Most purchases of organic products are made in supermarkets (64 %) and specialised stores (25 %).

Price differentials reduced in 2007

Organic products are generally more expensive than ordinary products. The differences depend on the type of product. These are particularly large in the case of eggs, where the price can be anything from the same to almost twice as high. The price differential in the case of many products was less in 2007 than in 2006, owing largely to the global increases in the prices of non-organic products.

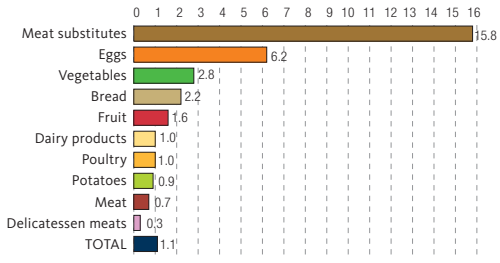
Regional support for the organic products sector

As well as the grants to organic farmers and those in transition, the organic sector in the Walloon Region received aid totalling 600,000 € in 2007. These subsidies were intended in particular for the supervision and training of organic farmers and horticulturists. The Region also supports punctual campaigns to promote organic products.

fig HOUSEH 5-1

Market share of organically produced foods in Belgium, by segment *(2007)*

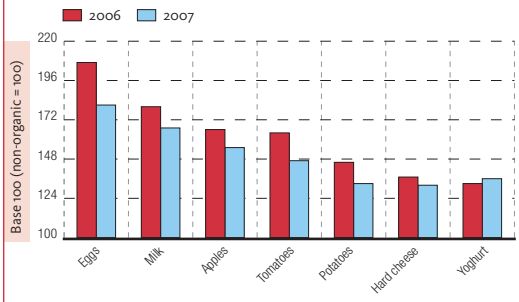
Percentage of spending



EOW 2008 – Source: Vlaamse overheid, Departement Landbouw en Visserij (annual GfK surveys)

fig HOUSEH 5-2

Average prices differences between organic and non-organic foodstuffs in Belgium



EOW 2008 – Source: Vlaamse overheid, Departement Landbouw en Visserij (annual GfK surveys)

[1] Samborski & Van Bellegem (2008) [2] CRIOC (2008)

households consumption/househ 6

Consumption of environmentally friendly products

Some products are more environmentally friendly than others: during their life cycle, they use less material and energy (organic products, local products, recycled products, etc.), generate less waste (bulk packed products, returnable packaging, etc.) or release fewer non-degradable substances. Consumption of these products in place of traditional products helps to reduce pressures on the environment.

More people claim to buy environmentally friendly products

In 2007, 77 % of consumers who claimed to make efforts to protect the environment said they regularly bought environmentally friendly products(1) and 23 % said they sometimes did so. The proportion of the whole population who said they bought this type of product was estimated at 57 % in 2007.

Such purchase claims are significantly higher than in 2006 (+ 25 %), coinciding with increasing consumer awareness of environmental protection and animal welfare in purchasing decisions(2).

Little change in trend by product category

Based on a number of reference products, it appears that purchases of environmentally friendly products are lower than consumer statements would suggest. For example, there has been a significant drop in purchases of drinks in returnable containers: in 2005, 65 % of consumers had bought such products in the month preceding the interview; this figure fell to 34 % in 2006 and 10 % in 2007.

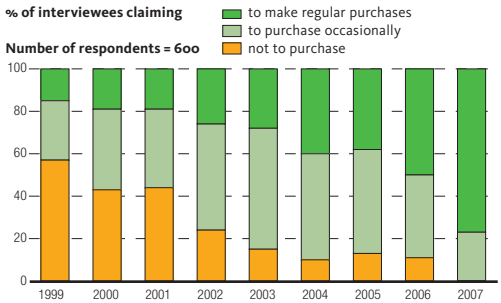
On the other hand, there is no evidence of a fall in consumption of products with a more worrying impact on the environment. The proportion of consumers buying throwaway batteries was 50 % in 2007, which is as many as in 2004, despite the increase over the same period in the numbers buying rechargeable batteries (up 26 % between 2003 and 2007). Almost one consumer in three bought throwaway wipes, a figure which has remained the same since 2002. Finally, 27 % of consumers purchased an insecticide in 2007, up from 14 % in 2006.

Routes to increasing purchasing frequency

- promote the labels and improve their readability, avoiding too many labels (risk of confusion). Preference should be given to the European Ecolabel which covers a wide range of products;
- improve the visibility of the products in question;
- diversify the products ranges;
- point out the benefits of these products to the consumer (e.g. nutritional properties of the foods, lower impact on the domestic environment, etc.);
- steer the behaviours, particularly through public sector purchases, which serve by way of examples and trials.

fig HOUSEH 6-1

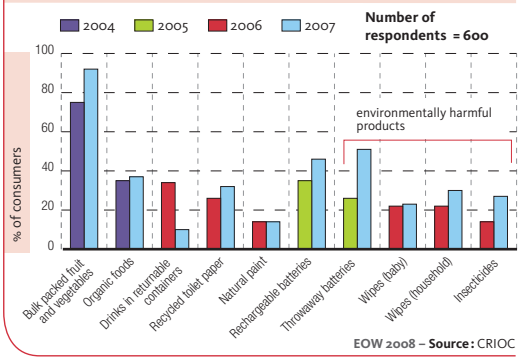
Statement of purchases of environmentally friendly products by Walloon consumers claiming to make an effort to protect the environment



EOW 2008 – **Source:** CRIOC

fig HOUSEH 6-2

Purchases of environmentally friendly and environmentally harmful products in the Walloon Region



EOW 2008 – **Source:** CRIOC

(1) CRIOC (2008a) (2) CRIOC (2008b)

Generation of household and household-like waste

Since the post-war years, the increase in purchasing power and the mass production have given the majority of households access to a range of goods previously only available to the most moneyed classes. Moreover, with the reduction in average household size, more goods and smaller portions are required. This lifestyle generates an increasing amount of waste.

Prevention of household waste

In the Walloon Region, the generation of household waste (comprising household refuse in the strict sense and coarse fractions of waste) follows a similar pattern to that of households private spending, with a slight lag. There is, however, a significant decoupling in the case of unseparated domestic refuse (unsorted domestic refuse (OMB) and OMB-like waste).

Since 2000, household refuse volumes, sorted or not, have been stable at around 300 kg/inhabitant/year. Compared with a "business as usual" scenario, prevention in this sector is estimated to have been worth 99 kg/inhabitant in 2005. On the other hand, the increase in coarse fractions of waste (267 kg/inhabitant in 2006) seriously jeopardises the achievement of the targets set in the *Plan wallon des déchets* (PWD)[1].

Taxation is more effective than raising awareness

Significant differences exist between municipalities in terms of the amount of OMB generated. A study conducted in 2007[1] showed variables linked to the tax regime to be responsible for 32 % of the variations around the regional average.

The municipality typology explains 17 % of the variations, with urban communities and those which attract tourists producing more OMB per inhabitant than residential, industrial or rural communities.

By comparison, campaigns to raise awareness have only a small effect on household waste generation (explaining just 2 % of the variations), despite grants of over 855,000 € awarded by the Region in 2006.

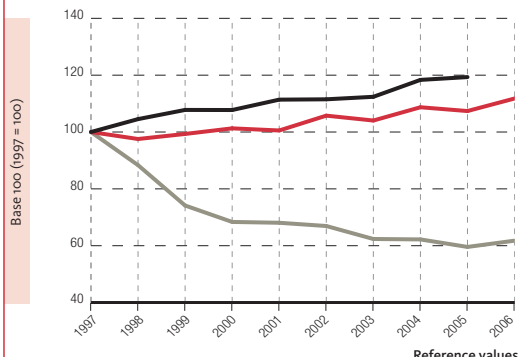
Current levels likely to remain unchanged

The target for 2010 set in the PWD for household waste is 445 kg/inhabitant, which would require a reduction of around 30 kg/inhabitant/year. By comparison, the European average (EU-27) in 2006 was 517 kg/inhabitant.

Given the trend in waste generated over recent years (+ 4 kg/inhabitant/year from 2002 to 2006) experts, however, expect household waste generation to continue at current levels[2].

fig HOUSEH 7-1

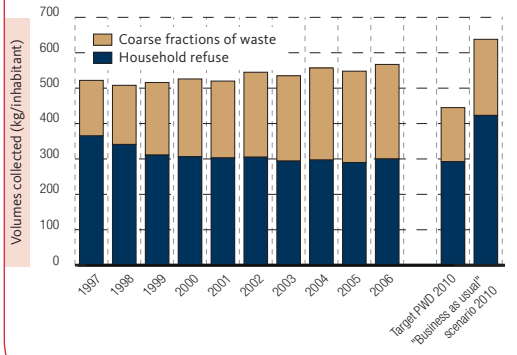
Generation of household waste and households private spending in the Walloon Region



EOW 2008 – Sources: SPW – DGO3 – DSD (FEDEM + CETRA databases); SPF Economie - DGSIE

fig HOUSEH 7-2

Generation of household waste in the Walloon Region



EOW 2008 – Source: SPW – DGO3 – DSD (FEDEM + CETRA databases)

[1] RDC Environment and IGEAT (2007) [2] RDC-Environment (2007)

Charging for household waste

One of the main levers available to the public authorities in the prevention of waste generation is the "polluter pays" principle. The direct allocation to households of the costs of the management of waste produced by normal household activities has been provided for by decree since 22 March 2007. The methods of charging at "true cost" are, however, critical in preventing waste generation.

Most municipal authorities are close to "true cost" charges

Of the 262 municipal authorities in the Walloon Region, 175 allocate 75 % to 110 % of the full, true cost of waste management to households.

Households waste collection systems enabling charges to be applied in proportion to the volume (pre-paid bags or bags with stickers) or weight of the waste generated (containers or duo bins with microchips) are now widely used throughout almost all the region. In 2006, only the municipalities of Ferrières, Jemeppe-sur-Sambre and Mont-Saint-Guibert were still operating exclusively with non-paying bags.

Costs based on weight or volume are becoming comparable

The majority (82 %) of municipalities using pre-paid bags, or stickers to be attached to the bags, charge between 0.5 € and 1 € per 60 l of waste. Only 3 municipalities charge over 1.5 € (with 2 € being the maximum), while 14 municipalities charge less than 0.5 €. In addition, some authorities offer a varying number of free bags and reduced charges for large families, those with young children or in financial difficulties.

In the case of containers or duo bins, the charge per kilogram varies between 0.05 € and 0.2 €. A fixed charge is generally made for emptying the bins.

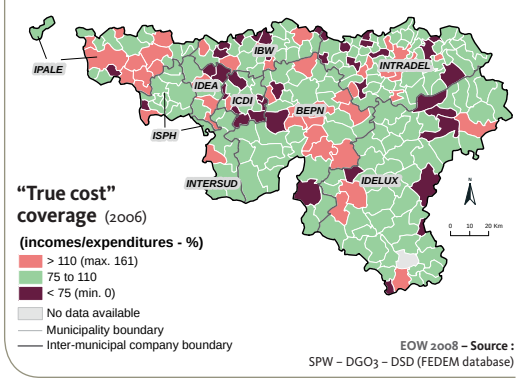
The charging method is critical in terms of prevention

According to a survey[1] conducted in 2007, the charging method is the main explanatory variable for deviations from the regional average in the amount of unsorted household refuse generated. A charging method providing incentives would, therefore, reduce the quantities of unseparated household refuse.

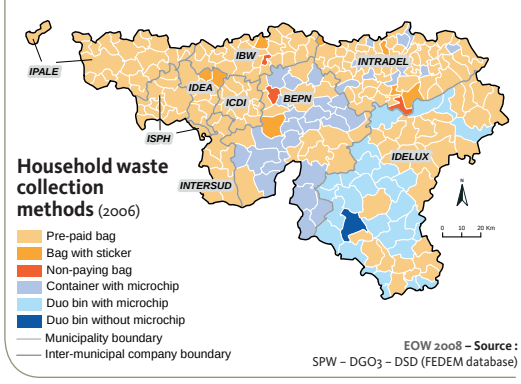
"True cost" charging by 2012

The decree of 27 June 1996 provides for the progressive allocation of the costs of waste management borne by the municipal authority: minimum 75 % in 2008, 80 % in 2009, 85 % in 2010, 90 % in 2011 and 95 % in 2012, but not exceeding 110 %. Moreover, the services provided to residents must be in accordance with the objectives of preventing waste, combating incivilities, and transparency. The introduction of a single charging system across all the municipal authorities in Wallonia would enable residents to compare the fair price charged by each authority for managing their household waste.

map WASTE 1-1



map WASTE 1-2



[1] RDC-Environment (2007)

Waste fractions collected separately

The organisation of separate collections of waste fractions is a pre-requisite for successful waste valorisation. By guaranteeing the availability of sizeable and homogenous material fluxes, it allows a range of treatment processes to be implemented and maintained. The organisation of such collections requires an appropriate extended infrastructure network and the active involvement of the population.

Progress in line with targets

Steady progress has resulted in a doubling of the amount of household waste fractions collected separately in the Walloon region since 1997. In 2006, almost 60 % of household waste was collected separately, which is in line with the targets of the *Plan wallon des déchets – Horizon 2010* (PWD).

A comparison of the amounts of unsorted household refuse with the amounts collected separately shows, however, that there is still considerable room for improvement in the case of:

- organic kitchen waste (collection rate less than 5 %);
- textiles (collection rate less than 5 %);
- plastics, metal and beverage cartons, in particular plastics (approximately 1/3 is collected separately).

A combination of successful measures

Progress in separate collections of waste fractions is supported by a range of complementary measures:

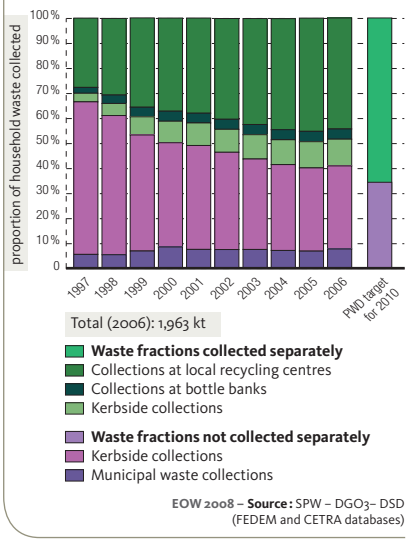
- a strict regulatory framework (take-back obligations, prohibitions on landfill disposal);
- establishment of appropriate management infrastructures;
- reinforcement of application of the "polluter pays" principle;
- publicity campaigns praising sorting efforts.

Subsidies mainly for paper and cardboard

In 2004, over 60 % of total subsidies given to second tier authorities were for implementing paper and cardboard collections. Since 2008, every municipality has to set up a special system for the collection of materials containing asbestos cement.

fig WASTE 2-1

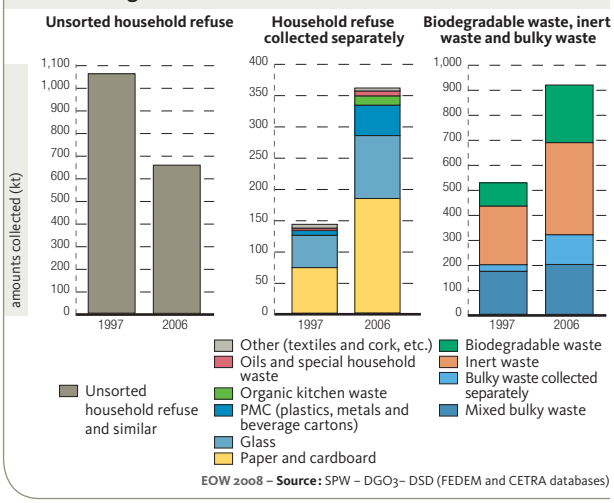
Methods of household waste collection in the Walloon Region



EOW 2008 – **Source:** SPW – DGO3– DSD (FEDEM and CETRA databases)

fig WASTE 2-2

Household waste collected by Public authorities in the Walloon Region



EOW 2008 – **Source:** SPW – DGO3– DSD (FEDEM and CETRA databases)

Take-back obligations

In the Walloon Region, certain waste items are subject to a take-back obligation(1). This obligation makes producers, importers and sellers responsible for the waste generated by their products, in order to encourage prevention, recycling or valorisation. The waste products in question have been chosen on the basis of the volume generated or their hazardous nature.

Over three quarters of disposable packaging are recycled

Over 1,600 kt of disposable (single-use) packaging were placed on the market in Belgium in 2006. 79 % of packing of all types was recycled in 2006. The figures were higher for glass (100 %), metal (93 %) and paper and cardboard (89 %) than for wood (64 %) and plastic (39 %). These results exceed Belgian(2) and European(3) targets (recycling rates of 50 % and 55 % respectively).

Collection and valorisation of other waste generally successful

The targets set for collection and valorisation under the environmental agreements are (largely) met in the case of most waste products with a take-back obligation. For example, the electrical and electronic equipment waste collected in Belgium amounted to 7.7 kg/inhabitant in 2007. This is almost twice the European target of 4 kg/inhabitant, which Belgium has met since 2003. The valorisation rate of appliances collected varies between 81 and 96 % depending on the type of appliance. Materials recycling rates exceed the targets under the environmental agreements, with metal materials being 100 % recycled.

Used batteries: stored at home

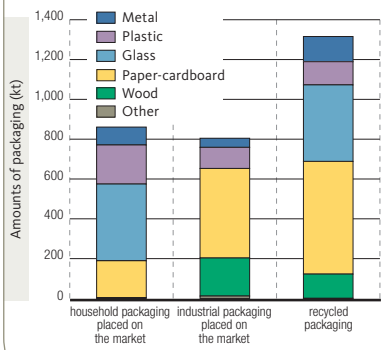
The collection rate of replacement batteries placed on the market in Belgium reached 70 % in 2006 (696 t collected). This is below the target of 75 %, fixed under the environmental agreements. But 86 % of used batteries were estimated to have been caught by the collection system. The difference between the collection rate and this estimate can be attributed primarily to the storage of batteries before they are taken to the collection point. Over 99 % of the weight of batteries collected goes through recycling units. The recycled material amounts to almost 70 % of the weight of batteries collected.

Reinforce prevention and select the correct treatment processes

While collection and valorisation are working well, the effectiveness of waste prevention measures (type, quantity, improvement in recyclable properties, etc.) is less apparent and would benefit from greater attention from the producers (prevention plans). Moreover, progress could be made by expanding the criteria for the choice of treatment processes, which would benefit from the inclusion of health (workers) and environmental criteria.

fig WASTE 3-1

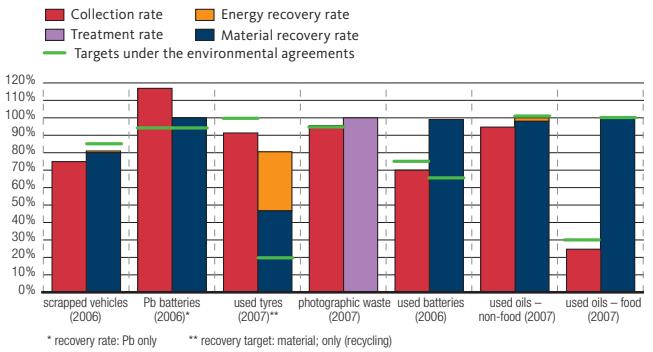
Placement on the market and recycling of disposable packaging in Belgium *(2006)*



EOW 2008 – **Source:** CIE

fig WASTE 3-2

Rates of collection and valorisation of specific waste with a take-back obligation in the Walloon Region



EOW 2008 – **Sources:** FEBELAUTO; RECYBAT; RECYTYRE; FOTINI; BEBAT; VALORLUB; VALORFRIT

(1) Decree of 16/01/97 (packaging) and AGW of 25/04/02 (other waste) (2) Co-operation agreement of 30/05/96 (3) Directive 94/62/EC

Management of household waste and household-like waste

Despite the efforts made in terms of prevention, significant quantities of household waste are generated each year. In managing these, the Walloon Region focuses on recycling and incineration with energy recovery. Various studies have shown that it is possible by employing a range of treatment processes to exceed the targets of the European directives, and at the same time achieve significant environmental benefits.

Progress in valorisation

The proportion of household waste going to valorisation centres is increasing. In 2004, almost 54 % (829,485 t) of household waste was sent to recycling, composting or biomethanisation centres.

On the other hand, the proportion of household waste going directly to incinerators has remained constant for several years (± 23 %), with a slight increase to 25 % in 2004. The proportion of waste going directly to landfill continues to reduce. The 2004 figure of 21 % is, however, significantly above the target of the *Plan wallon des déchets – Horizon 2010* (PWD).

"Carrot and stick" approach

This positive trend can be attributed largely to the increase in the amounts of waste fractions collected separately and the introduction and development of take-back obligations for certain types of waste.

Moreover, the ban on disposing of certain types of waste to landfill envisaged in the PWD and enacted in the AGW of 18 March 2004 supports this development by increasingly preventing recourse to the use of landfill for waste disposal.

Finally, the ban on the outdoor incineration of waste by private individuals is virtually ignored, probably owing to inadequate control capacities.

New tax decree

A new tax decree was adopted by the Walloon Parliament in March 2007. In the future, this decree will encourage the respect of the hierarchy of waste management options. indeed, from 2008, only practices aimed at waste valorisation will no longer be taxed, while the tax will be maintained for the systems which do not promote the separate collection of waste fractions.

Valorisation possibly supported by the increase in raw materials prices

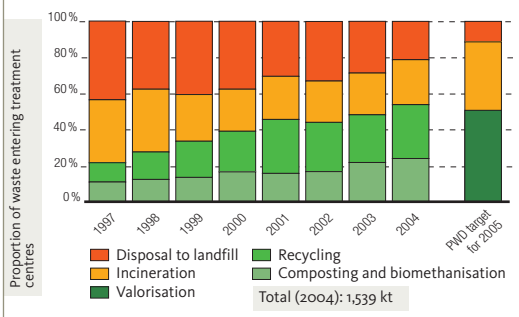
Although there is currently no modelling available, it is to be expected that the increase in raw materials prices will in the future encourage the re-use, recycling and energy recovery from waste products.

Valorisation statistics are overestimated

The data available relate only to the amounts of waste entering the first treatment plants after collection. The fact that rejects from sorting and other amounts redirected to disposal centres are included in the valorisation statistics overestimates the amount of the valorisation efficiency. The data necessary to establish actual valorisation rates, such as the amounts of waste leaving the plants on a regional level, are not available.

fig WASTE 4-1

Management of household waste and household-like waste in the Walloon Region



EOW 2008 – Source: SPW – DGO_3 – DSD
(estimates from inter-municipal companies statements)

Management of industrial waste

The valorisation of industrial waste is desirable for both environmental and economic reasons. For waste valorisation to be viable, however, quantities must be sufficient and management systems adequate.

The majority of industrial waste is recovered

In the Walloon Region, the percentage recovery from waste generated by large and medium-sized manufacturing and energy production industries is estimated to vary between 80 % and 90 % (in the period 1995 to 2006). Such waste is largely valorised for its materials content.

In the case of hazardous industrial waste, the percentage recovered is smaller (66 % in 2006). Waste not valorised is disposed of, generally to landfill, except for chemical waste.

Of the different categories of waste, valorisation is lowest in the category "other industrial waste" (less than 10 %, on a weight basis, in 2006). This can be attributed in particular to the fact that this waste is less identifiable or in smaller quantities (waste from construction and demolition, disused electrical and electronic equipment, maintenance waste, etc.)

Main factors influencing valorisation rates

The main factors influencing the valorisation of industrial waste relate to company size, namely :

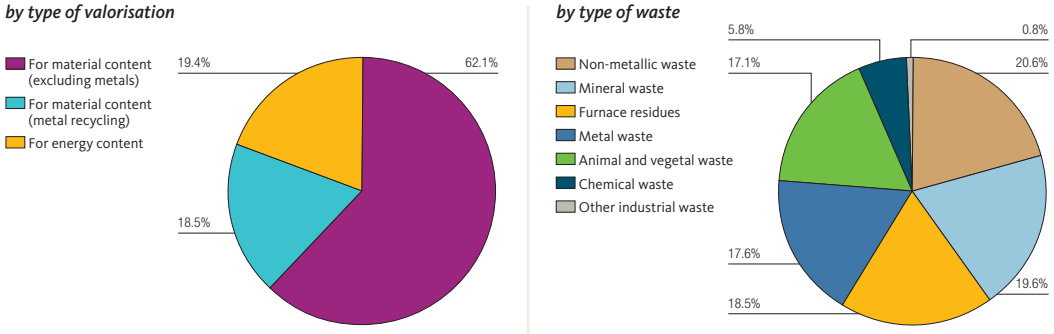
- → the availability of large quantities of homogenous waste;
- → the organisation of sorting at source;
- → the control of valorisation streams and processes;
- → the availability of sufficient human and financial resources.

Complementary legislative provisions

The AGW of 14 June 2001 promoting the valorisation of certain types of waste plays an important part in maintaining the valorisation streams for industrial waste. In the future, progressive bans on the disposal of certain types of waste to landfill and changes in the tax regime applied to waste management methods will lead industries to focus their choices on solutions with a lower environmental cost.

fig WASTE 5-1

Quantities of industrial waste* valorised in the Walloon Region *(2006)*



* proportions calculated on the basis of a non-representative sample of large and medium-sized industries in Wallonia

EOW 2008 – Sources: SPW – DGO3 – DSD; SPW – DGO3 – DEMNA (Bilan environnemental des entreprises)

Management of hazardous waste

Households, like companies, produce hazardous waste, though companies generate much greater quantities. Given the nature of such waste and its potentially harmful effects, a safe handling system is of prime importance in order to protect the environment and human health.

Hazardous waste increasingly managed abroad

According to declarations by producers of hazardous waste, the proportion of such waste managed abroad is continuously increasing, accounting for 65 % in 2005.

In the case of waste treated in the Walloon Region, valorisation has been increasing since 2003, largely through the recycling of metals, while the amount sent to landfill has declined. The recovery rate of 54 % in 2005 is, however, well below the target set in the *Plan wallon des déchets* (PWD) (target of 75 % for all waste, including that treated abroad).

Treatment is costly and requires careful handling

The treatment of hazardous waste is costly and difficult to implement, and valorisation requires extensive precautions, which undoubtedly explains a large part of the difficulty in developing the most ecologically sound treatment methods.

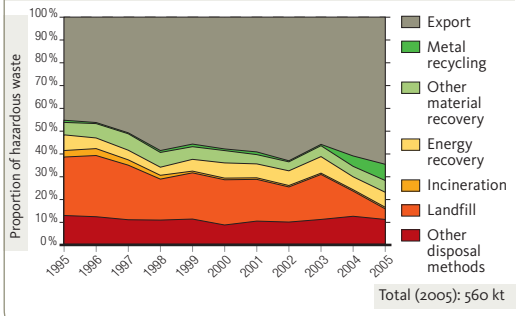
The reduction in disposal to landfill can be attributed to a significant reduction in waste from the steel industry in the period 2003 to 2005.

Reinforcement of the "polluter pays" principle

The recent change in the tax regime applied to waste products (tax decree of 22/03/07) reinforces the "polluter pays" principle. New taxes have been introduced, including in particular an increase in the tax on hazardous waste.

fig WASTE 6-1

Management of hazardous waste generated in the Walloon Region

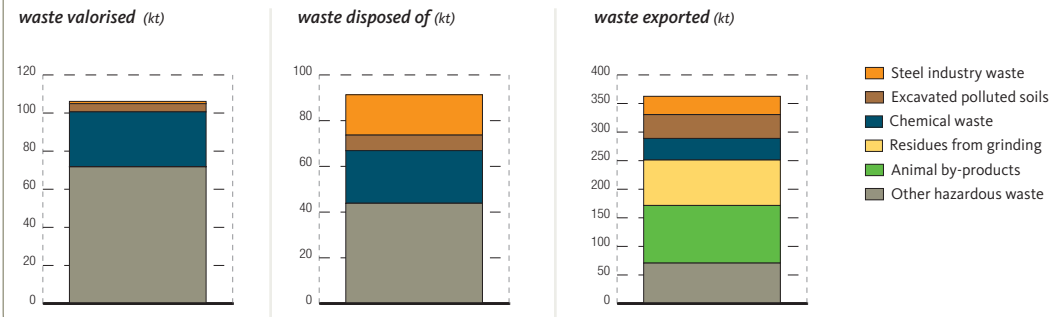


Total (2005): 560 kt

EOW 2008 – **Source:** SPW – DGO3 – DSD (declarations by producers of hazardous waste)

fig WASTE 6-2

Management of hazardous waste generated in the Walloon Region *(2005)*



EOW 2008 – **Source:** SPW – DGO3 – DSD (declarations by producers of hazardous waste)

Management of radioactive waste

Radioactive waste is generated primarily by companies involved in electricity production (nuclear power plants), but also by other uses of radioactive sources (medicine, research, sterilisation, etc.). This type of waste emits ionising radiations which may be harmful to human health and the ecosystems.

Federal competency

In Belgium, the *Organisme national des déchets radioactifs et des matières fissiles enrichies* (ONDRAF)[1] is responsible for the management of radioactive waste, under the terms of specific legislation. The principle followed is that such waste must be isolated from man and the environment until the radioactivity it contains has decayed to a level considered acceptable.

Waste treatment

Most of the waste produced in Belgium (apart from spent nuclear fuel) is sent to the Belgoprocess plant in Dessel, where it is treated and stored until a decision is taken regarding its long-term management (final disposal site). The radioactive waste is transported by road in specially adapted lorries. The aim of the treatment is then to concentrate the radioactive elements and isolate them in a special packaging. This is done by first reducing the volume of the waste (by incineration, compacting, evaporation, etc.). The waste is then stabilised and contained in special drums.

Spent nuclear fuel is either stored temporarily on the nuclear power plant site, or reprocessed, mainly at the Areva plant in La Hague. As well as new fuel, reprocessing generates highly radioactive waste which is vitrified before being returned to Belgium in special trains.

Classification of radioactive waste for the purposes of long-term management

	Low activity	Medium activity	High activity
Short half-life (30 years or less)	A	A	C
Long half-life (more than 30 years)	B	B	C

EOW 2008 – **Source :** ONDRAF

Storage and long-term management

The total volume of conditioned radioactive waste stored at the Belgoprocess plant at the end of 2005 was 17,714 m³, 75 % of which was low activity waste and approximately 1 % high activity waste. According to current forecasts[1], this will increase fivefold between now and 2070.

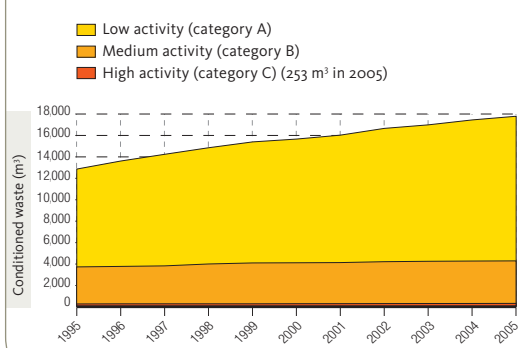
For the purposes of long-term management, radioactive waste is classified by its activity level and half-life.

Final storage on or just below the ground surface is only an option for category A waste, which must be isolated from man and the environment for 300 years. On the other hand, final disposal in deep stable geological layers may be used for all categories of waste. It has been the subject of many years of research, in particular at the Boom clay site in the north-east of the country (Euridice project).

*Radioactive radiation reduces over time. For a given radioactive source, this decay is described by its **half-life**, which is the time required for its activity to reduce by half.*

fig WASTE 7-1

Storage of conditioned nuclear waste in Belgium



EOW 2008 – **Source:** Belgoprocess

[1] Source : www.nirond.be

Management of sludge from sewage treatment plants and dredging

Sludge from sewage treatment plants and dredging is produced by operations to prevent (sewage treatment plants) or remove (dredging) silt build-up in watercourses. This sludge needs to be handled carefully as it may contain pollutants.

Progress in the incineration of sludge from sewage treatment plants

The increase in urban sewage treatment has resulted in an increase in the production of sewage sludge. This amounted to 31,000 t in 2006, 32 % of which was used in agriculture, 63 % was incinerated or valorised as energy, and 4 % was disposed of to landfill.

The trend over the last ten years in the proportion treated by each method can be explained by:

→ the dioxin crisis in 1999, which caused a reduction in the use of slurry in agriculture;

→ the prospect of a ban on landfill disposal, effective since 01/01/07[1] which favoured increased incineration and energy recovery.

The *Plan wallon des déchets* (PWD) envisaged total valorisation (as material or energy) from 2002.

Reinforcement of safety and transparency

Joint efforts are being made by the regional and federal authorities to reinforce the safety and transparency of the valorisation and marketing chains of sludge from sewage treatment plants. This is essential for development of sludge valorisation in agriculture.

Dredging lags behind schedule

Suspended matter carried by water as result of erosion or the discharge of waste water causes sediment to accumulate at the bottom of watercourses. Dredging recreates sufficient draft for navigation and reduce locally the risk of flooding.

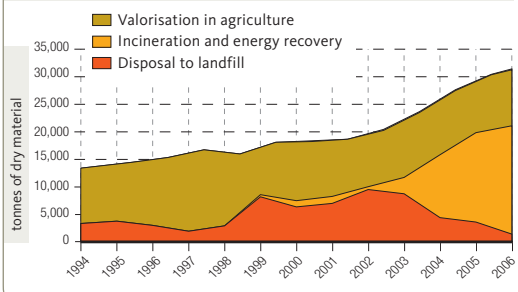
Since 2005, some 50,000 m³ of silt are extracted annually from Wallonia's navigable waterways, while the volume which should be extracted each year was estimated in 2004 at 700,000 m³ (annual maintenance and resorption of the dredging backlog on a 20-year basis). All the material extracted since 2002 has been re-used with the exception of the sludge from the Dendre river canal.

Pre-treatment required in the case of category B material

Dredging sludge considered to be not polluted (category A material) can be re-used without treatment (e.g. for embankments). Dredging sludge considered to be polluted (category B material) can only be re-used if it has been treated to meet category A criteria. A decision is awaited on the award of a works contract for the treatment and recovery of 235,000 m³ of category B material; the revival of the dredging of contaminated sediment is dependent on this.

fig WASTE 8-1

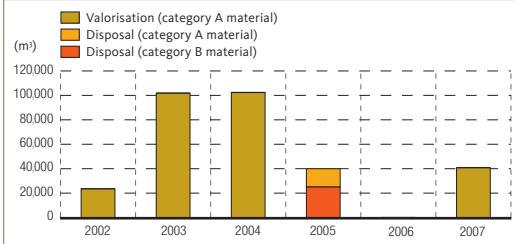
Management of sludge from sewage treatment plants in the Walloon Region



EOW 2008 – Source: SPW – DGO3 – DSD (declarations by the *Organismes d'Assainissement Agréés*)

fig WASTE 8-2

Management of sludge extracted from navigable waterways in the Walloon Region*



* Before valorisation, the products obtained from dredging are stored in collection centres to reduce their water content by evaporation. The volume of silt managed is not, therefore, comparable with the silt extracted from watercourses in the same year.

EOW 2008 – Source: SPW – DGO2 – DVH (Escaut, Namur, Liège)

[1] AGW of 18/03/04

Capacity of waste treatment plants

According to the proximity principle, waste should be treated as near as possible to the place where it was generated. In the Walloon Region, each inter-municipal company has a waste management infrastructure generally capable of handling industrial waste. Some decompartmentalization between the inter-municipal companies is, however, necessary in order to comply with the hierarchy of treatment options defined in the regulations.

Twelve major public waste treatment facilities

The Walloon Region has four incinerators and eight large capacity class 2 landfill sites.

Together the incinerators can theoretically handle some 700,000 t of waste a year. Over the last few years, they have been operating at close to their 100 % capacity.

As at the end of 2007, there was still available capacity for 10 million m³ of waste in landfill sites. In less than 10 years, the amount of waste disposed of in class 2 landfill sites has decreased by 40 %. Since 2003, these amounts have remained constant at just over a million tonnes a year. These sites are not, therefore, expected to be saturated for another 10 or so years.

Household waste accounts for most of the waste handled by public treatment facilities

In 2007, unsorted household waste, bulky waste and rejects and residues from sorting accounted for almost 65 % of the waste sent to public incineration plants. In 2005, 550,000 t of household waste (excluding inert waste) were disposed of in landfill, compared with around 200,000 t of ordinary industrial waste.

Looking for new treatment options for industrial waste

The introduction of new regulatory provisions will result in changes in the treatment processes for certain waste streams. The ban on discharges, for example, is forcing the inter-municipal companies in the provinces of Namur and Brabant wallon to redirect their unsorted household refuse to the incinerators at Herstal and Pont-de-Loup, where they become in competition with the industrial waste previously accepted by these two plants.

These provisions are, however, forcing the inter-municipal companies to work together and to look for partners (from the public and/or private sector) to treat their waste.

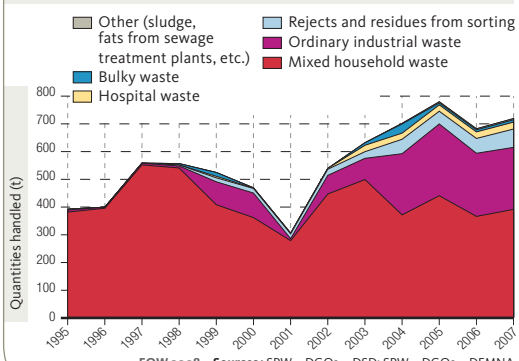
The different classes of landfill site

There are 4 classes of landfill site in the Walloon Region:

- *class 1 landfill sites for hazardous waste (currently none exist);*
- *class 2 landfill sites for non-hazardous industrial waste and household waste and household-like waste;*
- *class 3 landfill sites for inert waste;*
- *class 5 landfill sites for waste from a specific producer or its subsidiaries. These are classed as 5.1, 5.2 or 5.3 depending on the type of waste deposited.*

fig WASTE 9-1

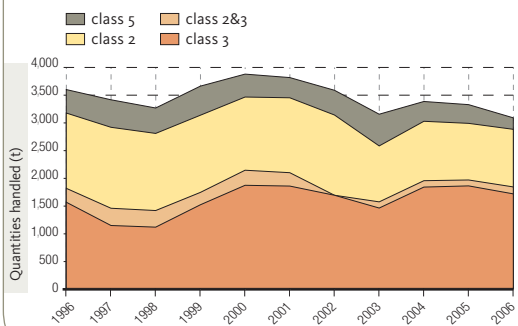
Waste entering incineration plants in the Walloon Region



EOW 2008 – **Sources:** SPW – DGO3 – DSD; SPW – DGO3 – DEMNA (*Bilan environnemental des entreprises*)

fig WASTE 9-2

Waste entering by landfill sites in the Walloon Region



EOW 2008 – **Source:** SPW - DGO3 - DSD

Waste transfers

According to the self-sufficiency principle, the Member states of the European Union must aim for independence in the management of their waste. The regulations in force do, however, take account of geographical conditions and the need for specialised facilities for the management of certain types of waste. Unless an exemption has been granted, the export of waste for disposal in a country which is not a member of the European Union is prohibited.

Imports exceed exports

Since 2000, imports of waste into the Walloon Region have been equal to or greater than exports. Cross-border movements generally involve the countries bordering the Region: Germany, France and the Netherlands.

Import requests received by the *Office Wallon des Déchets* (OWD) all relate to waste intended for valorisation.

Cost differentials undermine the self-sufficiency principle

The high levels of imports compared with the size of the Region can be attributed to Wallonia's central position in Europe and a recognition of its expertise in waste recovery.

Exports relate to waste for which there are either no or insufficient treatment facilities in the Walloon Region, or where the cost of treatment abroad is more attractive.

Transfers strictly controlled

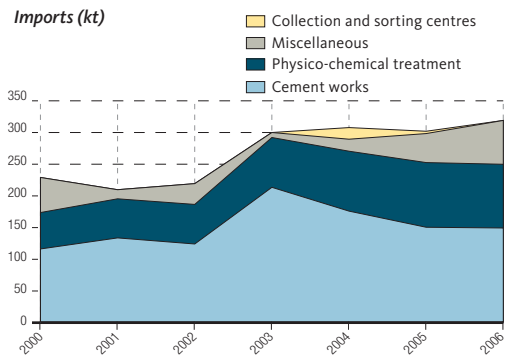
European regulations on the transfer of waste are based primarily on the Basel Convention and the OECD decision on the control of transboundary movements of waste intended for valorisation processes. Under regulation 259/93/EC, transfers of waste not on the "green list" must be notified before transport. Under the new regulation (1013/2006/EC) which came into force on 12 July 2007, a form must be completed and accompany all waste being transferred. This requirement also applies to waste on the "green list" and intended for valorisation.

No statistics for "green list" waste

European legislation specifies a "green list" of waste which does not normally represent a risk to the environment if recovered in accordance with the regulations applicable in the country of destination. Up until 12 July 2007, transfers for valorisation of waste contained in this list were generally exempt from the controls under regulation 259/93/EC. The corresponding quantities are not, therefore, included in the statistics.

fig WASTE 10-1

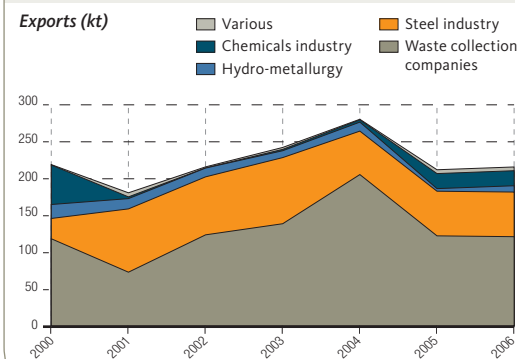
Imports into the Walloon Region of waste subject to notification, by destination



EOW 2008 – **Source:** SPW - DGO3 - DSD

fig WASTE 10-2

Exports from the Walloon Region of waste subject to notification, by origin



EOW 2008 – **Source:** SPW - DGO3 - DSD

conclusion

Implementation of a production-consumption approach

This second part of the Environmental Outlook for Wallonia (EOW) 2008 contains 58 "indicators" files dealing with socio-economic stakeholders and the pressure that they put on the environment (air, water, soils, biodiversity). These files have been organised into 3 themes (production of goods and services by companies, households consumption, and waste management), so that environmental impacts can be looked at from the beginning to the end of the production and consumption processes. This approach is in continuity with previous EOWs, as well as the Analytical Report 2006-2007, but it is also moving towards a more integrated assessment of the impact of production and consumption patterns on the environment in the Walloon Region. Indeed, over half the files in questions include environmental efficiency indicators or indicators connected with the acknowledgement and the management of pressures on the environment.

Assessment of environmental efficiency

Environmental efficiency indicators help to assess the evolution of the pressures produced by the sectors of activity on the environment relatively, by comparing them with activity level[1]. They can be calculated for the Walloon Region or for a particular sector of activity. At a regional level, certain structural indicators developed by the European Commission are based on the same approach (cf. Part 6: International Framework). At the level of sectors of activity, the main environmental efficiency indicators of the EOW 2008 are brought together in Table 1, and assessed qualitatively.

The results in Table 1 must nevertheless be considered carefully. Interpreting the evolution of environmental efficiency only gives a relative picture of the pressures put on the environment. Evolution in favour of environmental efficiency can in fact result from an alleviation of initial intense pressure, or an increase in less intense pressure compared to the growth of activity in the sector in question. Comparing sectors of activity with each other is just as delicate : the reference parameters used (gross value added, industrial production, employment, number of households, etc.) can indeed vary from case to case. Furthermore, the margin for potential improvement in environmental efficiency can be different from one sector to another, either where significant efforts have already been agreed to, or where technological constraints linked to production processes currently limit possibilities for improvement. Lastly, the indicators presented here do not cover all of the pressures put on the environment, as some sectors are under-represented. It is indeed crucial to have sufficiently comprehensive and detailed information, which is not the case at the moment for the consumption of water in the services sector for example.

Acknowledgement of the environment by sectors of activity

Alongside environmental efficiency indicators, the EOW 2008 also provides a certain amount of information about the implementation by economic stakeholders of measures aiming to reduce the pressures on the environment relating to production and consumption patterns. The corresponding indicators files, most of which are labelled as "management indicators", are detailed in Table 2[2].

The analysis of the current situation reveals that while environmentally friendly measures are being implemented by most of the economic stakeholders, reference values (objectives) are not always available (or they are difficult to use). Furthermore, indicators of impacts (on production and consumption activities and/or on areas of the environment) are almost non-existing, even though substantial work has been already been done in this area for the Walloon Region (impact of agri-environmental measures, analysis of the lifecycle of some type of waste, etc.). This can among others be explained by the fact that the databases used have generally not been developed with the intention of assessing the state of the environment, but also by the multi-faceted nature of most of the issues in question, and consequently by the complexity of their impacts on the environment.

[1] The activity level is in some cases measured indirectly, especially for households (total population, number of households, private households spending, etc.) [2] Please note that the information in Table 2 only relates to Part 2 of the EOW 2008, and the economic stakeholders (the policies and measures implemented by the Public authorities are therefore not taken into account).

Table 1 – Main environmental efficiency indicators (EOW 2008, Part 2)

SECTOR	INDICATOR FILE	ENVIRONMENTAL EFFICIENCY INDICATOR	TREND
Total Walloon Region	prod 2	Total gross domestic energy consumption, compared with gross domestic product for the Walloon Region (energy intensity)	
Total Walloon Region	househ 4	Consumption of public drinking water (domestic and non-domestic uses), compared with the total population	
Agriculture	agr 4	Consumption of fertilisers (mineral and organic), compared with the production of the main arable crops*	
Agriculture	agr 6	Consumption of active substances (pesticides), compared with the production of the main arable crops*	
Agriculture	agr 7	Atmospheric discharges (greenhouse gases and acidifying substances), compared with the total UAA	
Agriculture	agr 7	Atmospheric discharges (greenhouse gases and acidifying substances, excluding combustion), compared with the number of heads of cattle**	
Industry	indus 1	End use of energy (combustion, excluding transport), compared with gross value added	
Industry	indus 1	End use of energy (combustion, excluding transport), compared with the industrial production index	
Industry	indus 2	Atmospheric discharges of pollutants, compared with the end use of energy (combustion, excluding transport)	
Industry	indus 3	Consumption of water, compared with the industrial production index	
Industry	indus 3	Volume of waste water released, compared with the industrial production index	
Industry	indus 3	Pollutants load of waste water, compared with the industrial production index	
Industry	indus 4	Industrial waste, compared with gross value added	
Industry	indus 4	Dangerous industrial waste, compared with gross value added	
Production of electricity	ener 4	Atmospheric discharges of pollutants, compared with electricity production	
Services sector	tert 1	Residential end use of energy (excluding electricity and transport), compared with employment	
Services sector	tert 2	End use of electricity, compared with employment	
Services sector	tert 2	Atmospheric discharges of pollutants, compared with end use of energy (excluding transport)	
Transport	trans 1	Energy consumption, compared with total transport demand (passengers and goods)	
Transport	trans 1	Atmospheric discharges of pollutants, compared with energy consumption	
Transport	trans 2	Goods transport demand, compared with the gross domestic product of the Walloon Region	
Transport	trans 5	Passengers transport demand, compared with the total population	
Households	househ 3	Normalised energy consumption (excluding transport), compared with the number of households	
Households	househ 3	Electricity consumption, compared with the number of households	
Households	househ 7	Production of household waste, compared with private households expenditures	

* potato, maize, wheat, beet
** overall discharges for the sector, atmospheric emissions solely associated with livestock rearing being difficult to isolate in some cases

Improvement in eco-efficiency
Level of eco-efficiency globally stable
Deterioration in eco-efficiency

Table 2 – Main environmental management indicators (EOW 2008, Part 2, economic stakeholders)

SECTOR	INDICATOR FILE	INDICATOR OF IMPLEMENTATION	OBJECTIVES FOR THE WALLOON REGION AS A WHOLE
Total Walloon Region	prod 3	YES: number of organisations with ISO 14001 certification and/or EMAS registration	NO
Agriculture	agr 5	YES: transfers of organic nitrogen between farms (exchange contracts), within the framework of the PGDA	NO
Agriculture	agr 9	YES: number of agri-environmental measures (contracts) + winter cover of agricultural plots before a spring crop (agr 2 indicator file)	YES: objectives of the PDR 2000-2006. These objectives have been evaluated (cf. indicator file agr 9)
Agriculture	agr 10	YES: number of farms converted to organic farming + relative proportion in the Walloon Region (comparison of figures agr 10-1 and agr 1-1)	NO
Forest management	for L1	YES: PEFC certified forests	NO
Industry	indus 1	YES: implementation of agreements to reduce greenhouse gas emissions and/or improve energy efficiency	YES : sectoral objectives
Industry	indus 6	YES: investments and expenditures by businesses in connection with the environment (relative values)	NO
Production Of electricity	ener 3	YES: production of electricity using renewable energy sources	YES : objectives of the PMDE (8 % in 2010)
Production Of electricity	ener 3	YES: production of electricity using cogeneration	YES : objectives of the PMDE (15 % in 2010)
Households	househ 5 and househ 6	YES: consumption of environmentally-friendly products	NO
Households	househ 7	YES: quantities of household waste generated	YES: objective of the PWD (445 kg/inhab in 2010)
Waste management	waste 3	YES: levels of collection and valorisation of waste subject to take-back obligations	YES : objectives of environmental agreements
Waste management	waste 5	YES: proportion of industrial waste valorisation	NO
Waste management	waste 6	YES: proportion of dangerous waste valorisation	YES: objective of the PWD (75 % in 2005)

PART [3]

State of environmental components

air and climate

water and aquatic environment

soils

flora, fauna and habitats

introduction

Air, water, soils, living organisms and their habitats are the main components of the environment. Their quality is mainly determined by natural phenomena (biogeochemical cycles, water cycles etc.) and different kinds of pressure exerted by human activities (land use, production, consumption etc.) Evaluating the state of environmental components helps identify changes and deterioration in progress, follow their development, implement adequate responses, or estimate the effectiveness of measures which have already been taken.

The different elements, air, water, soils, flora, fauna and habitats are evaluated in turn:

- Air transports elements and pollutants in a solid, liquid or gas form, across vast distances. This property and the impact of air quality on climate (e.g. greenhouse effect), ecosystems (e.g. acid rain) and human health (e.g. breathing and cardiovascular problems linked to particulate matter in the air) make air quality a major environmental concern.

- Groundwater and surface water are plentiful resources which are made full use of in the Walloon Region. Their quality (ecological, chemical and/or morphological) is influenced by atmospheric fallout, the volume and nature of sediment, as well as by the quality of soil or artificial covering over which water runs or through which it flows. On the other hand, it is affected by domestic, agricultural and industrial supplies of organic matter, various nutrients (nitrogen, phosphorous etc.), and many micropollutants (metallic trace elements, pesticides, hydrocarbons etc.). These changes can affect aquatic ecosystems and human health. They also have repercussions on the costs linked to the management of water resources (e.g. treatment for drinking water).

- Soils slowly formed by the weathering of geological materials, are a resource that is hardly or not at all renewable. They have environmental roles (biogeochemical cycles, water filtering, habitat etc,), economic ones (agricultural and sylvicultural production, support for industrial or commercial activities etc.), as well as social and cultural ones (the soil is a major component of the landscape for example). Different dangers (water erosion, reduction in stocks of organic matter, local and widespread pollution, soil compression and sealing etc.) today threaten the ability of soils to maintain these roles.

- Flora, fauna and natural habitats are resources with both useful (agronomic, food, tourism, therapeutic etc.) and non-useful (intrinsic value and heritage) values. The links between biodiversity and the services provided by ecosystems are hard to establish, especially because of the complexity of the notion of biodiversity, which covers the diversity of species, of ecosystems and of genes. Nevertheless, the current decline in biodiversity poses the question of the sustainability of these services, which might be endangered by a reduction in productivity and a reduced ability to react to major disruption.

The compartmentalised approach to the environment presented in this report facilitates its analysis, presents a coherent overview based on the very different properties and roles of air, water and soils, but the constant exchanges between these components and their interaction with living organisms must not be forgotten.

Primary sources of energy and air pollution

Energy is used for economic activities (industry, services, transport), and for residential purposes. The valorisation of energy resources is however a source of air pollution. The impact of this pollution on public health and ecosystems depends among other things on the fuels used, and the level of energy consumption.

Increase in the use of natural gas and renewable energy sources

The valorisation of primary sources of energy can be done directly or after conversion to electricity. In the Walloon Region, the production of electricity largely relies on nuclear and natural gas. The latter is also used in industry (fertilizer, the steel industry) and in buildings (heating).

The consumption of natural gas is on the rise, to the detriment of coal. The need for oil products is consistently rising, mainly because there is no real alternative to the current main uses. Renewable energy sources have seen the most dramatic increase, but only represent 4.0 % of gross internal consumption of energy in 2006 (1).

Decoupling between energy consumption and air pollution

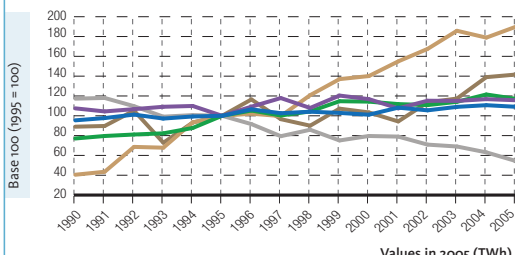
The reduction in acidifying emissions is mainly attributable to the reduction in sulphur emissions (SO_2), which is largely connected to the gradual replacement of coal with natural gas in industry. The decrease in emissions of volatile organic compounds can mainly be explained by technological improvements in the transport sector (catalytic converters, EURO standards, etc.). For particulate matter (PM_{10}), it's largely industry which has reduced emissions, with transport not showing much improvement over the period in question. As for greenhouse gases, there is not really a decoupling, although emissions per unit of energy used went down by 11 % between 1990 and 2005. This trend is largely connected to the increased use of natural gas and electricity by industry.

Controlling consumption, technical advances and political choices

The control of energy consumption is one of the main reasons for the reduction in air pollution associated with energy. Different approaches are presented in the *Plan pour la maîtrise durable de l'énergie à l'horizon 2010* in Wallonia(1) and the Walloon Region *Plan Air Climat*(2). Technological advances are also likely to reduce emissions at source or filter emissions more effectively. Political choices will also be influential, especially as far as electricity is concerned (the nuclear sector, renewable energy, etc.).

fig AIR 1-1

Gross internal energy consumption in the Walloon Region, by fuel



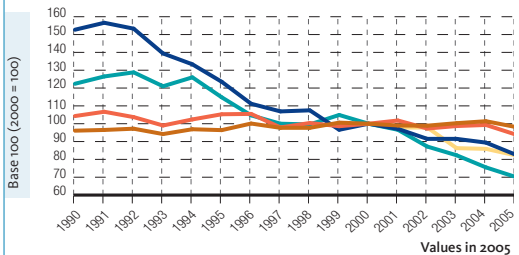
Values in 2005 (TWh)

Renewables (excluding wood) and energy recovery	5.52
Wood	3.89
Natural gas	45.96
Nuclear fuels	69.85
Oil products	67.89
Solid fuels (excluding wood)	25.87

EOW 2008 – **Source :** SPW - DGO4 - DEBD

fig AIR 1-2

Consumption of energy* and air pollution in the Walloon Region**



Values in 2005

Energy consumption (primary sources)	221.1 TWh
Greenhouse gas emissions (GHGs)	36,446 kt CO_2 eq
Acidifying pollution	3,084 t Aeq
Particulate emissions (PM_{10})	7,448 t
Volatile organic compounds (VOCs)	27,362 t

* Primary sources of energy (excluding steam and industrial heating, and excluding electricity exports)
** Pollution linked to the use of primary fuels for their energy content

EOW 2008 – **Sources :** SPW – DGO4 – DEBD; SPW – AWAC

(1) http://energie.wallonie.be (2) http://air.wallonie.be

Greenhouse gas emissions

To combat global warming and to comply with the Kyoto Protocol, the Walloon Region has made a commitment to reduce its greenhouse gas emissions (GHGs) by 7.5 % between 1990 and the period between 2008 and 2012. Several measures are being taken to reach this goal (quota allocation, efficient use of energy, car taxes, etc.) but a sustained structural effort is probably still required.

CO_2 as the main GHG

In 2006, Wallonia released around 47,800 kt CO_2 eq GHGs into the atmosphere, 86 % of which was in the form of CO_2, and the rest of which was N_2O (8 %), CH_4 (5 %) and Fluorine gases (± 1 %). Emissions from Wallonia represent 35 % of Belgian GHGs emissions(1). With 13.9 t CO_2 eq produced per inhabitant, the Walloon Region is above the average for the 27 EU countries (10.4 t CO_2 eq/inhab). The main sources of emissions are industry (43.1 %), road transport (18.8 %) and the residential sector (12.7 %).

Marked reduction in emissions in 2006

Anthropic GHGs emissions in Wallonia went down by 12.7 % between 1990 and 2006. This reduction is the result of different trends in different sectors: a fall in terms of energy production (increasing use of natural gas), industry (industry-wide agreements, business closures, electric furnaces, etc.) and waste (harnessing of biogas in CET), while emissions connected to road transport have continued to rise. Furthermore, the mild winter of 2006 led to a reduction of 14 % in emissions associated with heating compared to 2005.

A very uncertain future

According to the most recent projections (February 2008), Walloon GHGs emissions for the period between 2008 and 2012 should be 9.4 % lower than emissions in the reference year (with unchanged policies). These projections take into account the EC's projections for the transport sector. The figures should be interpreted with caution given the many uncertainties which exist, particularly in terms of changes in industrial activities, including the steel industry, the development of power stations and the demand for heating (connected to climatic conditions).

According to the evolution of these different factors, the Region has already taken several measures to get the necessary number of Kyoto units (via flexibility mechanisms) and so respect its commitments. As far as more long term objectives are concerned (in other words, a likely reduction of - 20 to - 30 % depending on the results of negotiations), they cannot be reached without the implementation of supplementary measures, such as, for example, those laid out in the Walloon Region *Plan Air Climat*(2).

tab AIR 2-1

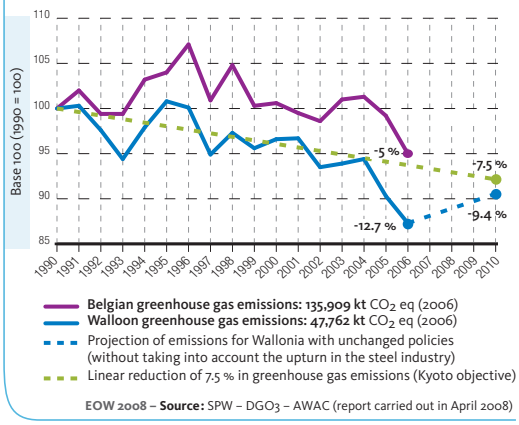
Changes in greenhouse gas (GHGs) emissions in the Walloon Region, by area of activity (between 1990 and 2006)

Sectors	GHGs (kt CO_2 eq)		Change
	1990	2006	
Waste	1,146	396	- 65 %
Energy	6,711	4,570	- 32 %
Industry (combustion)	17,984	12,705	- 29 %
Other transport	424	344	- 19 %
Other (solvents etc.)	269	221	- 18 %
Residential	6,859	6,043	-12 %
Agriculture	4,978	4,513	- 9 %
Industry (processes)	7,906	7,878	- 0,4 %
Services	1,270	1,606	+ 26 %
Road transport	6,869	8,979	+ 31 %
Fluorine gases (HFC, PFC, SF_6)	174	508	+ 192 %
Total	**54,589**	**47,762**	**- 12,7 %**

EOW 2008 - **Source :** SPW - DGO3 - AWAC

fig AIR 2-1

Greenhouse gas emissions in the Walloon Region and in Belgium compared to the Kyoto objective



EOW 2008 – **Source:** SPW – DGO3 – AWAC (report carried out in April 2008)

(1) MRW-DGRNE *et al.* (*Rapport National d'Inventaire* (NIR), report carried out in April 2008 as part of the Kyoto Protocol)
(2) http://air.wallonie.be

The *Plan Air Climat* for the Walloon Region

Over the centuries, the evolution of human activities has lead to a change in the composition of the atmosphere with the increasing risks to human health and ecosystems that come with that. In the Walloon Region, in spite of the progress that has been made, to improve the quality of the air we still need to make a coherent and sustained effort over time.

A Plan, why? For whom?

The *Plan Air Climat* was adopted on 15th March 2007 by the Walloon Government. It contains a series of quantitative objectives and around a hundred actions for all sectors aiming to reduce air pollution and help in the fight against global warming for 2020[1]. The Plan has a budget of around 200 million Euro set aside for this.

Most of the measures involve the public authorities, the tertiary sector , land use management and transports. Some actions are aimed at the residential sector, agriculture, forestry, energy and industry, the latter having already achieved a great deal as part of branch agreements and the "Emissions Trading" system.

Actions contained in the *Plan Air Climat*

The actions which have been defined are mainly geared towards:

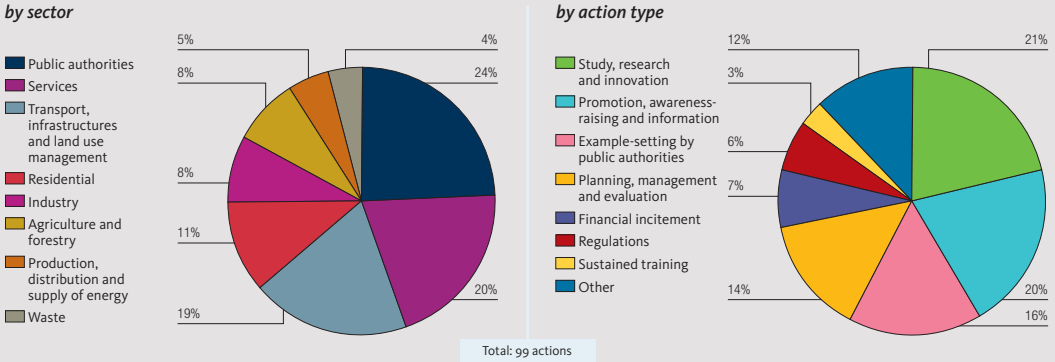
- research, technological innovation and studies of alternative solutions;
- promotion of cleaner production and consumption methods;
- information and awareness-raising among professionals and private individuals;
- the example set by public authorities (transport, buildings management etc.);
- the planning, management and evaluation of tools (insulation standards, sectoral conditions, emissions quotas etc.).

A few examples of the priority actions put in place:

5. *Consolidate the air quality monitoring network*
10. *Create a technological centre of excellence for cleaner motorisation*
12. *Develop an applied research project for the capture of CO_2*
17. *Back up the implementation of the "heat wave" Plan and the "ozone peak" Plan*
36. *Pursue the ideals of the branch agreements*
37. *Encourage the cogeneration and use of renewable energy in industry*
54. *Encourage energy audits and energy-saving investments to improve the energy performance of public and school buildings*
80. *Reduce consumption of electricity in the public lighting network*
84. *Introduce telecommuting within the public services*
87. *Adapt taxing for vehicles* (écobonus, écomalus)

fig AIR L1-1

Breakdown of the actions of the *Plan Air Climat* for the Walloon Region



EOW 2008 – **Source:** SPW – DGO3 – AWAC (CEEW calculations)

[1] http://air.wallonie.be

Ozone layer depletion

The stratospheric ozone layer fulfils the vital role of filtering the sun's ultraviolet rays which can be dangerous (causing cancer, cataracts, etc.). Since the implementation of the Montreal Protocol in 1987, the emissions of ozone-depleting substances (ODSs) have gone down significantly, leading to hopes of a return to a normal ozone layer in around 2050 for parts of the world on our latitude.

The "hole in the ozone layer" appeared above the Antarctic in the early 1980s. It is largely caused by the release into the atmosphere of various halogens (CFCs, HCFCs, halons, etc.) which, until recently, were frequently and intensively used in a wide range of applications (aerosols, refrigeration, insulation, air-conditioning, disinfection, etc.).

Caution and optimism

In parts of the world on our latitude, the measures taken in Uccle for more than 30 years show that the thickness of the ozone layer went down an average of 0.28 % ± 0.05 % a year between 1981 and 1996, equivalent to a cumulative loss of around 5 % compared to the reference level (1972-1980). Since 1997, the ozone layer has gradually been recovering. This development should nevertheless be interpreted with caution as, on the one hand, the period in question is relatively short and, on the other, the phenomenon has significant natural variations which depend in particular on climate conditions and volcanic eruptions.

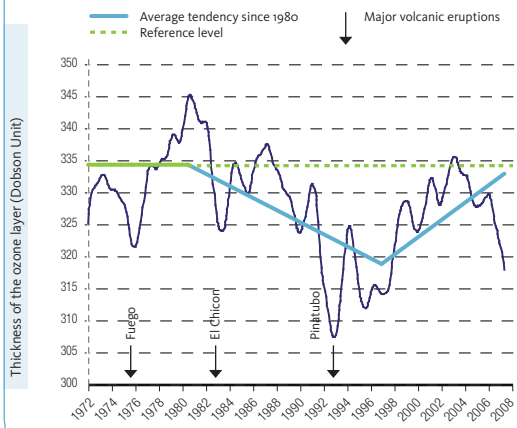
Drastic reduction in ODSs emissions

Emissions of ODSs from the Walloon Region have been reduced by three quarters in the period between 1995 and 2006. The most pronounced reductions can be seen in the area of inhalers (- 92.5 %) and refrigeration (- 85 %). An increasing proportion of total emissions come from thermal insulation foam, following the slow and gradual release of chlorofluorocarbons (CFCs) which are still present in existing insulation panels. Nevertheless, these emissions are going down following regulations which came into force a dozen or so years ago which prohibited the use of CFCs as an expansion agent in this type of foam.

The positive results gathered by the Region largely result from compliance with the obligations laid down by the Montreal Protocol (and its amendments) and from the European regulation 2037/2000/EC, which intends to prohibit and gradually reduce the production and use of ODSs. As a consequence, the Walloon Region adapted its legislation(1) and undertaken different recuperation and elimination routes. This is the case, for example, for CFCs contained in insulating foam and refrigeration circuits in fridges at the end of their life (*Recupel* programme).

fig AIR 3-1

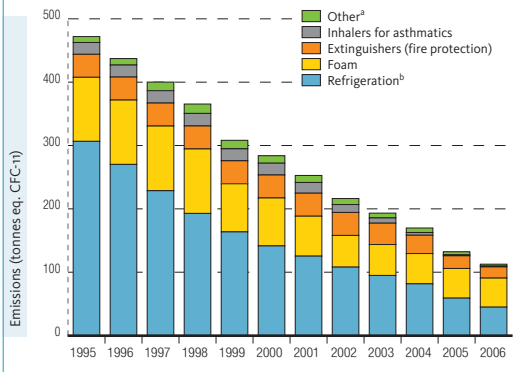
Long term changes to the total ozone column over Brussels



EOW 2008 – **Source:** KMI-IRM

fig AIR 3-2

Emissions of ozone-depleting substances in the Walloon Region, by kind of application



[a] Solvents, fumigation, disinfection, dry-cleaning, degreasing, etc.
[b] Refrigeration and air-conditioning

EOW 2008 – **Sources:** SPW – DGO3 – AWAC; ECONOTEC; VITO

(1) AGW dated 12/07/2007 aiming in particular to reduce pollution during the installation and repair of refrigeration equipment containing fluorine gases

Acidifying emissions

Some atmospheric pollutants, such as sulphur dioxide (SO_2), nitrogen oxides (NO_X) and ammonia (NH_3) can turn into acid or potentially acidifying components. The fallout from these acidifying components, better known as "acid rain", can affect the health of plants as well as the quality of the soils and surface waters.

Nitrogen as the main cause

NO_X and NH_3 are the two gases which contribute the most to the phenomenon of acidification. Their emissions represent 46 % and 29 % respectively of total emissions. In 2005 these reached 5.43 kilotonnes of acid equivalent (kt Aeq), or 34 % of Belgian emissions of acidifying substances. With 1.60 kg Aeq/inhab, the Walloon Region is just above the European average (1.52 Aeq/inhab). The main sources of these emissions are industry (35.4 %), agriculture (25.4 %) and road transport (18.6 %).

Emissions are going down

By reducing emissions into the atmosphere by 35 % between 1990 and 2005, the Region has already achieved more than 70 % of the reduction needed by 2010. In absolute values, the reductions were mainly made in industry, energy transformation, road transport and agriculture. The reduction in sulphur emissions (- 58 %) can be explained by the reduced sulphur content of diesel and heavy fuel oils, as well as by the increasing use of natural gas. NO_X emissions have gone down by 21 %, largely thanks to the availability of more efficient burners, the improved performance of engines and the spread of catalytic converters, even thought the impact of the latter two measures has been reduced by the increase in traffic. The closure of certain industries producing particularly high level of pollution should also be taken into account.

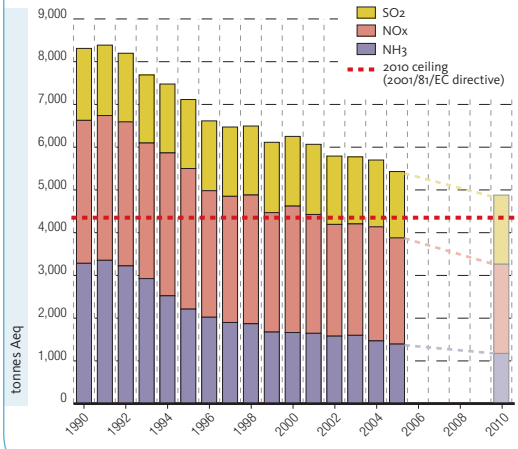
The 2010 objective will be difficult to achieve

The extrapolation of acidifying emissions in 2010 (with unchanged policies) indicates that further measures must be taken, as well as those planned in 2000 (branch agreements, emission standards for large combustion plants, building insulation, etc.), all the more so as the EU is planning to reduce emissions ceilings.

This is why the *Programme wallon de réduction progressive des émissions de SO_2, NOX, COV et NH_3*[1] suggests several measures, including the establishment of emission standards between now and 2010 for small combustion plants and the application of more evolved technology (purification of fumes, burners working at lower temperatures, etc.). These will be backed up by measures detailed in the recent *Plan Air Climat*.

fig AIR 4-1

Acidifying emissions in the Walloon Region
and projections compared to the emissions ceiling defined for 2010



EOW 2008 – **Source:** SPW - DGO3 - AWAC

tab AIR 4-1

Changes in acidifying emissions in the Walloon Region, by area of activity (between 1990 and 2005)

Sectors	Acidifying emissions (t Aeq)		Change
	1990	2005	
Energy	1,114	380	- 66 %
Road transport	1,727	1,010	- 42 %
Industry	3,106	1,921	- 38 %
Waste	77	54	- 31 %
Residential	468	351	- 25 %
Agriculture	1,557	1,431	- 8 %
Other transport	202	212	+ 5 %
Services	59	72	+ 22 %
Total	**8,311**	**5,430**	**- 35 %**

EOW 2008 - **Source :** SPW - DGO3 - AWAC

[1] AGW dated 25/03/2004

Quality of ambient air

The deterioration of the quality of the air can have an effect on the climate, human health, the way some ecosystems function, and the properties of some materials, on a local, regional and global level. This is why ambient air is the subject of increasing surveillance by public authorities, who must try to make sure that concentration levels of pollutants are kept below certain critical values.

Ambient air under stricter and stricter controls

At the moment, the Walloon Region has a surveillance network for air quality[1] made up of 182 measuring points. With this network, 118 parameters can be measured in different fractions (gas, rain, particulate matter, settleable particles). The level of surveillance has been increased over recent years, and the network can now monitor 47 more parameters than in 1996. The location of stations as well as the number and nature of pollutants monitored vary depending on local issues (the influence of industrial activities for example), or the population density, which means that the results produced by the network are not always representative of the general quality of the ambient air in the Walloon Region.

The two main culprits: ozone and particulates

In 2007, no station measuring particulate matter (PM_{10}) concentrations and tropospheric ozone respected the values set out by European legislation for human health. Furthermore, the norm established for PM_{10}, i. e. a daily value of 50 µg/m³ not to be exceeded more than 35 times a year, was not respected in 6 of the 12 stations (in Marchienne, Charleroi and Engis in particular). This situation has gone on for several years, and is not unique in Europe. This is why the reduction of PM and ozone pollution is a subject which is seen as a priority for Europe's strategy for air pollution (CAFE).

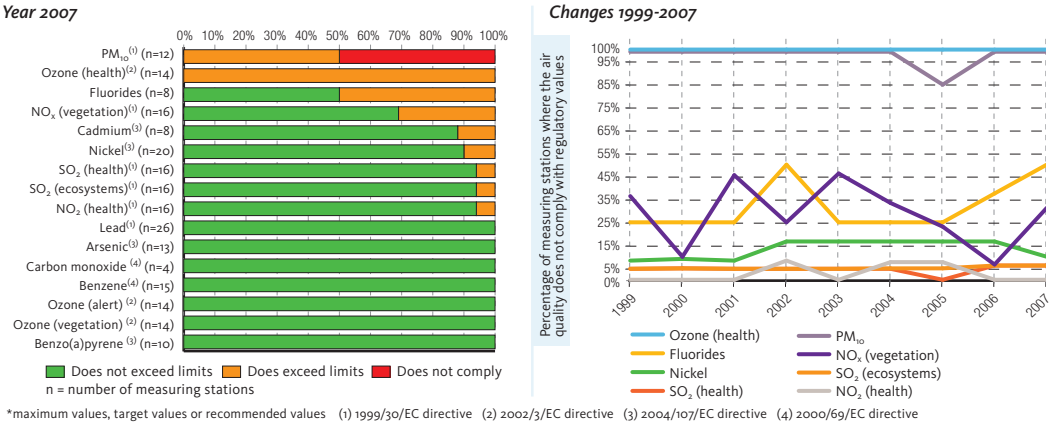
Other pollutants which cause problems, to a lesser extent, are fluorides (only monitored in the areas surrounding 3 emitting industries), nitrogen oxides (for plant protection) and two metallic trace elements (Ni and Cd).

Action on all fronts

The Walloon Region has drawn up various plans and programmes of actions aimed at improving the quality of ambient air (*Plan Air Climat, Programme wallon de réduction progressive des émissions de NO_X et COV*[2], *Plan d'actions en cas de pics de pollution par les poussières fines*). Most of the measures are part of integrated policies which are adapted to the different forms of pollution and characteristics of activity sectors.

fig AIR 5-1

Percentage of measuring stations in the Walloon Region where concentrations of pollutants into the ambient air exceed regulatory values*



*maximum values, target values or recommended values (1) 1999/30/EC directive (2) 2002/3/EC directive (3) 2004/107/EC directive (4) 2000/69/EC directive

EOW 2008 – Source: ISSeP (air quality monitoring networks)

(1) The results produced by this network are available at http://air.wallonie.be (2) AGW dated 25/03/2004

Emissions of particulates into the air

Particulates in the air and the toxic substances that they carry can enter the lungs to a greater or lesser level and have a damaging effect on health. These particulates are generated by different human activities (industrial production, transport, domestic heating, etc.) which must, in some cases, be controlled in order to avoid chronic or occasional pollution.

More than 80% of emissions come from transport and industrial activities

According to existing emissions inventories, the release of dust into the air (with a diameter of less than 75 µm) represented ffl 43,000 t in 2005. Around 30 % of emissions are made up fine particles ($PM_{2.5}$), which are generally more harmful to health.

The two sectors which emit the highest levels of particulates in the Walloon Region are industry (steel, quarries, cement) and road transport (combustion of diesel, brakes and tyres wearing). The contribution of the residential sector in terms of $PM_{2.5}$ emissions has probably been under-estimated because of the lack of statistics on the increasing use of wood for heating in the Walloon Region.

A tendency to drop, but yet to be confirmed

Emissions of particulates in Wallonia went down by 16 % between 2000 and 2005. This trend needs to be confirmed in the years to come, given the many uncertainties which still plague current emissions inventories. However, this reduction can reasonably be explained by the closure of businesses, the gradual replacement of solid fuels with natural gas, the installation of filtration systems, the development of new technology, the introduction of stricter norms for new vehicles (EURO standards) and large combustion plants (review of environment permits) or the application of new operating conditions in some sectors (such as quarries[1] for example).

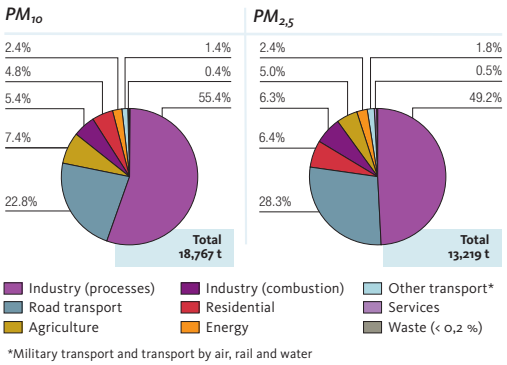
Action on different sources

As well as the measures laid out in the *Plan Air Climat*[2], a programme of specific actions in case of pollution peaks due to fine particles has recently been adopted. It stipulates harmonised warning procedures for Belgium, and different actions to be taken depending on the level of pollution (restrictions on motorway speed limits, provision of free public transport, restrictions on certain industrial activities, etc.).

Particulates are classed according to their size, depending on the average diameter of a sphere that would have similar aerodynamic behaviour (e.g. 0.1, 2.5, 10 or 75 µm).

fig AIR 6-1

Emissions of primary particulates (PM_{10} and $PM_{2,5}$) in the Walloon Region, by sector *(2005)*

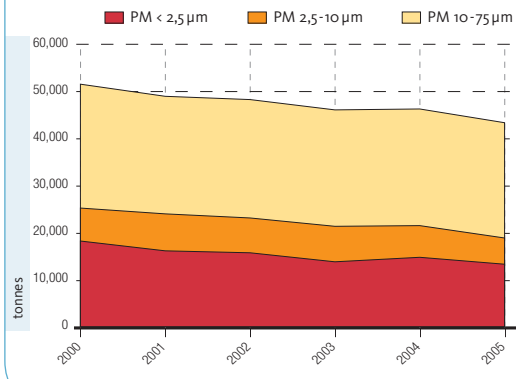


*Military transport and transport by air, rail and water

EOW 2008 – **Source:** SPW – DGO3 – AWAC

fig AIR 6-2

Primary emissions of dust and particulates in the Walloon Region



EOW 2008 – **Source:** SPW – DGO3 – AWAC

(1) AGW dated 17th July 2003 (2) http://air.wallonie.be

Precursors of tropospheric ozone

Tropospheric ozone forms in the air via a series of complex photochemical reactions involving precursor pollutants such as nitrogen oxides (NO_X) and volatile organic compounds (VOCs). A European directive stipulates emissions ceilings for these compounds in order to reduce concentrations as well as the intensity and frequency of summer ozone peaks.

Transport in the line of fire

In 2005, atmospheric emissions of NO_X and VOCs from human activities were 114,500 and 48,000 tonnes respectively. The main sources of NO_X in the Walloon Region are transport and industry (steel, cement, glass, coke, chemicals, etc.). VOCs are mainly produced by activities connected to transport (incomplete combustion of fuels, petrol fumes) and the use of solvents (paint, glue, degreasing products, etc.).

Emissions are falling

In the Walloon Region, emissions of NO_X went down by 26 % between 1990 and 2005. This can be explained by:

- a branch agreement with electricity producers which reduced emissions for this sector by 47 %;
- a 40 % reduction in emissions from road transport (catalytic converters, EURO standards, etc.), in spite of the constant rise in traffic and the growing proportion of diesel vehicles on the road;
- the closure of steel works;
- changes in chemical and cement industry processes.

VOCs produced by human activities fell by 45 % between 1990 and 2005, largely thanks to the installation of catalytic converters in cars and systems for collecting petrol fumes, the reduction in the amount of benzene in petrol, the reduction in quantities of solvents in some paints and the review of environment permits(1) in sectors such as printing and dry-cleaning.

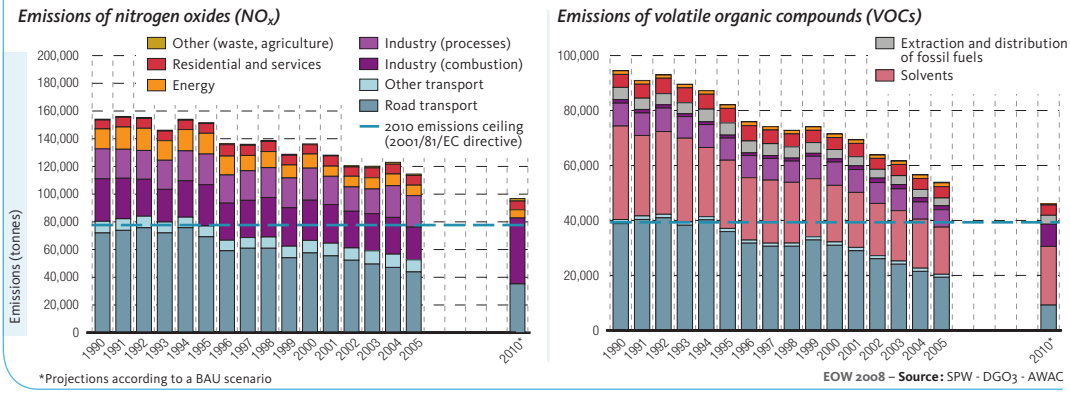
Ceilings which are hard to respect

According to projections, the measures taken so far in the Walloon Region would not be enough to make sure NO_X and VOCs emissions respect the ceilings fixed by European legislation by 2010. They therefore need to be backed up by the implementation of additional measures, some of which are included in the recent *Plan Air Climat*(2) and the *Programme wallon de reduction progressive des émissions de SO_2, NO_X, COV et NH_3*(3).

VOCs include different kinds of compounds (aldehydes, benzene, terpenes, etc.). Around 40 % of VOCs emissions in the Walloon Region (35,700 t) are produced naturally by vegetation.

fig AIR 7-1

Anthropic emissions of ozone precursors (NO_X et VOCs) in the Walloon Region and projections compared with emission ceilings set for 2010



*Projections according to a BAU scenario

EOW 2008 – Source: SPW - DGO3 - AWAC

(1) In association with the 2004/42/EC directive (2) http://air.wallonie.be (3) AGW dated 25/03/2004

Photochemical pollution by tropospheric ozone

Photochemical pollution, also known as "ozone peaks", can affect human health and the growth of vegetation. Is also contributes to the greenhouse effect. European legislation has defined indicators for monitoring this kind of pollution for various target groups. The values of these indicators must respect certain thresholds between now and 2010 and aim towards more long-term objectives.

The indicators correspond to those which were drawn up as part of the implementation of European directive 2002/3/EC[1]. They were produced by integrating certain standards aiming to protect both human health and vegetation (woodland species and other types of vegetation) from the harmful effects of tropospheric ozone (O_3). The values are levelled out (sliding averages calculated over a period of 3 to 5 years) in order to reduce the impact of fluctuations between the years which are generally quite significant. These are essentially linked to meteorological conditions (hours of sunlight, temperature).

Higher levels of ozone in the countryside than in urban areas

Levels of O_3 pollution are regularly higher in rural areas than in urban areas. This can largely be explained by the presence of another gaseous pollutant in urban areas: nitric oxide (mainly produced by exhaust fumes) which destroys ozone.

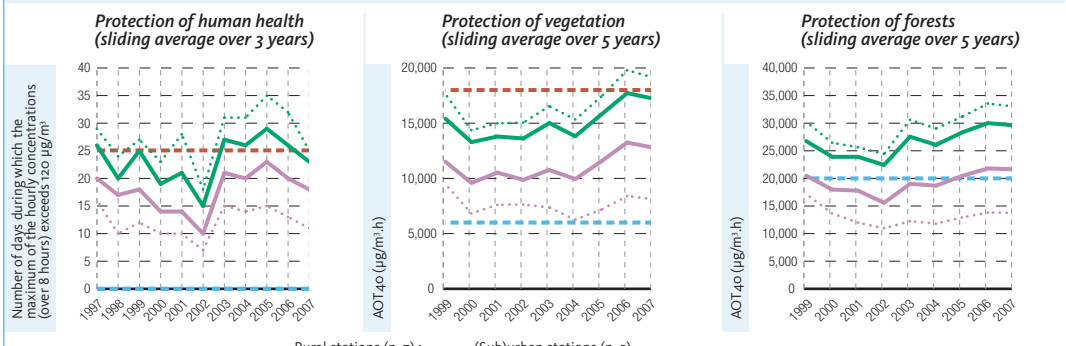
Long term objectives out of reach

Overall, the average values of the three indicators have risen since 2002 because of the many ozone peaks recorded in 2003 and 2006, two years which were characterised by exceptionally high temperatures. The halt observed from 2006 onwards is connected to the fact that 2007 was "relatively low in ozone" (with the absence of a summer heat wave). This means that in 2007, the Walloon Region was able, but only just, to respect the European target values. This is not the case for the long term objectives which seem to be moving further and further out of reach. Improvements are expected soon, both in Wallonia and throughout Europe, following the measures planned and implemented[2] to reduce emissions of precursors of ozone gases (NO_X and VOCs) in the long term.

The AOT_{40} parameter corresponds to the accumulation of hourly doses of O_3 which are above the threshold of 80 µg/m³ (or 40 ppb), measured every day between 8 am and 8 pm. There is a distinction between AOT_{40} for the protection of vegetation, calculated over a period of 3 months (from the start of May until the end of July) and AOT_{40} for forests, calculated over a period of 6 months (from the start of April until the end of September).

fig AIR 8-1

Indicators for exceeding levels of tropospheric ozone for the protection of health, vegetation and forests in the Walloon Region



EOW 2008 – **Source:** ISSeP (Telemetric network)

[1] Transposed by AGW dated 05/12/2002

[2] *Programme wallon de réduction des émissions de NO_x et de COV* (AGW du 25/03/2004) and *Plan Air Climat* (http://air.wallonie.be)

Emissions of micro-pollutants into the air

The micro-pollutants in the ambient air are basically metallic trace elements (sometimes called "heavy metals") and persistent organic components. Given their potentially toxic effects on health and ecosystems, their atmospheric emissions must be reduced as much as possible to respect the protocols agreed both in Europe and internationally.

Industry and the residential sector the main sources of emissions

According to emissions inventories available in the Walloon Region, emissions into the atmosphere of metallic trace elements (heavy metals: Zn, Pb, Cr, Ni, Cu, As, Hg, Cd) represented ± 160 tonnes in 2005. Industry (steel, metal processing etc.) is the main source of emissions, ahead of road transport (brake pads wearing for example).

Organic micro-pollutants (polycyclic aromatic hydrocarbons – PAHs, dioxins and furans etc.) are mainly released into the atmosphere during combustion (fuels, biomass) which takes place in industry, waste incineration, transport and in people's homes (heating, illegal waste incineration etc.).

Reduction efforts starting to bear fruit

Overall, emissions of metallic trace elements in the Walloon Region went down by 56 % between 1990 and 2005. This reduction can largely be explained by the closure of steelworks, changes to certain industrial processes, increased control of industrial plants and the treatment of their fumes. It is also a result of the disappearance of leaded petrol and the gradual reduction in the use of coal (rich in metallic trace elements), which has been replaced by natural gas. However, there was a rise in levels of zinc being released into the air between 2000 and 2004, due to the increased production of steel from electric furnaces.

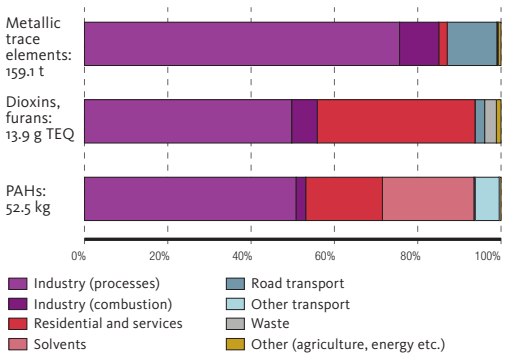
Changes in emissions of PAHs is more unpredictable, although the considerable reduction of emissions seen since 1999 (- 90 %) is the result of the closure of the Clabecq iron foundry and the installation of more efficient filters on some blast furnaces. The drop in dioxin and furan emissions can largely be explained by the modernisation of waste incinerators following the implementation of stricter norms[1].

Regulatory tools

Most of the measures taken to reduce micro-pollutant emissions stem from European legislation (IPPC directive: use of the best techniques available for example) and various international conventions (LRTAP, Stockholm). These are mainly applied in the Walloon Region by the release and revision of environment permits.

fig AIR 9-1

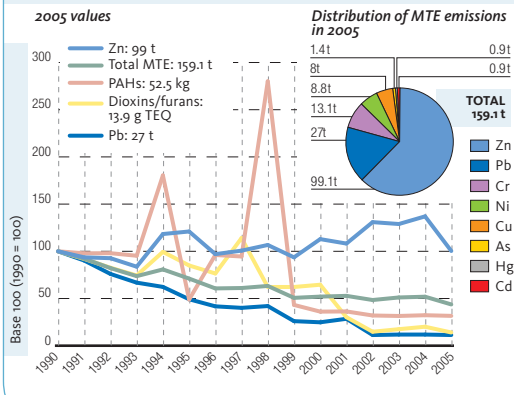
Distribution of emissions of metallic trace elements (MTE), PAHs, dioxins and furans by sector in the Walloon Region *(2005)*



EOW 2008 – **Source:** SPW - DGO3 - AWAC

fig AIR 9-2

Changes in emissions of the main micro-pollutants in the Walloon Region



EOW 2008 – **Source:** SPW - DGO3 - AWAC

[1] AGW dated 03/12/1998

water and aquatic environment

water 1

Main watercourses flows

The fluctuation in water flows affects the ecological and chemical state of watercourses (e.g. concentration of pollutants and poor oxygenation of the water in low stream flow periods). Consequently, flows must be monitored, not only within the context of managing floods and flash floods, but also when it comes to qualitative objectives set by the European Water Framework Directive.

The range of flows is considerable

In 2007, the median flows (*débits médians* - DM)(1) of the main watercourses in Wallonia were between 0.9 m^3/s on the Grande Gette and 151 m^3/s on the Basse Meuse. The characteristic low water flows (DCE) were between 0.6 and 29.5 m^3/s. These are generally between 1.5 and 5 times lower than the median flows, the relationship between the DM and DCE being dependent on the characteristics of the watershed, but also on the different possible sources of water supply for the watercourse from groundwater (depth of the underground waters, porosity of the aquifers etc.).

Flow in the "troughs of the wave"?

The changes in annual median flows over a relatively long period (1970-2007) shows a cyclical tendency which doesn't reveal the general trend of long term decrease. However, a considerable reduction in median flows (of more than 50 % on average) can be observed between 2001 and 2007, during which time rainfall levels were among the lowest of the decade.

Foreseeing and managing low water periods

The Walloon Region is keen to maintain a minimum ecological flow in its watercourses, in particular by way of surface water uptakes permits and environmental permits that are issued. Furthermore, in its project of river basin district management plans(2) there are plans to apply further measures if the watercourses do not manage to achieve a good ecological status. In this case, there are plans to set a maximum daily water volume uptake, review permits and tighten control.

Low water corresponds to the period of the year where the flow of a watercourse is at its lowest. Its usual statistical parameter is the characteristic low water flow (DCE) which represents the daily flow that has not been reached for 10 days a year.

tab WATER 1-1

Annual median flow (DM) and characteristic low water flow (DCE) of the main watercourses in the Walloon Region (2007)

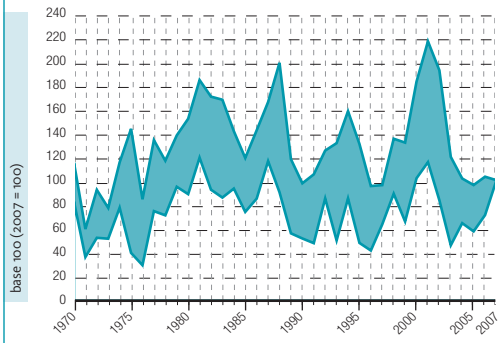
Watercourses	Location*	DM (m^3/s)	DCE (m^3/s)
Basse Meuse	Lanaye (exit)	151	29.5
Meuse moyenne	Namêche	140.3	52.2
Haute Meuse	Heer (entrance)	94.6	32.7
Ourthe	Angleur	43.6	18.4
Escaut	Pottes (exit)	21.3	11.8
Escaut	Bléharies (entrance)	18.3	10.2
Semois	Bohan	16	4.7
Amblève	Comblain-au-Pont	15.2	4.8
Sambre	Namur	14.9	5.0
Lesse	Anseremme	11.7	4.6
Vesdre	Chênée	8.8	3.5
Sambre	Erquelinnes (entrance)	6.8	3.0
Chiers	Torgny	6.1	3.1
Haine	Hensies	4.4	2.6
Our	Ouren	3.7	1.0
Dendre	Deux-Acren	3.2	1.5
Dyle	Ottenburg	2.5	1.8
Senne	Clabecq	2.2	1.3
Gette	Hoegaarden	0.9	0.6

** Flows calculated at the outlets of the sub-catchments, at the entrance or exit of Walloon territory*

EOW 2008 - **Source :** SPW - DGO2 - DEAG (SETHY)

fig WATER 1-1

Changes in annual median flows of the main watercourses* in the Walloon Region



*Envelope curve drawn up from flows calculated for the 15 main watercourses in the Walloon Region (Amblève, Chiers, Dendre, Dyle, Escaut, Gette, Haine, Lesse, Meuse, Our, Ourthe, Sambre, Semois, Senne and Vesdre)

EOW 2008 – **Source :** SPW - DGO2 - DEAG (SETHY)

(1) Calculated using flows measured within the SPW's two water level networks (http://mrw.wallonie.be/dgrne/aqualim and http://voies-hydrauliques.wallonie.be) (2) http://eau.wallonie.be

Flash floods and flood risks

Heavy water flows caused by intense or extensive rainfall can cause flash floods and, in some cases, flooding, when watercourses burst their banks. These natural events often cause considerable damage and changes to the quality of water and riverbank habitats (e.g. by dispersing waste and pollutants).

Are flash floods getting less common?

Over the last 10 years, flash floods have been common in watercourses in Wallonia. Regardless of their intensity, there was a particularly large number in August 2002 and January 2003, more specifically in the Dendre, the Haine and the Ourthe. The Walloon Region has not experienced major flash floods in recent years, but rather localised flooding, mainly caused by muddy flows, following particularly intense rainfall, as was the case in July 2007 for example in the province of Hainaut and in May 2008 in the province of Liège.

Flooding in every municipality in Wallonia

Between 1969 and 2007, in periods of intense rainfall, flooded watercourses and surface runoff triggered flooding which caused major damage (recognised as a national disaster) in every municipality in Wallonia. The most affected sub-catchments were those of the Escaut-Lys, the Sambre, the Meuse (upstream and downstream) and the Lesse. According to information available for the period 1969-2007, in a third of cases, floods are caused by watercourses overflowing and in the remaining cases, by water runoff on agricultural land (mud flows) or blocked sewers.

The P.L.U.I.E.S. Plan anticipates the requirements of the 2007/60/EC "flood directive»

In 2003, The Walloon Region launched the P.L.U.I.E.S. Plan (*Prévention et Lutte contre les Inondations et leurs Effets sur les Sinistrés*). This is an integrated and multi-disciplinary plan containing 30 concrete actions aiming to reduce the risk of damage caused by flooding(1).

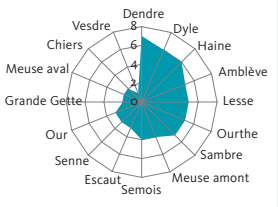
In 2007, a major action in this plan was finalised. This was the mapping of flood-risk zones throughout Wallonia (available on the map portal of the Walloon Region)(2).

An event is classed as a flood event every time the maximum flow on a watercourse exceeds the value of the 75th percentile of the annual maximum flows recorded over a minimum of 10 years.

fig WATER 2-1

Number of flood events in the Walloon Region

Calculated between 1997 and 2007 at the outlet of the main river basins



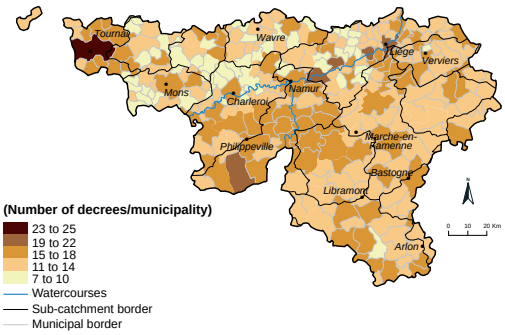
*Calculated by year at the outlet of the main river basins**

*Total for the basins listed in the left-hand figure

EOW 2008 – Source: SPW - DGO2 -DEAG (SETHY)

map WATER 2-1

Municipalities in Wallonia included in a Royal Decree considering the damage caused by flooding as national disasters (1969-2007, all causes combined)



EOW 2008 – Sources : Moniteur belge; SPW - DGO2 -DEAG (SETHY)

(1) http://environnement.wallonie.be/de/dcenn/plan_pluies (2) http://cartographie.wallonie.be

water 3

Water abstractions

In Europe, Wallonia is one of the regions that exploit its water resources intensively. So it needs to be careful to withdraw water volumes which are lower than the volumes of rainfall, at the risk of leading to a lowering ground water levels and a reduction in the flow of watercourses, with the possible consequences of rationing water consumption, drying out of wetlands and higher concentrations of pollutants.

30 billion m³ used in 10 years

In 2005, the Walloon Region removed around 2,600 million m³ of water from its watercourses and groundwater. Annual uptakes of surface water represent 2,230 million m³, or 6 times more than volumes taken from aquifers. However, more than 85 % of the volume of surface water taken is returned to watercourses after use because it is used as cooling water, mainly in electricity production. Since 2000, the total water abstraction has gone down, basically following a 30 % reduction in industrial cooling water volumes (closed circuit operations, closures of factories etc.).

Groundwater going to taps

Abstraction from aquifers represents ± 385 million m³ a year, or 70 % of the volumes which are naturally refilled by rain. Most of this abstracted water is destined to be distributed as public drinking water in the Walloon Region as well as in other Regions of the country (for ± 40 %). With a density of water uptakes higher than 18,000 m³/(km².year), Wallonia exploits its aquifers more than most other regions in Europe. This situation needs to be put into context with the density of the population and the large proportion of exported volumes.

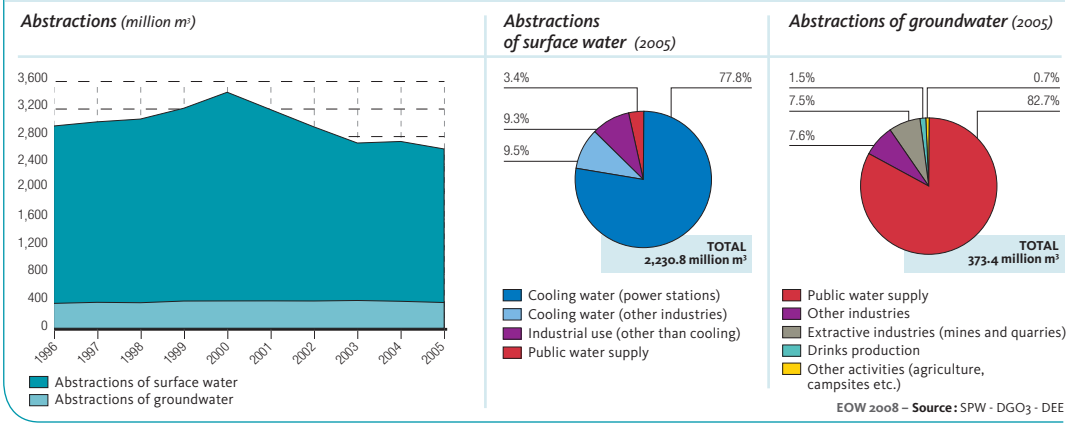
Keeping a balance

Against the backdrop of global warming, the management of water resources becomes a major concern, the difficulty being finding a sustainable balance between the need for water and the resources available. In this context, the 2000/60/EC directive requires Member States to make sure that their groundwater bodies reach a "good quantitative status", in other words that there is a balance between what is taken and how sources are renewed. In the Walloon Region, only the *Calcaires du Tournaisis* aquifer runs the risk of not achieving this objective until 2015(1).

In its project of management plan(2), as well as existing measures (recovery of pit waters, abstraction quotas etc.), the Walloon Region foresees the possibility of resorting to further measures: adapting environmental permits, consolidating control or carrying out further studies to make better estimation of the resources available.

fig WATER 3-1

Abstractions of surface water and groundwater in the Walloon Region



EOW 2008 – **Source:** SPW - DGO3 - DEE

(1) State of groundwater of Wallonia: http://environnement.wallonie.be/de/eso/atlas (2) http://eau.wallonie.be

Production of public drinking water

Piped water is a very important resource that is used to satisfy a range of needs (diet, hygiene etc.). The consumption of piped water is not only an issue for public health; it is also an environmental issue, as this water is abstracted from resources (surface and groundwater) before being released into the environment after use.

Little change to water abstraction

In 2006, the total volume of water withdrawn in Wallonia for public water distribution was 395.2 million m³. While annual uptakes have been relatively stable since the end of the 1970's, the distribution of volumes taken from underground sources and surface water can vary slightly from year to year. On average, 80 % of water is taken from underground waters, which are generally better quality and can be turned into drinking water at a lower cost. However, while the level of groundwater is no longer sufficient, as is often the case in periods of dry weather (e.g. in 1991), drinking water producers need to pump more from surface water.

Walloon water supplies Brussels and Flanders

More than half of water collections (55 %) are carried out by Walloon producers (56 in total) and the rest by a Brussels-based operator (VIVAQUA) and two Flemish producers (VMW and TMVW). The water collected can be exchanged between operators for technical or financial reasons. In the end, ± 40 % of water produced in the Walloon Region is exported to two of the country's other Regions. The remainder (240.3 million m³) is used for the distribution of drinking water in the Walloon Region.

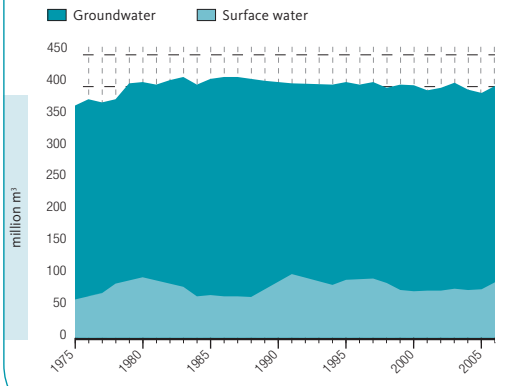
Battling leaks

In 2006, the total efficiency of the Walloon distribution network was 68 %, which means that out of every 100 m³ of water destined for public water supplies in the Walloon Region, just under 70 m³ are invoiced to users. The 30 m³ not recorded are either used by the distributers to clean their plants and/or civil protection and the fire services, or lost through leaks in the network, or just not accounted for by water meters. At the moment, it is not possible to provide a figure for the volumes corresponding to these different points.

Overall, the efficiency of the Walloon distribution networks is tending towards an improvement, thanks to the gradual renewal of pipes. In recent years, projects to find and eliminate leaks have accelerated. This kind of work now represents the majority of investment made by water distributors (140 million € for the period 2004-2006).

fig WATER 4-1

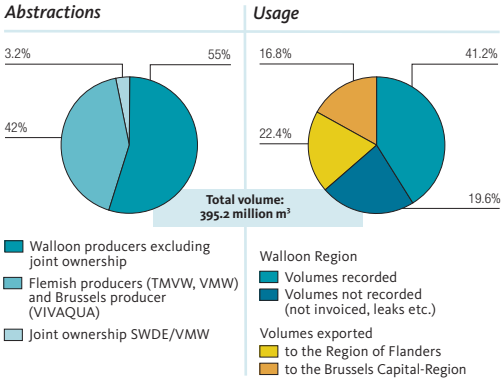
Abstractions of water for public water supplies in the Walloon Region



EOW 2008 – **Source:** SPW - DGO3 – DEE

fig WATER 4-2

Destination of drinkable water produced in the Walloon Region *(2006)*



EOW 2008 – **Sources:** S.A. Aquawal; BELGAQUA; SPW – DGO3 – DEE

water 5

Pollution released into the watercourses

The excessive introduction of organic matter, nitrogen, phosphorous and other micro-pollutants (heavy metals, pesticides, etc.) into surface water is one of the main causes of the poor ecological status of some watercourses. These pollutants are mainly the result of direct discharge of waste water and surface runoff of water that is contaminated after going through agricultural land, polluted soil, or different kinds of surfaces (roads, roofing etc.).

The levels of carbon (C), nitrogen (N) and phosphorous (P) which reach Walloon watercourses can be assessed using the PEGASE model. The results produced by this model should be interpreted carefully, taking into account the characteristics and limits of the model.

Urban waste water and soil leaching are the main sources

In 2005, levels of C, N and P discharged in the Walloon water network were estimated at ± 62,600 t, 32,500 t and 2,400 t respectively. According to simulations, more than 85 % of the total levels come, in equal parts, from (agricultural and non-agricultural) soil leaching and domestic activities (release of urban waste water).

Between 1992 and 2005, the pollution associated with domestic activities went down by 5 % to 40 %, depending on the type of substance. This change is mainly due to the increasing treatment of urban waste water in the Walloon Region. The evolution of diffuse pollution inputs (soil leaching) is less predictable, as it depends more on climate conditions (e.g. the rainy 1999 and 2002).

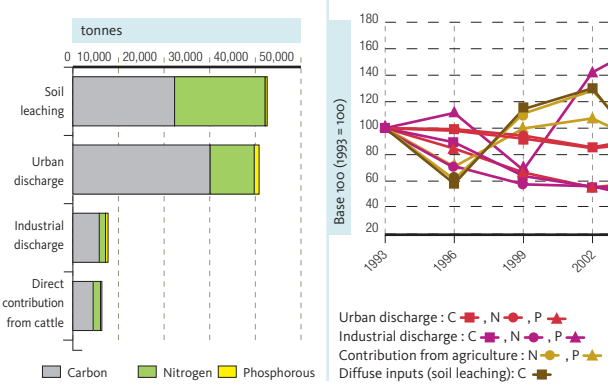
Industrial discharges generally coming down

Industrial pollution released into watercourses went down by 37 % to 91 % depending on the type of compound. This encouraging trend is the result of the application of a tax on the discharge of industrial waste water, of the end to the most pollutant activities and the effort made by manufacturers in terms of treatment and improving certain processes. Only P discharges are on the rise (+ 70 %), following repeated uncontrolled discharges (in particular, in a fertilizer factory).

As well as the basic measures that have already been taken to reduce the pollution of watercourses (treatment of waste water, environment permits, combating soil erosion etc.), the Walloon Region plans, where necessary, to apply supplementary measures for certain water bodies which are at risk(1). These measures affect all sectors. As far as industry is concerned, the measures will, for example, consist of reviewing certain permits, consolidating controls, or drawing up waste water treatment contracts for industries that discharge their waste water into public treatment plants.

fig WATER 5-1

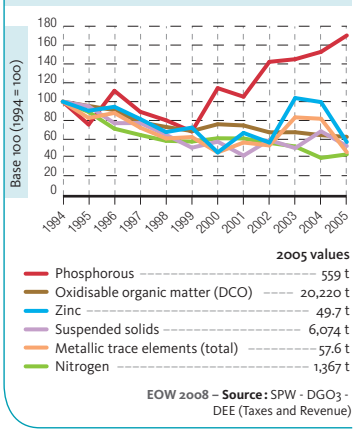
Discharges of carbon (C), nitrogen (N) and phosphorous (P) in water courses in the Walloon Region



EOW 2008 – Source: SPW – DGO3 – DEE (Taxes and Revenue) (PEGASE model)

fig WATER 5-2

Industrial pollution discharged into surface water in the Walloon Region



EOW 2008 – Source: SPW - DGO3 - DEE (Taxes and Revenue)

(1) These measures are detailed in the project of River Basin Management Plan (http://eau.wallonie.be)

water 6

Organic pollution of watercourses

Some watercourses run the risk of not achieving a good status or a good ecological potential as defined by the 2000/60/EC directive when organic matter discharges exceed the self-purification capacity of water ecosystems. The considerable efforts made in recent years, mainly in terms of the treatment of waste water, still leaves room for improvement.

The quality of waters from the river basin district of the Escaut is getting worse

In 2007, around 40 % of the monitoring sites in the river basin district of the Escaut saw values of BOD_5 higher than 6 mg O_2/l, compared with less than 1 % in other river basin districts. This difference can largely be explained by the presence to the north of the Sambre-et-Meuse river line of many urbanised areas, which means higher levels of waste water. The north of the Walloon Region is also an area of intensive livestock-rearing and crop-farming, the latter being carried out on land where there is a high risk of soil erosion. It should also be pointed out that many food factories are present in the valleys of the Escaut, the Haine, the Dendre and the Senne. Furthermore, most of the watercourses in the Escaut basin have a fairly weak current, which intensifies the negative effect of domestic and industrial waste water discharges on the water quality.

Gradual improvement

The increase in the rate of new treatment plants, and the reduction in industrial pollution over the last ten years have reduced the organic pollution of watercourses. This improvement is particularly marked in the Escaut basin. As a consequence, Walloon watercourses are getting more oxygenated: the proportion of sites where the minimum oxygen saturation rate is higher than 90 % went from 9 % to 40 % between 1996 and 2007.

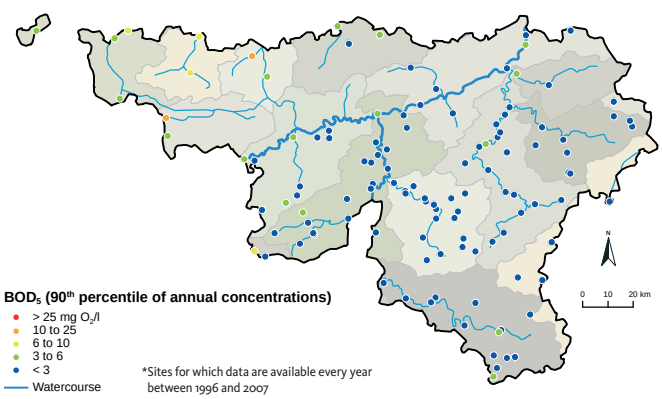
However, it is not unusual to observe locally a slight decline in certain years. This may follow on from a reduction in the flow rate of the watercourses (concentration of pollution during dry years) or, in other cases, as a result of water erosion phenomena (in periods with more rain).

For bodies of water which run the risk of not being in a good status or achieving a good ecological potential as required by the framework water directive, the Walloon Region intends to put into action a programme of supplementary measures, specifically aimed at the residential, agricultural and industrial sectors(1).

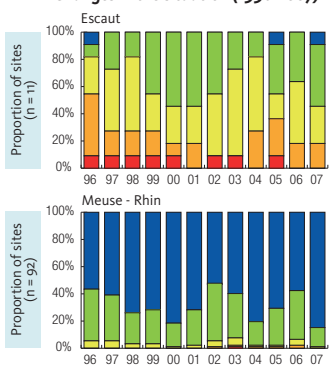
The BOD_5 (biochemical oxygen demand over 5 days) represents the quantity of dissolved oxygen used by microorganisms to oxidise the organic matter of a sample of water kept at 20°C over 5 days. It is used to estimate the quantity of biodegradable organic matter.

map WATER 6-1

Concentration of biodegradable organic matter (BOD_5) in watercourses in the Walloon Region *(2007)*



Changes in the situation (1996-2007)*



EOW 2008 – **Source :** SPW – DGO3 – DEE (AQUAPHYC database)

(1) This programme can be viewed at http://eau.wallonie.be

Eutrophication of watercourses

Excessive discharges of phosphorous in fresh surface water may lead to eutrophication. This generally causes increased algae growth and less oxygen in the water, accompanied by an increased risk of mortality for some aquatic organisms. In these circumstances, the watercourses will probably not achieve the good ecological status required by the 2000/60/EC directive.

The watercourses in the Escaut basin are fairly eutrophic

The watercourses with the highest concentrations of phosphates are located in the Escaut-Lys, Dendre and Senne basins. These basins have a large density of urban and industrial areas (discharge of waste water) as well as a lot of agricultural soils which are rich in phosphorous (P) and susceptible to erosion. Furthermore, the watercourses concerned show fairly weak flows, which intensifies the negative effects of phosphorous discharges.

Improvements are cyclical

While the treatment of waste water has accelerated in recent years in the Walloon Region, the expected effect on the quality of the watercourses has not yet materialised. This can be explained by the combination of several factors whose effects are sometimes conflicting.

The improvements mainly come from:

- ➜ the reduction in domestic pollution, principally caused by the banning of phosphates in washing products;
- ➜ the gradual introduction of tertiary treatment (phosphate-removing systems) in large capacity (≥ 10,000 p.e. (population equivalent)) treatment plants;
- ➜ the reduction in the use of phosphorous fertilisers in agriculture;

while the increase in pollution is mainly caused by:

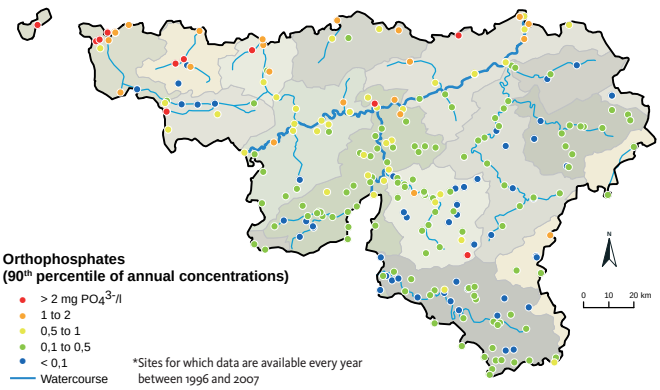
- ➜ higher diffuse inputs (runoff, particles of eroded soil) in rainy years, especially to the north of the Sambre-and-Meuse river line where the rates of P saturation in agricultural soils are higher;
- ➜ a local rise in industrial discharge of P (uncontrolled discharge);
- ➜ a reduction in the flow rates of watercourses in some dry years (e.g. 2003).

The Region intends to take supplementary measures as well as those already in place for water bodies which might not achieve a good ecological status between now and 2015. The measures put forward(1) focus on the domestic, agricultural and industrial sectors.

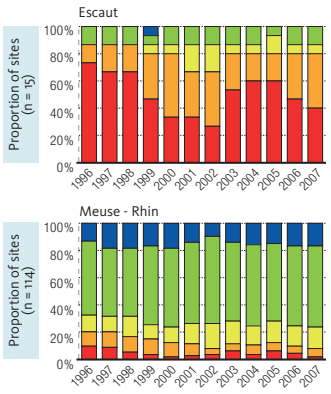
Phosphorous is the nutrient which restricts the development of algae biomass in fresh water, as opposed to nitrogen in sea water. This is why concentrations of nitrate in watercourses are the subject of compulsory reporting ("nitrates" directive)(2) in order to assess their contribution to the eutrophication of the North Sea.

map WATER 7-1

Concentration of phosphates in watercourses in the Walloon Region *(2007)*



Changes in the situation (1996-2007)*



EOW 2008 – Source : SPW - DGO3 - DEE (AQUAPHYC database)

(1) The programme of measures can be viewed at http://eau.wallonie.be (2) SPW – DGO3 (PGDA scoreboard, 2008)

water 8

Nitrate in groundwater

The degradation of groundwater quality is largely the result of excessively high concentrations of nitrate which usually appear when the amount of nitrogen fertilisers applied go beyond the needs of the crops. To reduce this kind of pollution and reduce treatment to make water drinkable, the Region has high hopes for the effects of the measures taken as part of the Programme de gestion durable de l'azote en agriculture *(PGDA).*

More than 40 % of the territory is affected

The highest levels of contamination (more than 40 mg NO_3^-/l) are observed in the groundwater bodies of the Cretaceous of the Herve area [1], the Quaternary sands of Comines-Warneton [2] and the Brusselian sands [3], in areas where the density of population and/or agricultural activity are particularly high. Other aquifers are also contaminated, but to a lesser extent (the Vesdre massif [4], limestones of the Mons basin [5], Cretaceous of the Hesbaye area [6] and formations of the Dinant basin [7]). Between 2004 and 2007, around 20 % of the monitoring points located in nitrate vulnerable zones showed untreated water with levels exceeding the norm for drinkability of 50 mg NO_3^-/l.

The deterioration continues in most of the vulnerable zones

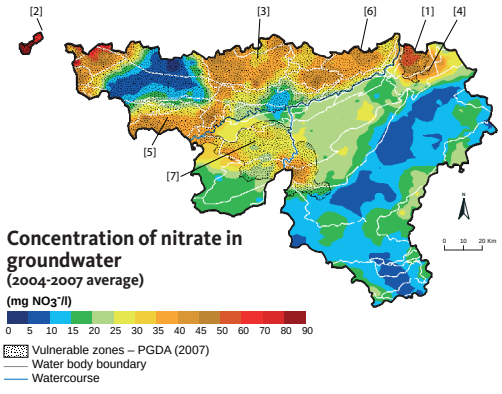
The contamination of groundwater throughout Wallonia has slightly progressed in recent years: the proportion of monitoring points with average nitrate concentrations higher than 40 mg/l went from 15.1 % (over the period 2000-2003) to 17.8 % (over the period 2004-2007)(1). Locally, the situation can be worrying, especially in certain vulnerable zones where nitrate concentrations went up on average by 0.1 to 0.6 mg/l a year between 1992 and 2007.

This trend is not necessarily linked to the current development of agricultural practices, which goes towards a reduction in nitrogen fertilisers application. The degree of contamination of the groundwater bodies depends on other factors such as rainfall, transfer time to aquifers (which can exceed 15 years) or the quantity of nitrogen still present in the soils.

Moving towards optimised management of agricultural nitrogen

The PGDA imposes various measures on farmers to reduce nitrogen leaching (e.g. norms for fertilizer application, "nitrate trap" crops, storage of livestock effluent). The effectiveness of these measures will be evaluated in vulnerable zones from October 2008, in particular by measuring potentially leachable nitrate concentrations in the soil(2). If the quality of the water does not improve, the Region intends to apply supplementary measures, which are detailed in its project of river basin district management plan(3).

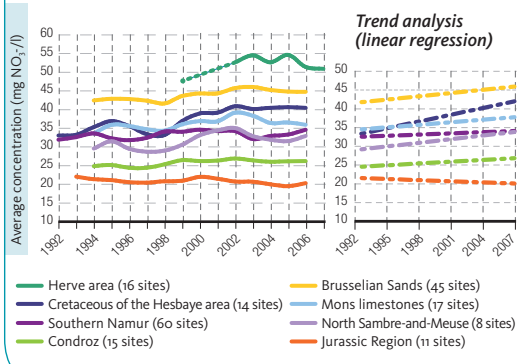
map WATER 8-1



EOW 2008 – **Source :** SPW – DGO3 – DEE (CALYPSO database, CEEW design)

fig WATER 8-1

Concentration of nitrate in groundwater located in vulnerable zones and outside vulnerable zones (Condroz and the Jurassic Region)



EOW 2008 – **Source :** SPW – DGO3 – DEE (nitrate survey)

(1) SPW – DGO3 (PGDA scoreboard, 2008) (2) AM dated 14/02/2008 (3) http://eau.wallonie.be

Micro-pollutants in surface water

The micro-pollutants present in surface water are potentially toxic. In particular, they can disrupt the development of micro-organisms involved in self-purification of the watercourses. The Walloon Region needs to make sure that existing quality norms are respected so that its watercourses can achieve until 2015 the good (ecological and chemical) status required by the framework water directive.

Some of the more problematic substances

The micro-pollutants taken into consideration to assess the good ecological and chemical status of surface water bodies are on the list of relevant dangerous substances monitored in the Walloon Region(1). This list contains 81 micro-pollutants which are frequently detected in Walloon watercourses and the substances listed in annexes IX and X of the 2000/60/EC directive.

Over the period 2004-2007, concentrations of polycyclic aromatic hydrocarbons (PAHs) exceeded the norms in 30 % of the samples analysed. Furthermore, the rate of non-compliance of samples for this type of compound multiplied by 2.5 between 2004 and 2007. Several studies indicate that the presence of PAHs in watercourses is caused by diffuse inflow: water runoff and eroded particles of soil contaminated by atmospheric fallout.

Concentrations of two other molecules exceed norms fairly frequently. These are persistent pesticides: pyrazon and lindane, although the use of the latter has been banned since 2001.

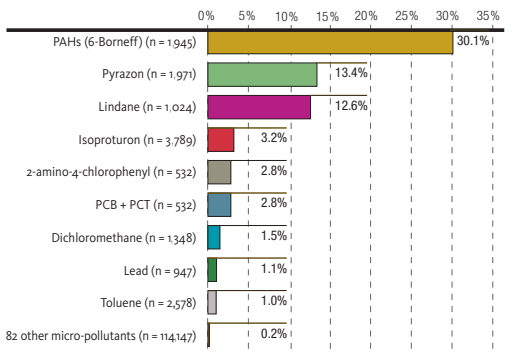
Given the large number of samples which do not comply for PAHs and according to experts' opinions, no bodies of surface water in Wallonia were in a good chemical status in 2008(2). However, this has been achieved in 61 % of surface water bodies if PAHs are excluded from the analysis. The bodies of water which are at risk are essentially located in the Escaut basin where the pressures put on watercourses by domestic, industrial and agricultural activities are considerable.

Control, manage and reduce micro-pollutants inputs

Various measures have been taken to reduce and eliminate discharges and losses of the most problematic micro-pollutants (environmental permits, taxes, agri-environmental measures - MAE), best available techniques (BATs), best practice guidelines, withdrawal of pesticides authorisations etc.). Alongside these, the Walloon Region is currently drawing up an inventory by sector of the micro-pollutants present in industrial waste water in order to identify which of them are the most dangerous. Although the quality of water is improving, the Region plans to apply supplementary measures which are detailed in its current project of river basin district management plan(3).

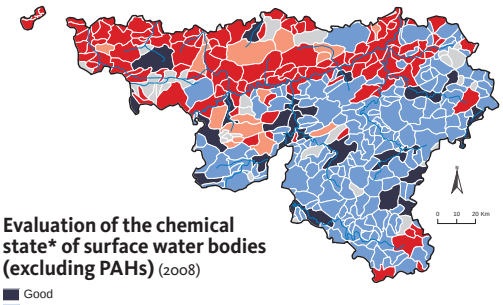
fig WATER 9-1

Non-compliance of samples taken from surface water in the Walloon Region compared with existing norms for micro-pollutants *(2004 - 2007)*



EOW 2008 – Source: SPW – DGO3 – DEE (AQUAPHYC database)

map WATER 9-1



Evaluation of the chemical state* of surface water bodies (excluding PAHs) (2008)

Good
Good (expert opinion)
Not good (expert opinion)
Not good
Insufficient data
Watercourse

*based on the analysis of 41 substances
(average annual values and maximum admissible concentrations)

EOW 2008 – Source : SPW – DGO3 - DEE

(1) AGW dated 29/06/2000 and AGW dated 12/09/2002 (2) SPW-DGO3 (2008) (3) http://eau.wallonie.be

water 10

Pesticides in groundwater

At the end of 2006, the Walloon Region implemented a new programme to monitor the quality of groundwater which was more representative than the one that was initially based on the network of water producers(1). The most recent results indicate that herbicides are among the most problematic micro-pollutants, in the sense that they imply specific treatments to produce drinking water which can be very expensive.

Contamination is fairly localised

The quality indices show that the bodies of groundwater which are currently most affected by pesticides are those in the Brusselian Sands and the alluvia of the Meuse (near Engis and Herstal). The aquifers located in Ardenne are relatively well preserved, probably because they are exposed to much weaker phytosanitary pressure (less land cultivated and smaller population density). The deepest captive aquifers which are covered with a waterproof layer of clay also seem well protected (e.g. limestones of Brabant area and calcareous rocks of the Tournaisis).

Banned molecules which are still present

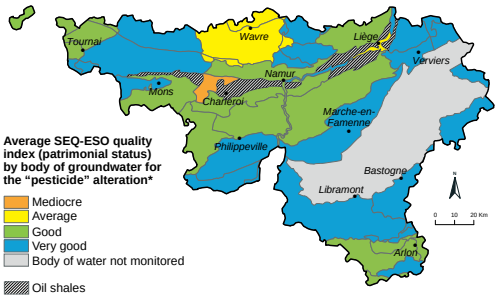
The use of atrazine, a systemic herbicide which was regularly used on maize crops, has been completely banned since September 2005. However, this active substance and its main metabolite (desethylatrazine) are still among the substances detected in significant concentrations in groundwater, particularly because of their mobility and their persistence in soil and aquifers. Distributers of drinking water have nevertheless observed a gradual decrease in atrazine pollution since 2002. Bromacil and diuron generally pose fewer problems, while new molecules (such as 2.6-dichlorobenzamide) are gradually starting to appear locally in concentrations which are sometimes very high. Some of these herbicides (diuron, dichlobenil etc.) are used for weeding roads, drives, parks, gardens (both public and residential) as well as in cemeteries.

Raising awareness among all users

Various measures have been planned or implemented to reduce the impact of pesticides on the quality of groundwater, both at a federal level (withdrawal of pesticides authorisations, introduction of a professional usage licence, programme to reduce pesticides and biocides etc.) and regionally (restricting or banning the use of certain molecules in water catchment areas, compulsory control of field crops sprayers, awareness-raising campaigns etc.). These measures will ultimately be finalised between now and 2009 within the framework of the implementation of the river basin district management plans required by the European Water Framework Directive(2).

map WATER 10-1

Impact of pesticides on the quality of groundwater
(period 2004-2007)

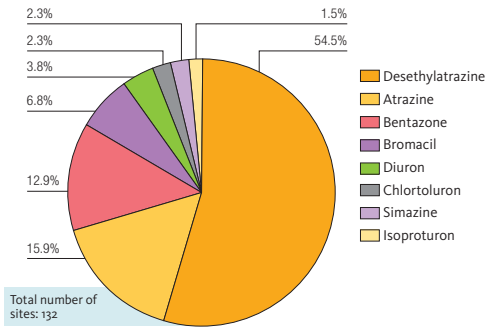


*This index is determined by taking the worst quality index calculated using the annual average concentrations of the 8 most problematic pesticides in the Walloon Region(1).

EOW 2008 – **Source :** SPW – DGO3 – DEE (WFD network)

fig WATER 10-1

Number of sites for the surveillance of groundwater bodies in the Walloon Region, sorted according to the pesticide with the highest concentration *(period 2004-2007)*



EOW 2008 – **Source :** SPW – DGO3 – DEE (WFD network)

(1) State of groundwater of Wallonia (http://environnement.wallonie.be/de/eso/atlas) (2) http://eau.wallonie.be

water 11

Groundwater catchment protection areas

In order to preserve and improve the quality of its groundwater, the Walloon Region has developed a range of regulatory tools which facilitate, on the one hand the delimitation of protection and surveillance zones around water catchment points and, on the other, to control activities which might pollute groundwater within these boundaries.

In the prevention zones approved by a ministerial decree, some kinds of installations and some activities which are at risk (e.g. underground conversions, transport, storage and disposal of potentially pollutant materials) may be banned, regulated or subjected to an environmental permit.

Water producers carry out studies which help define the prevention perimeters as well as a set of protective measures to be implemented. These are carried out in collaboration with the SPGE (*Société Publique de Gestion de l'Eau*) which funds operations by collecting a fee for every m³ of water produced (0.0744 €/m³).

Objectives which are difficult to achieve

On 03/06/2008, the Walloon Region had 148 prevention zones and 4 surveillance zones (Spa, Spontin, Chaudfontaine and Sprimont)[1], whose delimitation has been adopted. Almost all of the prevention zones (140) concern water destined for the public water distribution. They include 309 groundwater points, representing ± 32 % of annual abstraction of drinkable groundwater. The volumes affected by the protection measures have multiplied by 20 since 2001. In spite of this progress, less than a third of the objective set by the SPGE had been achieved by the end of 2007.

Consolidate measures in practice

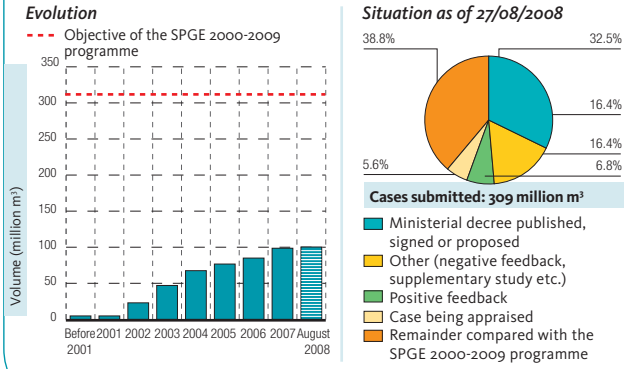
Alongside the definition of new prevention zones, many potentially pollutant activities must be made to comply with the perimeters that have already been set, not forgetting that some regulations will be revised to integrate the requirements of the water framework directive. In light of this directive, in 2005 the SPGE set up a subsidiary company called PROTECTIS whose main objective is to accelerate procedures and work to be carried out, including the remuneration set out by legislation.

Substantial investments on the horizon

The annual budgets used for the protection of water catchment zones are increasing exponentially. At the end of 2007, the SPGE had committed 22.7 million € to the completion of studies to define the zones and 19.9 million € to actions to guarantee compliance. At the moment, these totals barely represent 30 % of investments planned by the SPGE for the period 2000-2009.

fig WATER 11-1

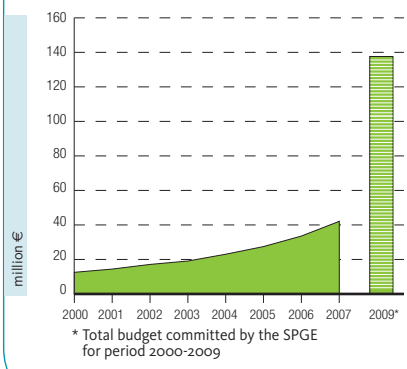
Progress in the delimitation of groundwater catchment protection zones in the Walloon Region *(in volumes of drinkable water abstracted)*



EOW 2008 – **Sources:** SPW – DGO3 – DEE; SPW – DGO3 – DEMNA (SIG unit)

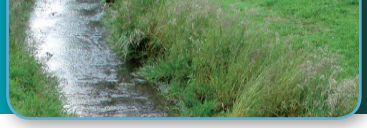
fig WATER 11-2

Budget committed to the protection of groundwater catchment zones in the Walloon Region *(cumulated values)*



EOW 2008 – **Source:** SPGE

[1] The list of protection zones is available at http://environnement.wallonie.be/zones_prevention and http://environnement.wallonie.be/de/eso/atlas



water 12

Drinking water treatment and decommissioning of groundwater catchment sites

Some groundwater points have to be permanently or temporarily abandoned when concentrations of pollutants are too high and the cost of treatment becomes disproportionate. In other cases, it is sometimes necessary to apply drinking water treatment on raw water to produce piped water that meets the requirements of norms in force.

Is water pollution the only culprit ?

Between 2000 and 2007, 63 groundwater catchment sites were decommissioned in the Walloon Region, either temporarily or permanently. In 57 % of cases, the closures can be explained by the poor quality of the water. In other cases, halting production was linked to the restructuring of water distribution networks.

Different treatments used for nitrate and pesticides

In the Walloon Region, the volumes of drinkable groundwater presenting a nitrate pollution risk (concentrations higher than 37.5 mg/l) are around 7 times greater than the volumes affected by the presence of pesticides. Nitrate pollution is usually dealt with by dilution and mixture with better quality water. This is rarely the case for pesticides. As far as they are concerned, the closure of water catchment sites is a practice which is almost disappearing, more and more frequently being replaced by the treatment of raw water by filtration using activated charcoal.

In total, between 1993 and 2008, there were 39 sites which had to use drinking water treatments or interrupt production because of pesticides. In terms of volumes, they represent ± 15.9 million m³, or 5 % of annual production of piped water in the Walloon Region.

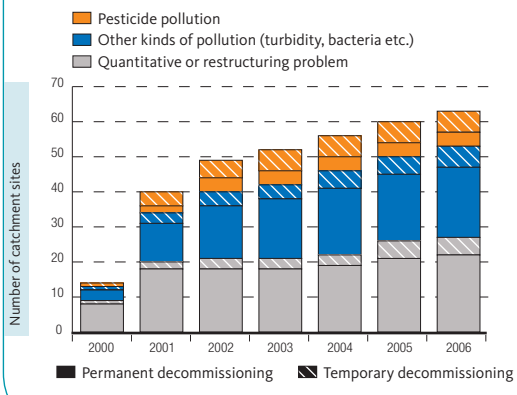
Since 2003, the number of water catchment sites and volumes of groundwater affected by the presence of pesticides have been tending to level off. This is probably the result of measures taken both at federal level (e.g. withdrawal of acceptance for certain molecules) and regional level (restricting or banning the use of certain active substances in water catchment protection zones, control of field crop sprayers, plant protection product warning service(1), awareness-raising campaigns etc.).

How much does that cost?

A recent study(2) shows that the annual additional cost associated with water treatment (biological denitration, membrane treatment, activated charcoal) and connection and mixing operations varies between 0.14 and 0.39 €/m³ of drinking water produced, while the extra costs connected to decommissioning catchment sites the drilling of groundwater wells is an average of 0.4 €/m³.

fig WATER 12-1

Decommissioning of groundwater catchment sites in the Walloon Region *(cumulated values 2000-2006)*

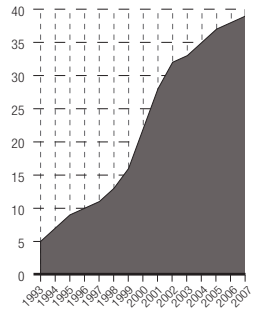


EOW 2008 – **Source:** SPW - DGO3 - DEE

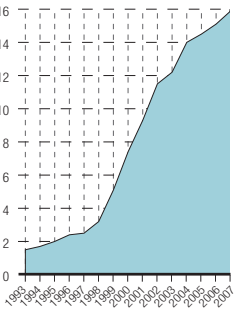
fig WATER 12-2

Impact of pesticides on the production of drinkable groundwater in the Walloon Region

Cumulated number of sites affected



Abstractions of groundwater affected (cumulated volume in million m³)



EOW 2008 – **Source:** SPW - DGO3 - DEE

(1) http://www.cra.wallonie.be (2) Delloye *et al.* (2007)

water 13

Suspended solids in surface water

Natural phenomena (e.g. soil erosion by water) and human factors (e.g. discharge of waste water) are responsible for suspended solids (SS) in watercourses. Their concentration and the pollutants that they carry affect the quality of the water and disrupt aquatic life. The suspended solids also contribute to deposits of sediments.

Major input from soil erosion by water

The soil erosion by water is the main source of suspended solids in surface water. Annual production of sediments has been estimated at 0.53 t/(ha.year) for 2000-2005, which corresponds to a total input of 893,000 t/year of (dry) sediment at a regional scale. 2002 saw periods of particularly erosive rainfall which caused soil loss and higher production of sediment (0.97 t/ha).

More suspended solids in loamy and sandy-loamy regions

In 2007, 23 % of monitoring sites presented concentrations (90th percentile) higher than 50 mg/l, a level associated with watercourses' poor aptitude for biology according to the *système d'évaluation de la qualité des eaux de surface* (SEQ-Eau). Concentrations of suspended solids in water depend heavily on flow and how it varies over time (especially meteorological factors). They also vary depending on the type and use of the soil in the river basin, which determines its sensitivity to erosion. Concentrations of suspended solids are also much higher in watercourses in loamy and sandy-loamy regions, as well as in Lorraine belge.

Quality of suspended solids: monitoring is intensifying

The measuring of suspended solids concentrations intensified in 2007, the first year of monitoring for nearly 2/3 of the monitoring sites. The presence of certain pollutants appears to be more marked in the suspended solids in the Dendre at Ath, the Espierres at Estaimpuis, the Haine at Hensies, the Meuse at Visé, the Sambre at Pont-de-Loup and the Vesdre at Vaux-sous-Chèvremont. A few years of monitoring will however be necessary to allow a valid analysis of the situation.

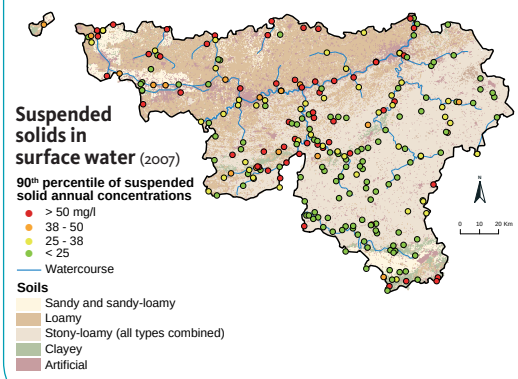
Reducing suspended solids supplies and improving their quality

Measures aiming to reduce solids[1] and pollutants supplies in watercourses must be reinforced. These specifically deal with:

- → reducing soil erosion by water and runoff (introduction and maintenance of hedges, embankments, groves and grass strips, winter cover of cultivated land, introduction and maintenance of storm-water overflows, installation of more permeable surfaces etc.);
- → carry on improving the management of domestic and urban waste water (collection, treatment etc.).

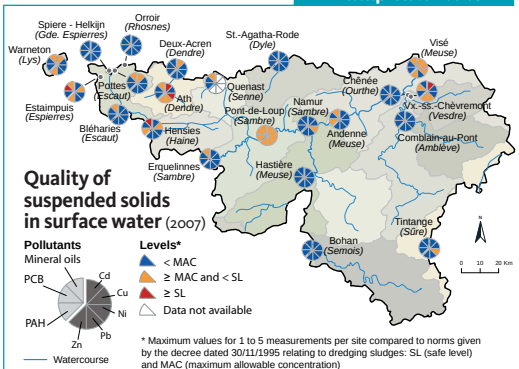
These measures are detailed in the Walloon Region project of river basin districts management plan[2].

map WATER 13-1



EOW 2008 – **Source :** SPW – DGO3 – DEE (AQUAPHYC database)

map WATER 13-2



* Maximum values for 1 to 5 measurements per site compared to norms given by the decree dated 30/11/1995 relating to dredging sludges: SL (safe level) and MAC (maximum allowable concentration)

EOW 2008 – **Source :** SPW – DGO3 – DEE (AQUAPHYC database)

(1) See the river contracts, the programme of agri-environmental measures and the P.L.U.I.E.S. Plan. (2) http://eau.wallonie.be

water 14

Sediments in watercourses

The accumulation of sediments at the bottom of watercourses reduces the depth available for navigation, increases the risks of flooding and makes certain aquatic biotopes disappear. Dredging has a curative effect but that has its own ecological impact. Furthermore, the contamination of dredging sludges by different pollutants requires specially-adapted management methods.

Waterways : the backlog is not being reduced

The volumes of sediments to dredge from waterways to reduce the backlog was estimated at 2.05 million m³ in 2004, while annual recurrent deposits (excluding reduction of the backlog over 20 years) was estimated at nearly 600,000 m³. Two thirds of these sediments are considered to be polluted (category B substances) and one third non-polluted (category A substances). Category B substances can only be recycled once they have undergone treatment and satisfy the conditions for category A.

Since 2005, volumes removed from watercourses have been going down ; they were below 50,000 m³ in 2007. Two contracts, one for dredging (235,000 m³/year of category B substances and 70,000 m³/year of category A substances), the other for the treatment of category B substances (235,000 m³/year), are currently blocked following legal action in which the latter was the subject of protests at the awarding of the public contract.

Non-navigable watercourses: the quality of the sediments is being assessed

The volumes of sediments in non-navigable watercourses have not been estimated. However, a status report of the quality of sediments by catchment basin across the Region is underway (62 % of the Region covered at the end of 2007) ; this should be completed at the end of 2009. The results obtained up to now show a great spatial heterogeneity of the sediments quality, marked by current and past human activities.

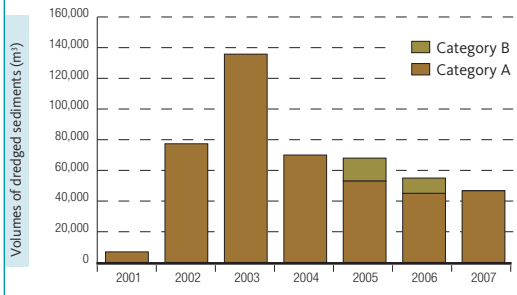
This initial diagnosis is being supplemented by the establishment of a network monitoring the changes in the quality of sediments in non-navigable watercourses.

Developing prevention

Current Walloon legislation looks at sediments in terms of what will become of it ex situ, as waste(1). No European or regional legislation deals with all the sanitary, economic and ecological aspects of its management. While expecting progresses in this area, the cost and environmental impacts of dredging are an argument for the consolidation of preventative measures to reduce the suspended solids (SS) supplies in watercourses and improve their quality. Such measures have no effect on deposits, the reduction of which depends on the renewal of dredging projects.

fig WATER 14-1

Sediments removed from watercourses in the Walloon Region



Year	Category A	Category B
2001	Charleroi-Brussels Canal	-
2002	Charleroi-Brussels Canal	-
2003	Charleroi-Brussels Canal	-
2004	Charleroi-Brussels Canal	-
2005	Haute Sambre, Dendre	Dendre
2006	Haute Sambre, Meuse, Haine	Haine
2007	Vieille Haine, Rivièrette, Meuse, Ourthe, Amblève	-

EOW 2008 – Source: SPW - DGO2 - DVH (Escaut, Namur, Liège)

(1) AGW dated 30/11/95

Morphological quality of watercourses

The hydromorphological component of aquatic ecosystems constitute a major area for work in the implementation of the European water framework directive. It is an element which comes into the characterisation of bodies of surface water, as well as in the diagnosis of their ecological status (or of their ecological potential if they have been heavily modified).

Three quarters of the linear watercourses are not altered very much

Out of the 354 bodies of surface water in the Walloon Region, around 70 % are qualified as "natural", 25 % are deemed to be "heavily modified" (in other words, penalised by major obstacles to the circulation of fish or with artificial banks), and the remaining 5 % are "artificial" surface water bodies (canals). If this information is interpreted as a linear watercourse, this means that a quarter of the 6,800 km analysed have a (very) poor morphological quality(1). The most altered water bodies are principally located in the sub-catchments of the Escaut, the Dendre, the Haine, the Sambre and the Meuse.

Improve surveillance to improve action

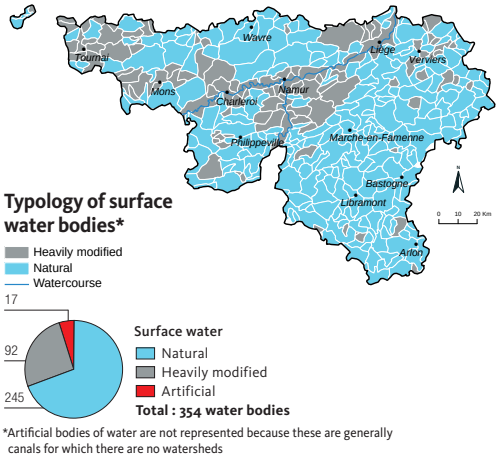
The water framework directive stipulates the implementation of a network monitoring the hydromorphological quality of watercourses. This surveillance must cover a series of standardised parameters (physical characteristics of the waterbed, banks, the riparian zone and the alluvial plain, for example).

The Walloon network will be operational by the end of 2008. It will mean that hydromorphological monitoring records can be combined with those already produced from biological and physico-chemical networks. In practice, 500 m sections of the river (a minimum of 20 times the width of the watercourse) will be inventoried and analysed in a field study using the QUALPHY method.

A better understanding of the physical status of watercourses should help target and adapt measures already included in the Walloon project of river basin district management plan(2). The main actions aim to prohibit access to the watercourses for cattle, to restore the functionality of rivers or to manage watercourses and their annexes in an ecological manner (e.g. plant-based techniques).

The hydromorphological quality of Walloon watercourses has been evaluated by applying the simplified French QUALPHY method(1). It provides a global index of the physical quality of the watercourse, integrating different criteria, in particular, those associated with the hydrological regime, the continuity of the watercourse and its morphology (e.g. structure of the river bed and banks).

map WATER 15-1

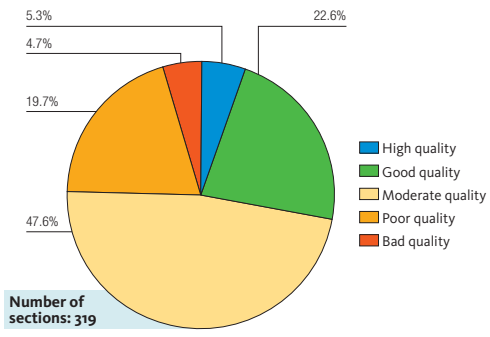


*Artificial bodies of water are not represented because these are generally canals for which there are no watersheds

EOW 2008 – **Sources :** SPW – DGO3 – DEE; SPW – DGO3 – DEMNA

fig WATER 15-1

Hydromorphological quality of watercourses in the Walloon Region *(2006)*



EOW 2008 – **Sources :** SPW – DGO3 – DEE; SPW – DGO3 – DEMNA (QUALPHY project)

(1) Guyon *et al.* (2006) (2) Subject to public consultation up to 16/12/2008 (http://eau.wallonie.be)

Ecological quality of watercourses

The European water framework directive stipulates that Member States have to take the necessary measures to make sure their bodies of surface water are in a good ecological status by 2015. The fulfilment of this directive requires the monitoring of the composition and quantities of different reference populations (aquatic flora, benthic invertebrate fauna, fish) compared with the standard quality conditions (undisturbed).

The monitoring network is up and running

In 2006, the Walloon Region set up a permanent network made up of more than 400 monitoring points. Among these, 54 "surveillance monitoring" sites have been chosen to give a representative picture of the general quality of surface water in the long term.

The control networks focus on 4 major groups of biological indicators: phytobenthos, macrophytes, invertebrate benthic fauna and fish. Only the indicators which have been monitored for several years in the Walloon Region will be presented here. These are IBGN index for macro invertebrates[1] and IPS index for diatoms.

The traditional divide around the Sambre-and-Meuse river line

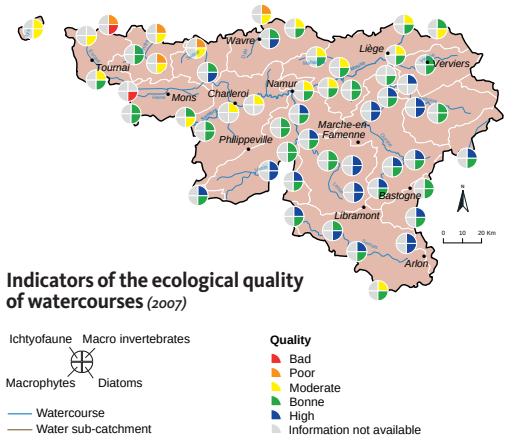
In 2007, more than 65 % of the 54 sites in the surveillance network presented water of good or high ecological quality. While water is generally of a (very) good quality in forest areas, it often becomes bad where there is a high level of urbanisation, a lot of industry and intensive farming. These circumstances are found in the basin of the Escaut (Dendre, Senne, Dyle etc.) as well as in the sub-catchments of the Orneau, the Mehaigne or the Geer. Furthermore, these watercourses often show weak flows, which reinforce the negative impact of waste water discharges. They are also, to a large extent been turned into canals, which leads to a banalisation of habitats and a loss of biodiversity.

A slow uneven improvement

The number of sites where the ecological quality of the water is moderate to very good, has slightly improved over the last 15 years. In some cases, the results are more mitigated, essentially because of the variability of weather conditions.

This slight improvement is connected to increasing awareness on the part of the general public (in particular through river contracts) and new legislation, the effects of which have been seen in the increase in the level of treatment of waste water and the reduction in pollutant waste water discharges. The implementation of the PGDA (*Programme de gestion durable de l'azote en agriculture*) and the ecological restoration of watercourses also seem to have had positive effects. Several of these actions are detailed in the programme of measures of the Walloon project of river basin district management plan[2].

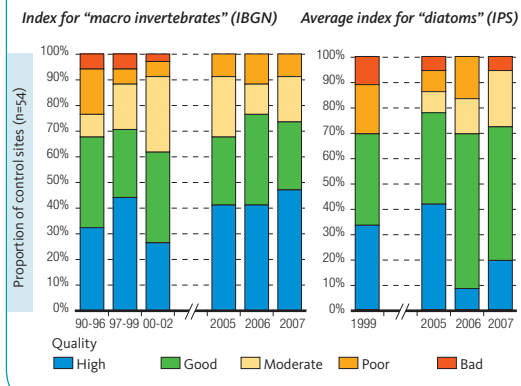
map WATER 16-1



EOW 2008 – **Source :** SPW - DGO3 - DEMNA

fig WATER 16-1

Changes in the ecological quality indicators of watercourses in the Walloon Region
(surveillance monitoring network)



EOW 2008 – **Source :** SPW - DGO3 - DEMNA

[1] Vanden Bossche (2008) [2] Subject to public consultation up to 16/12/2008 (http://eau.wallonie.be)

Quality of bathing waters

The quality of bathing waters, controlled to protect the health of bathers, is a factor in the development of tourism. It also provides a good indicator of the overall quality of water upstream of bathing areas. In 2007, the Walloon Region had 36 official bathing waters.

Quality criteria based on health

The 76/160/EEC directive fixes two levels of norms: mandatory values and guide values. In each bathing area, the mandatory values can only be exceeded in one of the twenty samples taken during the bathing season. If there are more samples which exceed the limits, the area is classed as non-compliant and temporary or permanent prohibitive measures must be taken. The guide values, which are more difficult to comply with, are the objectives to aim for.

More non-compliant areas in 2006 and 2007

Overall, the quality of bathing waters improved between 1990 and 2005. In 2007, as in 2006, 14 bathing waters were not compliant (8 more than in 2005). Nevertheless, bathing was only prohibited at Coo (Amblève river) for the whole 2007 season, while the other sites saw temporary restrictions. In terms of the proportion of non-compliant samples, all the sites combined, the situation stabilised at around 12 % in 2006 and 2007.

Major impact of rainy periods

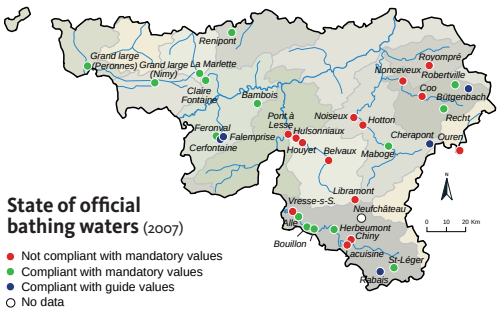
Annual variations in quality can largely be explained by variations in the intensity and frequency of rainy periods; these were common during the 2007 season. Rain increases surface runoff as well as storm-water overflows and overflow from sewage networks. These influxes cause contamination, particularly by faecal microorganisms.

Efforts must continue

Making bathing waters compliant is the subject of investment by the SPGE: the implementation rate of 2000-2004 and 2005-2009 programmes was 49.9 % in May 2008 (29.3 million €). Furthermore, the first river basin district management plans drawn up with respect to the water framework directive[1] include various measures specifically aiming to improve bathing waters (prohibiting cattle access to watercourses, inventory and reduction of input sources etc.).

Lastly, legislative changes are in progress: the new 2006/7/EC directive must come into effect at the latest for the 2015 bathing season; the quality criteria will then be modified.

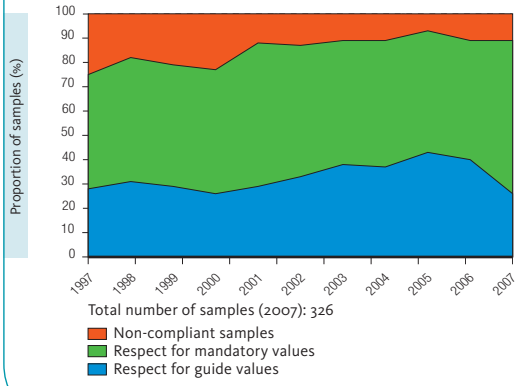
map WATER 17-1



EOW 2008 – **Source :** SPW - DGO3 - DEE

fig WATER 17-1

Compliance of samples taken from official bathing waters in the Walloon Region



EOW 2008 – **Source :** SPW - DGO3 - DEE

[1] Subject to public consultation until 16/12/2008 (http://eau.wallonie.be)

Collection of urban waste water

Before being treated, residual urban waste water must link into a sewage network which then takes them to a wider waterway (collector) connected to a waste water treatment plant. The Region has put several tools in place (legislative, financial etc.) with a view to accelerating and coordinating the collection of waste water with the construction of treatment plants.

Coordination at several levels

The European 91/271/EEC directive stipulates deadlines to be respected in terms of the collection of waste water. The deadlines (end of 1998, 2000 or 2005) vary according to the size and status of agglomerations. In Wallonia, the municipalities must draw up a status report for their sewage network, as well as the programme of works, in connection with the *Plan d'assainissement par sous-bassin hydrographique* (PASH) on which they depend. For its part, the Region can impose the construction of collecting systems in order to improve the efficiency of treatment stations, or in case of threats to health or the environment[1]. The SPGE plans the necessary investments.

The collecting system network widens

According to the PASHs, the total length of the sewage network should be 19,580 km. At the end of 2007, 84 % of sewers were constructed, and ± 60 % of municipalities had sewage rates higher than 80 %. The disparity between municipalities can be explained by the size of agglomerations as well as the land topography, the type of habitat, or the way municipalities manage urban waste water.

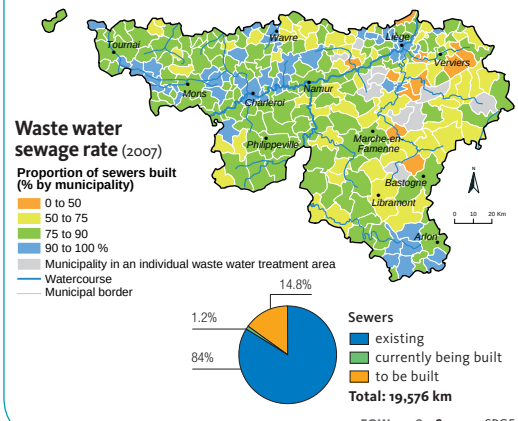
Performance in terms of collection of urban waste water does not seem so good, given that more than 50 % of collectors are yet to be installed. However, existing waterways already collect most effluent, with the density of the habitat upstream of future collectors generally being less elevated than at the agglomerations centres.

Failure to meet European deadlines

This situation is at the origin of an infringement procedure with European authorities. Therefore, major investments have been committed to this field (± 800 million € since 2000) and will be in the future to finalise the waste water collection network by 2015, without taking into account those which will have to be renovated or rebuilt. The Region is encouraging the municipalities which have agreed a "*contrat d'agglomération*" to complete their sewage networks. Thanks to this contract, they can have access to a sewage funding system which will halve their contribution to the total cost of the work.

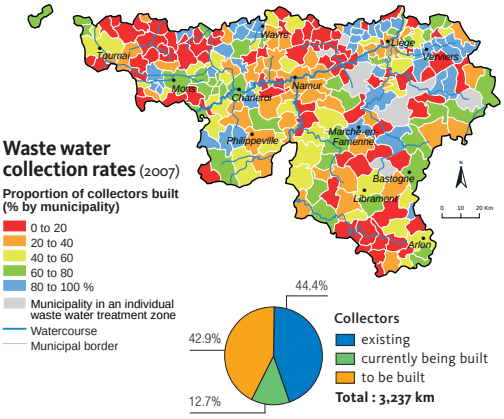
While waiting for a cadastre for sewage which will make it possible to determine the levels of the population's connection to sewers, the sewage rate is here defined as the relationship between the length of existing sewers and the total length of sewers to be installed.

map WATER 18-1



EOW 2008 – **Source :** SPGE

map WATER 18-2



EOW 2008 – **Source :** SPGE

[1] *Code de l'Eau* (Water Code) (art. R233, R271, R272 *et al.*)

Collective treatment of urban waste water

Human activities generate waste water which contains different contaminants (organic substances, nitrogen, phosphorous etc.) in such quantities as it sometimes exceeds the self-purification capacity of the receiving water, leading to a risk to human health and ecosystems. The management of waste water is therefore a major issue for the Walloon Region's environmental policy.

A speedy improvement

As of 31/12/07, Wallonia had 350 public treatment plants, more than half of which were low capacity (in other words, treating urban waste water from agglomerations with a population equivalent (p.e.) less than 2,000. In total, the treatment plants can treat ± 3,300,000 p.e., which makes the plants equipment rate for the region 70 %.

Since the creation of the *Société Publique de Gestion de l'Eau* (SPGE) in 2000, collective treatment of waste water has improved dramatically, largely thanks to the building of large capacity public treatment plants, Wallonia's latest and biggest of which (Liège-Oupeye: 446,500 p.e.) was opened in November 2007.

Among the 56 plants with a capacity of 10,000 p.e. and over, 42 are equipped with tertiary denitrification and dephosphorisation treatments (for a total capacity of 2,115,000 p.e.), so as to respond to the requirements of the 91/271/EEC directive. Work is in progress or being planned in treatment plants which need to be updated. Furthermore, at the end of 2007, more than 97 % of urban waste water treatment plants with a capacity of more than 2,000 p.e. were discharging water which complied with European requirements in terms of organic pollution. The level of conformity for nitrogen and phosphorous reached 86 % and 100 % in treatment plants equipped with tertiary treatment.

The Walloon Region is catching up

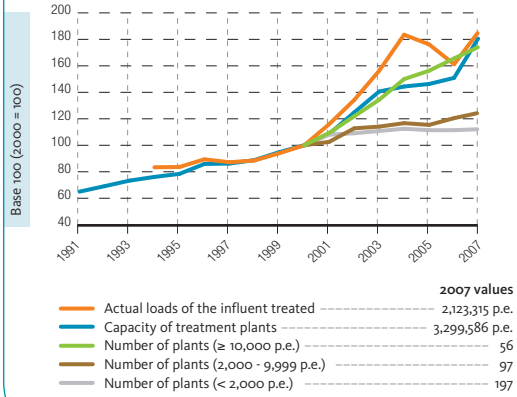
The Region had got quite a long way behind the deadlines imposed by European legislation, in particular in terms of the treatment of waste water from agglomerations with more than 10,000 p.e., which lead to an infringement procedure. The Region has been pulling its socks up and at the end of 2007, the treatment plants that are still to be installed represented less than 10.5 % of the objectives which needed to be reached at the end of 2005.

Two billion euro invested in 10 years

Funding for collective treatment largely relies on the application of a system taking into account the full recovery of the waste water collection and treatment costs (*coût-vérité à l'assainissement* – CVA), received for every m³ of piped water consumed. The CVA should go from 0.8 €/m³ in 2007 to around 1.75 €/m³ by 2012, so that the Government can carry out investment programmes developed by the SPGE [1].

fig WATER 19-1

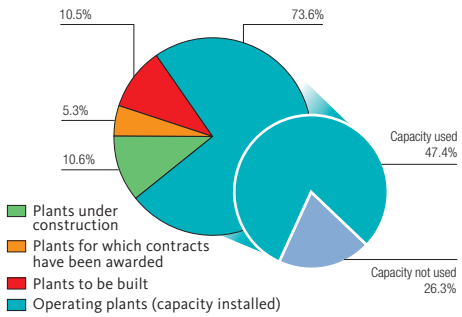
Collective treatment of residual urban waste water in the Walloon Region



EOW 2008 – Source: SPGE

fig WATER 19-2

Capacity and status of treatment plants (≥ 2,000 p.e.) in the Walloon Region compared with the objectives of the 91/271/EEC directive *(situation as of 31/12/07)*



Objective of the 91/271EEC directive: 4,301,716 p.e. (100 %)

EOW 2008 – Source: SPGE

[1] SPGE (2007) - http://www.spge.be

Individual treatment of domestic waste water

In sparsely populated areas, the construction of a waste water collecting system network is sometimes deemed to be too onerous or technically difficult to implement. In this case, the treatment of urban waste water requires the installation of an individual treatment system (ITS) which can bring some financial advantages provided by the Region.

12 % of Walloons are affected

According to the *Plans d'assainissement par sous-bassin hydrographique* (PASH), ± 130,000 residences are located in an individual waste water treatment zone (IWTZ) (*zone d'assainissement autonome*), around a third of which are located outside the zone that can be urbanised according to the *Plans de secteur.*

Target the priority areas

In IWTZs, new builders are supposed to install an ITS. This is not compulsory for homes built before the date of approval or modification of the municipal sewage plan (*Plan d'assainissement par sous-bassin hydrographique* – PASH). Nevertheless, in areas where domestic pollution is high and where the water bodies must be protected (Natura 2000, bathing areas, groundwater catchment protection zones) and or run the risk of not reaching environmental objectives, specific studies (called *"études de zones"*) are carried out in order to determine :

- the most appropriate treatment of urban waste water;
- the buildings which will have to install an ITS;
- the deadlines by which compliance must be achieved.

These studies must be completed by the end of 2010.

Requests for fees have "run out of steam"

Anyone who has installed an ITS at their own expense can benefit from an exemption for tax and the *"coût-vérité à l'assainissement"* (CVA) as well as a subsidy granted by the Region[1] on certain conditions. The total number of subsidies awarded between 1998 and 2007 was 6,253, for a total value of 14.6 million €. After an exponential rise, requests for subsidies fell in 2006 and 2007, probably because legislation no longer really imposes delays for compliance.

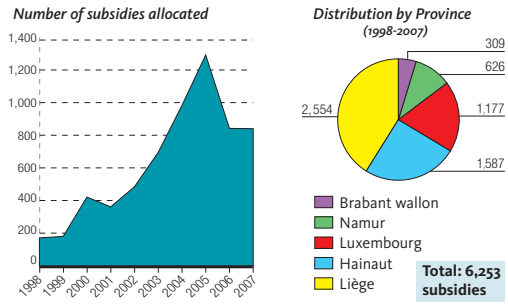
Encouraging quality treatment

As of January 2009, the Walloon legislation will require the implementation of certified individual treatment systems for new homes built in IWTZs[2]. Furthermore, the Walloon authorities have regularly increased their financial aid with a view to encouraging the installation of certified ITSs, especially in sensitive areas. Consequently, the certified ITSs represent most ITSs for which a subsidy has been awarded, to the detriment of compliant ITSs which present more operating restrictions and poorer treatment performance.

Finally, the European standardisation and labelling procedures applied to certain ITSs are now integrated in the certification system put in place in the Walloon Region.

fig WATER 20-1

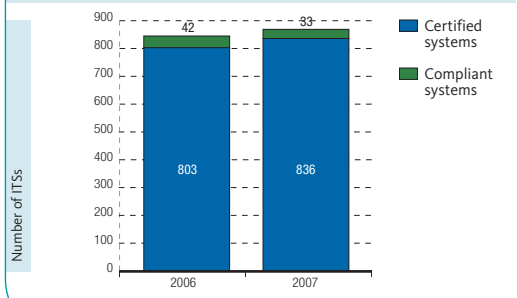
Subsidies allocated to individual treatment of domestic waste water in the Walloon Region



EOW 2008 – **Source:** SPW – DGO3 – DEE (ASSAINIS database)

fig WATER 20-2

Types of individual waste water treatment systems (ITSs) for which a premium was awarded in the Walloon Region



EOW 2008 – **Source:** SPW – DGO3 – DEE (ASSAINIS database)

[1] http://environnement.wallonie.be/publi/de/eaux_usees [2] AGW dated 14/03/08

water L1

River contracts

River contracts are participative management structures whose aim is to bring together everyone working in the same water catchment basin, whether they come from a political, administrative, financial, associative or scientific background, in order to define a programme for restoring watercourses and their surrounding areas in a consensual way.

More than 70 % of the territory covered by a river contract

Since the institutionalisation of river contracts(1) by the Walloon Environment Minister in 1993, 19 river committees have been formed, working on 19 river basins covering more than 78 % of Wallonia. Furthermore, 196 Walloon municipalities have become partners in a river contract. The total land area covered by signatory municipalities is ± 12,000 km², or 71 % of the region.

The Walloon Government gives subsidies to river contracts on certain conditions. Regional involvement is limited, for example to the total amounts allocated by the municipalities and provinces, with a maximum annual amount fixed per sub-catchment (the total value of subsidies for 2008 is limited to 870,500 €).

Partners who know how to "dive in"

On the basis of its own basin inventory, the river committee, in particular made up of administrations managing regional, provincial and municipal watercourses, draws up then implements a programme of actions aiming to restore, protect and emphasise the water resources of the basin.

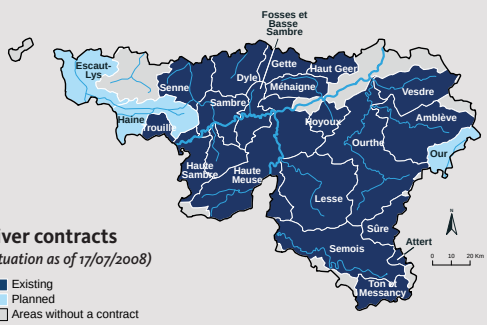
Within the framework of their triennial programmes of actions, the river contracts currently incorporate more than 5,000 actions, the majority of which (69 %) are intended to practically preserve and improve the qualitative (physical, chemical and biological), quantitative, historical and aesthetic aspects of watercourses. They thus contribute significantly to the watercourses reaching a good status by 2015, in accordance with the objectives set by the European water framework directive.

In its projects to inform and raise awareness among the general public, the river contract is also a point of reference for the distribution of public enquiries relating to water management in the Walloon Region.

Evaluating commitments

Since 1993, several ministerial circulars(2) specify acceptable conditions and the process for drawing and evaluating contracts. The river committees must submit an annual activity report to the authorities outlining the current state of the budget, a detailed programme of actions, any difficulties encountered and possible new actions. The result of the evaluation will determine the total value of regional subsidies.

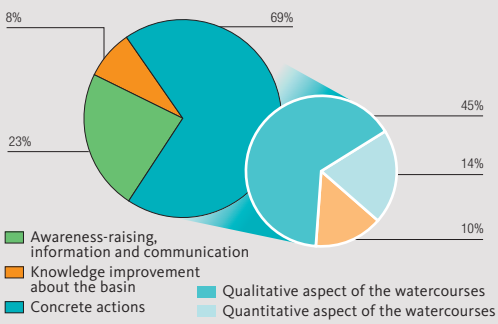
map WATER L1-1



EOW 2008 – **Source :** SPW - DGO3 - DEE

fig WATER L1-1

Type of actions undertaken by river contracts in the Walloon Region *(situation as of 17/07/2008)*



EOW 2008 – **Source:** SPW - DGO3 - DEE

(1) http://environnement.wallonie.be/contrat_riviere (2) Circular dated 20/03/2001 modified on 07/12/2007

water L2

River basin district management plans

The 2000/60/EC directive requires integrated management of water by hydrographic district, and sets strict qualitative and quantitative objectives so that surface and groundwater can maintain or achieve a good status by 2015. For this purpose, the Walloon Region has just drawn up its first Management plan project. This contains, in particular, a list of measures to be taken to achieve the environmental objectives defined.

The prospects are mitigated

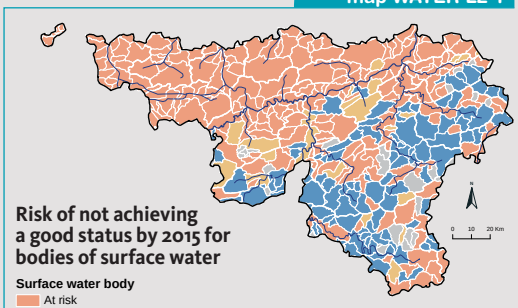
The main objectives defined by the European water framework directive are:

- to restore and improve the state of aquatic environment (water resources and ecosystems) and associated wetlands;
- to reduce and eliminate emissions of hazardous substances;
- to achieve a good status by 2015: a good ecological and chemical status for surface water and a good quantitative and chemical status for groundwater.

At the current stage of the analysis (30/09/2008), more than half of the water bodies run the risk of not achieving a good qualitative status by 2015. The problems are mainly in the district of the Escaut and in certain sub-catchments in the Meuse district (e.g. Sambre and Vesdre).

Failure to achieve a good state	Number of water bodies			
	Surface water		Ground water	
	ecological	chemical	chemical	quantitative
Risk	185	129	19	1
Possible risk	8	100	3	6
No risk	123	119	11	26
Undetermined risk	38	6	-	-
Total	**354**	**354**	**33**	**33**

map WATER L2-1



EOW 2008 – **Source :** SPW - DGO3 - DEE

It's time to act

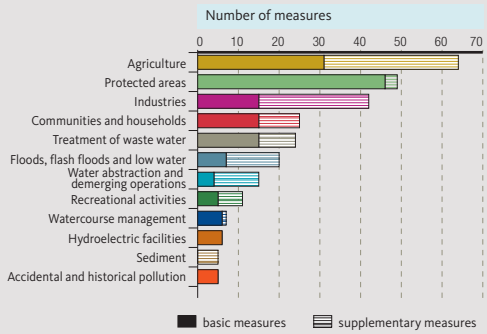
After a status report of the water bodies and the implementation of a surveillance network, the Region must now draw up its first Management plan before the 22/12/2009. This must, in particular, set the reference conditions for a good state, the environmental objectives, possible exemptions, and the measures to put in place within each river basin district (Rhin, Meuse, Escaut, Seine). All the measures must be operational before 31/12/2012.

The current planning project[1] proposes 202 measures mainly geared towards the agricultural and industrial sectors as well as towards protecting zones which are at risk (Natura 2000, bathing, groundwater catchment protection zones etc.). A large proportion of the actions proposed are already included in regulations (basic measures). Nevertheless, a series of supplementary measures must be applied for water bodies which are at risk, in other words, where the basic measures are inefficient.

These supplementary measures must be the subject of a cost/efficiency study, the results of which will have to justify, for some water bodies, the eventual recourse to exemptions in the form of a postponement of deadlines or objectives which are not as strict.

fig WATER L2-1

Programme project for measures aiming to achieve a good status of water in the Walloon Region
(water framework directive 2000/60/EC)



EOW 2008 – **Source:** SPW – DGO3 – DEE (CEEW calculations)

[1] Subject to public consultation until 16/12/2008 (http://eau.wallonie.be)

Local soil pollution: rubbish dumps and service stations

Rubbish dumps and service stations are two categories of potentially polluted sites for which legislation provides a framework for site remediation. Some of these sites damage the environment, present a risk to health, or negatively affect the life environment. Furthermore, if they stay as they are, local economic redevelopment will suffer the consequences.

More than 3,250 sites surveyed

The areas with a particularly high density of rubbish dumps and service stations correspond to areas with high population density (the area along the Haine and Sambre-and-Meuse river line). Over the course of 15 years of legislation relating to dumps remediation, 1,229 applications were submitted to the OWD: one third of sites surveyed have now been remediated. As for service stations, 2,030 applications were submitted to the OWD in 9 years of legislation being in place; half of the sites are not polluted, remediated or in the process of being remediated.

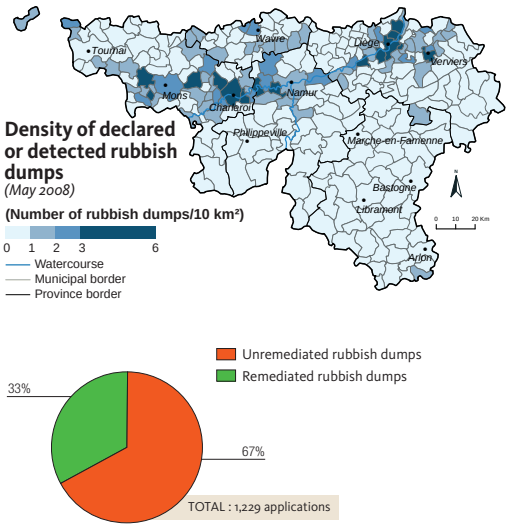
The BOFAS fund encourages the remediation of service stations

In the last two years, the number of applications relating to rubbish dumps went up by 6.5 %, while for service stations, the number went up by 39 %. This encouraging progress can be related to the extension of the intervention conditions of the *Fonds d'assainissement des sols de stations-service* (BOFAS), intended to financially support owners or managers who carry out site remediation(1).

An overall management policy for potentially polluted sites and soils is still expected

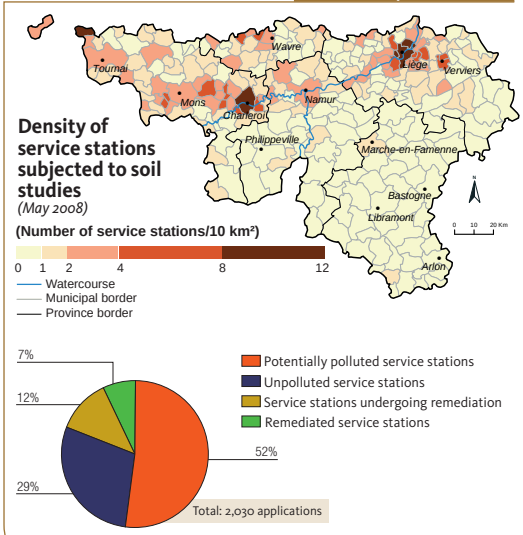
Legislation relating to waste and service stations is currently the only legal reference for the management of potentially polluted soils in the Walloon Region. The decree relating to soil management should soon harmonise the treatment of all potentially polluted soils via an approach based on reducing risks for health and ecosystems. It will replace the "soil" decree dated 01/04/04 which never came into force.

map SOILS 1-1



EOW 2008 – **Source :** SPW - DGO3 - DSD

map SOILS 1-2



EOW 2008 – **Source :** SPW - DGO3 - DSD

(1) http://www.bofas.be

soils 2

Local soil pollution: disused sites

Disused sites are likely to present soil pollution linked to the activities carried out there previously or from when it was abandoned and rubbish was likely to be left there. Damage to the life environment, risks to health and the environment and disruption to local economic development have made their rehabilitation a priority for the Walloon Government(1).

Sites à Réaménager *(SAR) are disused sites, which may or may not have been used for economic activities (except housing), designated by the Walloon Government as sites to be rehabilitated, cleaned, renovated and (re)built. All* Sites d'Activité Economique Désaffectés *(SAED) recognised before 1/01/06 have been qualified as SARs. The* Sites de Réhabilitation Paysagère et Environnementale *(SRPE) are priority sites of regional interest, designated by the Government to be rehabilitated and renovated quickly (no soil studies, permit requests or public consultation).*

Working on behalf of the Land use management Ministry, the DGATLP manages the redevelopment of SRPEs and SARs as long as the cost of the clean-up remains under 25% of the total cost of the planned work(2). The SARs which need more substantial clean-up work are dealt with by the SPAQuE(3) on behalf of the Environment Ministry.

Two inventories which have not been coordinated

The combined DGATLP/SPAQuE inventory of disused sites (2001-2002) counted 3,550 sites (13,000 ha). After 2002, these data were updated on the basis of different objectives by the two managers. Of the 3,759 sites currently inventoried by the DGATLP, 1,620 (5,984 ha) are still disused (*de facto* SARs). On the basis of historic data or soil studies, the DGATLP estimates that 7 % of *de facto* SARs (17 % of the land area) present a high risk of pollution. For its part, the SPAQuE counts nearly 4,300 (formerly) disused sites, nearly 8 % of which have been the subject of soil studies.

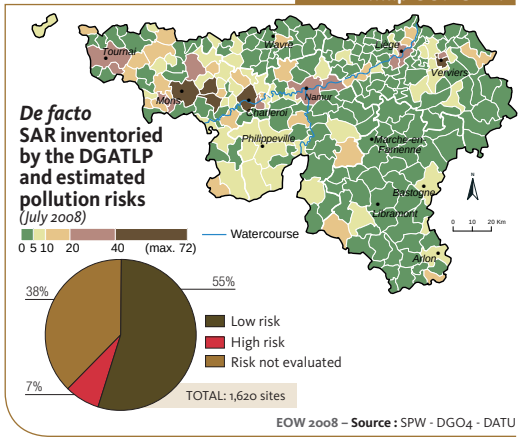
The Marshall Plan: 363 million euro for 262 priority sites

The redevelopment of disused sites benefit from extra funding allocated within the framework of the Marshall Plan: 241.5 million euro for 36 polluted SARs, 98.5 million euro for 149 SARs with no or little pollution and 22.7 million euro for 77 SRPEs (situation as of May 2008). Studies carried out before the field work (orientation, characterisation, feasibility and urban planning study as appropriate) will be completed at the end of 2008 for most sites. The redevelopment should be completed for 7 polluted SARs in 2008. It should start in 2009 for all sites.

Legal void

No Walloon legislation solves the problem of soil pollution in disused sites. After the "soil" decree dated 01/04/04 which never came into force, the decree relating to soil management is expected to provide a legislative framework for the management of these sites and all potentially polluted soils (centralised database, stages of the soil study, criteria for decisions in terms of cleaning up etc.).

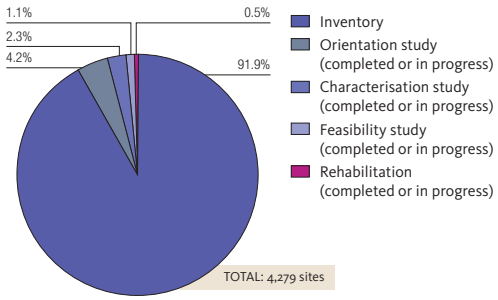
map SOILS 2-1



EOW 2008 – **Source :** SPW - DGO4 - DATU

fig SOILS 2-1

Management stages of disused or formerly disused sites inventoried by the SPAQuE in the Walloon Region *(August 2008)*



EOW 2008 – **Source :** SPAQuE (WALSOLS)

(1) Programme-decree dated 3/02/05 and programme decree dated 23/02/06, known as the "Marshall Plan" (2) AGW dated 14th March 2008
(3) http://www.spaque.be

soils 3

Atmospheric deposits of dusts and metallic trace elements

Metallic trace elements (MTEs) fall on the soil in the form of settleable dusts and accumulate there, general a few hundred metres from their source. This fallout is monitored by a network of gauges located near industries emitting high levels of these substances, mainly along the Sambre-and-Meuse river line.

The results of the measurements taken within the framework of this network[1] must therefore be interpreted carefully, as they are not representative of the overall level of contamination of the soils for the whole Region. Furthermore, the impact of each industrial group must be the subject of a specific analysis, taking into account the nature of the emissions, the distance from the source, and the weather type.

Deposits falling... aside from accidents

- On average, the deposits recorded in 2007 are lower than the guide values;
- For some MTEs, the maximum deposits observed in 2007 significantly exceed the reference values. This is the case in the region of Ath for Ni (chemical industries), Cd (Cd treatment plant) and to a lesser extent, for Pb;
- Deposits of dusts, Cu, Pb and Zn near the most pollutant infrastructures went down by about 50% between 1995 and 2007. The change in fallout of Ni, Cd and to a lesser extent Cr is more worrying, even though a downwards trend has been observed since 2005.

When the deposits of dusts and MTEs goes down near certain businesses, it usually follows a reduction in source emissions, linked in particular to the application of a new legal framework (e.g. in the quarrying sector and IPPC businesses), the reduction in certain activities and the development of new technology (more effective filters, new industrial processes etc.).

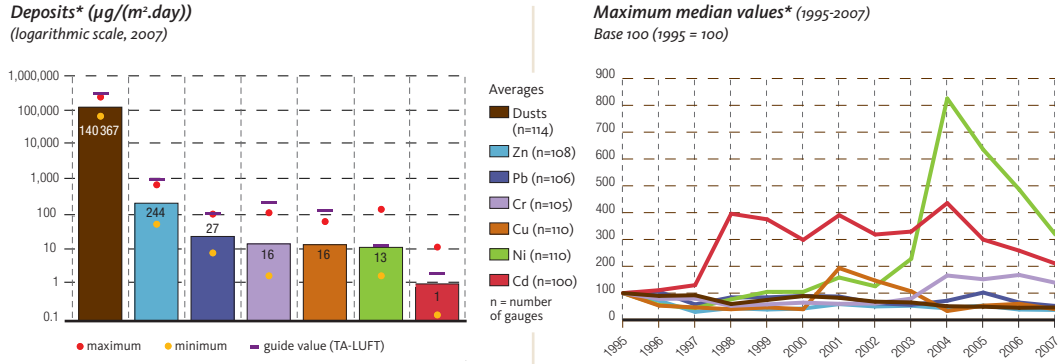
Awaiting adapted regulations

There are currently no European regulations setting limits for MTEs deposits. Furthermore, the German guide limits used by default in the Walloon Region cannot strictly be used as they are, as the impact of fallout depends among others on the nature of the soil and the kind of vegetation.

Consequently, as the 2004/107/EC directive suggests, in-depth studies (adapted to the Walloon situation in particular) will be needed to evaluate and reduce the possible consequences of these deposits on the environment and human health.

fig SOILS 3-1

Deposits of dusts and metallic trace elements near industrial infrastructures in the Walloon Region



* calculated on the basis of data from the gauges installed in different industrial environments

EOW 2008 – **Source:** ISSeP (Settleable dusts network)

[1] "Settleable dusts" network of the ISSeP the detailed results of which are available at http://air.wallonie.be

soils 4

Enrichment of the soils in nitrogen and phosphorous

The presence of nitrogen and phosphorous in soils, at levels exceeding vegetation's uptake capacity, can present risks to the environment, especially in surface and groundwater. These surpluses can contribute to the eutrophication of watercourses, a loss of biodiversity as well as nitrate pollution of water intended for the abstraction of drinking water.

Without an indicator to translate the changes in contents of nitrogen (N) and phosphorous (P) in soils at a regional scale, the enrichment of soils is here covered indirectly, by estimating the transfer of these two elements to water bodies. The flows are evaluated using the EPIC grid model(1) which uses different parameters (climate, use and type of soil, agricultural practices etc.).

Arable crop areas in danger

The model indicates that nitrate concentrations in the water which runs through the root system are higher than 50 mg/l (the norm for drinking water) over a large part of the loamy region and to the west of the grassland region of Liège where agricultural soils are mainly used for arable crops.

The behaviour of phosphates in the soil is different from that of nitrate, in the sense that they are less labile and mainly fixed to clay particles. A study(2) is currently underway to determine the saturation level of agricultural soils in P. Initial results show that this varies between 30 and 60 % to the north of the Sambre-and-Meuse river line.

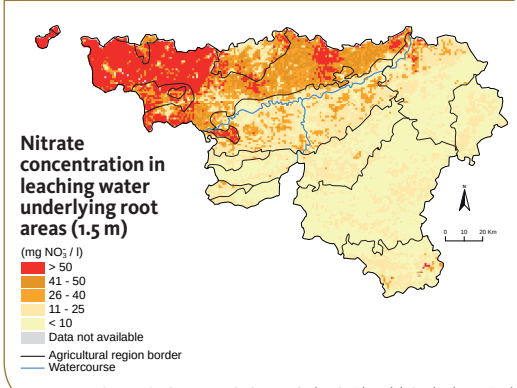
Less transfer towards watercourses

After a continuing rise in the flows of nitrogen towards water bodies since 1971, these have gone down by ± 10 % between 1991 and 2005, essentially for surface water. The change is less marked for P, although a downward trend seems to have begun in 1991. This situation can mainly be explained by the changes in climate phenomena, a reduction in the use of fertilizers (- 17 % for nitrogen and - 60 % for mineral phosphorous between 1990 and 2006) and a better management of livestock effluent imposed by the *Programme de gestion durable de l'azote en agriculture* (PGDA).

Monitoring the remaining levels of nitrogen in soil

The reduction in the remaining levels of N and P in agricultural soils is included in the approaches connected to, for example, the future River basin district management plan (water framework directive), legislation relating to organic farming and agri-environmental measures, principles of eco-conditionality or the PGDA. On the same subject, legislation(3) now imposes measures for potentially leachable nitrogen (PLN) in a fixed number of agricultural plots located in vulnerable zones, among others to make sure that farmers respect the good practices defined in the PGDA.

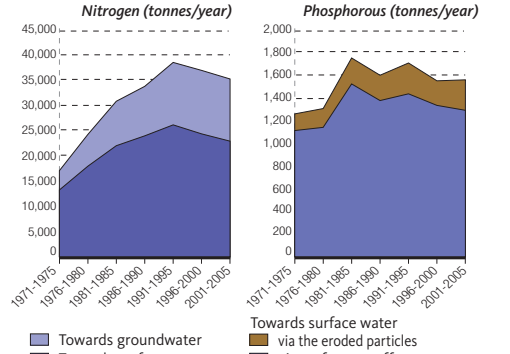
map SOILS 4-1



EOW 2008 – **Source :** FUSAGx-UHAGx (EPICgrid model, Qualvados project)

fig SOILS 4-1

Average annual flows of nitrogen and phosphorous towards surface and groundwater in the Walloon Region



EOW 2008 – **Source :** FUSAGx-UHAGx (EPICgrid model)

(1) Sohier *et al.* (2008) (Qualvados Project) (2) Pereira *et al.* (SATUPHOS Project) (3) AGW dated 14/02/2008

Organic matter in agricultural soils

Soil organic matter provides nutrients to vegetation, but also plays an essential role in the structure of the soil (anti-erosive effect), the storage of CO_2 (battling climate change), as well as the fate of nitrogen and certain micro-pollutants. Consequently, the decline in stocks of organic carbon in cultivated soils is an issue which affects both agriculture and the environment.

Mapping the contents of organic matter (OM) in agricultural soils (crops and permanent grasslands) relies on an empirical model(1) using different variables (soil types, agricultural practices, climate etc.). This model uses data from samples taken from soils with the same occupation since 1955, which means that this variable can be neglected in the interpretation of maps.

Arable crop areas showing low contents

OM soil contents follow a rising gradient moving from the north-west to the south-east of Wallonia, reflecting the trends in terms of climate and soil types. Ardenne has a more humid climate, lower average temperatures and longer periods of frost which reduce biological activity and the mineralisation of OM. Furthermore, the south of the Region has more grassland where OM contents are higher than in crop land.

In 2005, soils with low contents in relation to the critical threshold of 2 % OM represented 41 % of cultivated land. These are mainly located in the loamy region where, what's more, the risks of erosion are particularly high.

The cultivated soils in the grazing regions of Liège, sandy-loamy and loamy regions and Condroz have seen sometimes considerable drops in OM since 1955. This trend is connected among others to the initial OM content, climate changes, the reduction in cereal crops and production systems whereby OM has gradually been replaced by mineral fertilizers.

Restoring stocks in cultivated soils

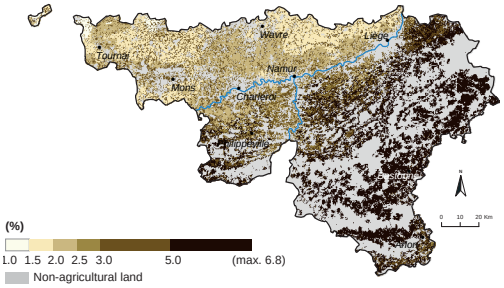
Different initiatives have been taken in recent years to improve the organic status of cultivated soils. This mainly involves implementing agri-environmental measures (e.g. soil cover), support for organic farming, and the possibility of spreading exogenous OM (sewage sludge, compost etc.), thanks to respect for specific conditions (e.g. MTEs contents).

According to estimates, the production of biodegradable OM in the Walloon Region only accounted for 22 to 45 % of OM losses in agricultural soils(2). The restoration of humus stocks, as a priority in deficient soils, must be assured by encouraging the spread of the most appropriate OM and by optimising certain practices, such as crop rotation, ploughing, the management of crop residues or the use of livestock effluents.

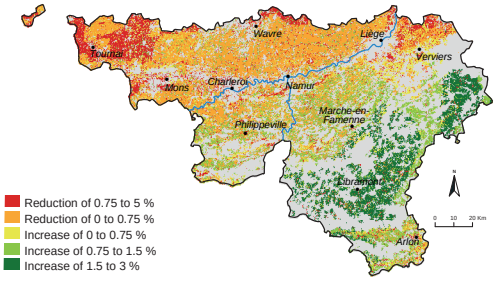
map SOILS 5-1

Forecast contents of organic matter in agricultural soils* *(o-30 cm soil depth)*

Situation in 2005



Evolution between 1955 and 2005



* for cultivated and grassland soils with the same occupation (grassland or crops) since 1955

EOW 2008 – Sources : SPW – DGO3 – DEMNA (CEEW); UCL-GEOG

(1) Goidts *et al.* (2008) (2) Culot (2005)

Soil erosion by water

Rain and water runoff over agricultural land can lead to soil erosion, accompanied by the possible movement of eroded particles towards watercourses. The ecological and financial impacts of these phenomena are multiple: mudflows, crop yield losses, overflows of watercourses and sewers, higher risks of flooding etc.

Loamy soils are the most sensitive

According to modelling results, the average annual loss of soil at the regional scale was around 2.9 t/ha in 2005 (all types of soil surface combined). The highest quantities of eroded soil can be seen in loamy and sandy-loamy regions where the soils are particularly vulnerable to erosion, but also locally in Lorraine Belge where some low permeable clayey soils encourage water runoff.

Soil losses on the rise

Overall, soil losses have increased by ± 75 % since 1971, although there have been significant changes from year to year, mainly linked to climate fluctuations (e.g. highly erosive rain in 2002). Over the period 2001-2005, around 50 % of agricultural land was affected by soil losses higher than the threshold value of 5 t/(ha.year), while less than 35 % of agricultural land saw high risks of erosion between 1986 and 1990.

This trend can largely be explained by the rise in the rainfall erosivity, as well as by the increasing proportion of agricultural land occupied by hoed crops (maize, potato etc.), which do not provide much cover in spring when the rainfall is generally more erosive.

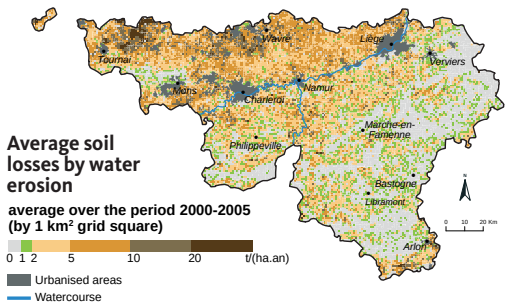
Prevention is better than cure

The actions currently undertaken in the Walloon Region to reduce soil erosion have mainly been within the context of:

- the conditionality of CAP aid(1), with some obligations having to be respected in plots which are most at risk;
- the P.L.U.I.E.S. plan which is geared towards combating the effects of floods;
- the programme of agri-environmental measures (e.g. soil cover);
- subsidies awarded to municipalities and provinces to install protection systems preventing erosion(2).

In the absence of a plan of specific actions, preventive measures must be geared towards awareness-raising, reorganisation of plots, promoting agricultural practices which encourage the infiltration of runoff water, and the landscaping for its transfer towards watercourses.

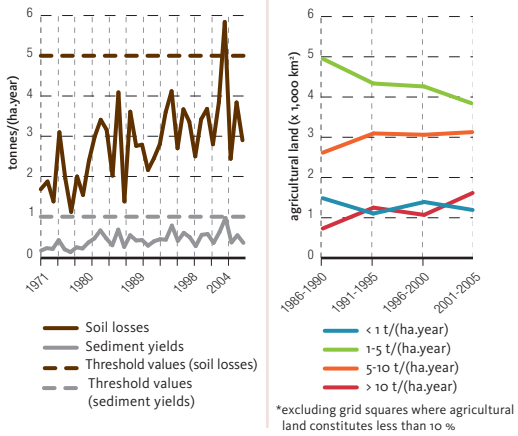
map SOILS 6-1



EOW 2008 – **Source :** FUSAGx-UHAGx (EPICgrid model)

fig SOILS 6-1

Soil losses by water erosion and sediment yields in the Walloon Region



EOW 2008 – **Source :** FUSAGx-UHAGx (EPICgrid model)

(1) AGW dated 22/06/2006 (2) AGW dated 18/01/2007

Capacity of agricultural soils to receive metallic trace elements

The uncontrolled accumulation of metallic trace elements (MTE) in agricultural soils runs the risk of making them lose their ability to fulfil certain essential roles (food production, water treatment etc.). Consequently, it is useful to evaluate the ability of these soils to receive substances which are rich in MTE with a view to managing the risks to health and the environment.

Predicting MTE concentrations

The spread of sewage sludge over agricultural soils is a potential source of MTE contamination. Since 1995, this practice has been regulated by a legal tool which demands a soil analysis in plots destined to be enriched. The aim is to control the soil quality before any spreading, and to prohibit the use of sludge on soils whose pH and MTE concentrations exceed certain norms.

The results of these compulsory analyses have been encouraged within the framework of a research convention (CAPASOL)[1], the aim of which is to develop a mapping tool, on the one hand to predict MTE concentrations in soils, and on the other to manage the ability of agricultural soils to receive enrichment in accordance with legislation.

The right substance in the right place

The 6,401 soil analyses carried out on 5,657 plots meant that, after the data had been validated, maps could be drawn up predicting MTE concentrations (an example is given below for nickel). The model used the kriging technique[2] and the existing links between MTE concentrations and soil properties.

This model also means that maps can be produced showing the theoretical amount of MTE that soils can (still) receive, in accordance with the maximum allowable values.

The database is incomplete

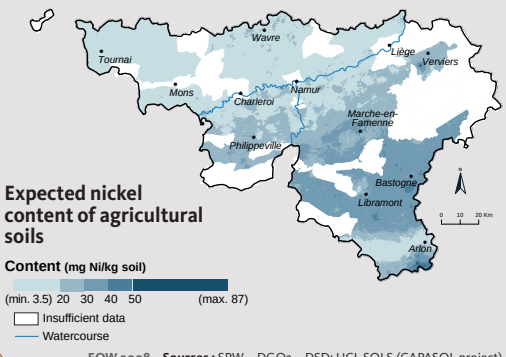
The current maps are not enough to satisfactorily predict abnormally high MTE contents, as the Administration does not have analyses whose results are higher than the norms (in this case, the analyses do not provide authorisation for spreading). Furthermore, sludge suppliers avoid regions where MTE soil contents tend to be high (Herve, Plombières, Theux, industrial basins etc.) which reduces the number of analyses carried out in these areas.

Getting near to a decision-making tool?

The ultimate aim of CAPASOL is to help the Administration on the basis of a risk management scheme:

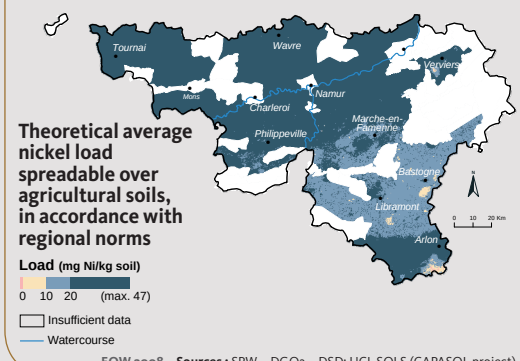
- ➜ to decide whether it is necessary to make soil analyses obligatory or not;
- ➜ to guide the choice and destination of enriching substances in order to reduce the risks to the environment;
- ➜ to permanently enrich a database for the status of soils, which is useful for developing an appropriate programme of actions to protect the soils.

map SOILS L1-1



EOW 2008 – Sources : SPW – DGO3 – DSD; UCL-SOLS (CAPASOL project)

map SOILS L1-2



EOW 2008 – Sources : SPW – DGO3 – DSD; UCL-SOLS (CAPASOL project)

[1] Sonnet *et al.* (2007) [2] statistical method to interpolate data spatially

Mapping of zones risking diffuse soil erosion by water

The erosion by water of agricultural soils can cause considerable environmental and soci-economic damage (mud flows, crop yieldlosses etc.). In this context, the ERRUISSOL project(1) aims to create a database of maps relating to the risks of runoff and soil erosion across Wallonia.

At the crossroads of digital data

The ERRUISSOL project is committed to reducing flooding risks (P.L.U.I.E.S. Plan) and the risks of erosion by way of the conditionality criteria for aid of the Common Agricultural Policy (CAP).

The mapping method is based on modelling soil losses and the integrated use of a digital model of the land, soil occupation, soil types and hydrographic networks.

The four ERRUISSOL products

The project has made it possible to produce 4 kinds of map. These are:

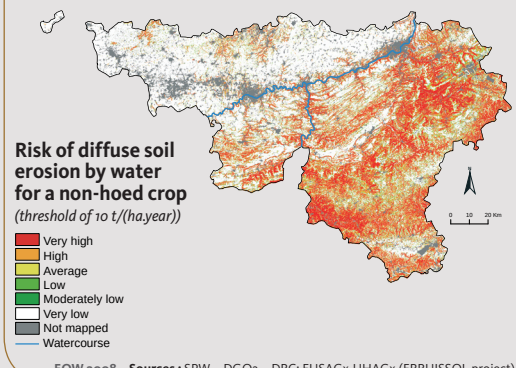
- the gradients of agricultural plots;
- areas at risk of concentrated runoff (water concentration axes);
- areas at risk of diffuse runoff;
- areas at risk of diffuse soil erosion by water.

The last map type is illustrated for hoed and non-hoed crops. The risk of soil losses exceeding a threshold of 10 t/(ha.year) is more pronounced to the south of the Sambre-and-Meuse river line, where the relief is more marked. The risk increases across most of the Region when plots are occupied by hoed crops (beet, maize, potato etc.) which do not provide much cover of the soil when the risks of erosion are higher.

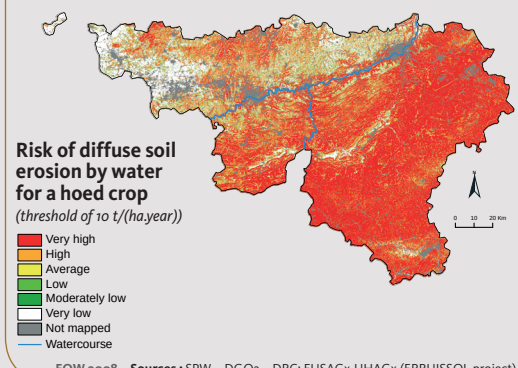
ERRUISSOL data

- *Who's it for? It is intended for agricultural, land management and watercourse experts.*
- *What's it for? It is useful for preparing impact studies before changing the soil use (modifying land allocation, reorganisation, preparing a zoning plan etc.), but also for analysing incidences of flooding and mud flows.*
- *How can it be used? This data represents the risk of runoff and soil losses, nothing more, nothing less. It helps understand the basics of the hydrologic functioning of a site, and must therefore be seen as a decision-making tool.*
- *When will it be available? It will be available online at the end of 2008. This is free, and will be provided as part of the Administration's work, research, education and public contracts funded by the Walloon Region(2).*

map SOILS L2-1



map SOILS L2-2



(1) Research convention between the DGA and FUSAGx (2) Send data requests to carto.dga@mrw.wallonie.be

flora, fauna and habitats

FFH 1

Conservation status of species

The development of lists of endangered species, also referred to as red lists, are born from the concern for the deterioration of biodiversity on a global scale and the influence of human activities in the process of extinction. The categories used by the IUCN for the classification of species on the red list reflect their relative risks of extinction. Even if their numbers are stable, or even on the rise, very rare species are also included in these lists.

Poor conservation statistics for 2/5 of the species in the groups monitored

Combining all the groups, 32 % of the species which have been studied run the risk of disappearing in the Walloon Region. Furthermore, nearly 9 % have already disappeared from the Region.

Among bats, fish, reptiles, butterflies, dragonflies and damselflies, more than half of species are in an unfavourable situation.

A range of causes of threats

The conservation status of a species is usually the result of a combination of factors such as:

- the loss, fragmentation and alteration of habitats;
- the use of pesticides, eutrophication and other air, water or soils pollutions;
- the deterioration of migration conditions;
- disturbance caused by invading exotic species;
- the stresses linked to climate changes.

As far as habitats are concerned, the major disruptive influences are growing urbanisation, the simplification and standardisation of agricultural and forest habitats, the rise in nutrients in the environment and the natural colonisation of heaths, grasslands and sparse meadows by forests.

Halt the erosion of biodiversity by 2010

The European objective of "halting the decline of biodiversity by 2010" is also included in the *Contrat d'avenir pour les Wallonnes et les Wallons* (CAWW).

To establish priorities in terms of conservation, taking into account the risks of extinction of species via the red lists is a necessary condition, but not enough. Other factors must be acknowledged, such as the value of species in terms of their heritage, their functions in ecosystems, the costs and effectiveness of the measures taken etc.

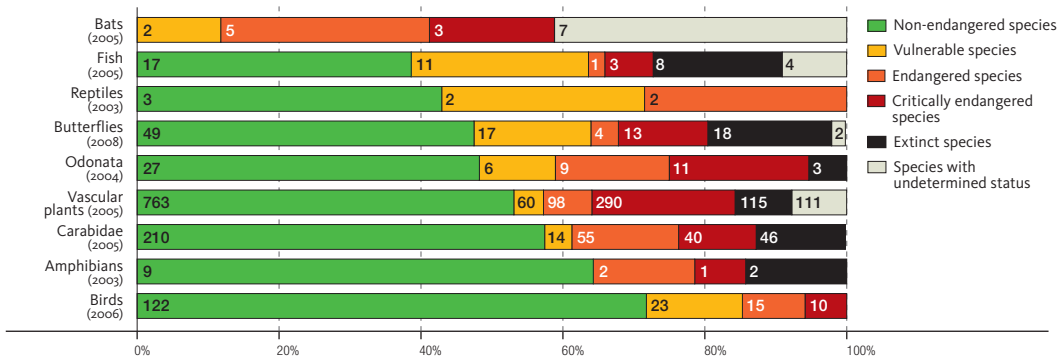
Changes on the horizon connected to climate changes

A recent study by BirdLife International[1] predicted a movement in the ranges of European bird species of 550 km to the north east by 2100. This study is based on the "climate envelope" model for a probable rise of 3°C for the global average temperature.

Wallonia would be the range limit for 60 species, 44 of which would be on the decline and 16 on the rise. There would be 19 new species, and the same number of species which would disappear.

fig FFH 1-1

IUCN conservation status of species in the Walloon Region



EOW 2008 – **Source:** SPW - DGO3 - DEMNA

[1] Huntley *et al.* (2007)

FFH L1

Conservation measures for butterflies

According to the latest red list for butterflies, just over 50 % of species have a poor status. This raises the issue of possibilities to improve and deploy the most vulnerable species. Responses are put forward by studying the species whose situation has improved, locally at least.

It is possible to reverse the trend

Endangered species of butterflies are largely connected to vulnerable semi-natural environments which are made fragile by human activities. Current investment in protected areas do not yet facilitate the rebuilding of an adequate network of habitats to curb their deterioration in Wallonia. However, various positive elements have come to the fore. As well as ubiquitous or thermophile species (helped by global warming), some endangered species are spreading, at least locally. They benefit from management which is geared in their favour.

When conservation goes hand in hand with action

Some actions seem to bear fruit very quickly. Thus, LIFE projects, supported financially by the Walloon Region and the European Union, have facilitated the restoration of vast complexes of damaged semi-natural environments. Work usually consists of bringing back to light areas which were previously left open by grazing or mowing (e.g. limestone grasslands abandoned or planted with conifers) or to restore the water balance in the case of damp grasslands or peat bogs (clogging of drains, felling of conifers, creation of dykes etc.). The post-restoral maintenance of these areas is often realised by extensive grazing, a method which provides refuge zones for insects.

These LIFE projects – very recent or still in progress – are already showing very interesting results. For example, after decades of absence, species which had disappeared from Calestienne such as *Lysandra bellargus, Maculinea arion* or *Melitaea cinxia* have been seen occasionally in the limestone grasslands of the Viroin. Similarly, a species of European interest, *Lycaena* dispar has widely colonised the marshland of the Haute-Semois, restored recently and having been unheard of there before 2000.

Other core measures have been taken more repeatedly, such as the extensive management of natural reserves (RNAs, RNDs etc.), the promotion and implementation of late mowing on roadsides, funding for agri-environmental measures etc.) It is encouraging to see that initiatives aiming to preserve semi-natural environments and to rebuild an ecological network see very quick results for butterflies.

Awareness-raising for forest managers

An awareness-raising and training programme for forest officers with butterfly problems has been in place since 2004, with a high rate of participation. (more than 175 signed up between 2004 and 2008). Forests are potentially very rich in butterflies, but 1 species out of 2 is endangered there. With this in mind, some DNF managers have undertaken successful measures (mainly opening up forest paths or valleys) aiming to encourage vulnerable species such as Melitaea athalia, Melitaea cinxia, Euphydryas aurinia, Erebia ligea *etc.*

Lysandra bellargus

FFH 2

Evolution of wild ungulates

The rise in populations of wild ungulates (deer, roe deer and wild boar) provokes different reactions from different parties. While foresters and farmers are concerned about the damage done by the animals, scientists and naturalists worry about the preservation of biodiversity. This situation however tends to please hunters, collectors of antlers and walkers, although reactions can vary depending on local situations.

Trends continue to rise for deer and wild boar

Despite the more and more pressing demand to reduce the populations and the measures taken in this direction, the trends continue to rise for deer and wild boar.

Since 2000, the population of wild boar has risen by 7 % a year. Over the same period, the increase in deer has gone up to nearly 5 % a year. Although these rates should be interpreted with caution because of the uncertainties connected to the measurement methods, the rising trend is undeniable. A similar evolution can be seen in neighbouring regions as well.

A reduction in roe deer is however noticeable in 2005 and 2006.

The number of animals killed is on the rise

In the absence of natural predators, hunting is the most important factor in regulating populations. Constantly rising, the number of animals which are shot does not however manage to compensate the positive effect on populations of factors such as:

- → good availability of food resources during the bad season (feeding, fructification of trees);
- → mild winters.

Furthermore, the high levels of hunting rental often penalise local candidates to the benefit of external hunters who are less likely to be present in the region. They also force some hunters to try to improve return by favouring densely populated areas.

Shooting plans, extending hunting periods and feeding bans

Shooting plans for deer have existed since 1989, but their application has not yet curbed the phenomenon.

In the absence of shooting plans for wild boar, the Walloon Government decided:

- → to extend hunting periods in 2004 and 2005 (battues are now allowed from the beginning of August – in fields – or October – in forests – until the end of December, while stalking and stand hunting are allowed all year round;
- → to ban feeding in new hunting leases in state-owned forests in 2006.

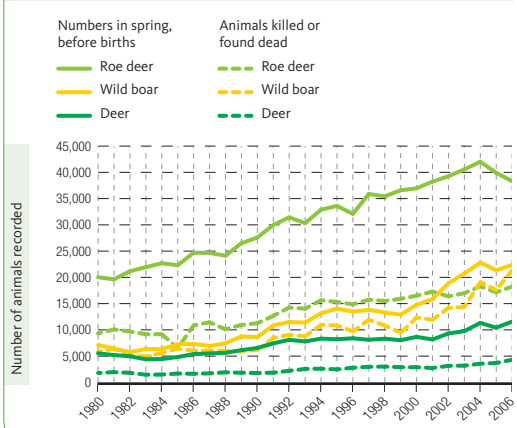
The impact of these measures is difficult to assess as it is difficult to disassociate them from other factors which influence the dynamics of the populations.

Frequent and well-distributed natural feeding grounds encourage the dispersion of animals and reduce the pressure on forest stands. Various forest management techniques have been implemented as a reduction in the density of forest stands or an increase in localised clear spaces.

The pressure of disruption is also a factor which influences the behaviour of animals leading to more damage. So, maintaining or creating large quiet areas and removing obstacles to free circulation of ungulates as far as possible is recommended.

fig FFH 2-1

Estimates of the populations of wild ungulates in the Walloon Region



EOW 2008 – **Source:** SPW - DGO3 - DNF

FFH 3

Invasive exotic species

Introduced by humans, taken out of their natural range, a growing number of exotic species come to develop and reproduce in the environment, sometimes becoming invasive. This phenomenon poses serious problems at an environmental and socio-economic level, as well as for public health. To be effective, measures taken for eradication must be taken right at the beginning of the development phase of these species.

35 species on the black list

In the Walloon Region, nearly 300 species of ornamental plants of exotic origin are spontaneously developing in nature (naturalised species). Among them, 9 % have a high environmental impact and are therefore included on the black list. The pressure of introduction is less significant for vertebrates, but the proportion of naturalised species appearing in the black list is much higher (36 %).

More invasive species in disrupted environments

Three main factors determine the development of species outside their natural range:

- the pressure of introducing the exotic species linked to the attraction that it represents and the intensity of commercial exchanges of which it is the subject;
- the biology and ecology of the exotic species which determines its ability to acclimatise and its potential for becoming invasive in the new environment;
- the receptivity of ecosystems to the invasion which is closely linked to their degree of artificialisation and disruption (damaged and/or polluted habitats are generally more easily invaded).

The pressure of introduction and the presence of anthropised ecosystems are particularly high in the north of the Sambre-and-Meuse river line, producing a concentration of observations of exotic species which damage the environment in this area.

The battle against invasive exotic species: a priority?

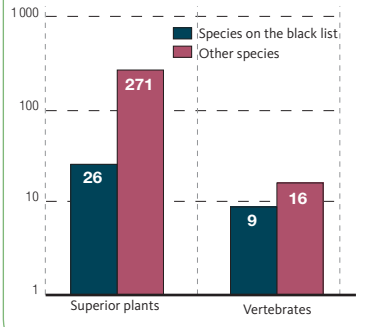
The European Union has made the battle against invasive exotic species a priority. In the Walloon Region, an action plan has been drawn up but does not (yet) benefit from an official status. Various studies intended to identify the best practices for combating the most harmful invasive plants have been commissioned in universities. The development of a huge communication campaign is in underway; its implementation will be put forward within the framework of the European LIFE+ programme.

Concrete management actions have also been undertaken on the initiative of the Natural Parks or River contracts. At the moment however these are still at an experimental stage, and their coordination will need to be developed at a regional level.

fig FFH 3-1

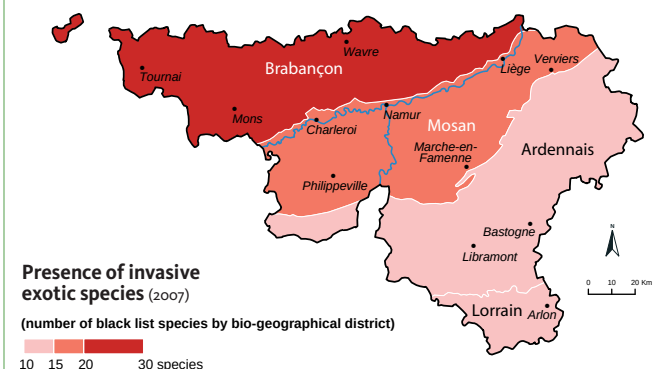
Naturalised exotic species in the Walloon Region *(2007)*

Number of species (logarithmic scale)



EOW 2008 – **Source :** *Belgian Biodiversity Platform* (Harmonia database)

map FFH 3-1



EOW 2008 – **Source :** *Belgian Biodiversity Platform* (Harmonia database)

FFH 4

Nitrogen enrichment of forest and semi-natural ecosystems

The nitrogen enrichment of ecosystems is one of the main causes of their deterioration. When critical loads of eutrophying nitrogen are exceeded, there is a risk of increased leaching of nitrate into the water, nutritional imbalances for vegetation and a loss of biodiversity following the decline of species associated with nutrient-poor environments.

Most of the Region is affected

According to estimates(1) made for 2005, around 45 % of forest land, and almost all other semi-natural ecosystems were affected by exceedings of the critical load of eutrophying nitrogen. In forests, the situation has noticeably improved compared to 1990, following a reduction in atmospheric deposits of nitrogen (- 12 % between 1990 and 2004).

More sensitive to this kind of disruption than forests, the ecosystems associated with open environments (peat bogs, heaths etc,) have seen higher surpluses of nutrient nitrogen, especially in the Hautes-Fagnes and to the north of the Sambre-and-Meuse river line.

The acidifying effects of nitrogen deposits are less problematic, in that they only affect 7 % of forest land.

The reduction in emissions is not enough

While the impacts on ecosystems depends on their sensitivity, the level of atmospheric fallout is closely linked to the quantities of nitrogen pollutants (NO_X and NH_3) emitted into the atmosphere. The dispersion of pollutants knows no boundaries; it is estimated that 50 % of nitrogen fallout across Wallonia comes from emissions of pollutants from neighbouring regions and countries(1).

The skies are gradually clearing for forests

Taking into account the measures planned to reduce nitrogen pollutants emissions by 2010 (AGW dated 25/03/2004), forecasts seem to indicate that 19 % of forest land is still set to be affected by problems of eutrophication. The (very unlikely) respect for emission ceilings set by European legislation (2001/81/EC directive) would mean that more than 90 % of wooded areas could be preserved.

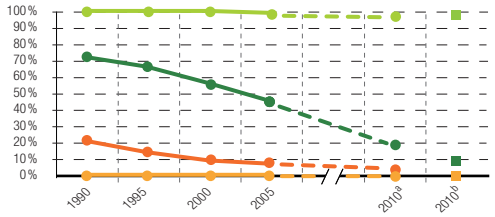
On the other hand, no beneficial effects are expected for the semi-natural vegetation of open environments, given that more than 98 % of land masses are still set to suffer the negative impacts of excessive nutrient nitrogen fallout between now and 2010.

The critical load corresponds to the maximum quantity of atmospheric deposits of pollutants that the natural environment can tolerate without seeing long-term undesirable effects.

fig FFH 4-1

Areas affected by exceedings of the critical load of nitrogen in the Walloon Region

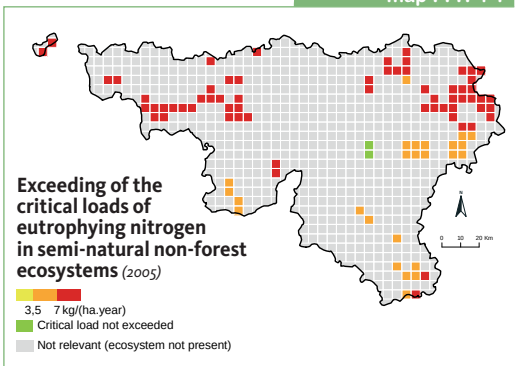
Percentage of area affected



a 2010 projections based on planned measures (AGW dated 25/03/2004)
b 2010 projections if the 2010 emission ceilings are respected (2001/81/EC directive)
* Data updated on the basis of VSD and EMEP-2006 models

EOW 2008 – Sources: CEEW; SPW – DGO_3 – AWAC; ISSeP; SITEREM

map FFH 4-1



EOW 2008 – Sources : CEEW; SPW – DGO_3 – AWAC; ISSeP; SITEREM

(1) SITEREM *et al.* (2006) – new methodology applied in 2008 for forests

FFH 5

Health status of forests

Since the early 1980's, deterioration phenomena have been observed in European forests. They correspond to a general weakening of the vitality of forest stands and mainly manifest themselves by a yellowing and abnormal loss of the leaves of trees.

Nearly 15 % of trees show signs of worrying defoliation

Leaf damage observed in deciduous and conifer trees was very similar in 2007, after seeing major differences between 1989 and 1997.

The improvement for deciduous trees in 2006 and 2007 is mainly attributable to beeches. In spite of an average defoliation percentage which remains high (18.2 % in 2007), this species is gradually re-establishing itself after the bark beetle episode and droughts of 2003.

Over the same time period, the health status of pedunculate oaks has deteriorated: with an average defoliation rate of 16.5 % in 2007, the negative trend seen since records began has been confirmed.

Soil poverty and pollution responsible for the underlying problem

Meteorological conditions and development of pests (bark beetles for beech and spruce, and defoliating caterpillars for oak) explain most of the variations around average results.

Similar fluctuations are also seen in neighbouring countries.

The underlying problem is attributed to nutritional disruption due to the natural poverty of the soils, which is exacerbated by air pollution (in the past, sulphur and acidifying nitrogen, now ozone and eutrophying nitrogen).

Adaptation of forest management practices

As well as fighting pollution, good forest management practices can help reduce this phenomenon. These include:

- ➜ choosing species and sources which are appropriate for the site and the probable changes in climate;
- ➜ diversifying the species;
- ➜ maintaining permanent cover (regeneration under the cover);
- ➜ maintaining coarse woody habitats.

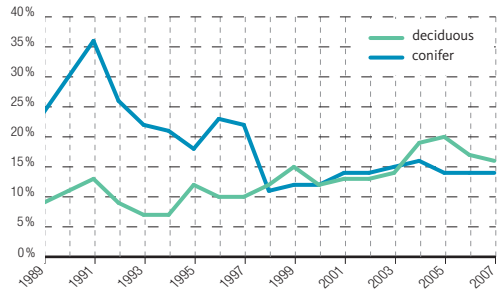
These practices have been reinforced in particular in the new Forestery code for the Walloon Region.

Forest certification, forest management plans drawn up for forest covered by forestry regulations as well as the conditions for granting different subsidies for forests, both public and private, also contribute to encouraging the application of these principles.

fig FFH 5-1

Defoliation of forests in the Walloon Region

percentage of trees with more than 25 % defoliation

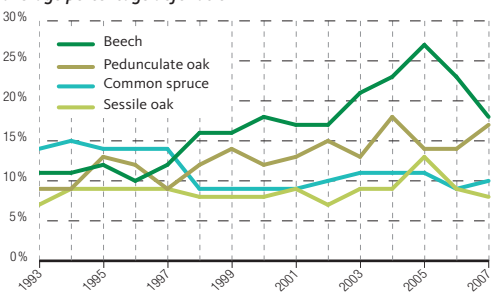


EOW 2008 – **Source:** SPW - DGO3 - DNF (IPRFW)

fig FFH 5-2

Defoliation of the main forest species in the Walloon Region

average percentage defoliation



EOW 2008 – **Source:** SPW - DGO3 - DNF (IPRFW)

FFH L2

Effect of nitrogen rains on peaty habitats

The effect of nitrogen rains on sensitive ecosystems such as peat bogs is often less well known than that of acid rains. The enrichment of environments which are naturally low in nitrogen is however becoming more and more central to concerns of the scientific community and managers of these natural environments.

In 2006, 33 peat bog sites to the south of the Sambre-and-Meuse river line were studied[1] with the aim of assessing the impact of nitrogen fallout on the functioning of peat bogs, and so shed some light on the role of nitrogen rains in the current deterioration of these ecosystems (toxicity, sensitivity to pathogens, frost and dryness etc.).

The study included:

- collecting and analysing rain water;
- collecting and analysing Sphagnum mosses and water from the peat bogs;
- monitoring algal bio-indicators (diatoms and desmids).

Nitrogen deposits are still too high

The most significant atmospheric nitrogen deposits are recorded on the summits of the Ardenne with a north-south gradient, the highest of which appears in the Hautes-Fagnes. Nitrogen fallout is between 10 and 20 kg N/(ha.year), which represents more than double the critical load that high peat bogs can accept. These deposits are falling however across all sites (- 19 % on average between 1990 and 2005). The apparently best state of health of the peat bogs of the Saint-Hubert plateau could partially be explained by lower supplies than in the Hautes-Fagnes.

Erosion of biodiversity

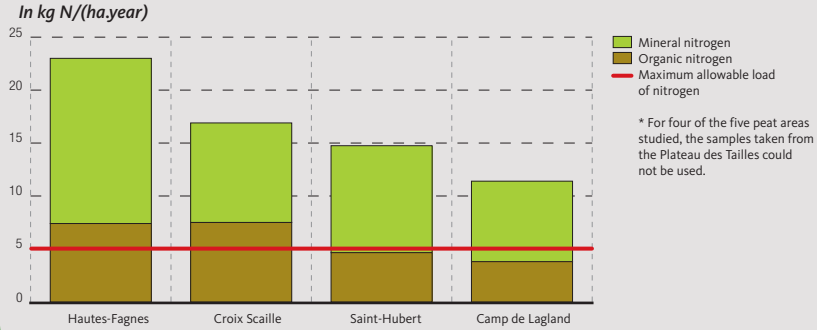
The study revealed the absence of nitrophilous diatoms which implies that the surpluses of nitrogen are directly taken by Sphagnum mosses and that they do not influence any more the dynamics of diatom populations. Furthermore, another study[2] highlighted a considerable loss of diversity in terms of diatom and thecamoebian communities over the last 200 years. This development follows on from drainage projects carried out to introduce spruces and coincides with the start of air pollution. The almost irreversible decline in these populations may have a significant negative impact on the overall functioning of peat bogs.

Other approaches are still to be explored

To establish the impact of nitrogen rains on peat bogs, the study of the nitrogen content of Sphagnum mosses and peat tissue seems an obvious step. This kind of study would require the analysis of peat carrots, to help retrace the history of the atmospheric pollutions. It would also be useful to study diatom and thecamoebian populations present in Sphagnum mosses covering areas which are in the process of being restored (90 hectares of which are located in the Croix Scaille).

fig FFH L2-1

Estimate of nitrogen deposits in relation to the critical load for peat bogs* in the Walloon Region *(2006)*



EOW 2008 – **Source :** ULg (Scientific station of the Hautes-Fagnes)

[1] Ponton & Leclercq (2007) [2] Dommes (2007)

Natura 2000 network

The loss or alteration of habitats combined with the development of ecological barriers are leading to the fragmentation of landscapes and the isolation of populations. In order to curb this phenomenon, the Natura 2000 network – a European network of protected sites – has been established in every Member State of the European Union, in accordance with the "Birds" (79/409/EEC) and "Habitats" (92/43/EEC) directives.

Natura 2000 covers 13 % of the Region

There are 240 Natura 2000 sites in the Walloon Region, covering 220,944 ha, equivalent to 13 % of the Region.

At a European level, the network represents more than 20 % of the Community's land area, to which should be added, since January and March 2008, 489 sites with a total area of 18,784 km² in alpine, Mediterranean and Macaronesian bio-geographical regions.

In the Walloon Region, the Natura 2000 network is nearly 70 % forest (31 % of Walloon forests). Grassland, fallow land and orchards on the one hand, and crops on the other, occupy 16 % and 2 % respectively of the total network, but represent less than 5 % of agricultural land.

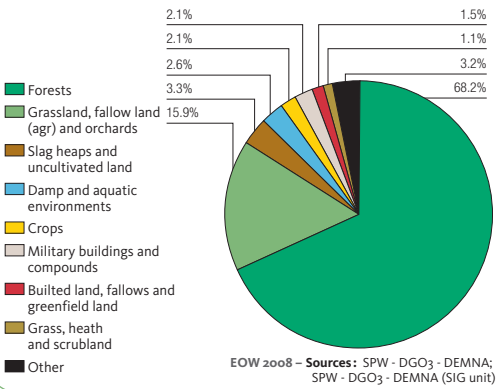
Scientific criteria prevail for the selection of sites

The selection of Natura 2000 sites is based on criteria established by the European Union, including:

- the degree of representativeness;
- the degree of conservation;
- the degree of isolation;
- the overall value of the site for conservation.

fig FFH 6-1

Land use in Natura 2000 sites in the Walloon Region
(January 2006)



EOW 2008 – **Sources :** SPW - DGO3 - DEMNA; SPW - DGO3 - DEMNA (SIG unit)

Designating sites: the first stage

Designating the sites is just the first stage in setting up the Natura 2000 network. Each site must be the subject of a designation order which specifies the following, backed up by maps:

- the perimeters of the sites;
- the intended species or habitats which are present there;
- the objectives of the active management system to be put in place, and the means suggested to reach them.

Establishment of the Natura 2000 network (November 2008)

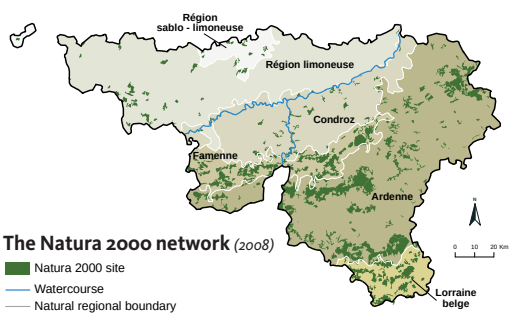
Stages	Completed	In progress	To be started
Detailed mapping of sites	45,000 ha	15,000 ha	160,000 ha
Designation order projects	0 site	103 sites	137 sites

EOW 2008 - **Source :** SPW - DGO3 - DEMNA

All of the Natura 2000 sites covered by a designation order are subject to general measures (AGW dated 23/10/2008).

Furthermore, as far as each site is concerned, this order will provide specific measures according to the characteristics of the habitats and species. The adoption process for designation orders is started for an initial batch of 8 sites covering just over 3,600 ha. Orders drafts are subject to public consultation from the beginning of November in the 25 municipalities concerned.

map FFH 6-1



EOW 2008 – **Source :** SPW - DGO3 - DEMNA

Evaluation of the conservation status for Natura 2000 species and habitats

Article 17 of the "Habitats" (92/43/EEC) directive establishing the Natura 2000 network specifies that every 6 years, starting from June 2007, the Member States of the European Union must draw up a report on the implementation of the Natura 2000 network. In particular, the report must summarise the conservation measures taken and their impact on the conservation status for the targeted habitats and species.

The report for Belgium was submitted to the European Commission in August 2007. The evaluation must be carried out by bio-geographical region, and a distribution of the work was organised between Flanders and Wallonia: the INBO was responsible for the Atlantic region, while the CRNFB basically looked at the data for the continental region.

The Commission's analysis process

In October 2007, the Commission provided Belgium with a series of preliminary comments on the evaluation report. They basically involved the evaluation methodology for the conservation status of the species. A corrected version of the report was sent and validated by the Commission in the middle of January. New comments following on from a more in-depth reading by the Commission are expected to come in June 2009.

Conservation status deemed to be unfavourable for 73 % of the species in the continental region

The CRNFB was able to analyse 67 taxons or groups of taxons. Among them, superior plants and butterflies had the largest number of taxons whose conservation status was unfavourable. As for vertebrates with a very unfavourable status, there were in particular:

- the great crested newt (*Triturus cristatus*) and the natterjack toad (*Bufo calamita*);
- the sand lizard (*Lacerta agilis*);
- 3 species of bats, the European hamster (*Cricetus cricetus*) and the European otter (*Lutra lutra*).

Only one continental habitat in favourable status

Overall, for the continental region, only boxwood xerothermic formations were deemed to be in favourable status. Rivers, megaphorbic areas and acidophilous beech forests with *Ilex* and *Taxus* were deemed to be in an inadequate status. The other habitats evaluated are in an unfavourable status.

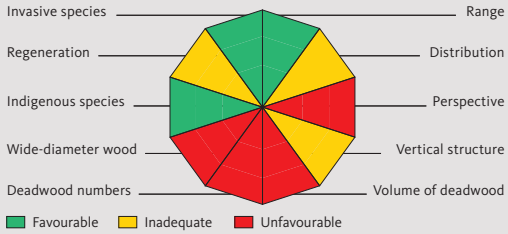
As far as forests are concerned, factors lowering the status basically involve the presence of wide diameter-wood and dead wood (insufficient volume and number). No forest habitat in the continental region had a good evaluation as far as the vertical structure was concerned or the presence of natural regeneration.

As well as various structural and functioning problems, the poor evaluation of other formations such as dry heaths, grasslands and screes comes from the reduced size of their distribution area in relation to the land area required for the good functioning of the habitat and its long term conservation.

Evaluation criteria for habitats	
Favourable	All criteria "Favourable" or three "Favourable" and one "Unknown"
Inadequate	One "Inadequate" criterion or more but no "Unfavourable"
Unfavourable	One "Unfavourable" or more
Unknown	Two or more "Unknown" together with "Favourable" or all "Unknown"

fig FFH L3-1

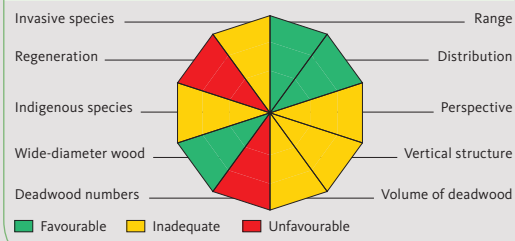
Evaluation of the status of *Luzulo-Fagetum* beech forests in the Walloon Region



EOW 2008 – **Source:** SPW - DGO3 - DEMNA

fig FFH L3-2

Evaluation of the status of oak forests or oak-hornbeam forests in the Walloon Region



EOW 2008 – **Source:** SPW - DGO3 - DEMNA

Protected natural sites

In view of the decline in biodiversity, the protection of the richest natural sites helps safeguard population groups on the basis of which a redeployment of species will be possible. Walloon legislation on nature conservation defines five kinds of status which give priority to nature: réserves naturelles domaniales (RND), réserves naturelles agréées *(RNA),* réserves forestières *(RF),* zones humides d'intérêt biologique *(ZHIB) and* cavités souterraines d'intérêt scientifique *(CSIS).*

The network is growing but remains limited

Since the early 1990s, with the use of the RNA and ZHIB statuses, the protection of natural sites accelerated. On average over the period 1990-2007, just over 300 ha were designated every year.

On 31st December 2007, more than 10,500 ha of natural sites benefited from a high-protection status, which corresponds to 0.6 % of the Walloon Region. In relation to the number of reserves recorded in 2006, fewer were counted in 2007. This can be explained by the regrouping of small neighbouring reserves into a single inclusive reserve

Number of protected sites in the Walloon Region (December 2007)

RND	RNA	RF	ZHIB	CSIS	**Total**
140	133	12	49	69	**403**

The consolidation of the network demands considerable effort

As well as the availability of targeted land areas, their market value and the available budget determine the speed at which the network can be consolidated. The RNAs must have a management plan approved by the *Conseil Supérieur Wallon de la Conservation de la Nature* (CSWCN) in order to benefit from an official protection status, which requires time and manpower.

Before adopting the "Natura 2000" decree in 2001, the preparation of a management plan was not compulsory for RNDs. Nevertheless, according to a report in 2006, 61 % of 127 RNDs had a management plan, which corresponds to 92 % of the land areas concerned.

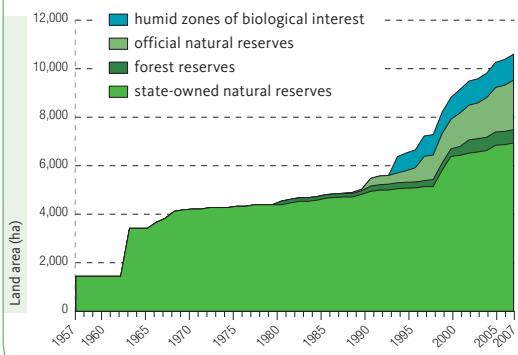
Guarantee adequate protection for core areas

European-wide agreements (Kiev, 2003) specify that, for 2006, each State must have defined its ecological network and that the core areas of this network must benefit from an adequate protection status from 2008. Experts generally say that it is necessary to grant a high protection status in areas representing 5 to 10 % of the land area of each ecological region.

In the Walloon Region, protected areas are an integral part of the core areas of the ecological network. The set-up of a network of the natural sites is essential for safeguarding the future populations by maintaining or restoring exchanges between sites.

fig FFH 7-1

Land area of protected areas in the Walloon Region



EOW 2008 – **Source:** SPW - DGO3 - DNF

FFH 8

Nature development programmes

Nature development programmes for the whole of the Region are complementary to the protection of sites of significant biological interest. They mainly aim towards the redeployment and consolidation of the ecological network. As well as the River contracts, four programmes are supported by the Walloon Region: Plans communaux de développement de la nature *(PCDN), Natural Parks and "roadside" and "attics and steeples" conventions.*

Most municipalities are involved in 1 or 2 programmes

In 2007, 62 % of municipalities were involved in one or two programmes and 18 % in three programmes. Four municipalities are involved in all of the programmes: Bastogne, Habay-la-Neuve, Tenneville and Viroinval. There were 47 municipalities which were not yet involved in any programmes.

Constraints of various degrees

The most successful programmes are the "roadside" and "attics and steeples" conventions. They are the easiest to set up at a municipal level and there is considerable regional support considering the effort to make.

For the PCDNs, with the help of a regional facilitator, municipalities must:

- draw up a report on municipal areas of natural heritage;
- draw up a strategic plan;
- draw up a programme of actions;
- establish partnerships including everyone involved locally.

Implementing a PCDN is more complex, but it means that greater progress can be made as nature is taken into consideration:

- throughout the municipality;
- with everyone involved;
- in all decisions which may have an impact on nature.

To achieve the status of a Natural Park, a rural area must:

- have a high level of biological and geographical interest;
- be subject to environmental protection measures;
- have a land area of at least 5,000 hectares in one piece.

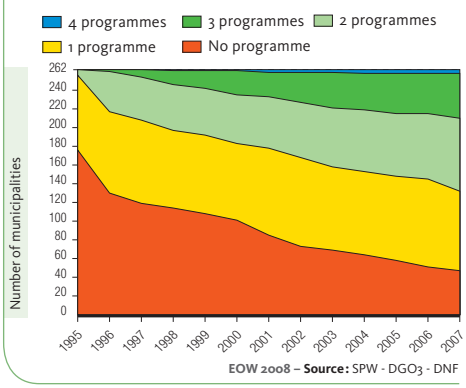
Most Natural Parks involve several municipalities.

Legislative support for Natural Parks alone

While these different programmes are all supported by the Walloon Region, only Natural Parks benefit from legislative support. In practice, performance has not always been as good as it could be, which is why the decree of 16th July 1985 on Natural Parks has been revised.

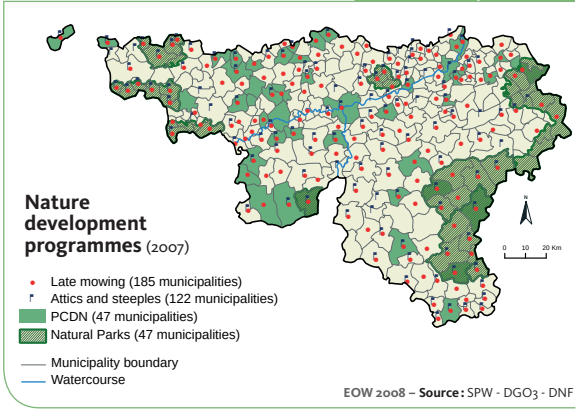
fig FFH 8-1

Involvement of municipalities in nature development programmes in the Walloon Region



EOW 2008 – **Source:** SPW - DGO3 - DNF

map FFH 8-1



EOW 2008 – **Source:** SPW - DGO3 - DNF

MANAGEMENT INDICATOR

Budgets for nature development

While they only represent a part of the resources to be mobilised, the budgets dedicated to nature development provide information about the action potential taken by the authorities, as well as about the major focuses for work undertaken in this area.

Funding for actions on the rise

For 2008, the DNF and former CRNFB's budgets for nature development came to a total of € 11,264,000, equivalent to € 3.6/inhab. For a few years, they have been going up slightly: + 54 % for the period 2005-2008.

The largest proportion of the budget is dedicated to protection and management measures

More than 40 % of the budgets are allocated to protection and management measures for sites of biological interest (purchase and management of natural reserves, LIFE Nature programmes for the conservation of Natura 2000 habitats etc,).

The relative significance of budgets for the support of themed operations management should also be noted ("attics and steeples", roadsides, PCDNs etc.). They represent around 10 % of the total budget, depending on the year.

Major objectives at the root of budget preparation

At the root of budget preparation are the major objectives to be achieved, such as:

- adopting and implementing active measures to preserve species and their populations;
- completing the network of protected areas and looking after their management;
- maintaining and developing biodiversity in sectoral policies for land use and rural environments management;
- consolidating skills and ensuring the monitoring of species and their populations;
- raising public awareness.

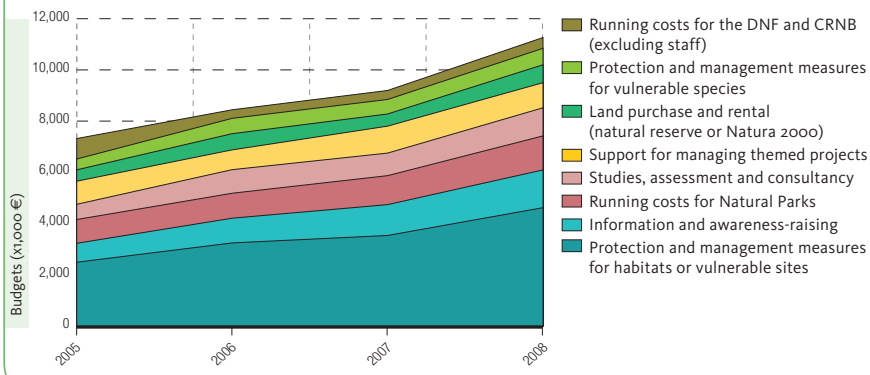
Other sources of funding exist

As well as the DNF and former CRNFB's budgets, other sources of funding are in place for nature development. These include:

- European funding (LIFE Nature and Interreg programmes etc,) which fund projects up to 50 %;
- funds invested in biodiversity components of agri-environmental and forest management programmes;
- municipal and provincial grants;
- private investment, in particular benefiting nature conservation associations.

fig FFH 9-1

Specific budget dedicated to nature development in the Walloon Region



EOW 2008 – **Source:** SPW - DGO3 - DNF

FFH L4

Grants for hedge planting

Hedges provide a structural element to the landscape. They play an important role in terms of ecological refuge and ecological corridor. They also play agronomic and economic roles. As well as hedges which are planted by the local authorities and agri-environmental subsidies for farmers, grants are awarded to individuals to encourage the planting of hedges.

Nearly 60 km of hedgerows planted in 8 years

The success of this measure varies. The lengths of subsidised hedgerows can triple from one year to the next, with a particular peak observed in 2000 and 2001. On average, grants totalling around 17,000 € are awarded every year, or 2.34 €/m.

Over the period 1999-2006, nearly 60 km of subsidised hedges were planted. In spite of an increase in grants when they are planted over several rows, most hedges are planted in single rows.

Conditions to be adhered to

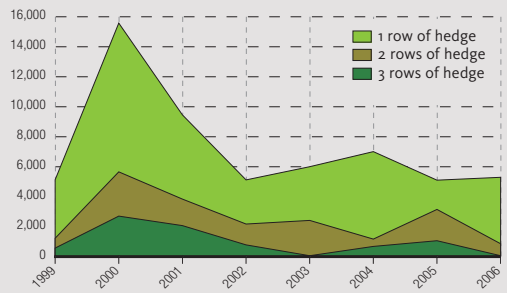
To benefit from a grant, several conditions must be adhered to, including:

- diversity (at least three species) and the indigenous nature of the species planted;
- respect for the "Species ecological file";
- a minimum length of 100 m and a minimum density of 2 plants per metre;
- no herbicides to be used;
- guarantee of good upkeep and maintenance for a minimum of 20 years.

fig FFH L4-1

Subsidised hedge planting in the Walloon Region

Combined length of hedge (in metres)



EOW 2008 – **Source:** SPW - DGO3 - DNF

Adoption of a new legal tool

On 20th December 2007, the Walloon Government adopted a new legal tool. This increased the sums granted for hedge planting and extended the measure to orchards and rows of trees. Furthermore, subsidies are now planned to encourage their upkeep.

The level of aids varies according to the kind of work planned and the location of the land. Higher subsidies are intended for areas in Natura 2000 sites or in Natural Parks. The Region's contribution can be up to 80 % of the actual cost.

Tree week

Every year, tree week celebrates a species or a group of species, organised by the DNF. Within this context, subsidies for hedge planting, rows of trees or ornamental trees are also possible.

Three kinds of subsidised actions can be carried out, in particular by authorities, schools or associations:

- *the distribution of plants to private individuals (via the municipal authorities);*
- *planting in a public place;*
- *development of a natural space.*

The annual budget dedicated to these actions varies from 245,000 € (2006) and 325,000 € (2005).

Year	Number of plants	Municipalities involved	Species favoured
2002	130,000	60	chestnut
2003	120,000	60	walnut
2004	120,000	51	hazelnut
2005	120,000	49	robinia
2006	120,000	50	cornel
2007	120,000	50	viburnum

conclusion

Some key elements of the state of the components of the Walloon environment (air, water, soils, flora-fauna-habitats) are summarised below and linked with an evaluation of their current situation and/or their change (colour codes). These evaluations are based on certain indicators presented in the files. They do not claim to provide an exhaustive account of the situation and cannot be directly interpreted in terms of the effectiveness of the policies that have been put in place.

Particulate matter in the air and tropospheric ozone are deemed to be the most worrying sources of air pollution

The atmospheric emissions of various pollutants are coming down in the Walloon Region, although decreases are sometimes not great enough to achieve the objectives laid down by European legislation (e.g. acidifying pollutants and precursors of tropospheric ozone). Concentrations of some pollutants in the ambient air have also gone down (nitrogen and sulphur oxides, lead etc.). Nevertheless, pollution levels are still too high for particulate matter (PM) recorded in urban and industrial areas and for ozone, with concentrations exceeding the levels set by regulations for the protection of health and ecosystems.

The cross-border nature of air pollution has led the International Community to take a series of measures in order to achieve the objectives for reducing air pollution defined in the Montreal Protocol (stratospheric ozone), the Kyoto Protocol (greenhouse gas emissions) and the Gothenburg Protocol (precursors of tropospheric ozone). In the Walloon Region, measures have already been taken in this way (among others via environment permits) and will be consolidated by the actions defined in the recent *Plan Air Climat*.

FILE	THEME	KEY MESSAGE	EVALUATION
air 2	Greenhouse gas emissions (GHGs)	The total emissions of GHGs produced by human activities went down by 12.7 % between 1990 and 2006. This reduction goes above and beyond the Kyoto objectives for the period 2008-2012 (- 7.5 %). However, emissions connected to transport and the services industry are on the rise and there are many uncertainties about the future for GHGs emissions (particularly for the steel industry).	
air 3	Emissions of ozone-depleting substances (ODSs)	Emissions of ODSs went down by 75 % between 1995 and 2006, basically following the application of international and European regulations.	
air 4	Acidifying emissions	Emissions of acidifying pollutants went down by 35 % between 1990 and 2005, but the European objective for 2010 will be difficult to achieve.	
air 6	Emissions of particulate matter (PM)	Although records are still inconclusive, particulate matter emissions went down by 16 % between 2000 and 2005.	
air 7	Emissions of precursors of tropospheric ozone	Nitrogen oxide emissions went down by 26 % and emissions of volatile organic compounds by 45 % between 1990 and 2005, but European objectives for 2010 will be hard to achieve.	
air 9	Emissions of metallic trace elements (MTEs)	Overall emissions of MTEs went down by 56 % between 1990 and 2005.	
air 5	Ozone and PM_{10} concentrations in the ambient air	In 2007, all measuring stations for PM_{10} and ozone concentrations recorded levels exceeding those set by European legislation for the protection of health. Long term objectives for reducing pollution by ozone appear to be getting further and further out of reach.	

Positive evaluation Neutral evaluation Negative evaluation

Further measures will be needed to improve the quality of water bodies at risk

More than half of surface and underground water bodies run the risk of not reaching the main objective of the European water framework directive, in other words, good qualitative (ecological and chemical) status by 2015. The main problems are in the district of Escaut, in some Meuse sub-basins (e.g. Sambre and Vesdre) and in some areas vulnerable to pollution by nitrates produced by agriculture. More than 200 measurements are detailed in the River basin district management plan that the Walloon Region intends to finalise and submit to the European Commission before the end of 2009. A large proportion of the actions put forward are already present in regulations (basic measures). Nevertheless, a series of further measures will probably need to be applied for water bodies at risk, in other words, where the basic measures will not be sufficient.

Among the positive elements, although the Region lags behind in terms of the collection and treatment of urban waste water, it is catching up, even though most of the deadlines for compliance stipulated by European legislation have run out since 2005. The progress made in terms of treating waste water from homes and industry does not always translate to a distinct and speedy improvement in the quality of surface water, among others because of the diffuse supplies which are hard to bring under control (surface runoff, soil erosion etc.) and climatic events which can lead to a concentration of pollutants in water.

FILE	THEME	KEY MESSAGE	EVALUATION
water 3	Use of groundwater resources	In Europe, Wallonia is one of the regions that exploit its water resources the most intensively, but overall, collection does not exceed natural refill.	
water 4	Production of drinking water	The main distributers of drinking water are gradually replacing pipes, thus reducing leaks from their distribution network.	
water 5	Pollutant levels in watercourses	Domestic (carbon, nitrogen, phosphorous) and industrial (carbon, nitrogen, metallic trace elements) pollutants released into watercourses are going down, while general influx (soil leaching) is harder to deal with.	
water 6	Organic pollution of watercourses	The organic pollution of watercourses is going down. Their oxygenation is generally improving.	
water 7	Eutrophication of watercourses	The reduction in concentrations of phosphates in watercourses remains limited, in spite of the progress made in terms of waste water treatment.	
water 9	Micro-pollutants in surface waters	Concentrations of PAHs in surface water exceed the norms in more than 30 % of samples, which prevents water bodies as a whole from having being in a good chemical status.	
water 16	Ecological quality of watercourses	The number of sites where the ecological quality of the water is between moderate and high is increasing, but this progress is still fairly slow.	
water 17	Quality of bathing waters	The quality of bathing waters generally improved between 1990 and 2005. The number of samples which are not compliant was around 12 % in 2006 and 2007.	
water 8	Nitrate in groundwater	Nitrate concentrations in groundwater continue to increase in most vulnerable areas.	
water 10 water 12	Pesticides in groundwater	The pollution of groundwater by atrazine (herbicide) and desethylatrazine is going down, but new molecules are appearing in concentrations which are sometimes high. The number of catchments affected by the presence of pesticides has been relatively stable since 2003.	
water 14	Sediments in waterways	The volume of sediments removed from waterways has been going down since 2005. The backlog in dredging is not being reduced.	
water 18	Collection of waste waters	Waste waters collection networks are expanding : at the end of 2007, municipalities in Wallonia had collecting levels higher than 80 %.	
water 19	Collective treatment of waste waters	The Walloon Region is catching up : at the end of 2007, the level of public waste water treatment stations reached 70 %.	
water 11	Catchment protection areas	Progress has been made but the volume of groundwater **intended for the** abstraction of drinking water currently protected represents less than a third of the volume that needs to be protected by 2009. Potentially pollutant activities have not all achieved compliances yet within the designated perimeters.	
water L1	River contracts	19 River Committees are active in 19 catchment basins covering more than 78 % of Wallonia. More than 5,000 actions are underway within the framework of the river contracts.	

Positive evaluation Neutral evaluation Negative evaluation

Eroded agricultural soils, deficient in organic matter, polluted soils waiting for legislation

The deterioration of soils is problem which is getting more and more worrying in Europe. The project of framework directive on the protection of soils, which is still under discussion, aims in particular to make sure that Member States identify areas where soils run the risk of deterioration, set objectives for reducing these risks and establish adequate programmes of measures.

In the Walloon Region, the deficiencies of organic matter in agricultural soils and the soil losses by water erosion are the main threats with which soils are confronted. Furthermore, the absence of global legislation for managing potentially polluted soils means that is can be difficult to identify the sites concerned and apply remediation criteria which are harmonised and suited to the characteristic of Walloon soils. The situation should change in coming months as a new decree relating to soil management comes into force.

FILE	THEME	KEY MESSAGE	EVALUATION
soils 1 soils 2	Local soil pollution	There is currently no coordinated inventory of potentially polluted soil in the Walloon Region. An overall management policy for potentially polluted sites and soil is still expected.	
soils 1 soils 2	Local soil pollution	The number of applications submitted for the cleaning up of the soil in service stations has made great progress thanks to the BOFAS fund. The redevelopment of disused sites has accelerated thanks to extra funding allocated within the framework of the Marshall Plan.	
soils 3	Atmospheric deposits of dusts and metallic trace elements (MTEs)	Atmospheric deposits of dusts and MTE near high-emission industries is going down. Nevertheless, for some MTEs the maximum deposits seen in 2007 significantly exceed the reference values.	
soils 4	Enrichment of the soils in nitrogen and phosphorous	After a continuous rise since 1971, the fluxes of soil nitrogen towards watercourses went down by about 10 % between 1991 and 2005.	
soils 5	Organic matter (OM) in agricultural soils	OM contents in agricultural soils have gone down considerably in arable crop areas in the last 50 years. In 2005, 41 % of cultivated soils were deficient in OM (contents lower than 2 %).	
soils 6	Soil erosion by water	Soil losses by water erosion varies considerably from one year to the next. However, the trend is rising: the average weight of eroded soil per hectare has gone up by 75 % since 1971.	

Positive evaluation Neutral evaluation Negative evaluation

State of flora, fauna and natural habitats: there has been progress, but the objective of stopping the erosion of biodiversity has not yet been achieved

The Walloon Region has taken various measures to combat the loss of biodiversity and the deterioration of ecosystems. The establishment of the Natura 2000 network, covering 13 % of Wallonia, is making progress, and nature development programmes (Natural Parks, Municipal nature development programmes, delayed roadside mowing, attics and steeples etc.) have been increasingly successful with municipalities. The new Forestry code for the Walloon Region focuses even more on forestry practices which encourage biodiversity. More and more, agricultural practices also take into account the objective of restoring biodiversity, in particular through agri-environmental measures. Lastly, several LIFE projects, financially supported by the Walloon Region and the European Union, help restore vast areas of damaged semi-natural sites.

Considerable effort still needs to be made, in particular to stop the decline of certain species, prevent the development of invasive exotic species, counter the growth of populations of wild ungulates or reduce the nitrogen enrichment of ecosystems.

FILE	THEME	KEY MESSAGE	EVALUATION
FFH 1	Conservation status of species	32 % of the species studied have been declining in the Walloon Region, and nearly 9 % have disappeared.	
FFH 2	Evolution of wild ungulates	Populations of deer and wild boar continue to rise at a rate of 5 to 7 % a year. This rise may increase the damage caused to forests and crops.	
FFH 3	Invasive exotic species	More than 300 species of invasive exotic ornamental plants are developing spontaneously in the Walloon Region, 9 % of which are included in the black list.	
FFH 4	Nitrogen enrichment of semi-natural ecosystems	In 2005, atmospheric deposits of nitrogen exceeded the critical loads of eutrophying nitrogen for 45 % of forest land and almost all other semi-natural ecosystems.	
FFH 5	Health status of forests	In 2007, nearly 15 % of trees observed were more than 25 % defoliated. Beech is gradually recovering after bouts of bark beetle and drought.	
FFH 6	Natura 2000 network	The Walloon Region has 240 Natura 2000 sites covering 13 % of the Region.	
FFH 7	Protected natural sites	In 2007, 0.6 % of the Walloon Region benefited from a high-protection status. The total land areas covered by protected natural sites went up by just over 300 ha/year between 1990 and 2007.	
FFH 8	Nature development programmes	Around two thirds of Walloon municipalities are involved in 1or 2 nature development programmes.	
FFH 9	Budgets dedicated to nature development	Budgets dedicated to nature development are on the rise (+ 54 % between 2005 and 2008).	

Positive evaluation Neutral evaluation Negative evaluation

→ **PART** [4]

Environment-health relationships

PART [4]
Environment-health relationships

introduction

The quality of the environment is one of the main determining factors in human health. This has been known for a long time in respect of a number of environmental factors, especially those associated with hygiene, working conditions, accidental pollution and food safety.

The steps taken to improve the quality of the environment and the effectiveness of control measures mean that problems of acute toxicity associated with a one-off exposure to massive doses of a particular agent (pathogen, pollutant, radiation, etc.) are no longer the main cause for concern today, but rather the effects of chronic toxicity resulting from continuous or repeated exposure to low doses involving a constantly increasing number of new risk factors.

The effects are difficult to prove: their occurrence is rare, retrospective assessment of the exposure is problematic and the latency periods between exposure and health problems are often very long. Despite their rare occurrence, their impact in terms of pubic health can be very significant, as the size of the population exposed to such risks is generally large. Changes in living, manufacturing, consumption and working conditions have resulted in a massive and rapid spread of exposure to risk.

Alongside these changes, the public perception of environmental health risks has also changed: non-elective risks are becoming less and less socially acceptable; measures are demanded to prevent their effects on life expectancy and quality of life.

Multiple and often uncertain risks, a demanding public, difficulties in communicating on sensitive subjects and uncertainty … the authorities responsible for health and environmental matters face some major challenges. On an international level, various organisations (WHO-Europe, EU, etc.) have been the driving force behind the development of actions in relation to environmental health. In Belgium, a co-operation agreement was signed in 2003 between federal, regional and community authorities on the implementation of a National Environment and Health Action Plan (NEHAP) 2004-2010, under which pilot projects have been initiated linking the federal, regional and community authorities responsible for health and environmental matters. In the Walloon Region, the *Plateforme Environnement-Santé* (PEnSa), which was in operation from 2003 to 2006, proposed a set of appropriate indicators and drew up a regional action list (LARES). The Environment and Health Task Force took over from PEnSa in the handling of isolated environmental health incidents, probably pending the creation of a new structure.

While there are extensive environmental statistics in relation to the Walloon Region and the delay regarding health data acquisition is reducing (cancer register, data on mortality by cause), data on environmental health (exposure, impact) are still scarce. They are generally gathered on an ad hoc basis in relation to time and place and not within the framework of an overall regional environmental health strategy. Certain data available are quoted in this chapter focusing in particular on three priority topics: atmospheric pollution, indoor pollution and chemicals which give cause for concern. Data on noise sources and the effects of noise on health are presented in a last section.

Exposure to tropospheric ozone

Ozone (O_3), the main oxidising gas of photochemical smog, can reach high concentrations in summer. It mainly affects the respiratory system: reduction in lung function, inflammation, aggravation of pre-existing conditions (e.g. asthma), etc. It is thought to be the cause of over 21,000 deaths and 14,000 hospital admissions for respiratory complaints a year in Europe (EU-25).

Health effects: probably non-threshold

The effects of ozone vary depending on the concentration and individual sensitivity. They are exacerbated by effort.

The WHO guideline for ozone concentration in the ambient air is 100 µg/m³ (average over 8 hours), which in theory offers sufficient protection for public health in general, but does not guarantee that sensitive individuals will not be affected: epidemiological studies show that at 100 µg/m³ deaths attributable to ozone are 1 to 2 % higher than the estimated number at 70 µg/m³. Above 160 µg/m³, significant effects are found, even in the case of young adults in good health.

Three regulatory concentrations (directive 2002/3/EC)

- *Target value: 120 µg/m³ as daily maximum of the averages over 8-hour periods. Maximum of 25 days exceeding this level per year on average over three years, from 2010.*
- *Information threshold: 180 µg/m³ in one hour*
- *Alert threshold: 240 µg/m³ in one hour; short-term action plan after three consecutive hours.*

Higher concentrations in rural areas

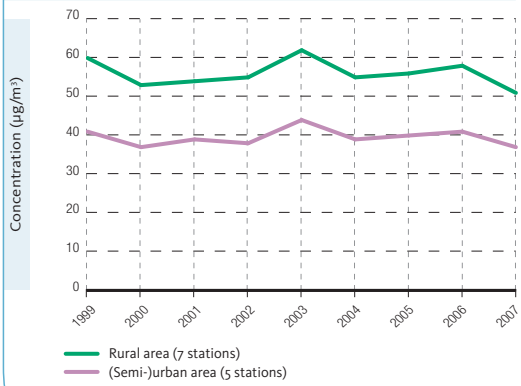
Average background concentrations in the Walloon Region for the period 1999-2007 were 48 µg/m³, with peaks occurring in summer in warm sunny weather with little wind. In exceptional years (e.g. 2003), these could exceed 240 µg/m³. Background concentrations and seasonal peaks are higher in rural areas than in urban areas: the reactions causing the destruction of ozone are less strong owing to lower concentrations of NO (less traffic) and higher concentrations of VOCs (terpenes from vegetation).

Reducing emissions of precursor gases

Directive 2001/81/EC sets targets of reducing European emissions of NO_x and VOCs by 56 % and 61 % respectively compared with 1990 levels. This should reduce ozone levels exceeding 120 µg/m³ by two thirds compared with 1990. Anthropic emissions in the Walloon Region reduced by 26 % in the case of NO_x and by 45 % in the case of VOCs between 1990 and 2005. The Walloon programme for the progressive reduction in emissions of SO_2, NO_x, VOCs and NH_3[1] and the Plan Air Climat[2] should lead to further reductions.

fig HEALTH 1-1

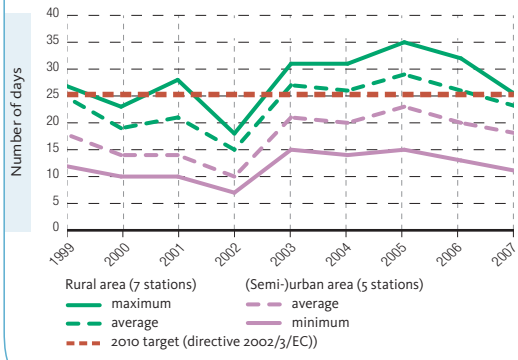
Average annual concentration of tropospheric ozone in the Walloon Region



EOW 2008 – **Source :** ISSeP (telemetric network)

fig HEALTH 1-2

Number of days exceeding the target value of 120 µg/m³ of tropospheric ozone in the Walloon Region – rolling average over three years



EOW 2008 – **Source :** ISSeP (telemetric network)

[1] AGW dated 25/03/04 (transposition of directive 2001/81/EC) [2] http://air.wallonie.be

health 2

Exposure to particulate matter in air

Particulates (PM) vary in size, physical state (solid, liquid) and chemical nature (organic, mineral) depending on their origin. Their oxidising and pro-inflammatory properties affect the cardiovascular and respiratory systems. While individual risks are low, the impact on health is significant given the size of the population exposed.

PM_{10} are particulates with a median aerodynamic diameter of less than 10 µm.

More cardiovascular complaints than respiratory ailments

The smaller the particle size and the higher the concentration of PM, the greater is their impact on health. In the short term, daily mortality increases by around 1% for every 10 µg/m³ increase in PM_{10} concentration, with the effect being more marked in summer than in winter. The elderly and those suffering from cardiopulmonary complaints are the most vulnerable. PM affects the respiratory system (asthma, chronic obstructive bronchopneumopathy) and above all the cardiovascular system (arrhythmia, thrombosis, myocardial infarction) via mechanisms which are beginning to be understood. In the long term, mortality and cardiopulmonary and vascular morbidity (atherosclerosis) are increasing in areas with high levels of PM pollution (urban areas, proximity to major arterial routes, etc.).

Regulatory thresholds exceeded

Although a threshold effect has not been identified, concentration thresholds are set by regulation for PM_{10} (average of 40 µg/(m³.year) and max. 35 days at over 50 µg/(m³.day), directive 1999/30/EC).

Values in excess of these regulatory thresholds remain localised. They are often particularly high at the Marchienne-au-Pont monitoring station, which is affected by industrial emissions. Elsewhere the situation is less concerning, though the concentrations are still too high relative to European targets. There is no significant trend in the pattern of average annual concentrations, with the exception of an increase at Marchienne-au-Pont in 2006 and 2007.

Significant impact on health

The annual mortality rates attributable to chronic exposure to PM_{10} are estimated at 40/100,000 inhab in Charleroi[1], 42/100,000 inhab in Brussels, 57/100,000 inhab in Antwerp and 74/100,000 inhab in Liège[2].

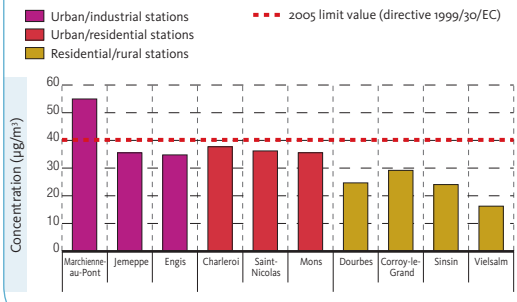
Structural measures required

PM emissions can be reduced on a local scale by targeting action at firms with high emission levels, as was done at Charleroi in 2008.

At a regional level, a reduction in PM concentrations requires structural measures, as over 80 % of the deaths linked to PM are due to chronic exposure. Such measures should target in particular road traffic (diesel engines), a major source of PM, whose immediate effects on the cardio-vascular system have now been demonstrated. The *Plan Air Climat*[3] includes some measures in this direction.

fig HEALTH 2-1

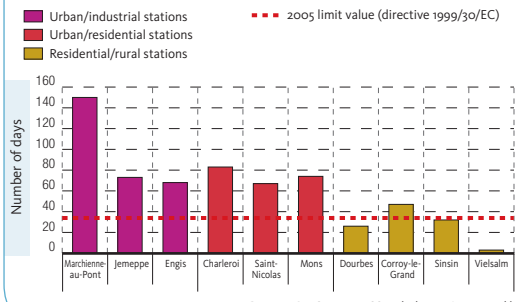
Average annual concentration of PM_{10} in the Walloon Region *(2007)*



EOW 2008 – **Source :** ISSeP (telemetric network)

fig HEALTH 2-2

Number of days exceeding the daily limit value of 50 µg/m³ of PM_{10} in the Walloon Region *(2007)*



EOW 2008 – **Source :** ISSeP (telemetric network)

[1] Versporten *et al.* (2007) [2] Remy & Nawrot (2008) ; http://www.nehap.be [3] http://air.wallonie.be

Health impact of particulates in urban air

According to the WHO, exposure to particulate matter (PM) is said to be responsible for 348,000 premature deaths a year in Europe (EU 25). The impact of PM_{10} on health has been estimated for the first time in the Walloon Region for the Liège agglomeration.

A harmonised European methodology

The APHEIS method for quantifying the impact of atmospheric pollution on health has been applied to over 30 European cities[1]. Using this method, it is possible to estimate, from PM_{10} concentrations and local data on mortality and morbidity, the expected reduction in deaths and hospital admissions following a decrease in PM_{10} concentrations to a given level. The method has been applied to three Belgian agglomerations: Antwerp, Brussels and Liège[2] (2004 data). The results obtained are not to be taken as absolute figures, but as plausible estimates on the basis of current data and knowledge.

Lower PM_{10} concentrations, fewer premature deaths

In 2004, the average PM_{10} concentration in Liège was 38 µg/m³ (population weighted average). According to the estimates, 7.3 % of all deaths in Liège in 2004 were attributable to chronic exposure to PM_{10} concentrations above 20 µg/m³. Keeping PM_{10} concentrations at 20 µg/m³ would have enabled over 300 premature deaths (75 per 100,000 inhabitants) to have been avoided, taking into account the long-term impacts. Concentrations below 20 µg/m³ would have produced further benefits to health.

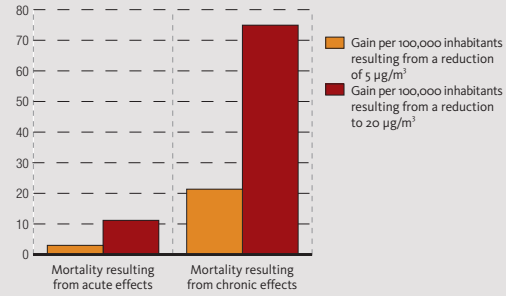
The estimated long-term health impact of PM_{10} concentrations greater than 20 µg/m³ is higher in Liège than in Brussels (42 per 100,000 inhabitants) and Antwerp (58 per 100,000 inhabitants), but close to that in many other European cities.

Measures to reduce emissions

The estimated impacts justify the need to take steps to reduce particulate emissions in urban environments. These measures should aim to reduce emissions throughout the year (chronic exposure) and not just the pollution peaks (acute exposure) against which a Walloon action plan was drawn up in 2008. Many European cities have initiated programmes with this objective, in particular by creating low emission zones with reduced traffic levels. In the Walloon Region, certain measures in the *Plan Air Climat*[3] aim to combat particulate pollution in the urban environment (clean engines, measurement of pollution in the streets, etc.).

fig HEALTH L1-1

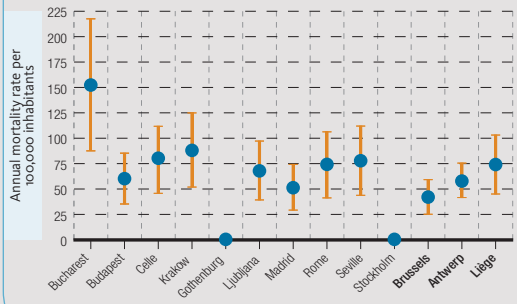
Estimate of the number of avoidable deaths (from all causes) in Liège
following a reduction in PM_{10} concentrations (2004)



EOW 2008 – **Source :** Remy & Nawrot (NEHAP project)

fig HEALTH L1-2

Comparative estimate of the number of avoidable deaths (from all causes) *by a reduction in PM_{10} concentrations to 20 µg/m³*



EOW 2008 – **Sources :** Medina *et al.* (2004); NEHAP

[1] www.apheis.org and www.enhis.org [2] Remy & Nawrot (2008) ; http://www.nehap.be [3] http://air.wallonie.be

Exposure to acidifying pollutants in the air

Sulphur dioxide (SO_2) and nitrogen dioxide (NO_2) are irritant gases essentially emitted as a result of combustion. The concentrations of SO_2 in the air are much less of a cause for concern than in the past. The concentrations of NO_2 are indicative of the levels of atmospheric pollution. Both gases are sources of particulates ($PM_{2.5}$) and NO_2 is an ozone precursor.

SO_2 concentrations higher at Engis

In the past, concentrations of SO_2 in the air had a major impact on health (Meuse Valley, 1930) and remained of concern up to the end of the 1970s. Following a substantial reduction in emissions (switch away from high sulphur fuel, decline in heavy industry), the concentrations measured today at the 16 stations in the monitoring network remain low. European health protection limit values (350 µg/(m³.hour) and 125 µg/(m³.day), directive 1999/30/EC) are only now ever exceeded at Engis, owing to the presence of SO_2-emitting industry and topographical conditions which impede the dispersion of pollutants. The number of exceedings is still below the maximum permitted. On the other hand, the WHO daily guideline (20 µg/(m³.day)) is exceeded 20 to 30 times a year in the Liège and Charleroi basins and on almost one day in two at Engis.

NO_2 concentrations higher at Charleroi

The fall in NO_2 emissions since the 1990's (sector agreements between the Region and industry, change to industrial processes, less polluting vehicles, etc.) has not resulted in an equivalent reduction in NO_2 in the air, due in particular to the interaction between NO and NO_2. European limit values (200 µg/(m³.hour) and 40 µg/(m³.year), directive 1999/30/EC), which are equivalent to the WHO guidelines, are met at all the stations, with the exception of Charleroi. Despite a net improvement since the 1980's, the average annual concentrations have often been slightly above the limit value. Generally NO_2 concentrations are higher in urban than in rural areas.

Long-term health risks difficult to quantify

The risks associated with the presence of SO_2 and NO_2 in the air now relate more to the environment (acidification, eutrophication) than to health. The effects of chronic exposure to SO_2 and NO_2 have not, however, been clearly identified; they are difficult to distinguish from those caused by other atmospheric pollutants resulting from combustion. Moreover, the contribution of SO_2 and NO_2 to the formation of $PM_{2.5}$ should not be ignored.

tab HEALTH 3-1

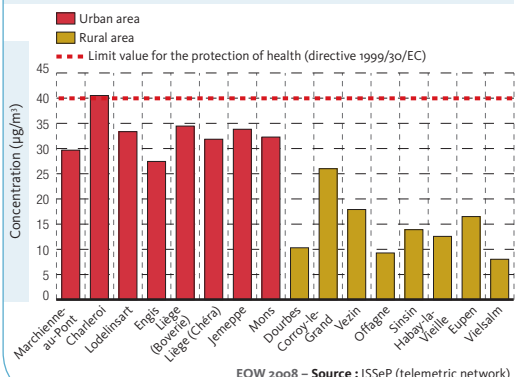
Sulphur dioxide in the ambient air in the Walloon Region. Number of times limit values exceeded in 2007

Station	Directive 1999/30/CE		WHO (2005)
	350 µg/(m³.h)	125 µg/(m³.d)	20 µg/(m³.d)
Marchienne-au-Pont	0	0	11
Charleroi	0	0	19
Lodelinsart	0	0	6
Châtelineau	0	0	8
Engis	5	1	159
Liège (Coronmeuse)	0	0	0
Liège (Chéra)	0	0	25
Mons	0	0	0
Dourbes	0	0	0
Corroy-le-Grand	0	0	0
Sinsin	0	0	0
Habay-la-Vieille	0	0	1
Eupen	0	0	0
Vielsalm	0	0	0
Jemeppe	0	0	14
Saint-Nicolas	0	0	12

EOW 2008 – **Source :** ISSeP (telemetric network)

fig HEALTH 3-1

Nitrogen dioxide average annual concentration in the ambient air in the Walloon Region *(2007)*



EOW 2008 – **Source :** ISSeP (telemetric network)

Exposure to atmospheric micropollutants

The term atmospheric micropollutants covers a wide range of different substances (MTEs, VOCs, PAHs, POPs, etc.), present in very low concentrations in the air. Some are in the gaseous state, others are constituents of particulates (PM). Their toxicity varies widely and is still not well understood in the case of many substances.

Metallic trace elements (MTEs)

The overall concentrations of MTEs measured in the ambient air in the Walloon Region have been decreasing for more than 15 years. With regard to the MTEs of most concern from a health point of view, the following are of note:

- a major reduction in Pb concentrations resulting from a decrease in emissions (unleaded petrol, dedusting of industrial exhaust gases, etc.); the average annual Pb concentrations are universally well below 0.5 µg/m³, which is the limit fixed in directive 1999/30/EC and the WHO guideline figure;
- the low level of average annual Cd concentrations, generally below the detection limit (23 ng/m³), though it is not possible to establish if they comply with the limit value in directive 2004/107/EC and the WHO guideline figure, fixed at 5 ng/m³;
- higher concentrations at stations in industrial zones, Ath (Cd, Pb, Ni), Dampremy (Cd, Cr, Ni), Sclaigneaux (Cd) and Liège-Ile Monsin (As, Cr).

It should be noted that the risks associated with MTEs present in the air are generally indirect: they accumulate in the soil from where they are likely to contaminate the food chain.

Organic micropollutants

With regard to the organic micropollutants of most concern from a health point of view:

- the average annual benzene concentrations were within the limit value of 5 µg/m³ (directive 2000/69/EC) at all measurement stations between 2002 (year of first measurements) and 2007. The levels are higher in areas of high traffic density, in particular Charleroi;
- the average annual concentrations of benzo(a)pyrene (the most toxic PAH) were within the limit value of 1 ng/m³ (directive 2004/107/EC) at all stations in 2007.

It should be noted that the European limit values do not guarantee an absence of health risk from these two carcinogens, which have no effect threshold. In the case of PAHs, food is another major source of exposure.

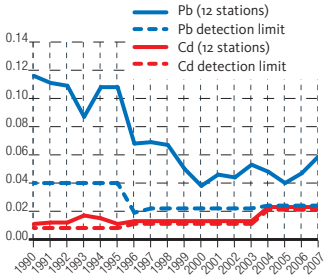
All exposure routes need to be taken into account

In the case of many micropollutants absorbed by the organism through various exposure routes (inhalation of air, ingestion of foodstuffs and dust, etc.), compliance with air quality standards is not sufficient to protect health. The development of human biomonitoring, an integrated measure of exposure from multiple sources and by multiple routes, would be of benefit for those of most concern.

fig HEALTH 4-1

Average annual concentrations of certain micropollutants in the ambient air in the Walloon Region

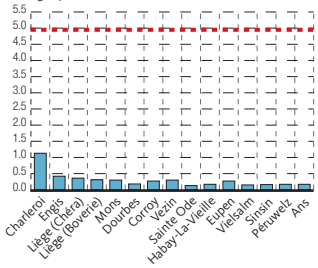
Concentrations of Pb and Cd (particulates) (µg/m³)



EOW 2008 – **Source:** ISSeP (Heavy Metals Network)

Concentration of benzene in 2007 (µg/m³)

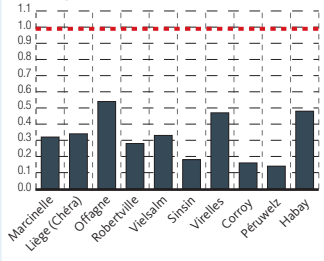
Limit value (directive 2000/69/EC). At this concentration, 3 people in 100,000 risk developing cancer in the case of life-long exposure.



EOW 2008 – **Sources:** ISSeP (VOCs Network); WHO

Concentration of benzo(a)pyrene in 2007 (ng/m³)

Limit value (directive 2004/107/EC). At this concentration, almost 9 people in 100,000 risk developing cancer in the case of life-long exposure.



EOW 2008 – **Sources:** ISSeP (PAHs Network); WHO

Indoor pollution: diagnoses from SAMIs

The majority of the population spend 80 to 95 % of their time in a confined indoor space, the quality of which can be adversely affected by physical factors (damp, mineral fibres, etc.), chemical factors (products of combustion, VOCs, biocides, radon, etc.) or biological factors (mites, moulds, allergens from animals, etc.), which may be harmful to health.

Action by SAMIs on medical prescription

The *Services d'Analyse des Milieux Intérieurs* (SAMIs)[1] are subject to provincial authorities. It is their job, on request from a doctor, to make a visit free of charge to a patient's home, where there is a health problem which may be linked to the home environment. It is not possible to establish the regional status with regard to indoor pollution from the analyses conducted in light of:

- the bias introduced by the fact that SAMI only act on a doctor's prescription;
- the lack of harmonisation of the data collected by different SAMIs.

The analyses do, however, provide an indication of the main ailments and their causes.

Respiratory complaints and biological factors predominate

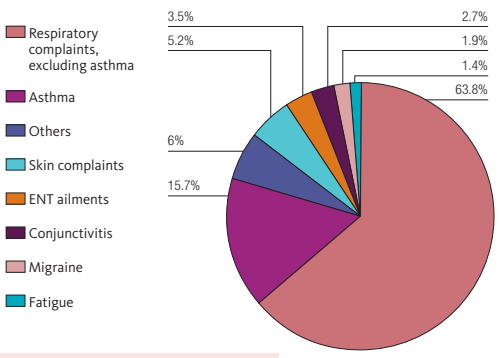
According to data from the SAMI for Liège Province (825 home visits between 1999 and 2007), 83 % of the illnesses observed were respiratory complaints (including asthma and ENT ailments). In 82 % of cases, moulds and mites were found to be responsible. Where SAMI's advice was followed, the measures implemented resulted in a complete improvement in the state of health in 28 % of cases, a partial improvement in 59 % of cases and no improvement in 13 % of cases.

Steps to improve the quality of indoor environments

The criteria for a healthy home environment have recently been strengthened, particularly with respect to CO, asbestos, moulds, lead and radon (AGW dated 30/08/07). Furthermore, two studies launched in 2008 are expected to improve understanding of the problems of pollution in buildings occupied by children: one relating to nurseries is being conducted at federal level in the NEHAP[2] framework, and the other is a regional study relating to the primary schools in the Province of Luxembourg. The aims of these studies are awareness and prevention. Finally the Walloon Region is supporting a project to train people providing assistance in the home (home helps, health visitors, nurses, etc.) in the problems of indoor pollution[3].

fig HEALTH 5-1

Illnesses observed by the SAMI of the Province of Liège
(1/10/99-31/12/07)

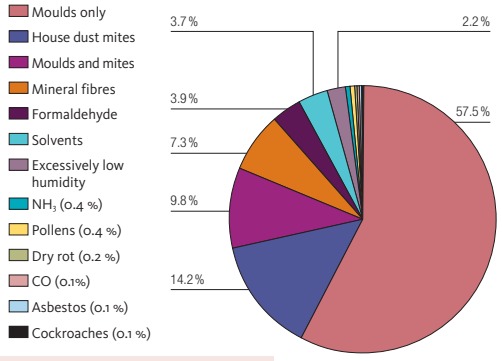


Total number of illnesses observed = 867

EOW 2008 – **Source:** SAMI-Liège

fig HEALTH 5-2

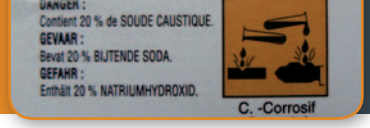
Causes observed by the SAMI of the Province of Liège
(1/10/99-31/12/07)



Total number of causes observed = 936

EOW 2008 – **Source:** SAMI-Liège

[1] www.sami.be [2] www.nehap.be [3] www.espace-environnement.be



health 6

Persistent organic pollutants in breast milk

Persistent organic pollutants (POPs) are resistant to degradation and liposoluble. They accumulate in the fatty tissue of living organisms. They are established or supposed toxics. The high lipid content of breast milk and the ease of sampling make it an excellent indicator of exposure.

Fourth WHO campaign

Four international measurement campaigns (WHO) in relation to the POPs content of breast milk have been conducted over 20 years. The concentrations measured cannot be directly interpreted in terms of potential effects on health, but they do enable assessments to be made of the effectiveness of measures taken to reduce POPs concentrations in the environment.

2006 campaign in Belgium

- *Sample: 197 mothers aged between 18 and 30 from the three Regions of the country*
- *Analysis: pesticides, PCBs, dioxins and furans, flame retardants, perfluorinated compounds, triclosan, musk.*

Encouraging results, but substances to watch

The results obtained in Belgium do not call into question the benefits of breast-feeding. They show that the ban or restrictions on POPs are having an effect: the amounts of PCBs, dioxins and furans in breast milk are decreasing and most of the organochlorine pesticides banned 20 to 30 years ago are scarcely found at all now. On the other hand, there are some substances which are clearly present in most of the samples:

- substances now banned: p'-DDE (a metabolite of DDT), hexachlorobenzene, PCB; it is necessary to assess whether their persistence results from greater resistance to degradation or to the continued existence of unknown sources of exposure;
- dioxins and furans, never intentionally produced but emitted into the environment following combustion;
- substances found in numerous consumer goods: flame retardants (PBDEs and HBDC), musk xylene; the risk to health from these substances is not certain and they should be monitored.

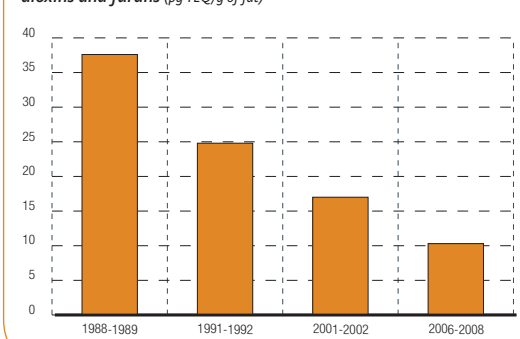
Age is the variable which best explains the differences between samples. This is due to the fact that POPs are bioaccumulable.

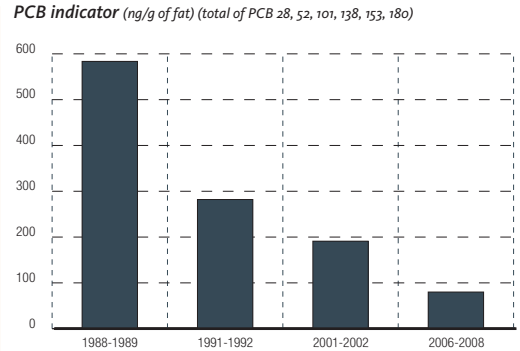
Controlling POPs on an international level

The results obtained will enable Belgium to draw up a plan to implement the Stockholm Convention(1) on POPs (2001, signed by 152 countries). In addition, the REACH(2) regulation requires authorisation for the use of persistent, bioaccumulable and toxic substances. This will only be granted if there is no substitute and if the socio-economic benefits of the product outweigh the risks to health and the environment.

fig HEALTH 6-1

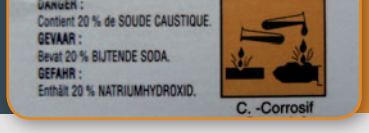
Average POPs concentrations measured in breast milk in Belgium during the 4 WHO campaigns





EOW 2008 – **Source:** NEHAP

(1) http://chm.pops.int (2) http://ec.europa.eu/environment/chemicals



Quality of vegetable gardens in Marchienne-au-Pont

A study under the name LEGUMAP(1) was conducted into the quality of vegetable gardens in Marchienne-au-Pont in 2008. The risks to health are low, but sufficient to justify measures being taken in some gardens to reduce exposure to a number of pollutants, which are basically a legacy of the region's industrial past and which are deposited from the atmosphere.

LEGUMAP study:

- *Samples from 81 vegetable gardens in the vicinity of the Marchienne-au-Pont steel works and from 9 control vegetable gardens;*
- *10,000 analyses: primarily for MTEs (As, Cd, Cr, Cu, Hg, Ni, Pb, Zn) and PAHs present in the vegetables (potatoes, carrots, lettuce, green beans and courgettes), the soil and the water used for watering (water from wells or rain water).*

Normal amount exceeded in the case of certain pollutants

In some varieties of vegetables, the concentrations of Pb, Cd, Zn and PAHs exceed the normal natural contents. The concentrations of Pb, Cd, Zn, Cu and PAHs in the soil are higher than the background concentrations to be expected in the absence of local pollution and atmospheric pollution in the vicinity. In the case of rain water, slight anomalies were found for Zn and Cu.

Limited risks to health

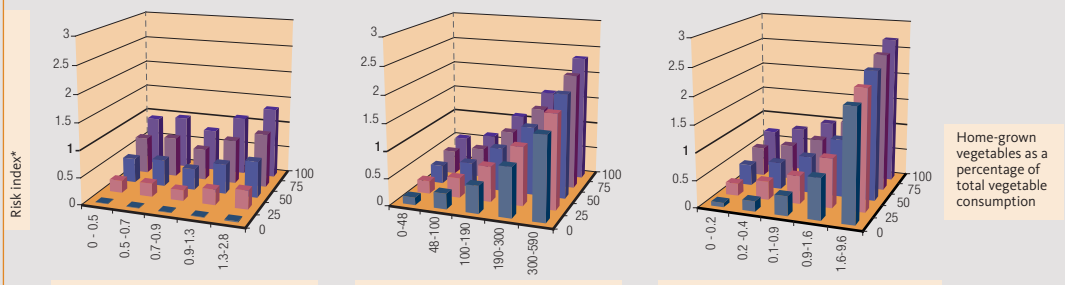
Modelling of the results in terms of risks(2) indicates that only the presence of Cd, Pb and benzo(a)pyrene (B(a)P) would create a health risk from eating vegetables from the garden or from the accidental ingestion of soil, especially by young children. In the case of risk index values greater than 1, it is recommended that steps be taken to reduce the risk of the ingestion of pollutants through vegetables (wash and peel vegetables, avoid to recycle garden waste, etc.) or contact with the soil (do not let children play on bare soil, wash hands after working in soil and before meals, prevent particles of soil being brought into the house on shoes or by pets, etc.).

Traces of past activities

The pollutants found are above all a legacy of the region's industrial past. The steel works at Marchienne-au-Pont remain a source of dust emissions containing metals and PAHs. The speed with which these dusts are deposited on the ground depends on their size, the direction and strength of the wind and the amount of precipitation. Other factors may have contributed to the enhanced levels of metals and PAHs in garden soil: fertiliser (composted waste), the treatment of vegetables (Bordeaux mixture), deposits from traffic and domestic heating systems, domestic waste incineration and the spreading of ash as fertiliser.

fig HEALTH L2-1

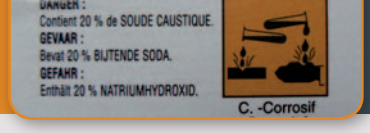
Health risks from the presence of cadmium (Cd), lead (Pb) and benzo(a)pyrene (B(a)P) in the vegetable gardens studied in Marchienne-au-Pont



**The risk index is the ratio of the estimated dose to the toxicological reference value. Risks are commonly accepted when the risk index is lower than 1.*

EOW 2008 – **Source:** SPAQuE

(1) Study requested by local residents: SPAQuE (2008) (2) *RISC Human* exposure model



Quality of home-produced eggs

There are no controls on the food safety of home-produced eggs. In 2008, the Belgian study CONTEGG[1] confirmed the presence of organic and inorganic pollutants in such products. Regular consumption could result in the toxicological reference doses for certain pollutants being exceeded.

CONTEGG study:

- *Samples of eggs, soil, food and faeces from 59 domestic hen-houses in different types of environment in each of the country's provinces*
- *Analysis of organic pollutants (dioxins, PCBs, PAHs, pesticides, brominated flame retardants, perfluorinated compounds, mycotoxins) and MTEs (As, Cd, Co, Cu, Hg, Mn, Mo, Ni, Pb, Sb, Se, Tl, Zn).*

Many metals, too many dioxins

The total intake of metallic trace elements (MTEs) following the consumption of home-produced eggs remains below the toxicological reference values, despite the higher concentrations in these eggs (by up to a factor of 7 in the case of Pb) compared with commercially produced eggs.

In the case of dioxins, however, the intake from the diet as a whole is already thought to exceed the toxicological reference value in the case of half the Belgian population. Against this background, the consumption of home-produced eggs, which would increase the dioxin intake by almost 20% compared with commercially produced eggs, is likely to increase the number of people falling into this category.

Contamination from ingestion of soil

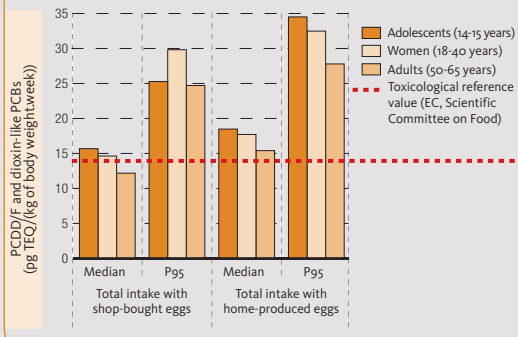
The ingestion of particles of soil by the hens (geophagy) is the main route by which eggs become contaminated with dioxins. These come primarily from atmospheric deposits resulting from human activity (industry, domestic heating, waste incineration). Because of their persistence, they are still present in the soil despite the reduction in emissions over the last 15 to 20 years.

Simple and cheap solutions

Dioxins have immunosuppressive, neurotoxic, hepatotoxic and carcinogenic properties and may harm the endocrine and reproductive systems. Since the end of the 1980's, the reduction in emissions has resulted in a drop of around 50 % in the amount of dioxins in the bodies of the populations of the industrialised countries. Certain locally produced foods, such as home-produced eggs, remain a route by which over-exposure can occur. The dioxin content of such eggs can be reduced by decreasing geophagy, e.g. by increasing the space available per hen (in order to allow a cover of vegetation to grow), putting down solid flooring in the hen house or feeding the hens in the hen house.

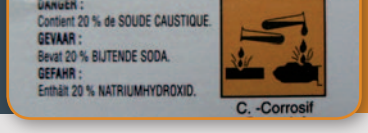
fig HEALTH L3-1

Estimated intake of dioxins, furans and dioxin-like PCBs through the diet as a whole in Belgium
shop-bought or home-produced eggs



EOW 2008 – **Source:** CONTEGG

[1] WIV-ISP, CODA-CERVA, Antwerp University, CART-University of Liège, Ghent University (2008)



Lead and cadmium content in the blood of adolescents

Heavy metals occur naturally in the environment, generally in low concentrations. The widespread and local pollutions found today are largely the result of human activity. Despite the significant decrease in emissions in the last 15 to 20 years, these pollutants persist in the soils and sediments, from where they may contaminate the food chains.

Absorption mainly by ingestion

Pb and Cd pollutions are widespread in Wallonia. It is largely a legacy of the past: mining and processing of non-ferrous metals, iron and steel industry, coking plants, gasworks, use of leaded petrol, lead pipes, old paint and pigments, etc. Apart from exposure at work, these metals are mainly absorbed through the digestive system, in food or by the tendency of young children to put everything in their mouths. Pb and Cd do not have any role in the metabolism of living organisms and are toxic in very low concentrations. Measurement of their concentration in the blood is an appropriate indicator of exposure.

Concentrations in the blood are low and decreasing

Under the framework of the European Phime[1] project, concentrations of Pb and Cd were measured in the blood of 797 adolescents living in Bastogne, Lessines and Louvain-La-Neuve in 2007. The concentrations found were in line with those expected for healthy subjects with low levels of exposure. As an indication, they were equivalent to the amounts measured in Flanders in the least affected zone (Sud-Limbourg) of the eight zones studied under the *Vlaams Humaan Biomonitoringsprogramma 2002-2006* (Pb = 15.2 µg/l, Cd = 0.16 µg/l).

The Pb and Cd in the blood have decreased in Belgium by at least 50% over the last ten years. At the end of the 1990s, the Pb and Cd concentrations in the blood of the adolescents monitored were of the order of 35 µg/l and 0.45 µg/l. These reductions should be seen in the context of the disappearance of the use of lead in the home (paint, plumbing, etc.) and the decrease in pollutant emissions over the last 15 to 20 years.

The results also show that there is a positive correlation between blood lead and the fact that the house was built before 1950 and a negative correlation with the parents' education level, a likely indicator of the quality of the home or the environment. There is a positive correlation between Cd in the blood and age and active smoking, and a negative correlation with the parents' education level.

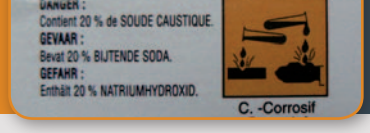
fig HEALTH L4-1

Lead and cadmium: exposure, effects, internal toxicity thresholds and concentrations measured in the blood of adolescents from Wallonia under the framework of the European Phime project.

	Exposure	Main effects	Toxicity thresholds	Concentrations in the blood
Lead	**Absorption through the digestive system** (predominant route in the general population) - foodstuffs (water, milk, drinks) - flakes of old paint - household dust - soil dust/ particles	Neurological, haematological (anaemia) and renal problems. In children: problems with psycho-motor and intellectual development, neuro-behavioural problems and growth problems (saturnism).	Neurological effects in children at blood lead concentrations of below 100 µg/l, without it being possible to identify a threshold. Other effects: generally above 100 µg/l.	Boys (15 years, n=364) **17.4 µg/l** (14.0-21.1) Girls (15 years, n=433) **13.4 µg/l** (10.7-17.2) (Lessines, Bastogne, Louvain-La-Neuve, 2007)
	Absorption through the lungs - exposure at work - atmospheric discharge			
Cadmium	**Absorption through the digestive system** (predominant route in the general population) - foodstuffs (leafy vegetables, fish, seafood, game liver and kidney) - soil dust/ particles	Irreversible damage to kidney function, bone damage	Limit on exposure at work set at a cadmium concentration in the blood of 5 µg/l, with no effects on health expected below 10 µg/l.	Boys (15 years, n=433) **0.18 µg/l** (0.14-0.28) Girls (15 years, n=433) **0.18 µg/l** (0.14-0.29) (Lessines, Bastogne, Louvain-La-Neuve, 2007)
	Absorption through the lungs - exposure at work - atmospheric discharge - tobacco	Lung and prostate cancers (especially in the case of exposure at work).		

EOW 2008 – **Sources :** INERIS; Cd and Pb in the blood: A. Bernard, UCL (Catholic University of Louvain) – Faculty of Medicine

[1] *Public health impact of long-term, low-level mixed element exposure in susceptible population strata*



Chlorinated swimming pools: a risk factor in the development of allergies

The majority of swimming pools are disinfected with chlorine. According to a number of studies conducted in Wallonia and abroad, exposure to the by-products of chlorination during swimming is a risk factor in the development of various allergic reactions. It has even been suggested as a hypothesis to explain the rise in ailments of this type in western countries.

Powerful oxidising agents

The by-products of chlorination, inhaled in the form of gases or aerosols, include powerful oxidising agents which damage the epithelium of the respiratory tracts and make it more sensitive to the allergens present in the air.

Increased risk for susceptible subjects

A study of 847 adolescents in Wallonia[1] showed a link between an increase in the prevalence of asthma, hay fever and allergic rhinitis and visits to chlorinated swimming pools.

This effect was found for both indoor and outdoor swimming pools, but only in the case of subjects predisposed to (atopic) allergic reactions, whether they were susceptible to allergens present in the air (37 % of those in the study) or had IgE serum antibodies concentrations above 25 kUI/l (66 % of those in the study). The effect was found whether or not there was a family history of allergy.

The risk of diagnosed asthma is multiplied by a factor of 10 in atopic subjects who have spent over 1,000 hours in swimming pools. In contrast, in the case of swimming pools disinfected by Cu-Ag ionisation, the risk is reduced by a factor of 4 in the case of asthma and by a factor of 2 in the case of hay fever and allergic rhinitis (risk compared to the general population).

Reducing exposure to the by-products of chlorination

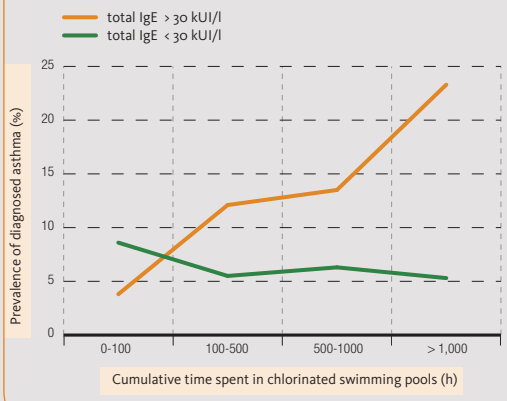
Swimming has real benefits and it is essential to disinfect the water. The risks associated with exposure to the by-products of chlorination can be reduced by:

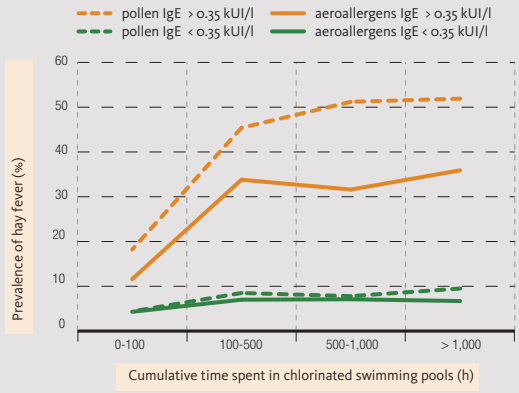
- → stricter standards and monitoring of water and air quality in public swimming pools;
- → sensible use of disinfectants in private swimming pools;
- → the use of alternative disinfection methods.

Making these changes in public pools and raising awareness among the owners of private swimming pools will take time. In the meantime, caution is advised with regard to swimming pools where there is a very strong smell of chlorine, particularly in the case of young children.

fig HEALTH L5-1

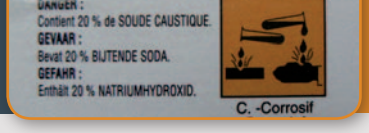
Prevalence of diagnosed asthma and hay fever among adolescents in Wallonia as a function of the cumulative time spent in chlorinated swimming pools.





EOW 2008 – **Source :** A. Bernard, UCL (Catholic University of Louvain) – Faculty of Medicine

[1] Bernard *et al.* (2008)



Health risks from chemicals as defined in REACH

The REACH regulation on chemical substances, which came into force on 1 June 2007, is a key event in the protection of the environment at a European level. Its aim in particular is to protect human health by putting in place a risk assessment and management system.

"No data, no market"

All chemicals produced or imported in quantities greater than 1 t/year per manufacturer or importer, i.e. around 1/3 of the 100,000 substances sold in Europe today, must be registered. Registration involves the gathering of characteristic data of each substance; the level of information required increases with the volume manufactured or imported.

Risks assessed in detail for a limited number of substances

To comply with REACH, a Chemical Safety Report based on a detailed risk assessment is only required for substances manufactured/imported in quantities greater than 10 t/year, i.e. around 1/10 of the 100,000 substances sold today. The risks to human health are assessed for exposure scenarios corresponding to the manufacturing process and to all identified uses of the substance. This assessment leads to an estimate of the maximum acceptable exposure levels for human health (DNEL, Derived No Effect level), taking into account the relevant exposure routes, duration and frequency and the populations in question (workers, consumers or vulnerable target groups).

Full knowledge of the risks associated with chemicals is impossible

The chronic risks resulting from repeated exposure to low doses are still difficult to measure using toxicity tests. On the other hand, there are still no standardised tests for assessing certain types of effect, e.g. effects on the endocrine system. Moreover, the assessments cannot take into account the interactions (synergy, antagonistic) between a number of substances within the organism; the combinations of substances and their metabolites or degradation products are innumerable.

A decisive step in the right direction

With regard to health risks, REACH should between now and 2018 progressively provide:

- a reduction in uncertainty surrounding a huge number of data;
- an improvement in the dissemination of information on risks (labelling, safety data sheets, etc.), ensuring better protection in the case of occupational exposure;
- encouragement to seek alternatives in the case of substances of concern.

fig HEALTH L6-1

Toxicity data required by REACH as a function of the volumes of chemical substances manufactured or imported

	REACH requirements in terms of toxicity data					
	< 1 t/year	1 - 10 t/year		10 - 100 t/year	100 - 1000 t/year	> 1000 t/year
Type of toxicity		not of concern*	of concern*			
Acute toxicity	-	-	Annex VII	Annexes VII and VIII	Annexes VII, VIII and IX	Annexes VII, VIII, IX and X
Irritation of the skin or eyes	-	-	Annex VII	Annexes VII and VIII	Annexes VII, VIII and IX	Annexes VII, VIII, IX and X
Sensitisation of the skin	-	-	Annex VII	Annexes VII and VIII	Annexes VII, VIII and IX	Annexes VII, VIII, IX and X
Toxicity of repeated doses	-	-	-	Annexes VII and VIII	Annexes VII, VIII and IX	Annexes VII, VIII, IX and X
Genotoxicity	-	-	Annex VII	Annexes VII and VIII	Annexes VII, VIII and IX	Annexes VII, VIII, IX and X
Carcinogenicity	-	-	-	-	-	Annexes VII, VIII, IX and X
Toxicity for reproduction and growth	-	-	-		Annexes VII, VIII and IX	Annexes VII, VIII, IX and X

* "of concern" means potentially CMRs, PBTs, or vPvBs or potentially dangerous as defined in directive 67/548/EC

EOW 2008 – **Source :** Regulation (EC) no. 1907/2006 (REACH)

noise 1

Sources of road traffic noise

Today almost everyone is exposed intermittently or regularly to high levels of noise, of which road traffic is one of the main sources. Vehicle traffic increases ambient noise and may have adverse effects on health, depending on the individual and the conditions in which it is experienced.

Traffic in excess of 18 million vehicles a year

Road traffic surveys show a higher traffic intensity in the north of the Walloon Region. A large part of the motorway network near the Sambre-and-Meuse river line and around Brussels carries over 18 million vehicles a year (E19, E411 and E40). Moreover, the number of noisy sitesremains high. In 2007, some 375 sites were identified as priorities in terms of noise abatement, mainly in areas of high population density.

Increasing traffic concentration and density

Noise pollution is a function of a number of factors:

- ➜ traffic density and speed;
- ➜ distance from the source;
- ➜ weather conditions.

Although advances in technology have reduced vehicle engine noise (sound insulation) and road noise (contact between the tyres and the road surface), overall noise levels have probably not declined, owing to the constant increase in the volume of traffic on the road network in Wallonia.

Various measures underway or in prospect

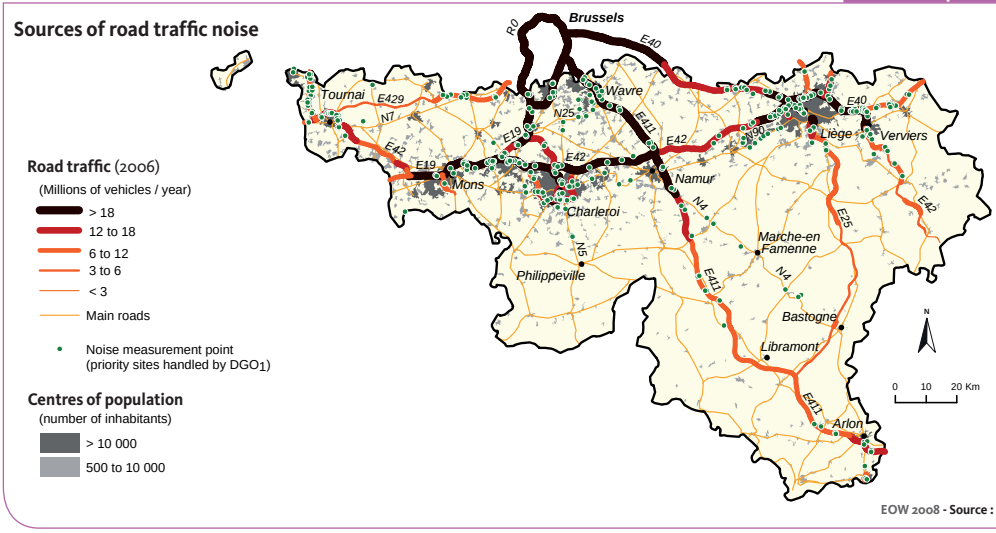
Various steps are already being taken to reduce road traffic noise, including:

- ➜ improvements to road surfaces;
- ➜ infrastructure measures (roundabouts, traffic calming, etc.);
- ➜ noise barriers (panels, earth mounds, vegetation barriers, etc.).

Noise produced by road traffic is also the target of directive 2002/49/EC, which requires noise level maps to be produced, population exposure levels to be calculated, noise reduction action plans to be adopted and quiet zones to be preserved. The first maps will be available at the end of 2008. The reduction of noise at source and exposure thereto may also be achieved through an indirect approach, in particular land use management (housing management, location of population centres, road surface type, etc.) or traffic management (traffic plans, driving styles, etc.).

map NOISE 1-1

Sources of road traffic noise



EOW 2008 - **Source :** SPW - DGO$_1$

noise 2

Sources of air traffic noise

Noise levels around airport sites are particularly high (often in excess of 100 dB), acute and repetitive. Aircraft noise is, therefore, a significant problem in terms of the health and quality of life of local residents.

Increasing problems as traffic grows

Air traffic noise in the Walloon Region mainly affects the municipalities in the vicinity of Liège Airport and Charleroi Brussels South airport, where noise has increased with the progressive increase in traffic. Residents may also suffer problems near public aerodromes (Spa, St.-Hubert), private aerodromes (Namur, St.-Ghislain, etc.), airsports sites (microlights, etc.) and military training sites (aircraft, helicopters, etc.).

Between 1988 and 2007, the number of aircraft movements (total number of take-offs and landings) increased from 22,500 to 46,230 at Liège Airport (+ 106 %) and from 38,000 to 70,700 at Charleroi Brussels South (+ 86 %). In its *Déclaration de politique régionale 2004-2007*, the Walloon government backed the operation of the economic poles represented by these two sites (trade in goods, logistics centres, transport companies, tourist travel, multimodal transport), while at the same time taking steps to preserve the quality of life of local residents.

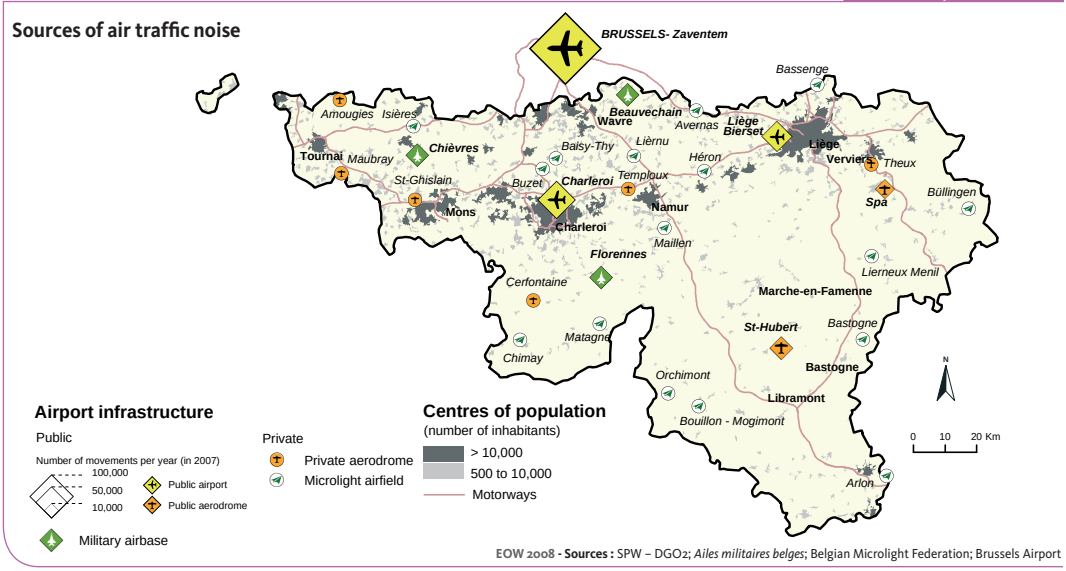
Noise exposure plans

In 2004, the Walloon Region adopted Noise exposure plans and Long-term development plans. These establish terms for monitoring environmental noise and identify noise exposure zones and the relevant accompanying measures. The total budget is around 500 million euros over 10 years(1). The compensation measures relate to:

- the repurchase of buildings;
- grants for noise insulation work;
- relocation grants for tenants;
- indemnification for commercial or professional disruption.

The airport sites are also the target of directive 2002/49/EC, which requires the production of noise level maps and action plans for the reduction of exposure to noise and the preservation of quiet zones. Only airports recording over 50,000 movements a year (except training flights lighter than 5.7 t) are targeted in the first tranche (2007). The Walloon airports are not affected.

map NOISE 2-1



EOW 2008 - **Sources :** SPW – DGO2; *Ailes militaires belges*; Belgian Microlight Federation; Brussels Airport

(1) www.acnaw.be and www.sowaer.be

noise 3

Sources of rail traffic noise

Train noise is short and repetitive. Most studies show that residents adjust more easily to it than to the noise from air or road traffic. Rail traffic is nevertheless a source of noise pollution and inconvenience for a section of the population.

Over 60,000 trains a year on 130 km of network

The highest volume of traffic is on lines which cross and link the large agglomerations, and those going into Brussels. Some 130 km of track (out of a total of 1,650 km in Wallonia) carries over 60,000 trains a year. This is the case in particular between Charleroi and Namur, between Brussels and Braine-l'Alleud or Ottignies and in the agglomerations of Mons, Charleroi and Liège. Almost 780 km of track carries between 30,000 and 60,000 trains a year. The remaining 45 % of the rail network carries less than 30,000 trains a year (lines providing a local service).

Increase in train use

Although trains are much less popular than road transport, rail traffic is growing in absolute terms, by 37 % between 1995 and 2006 in the case of passenger transport and 13 % in the case of freight. Incentives to travel by train (reimbursement of season tickets, increase in station car park spaces, etc.), constraints on road transport (traffic jams, fuel prices, etc.) and the increase in trade within Europe have all resulted in a rise in train movements and consequently in greater noise emissions.

Noise reduction

Reduction in the noise problems caused by rail traffic relies mainly on advances in technology: reduction in the noise produced by the rolling stock, improvement in the rails, installation of noise barriers, etc. According to the SNCB annual report for 2006, 82 % of the budget was spent on rolling stock, including the purchase of new engines and carriages (new rolling stock being expected less noisy). Track operation and maintenance and the installation of noise barriers are the responsibility of Infrabel. Noise produced by railway traffic is also the target of directive 2002/49/EC, which requires the production of noise maps (noise levels and calculations of population exposure levels) and the adoption of action plans (noise abatement, preservation of quiet zones, etc.). The first maps will be available at the end of 2008.

map NOISE 3-1

Sources of rail traffic noise

EOW 2008 - **Source :** SNCB - Holding

noise L1

Effects of noise on health

Exposure to noise has adverse effects on quality of life (stress, disruption to communication and sleep, loss of concentration, neighbourhood conflicts, etc.) and may cause various health problems (anxiety, hearing loss, cardiovascular risk, etc.).

Subjective and objective effects

Up to noise levels of 70 to 80 dB, the perceived discomfort depends on the situation (distraction, discussion, concentration, desire for sleep, etc.) and personal factors (acceptance of noise in the street, neighbourhood, etc.). Physical parameters also play a part in the perception of noise (distance from the source, nature of the source, intensity and frequency of the noise, etc.). The objective threshold for a risk to human health is around 85 dB. Above that level, irreversible damage may occur, such as lesions to the auditory system. People who are particularly sensitive may experience health problems at levels below 85 dB following stress, anxiety or lack of sleep, especially in the case of a relatively constant, ambient noise.

Effects on the cardio-vascular system

There are various studies which provide a quantitative analysis of damage to health caused by noise. Overall, exposure to high noise levels causes an increase in risk to the cardio-vascular system in a certain section of the population. In many cases, however, no links have been prooved between cause and effect. New studies are, therefore, required in order to increase knowledge in this field.

tab NOISE L1-1

Results of studies of the effects of noise on health

Noise source	Sample	Scale/ location	Results of study	Reference
Road traffic	667 inhabitants	Sweden	In people exposed to levels between 45 and 65 dB the risk of hypertension increases by 38 % on average for each 5 dB increase. The risk reaches 71 % in women and 93 % in men if exposure lasts for longer than 10 years	Bluhm *et al.* (2007)
Road traffic	41,000 inhabitants	Groningen (NL)	31 % increase in the consumption of hypotensive drugs for a 10 dB increase in ambient noise	de Kluizenaar *et al.* (2007)
Road traffic		Germany	Chronic exposure to noise is said to be responsible for 3 % of ischemic cardiac disease	WHO (2007)
Air traffic	140 persons	4 large European airports, including Heathrow (London)	Increase in blood pressure during sleep if the noise exceeds 35 dB	Haralabidis *et al.* (2008)
Urban noise	4,391 patients	Ile-de-France Region	Women aged 15 to 39: anxiety increased by a factor of 3 if living close to a railway line. Men aged 40 to 69: 6 times more likely to take hypotensive drugs if aeroplanes fly over the house at less than 1,000 m	Cohen (2007)

conclusion

A sound environment is essential to health and well-being. This has been known since ancient times, but the links between the environment and health are difficult to describe for a number of reasons: multiplicity of factors involved (exposure factors, individual factors, etc.), non-specific effects, multifactorial causes, long latency period, low individual chronic risks which can only be identified in a very large population, etc.

Moreover, neither health nor environmental statistics are good indicators of environmental health, for the following reasons in particular:

- Environmental statistics are subdivided (air, water, soils, etc.) and do not allow an integrated assessment of exposure sources and routes. They provide only very indirect information on internal exposure, i.e. the dose finally entering the organism;
- Traditional health statistics (mortality, morbidity) are not generally gathered for epidemiological use, but more for budget or administrative purposes. Furthermore, they are not sufficient to describe a state of health, as they are not adequate to assess quality of life, an integral element in environmental health as defined by the WHO.

Despite these difficulties and areas of uncertainty, the data available are used to try to assess the magnitude or progression of the (potential) effects of certain environmental factors on health. Often it is the case of concentrations of pollutants in the environment, which are used to estimate exposure, with varying degrees of accuracy depending on the pollutants in question and the location of the measurement points. Less common is the measurement of concentrations in the organism (biomonitoring) or of data relating to the effects of certain factors.

Significant effects of atmospheric pollution on health

Particulates (PM) are among the atmospheric pollutants which represent the greatest cause for concern. A comparison of the concentration of these against air quality standards based on the safeguarding of health offers a means of assessing risk. Without calling into question the practical value of such standards in monitoring environmental quality, it should, however, be stressed that they cannot be the only criterion used in assessing health risks for decision-making purposes, in particular because of the hypotheses adopted in calculating them. In this context, quantification of the impact on health can provide some clarification. Such impact can be quantified for PM and ozone, using e.g. the APHEIS methodology, a harmonised approach applied to a number of European cities. According to this approach, over 1,200 deaths could have been prevented if the average concentrations of PM_{10} in Brussels, Antwerp and Liège in 2004 had been kept below 20 $\mu g/m^3$.

Environmental quality in buildings: biological factors in the forefront

There are many sources of environmental pollution in buildings involving chemical factors (products of combustion, VOCs, biocides, flame retardants, phthalates, perfluorinated compounds, lead, asbestos and mineral fibres, radon, etc.), physical factors (electromagnetic fields) and biological factors (mites, moulds, legionella, etc.). Data from the *Services d'Analyse des Milieux Intérieurs* (SAMIs) show that over 80 % of diseases encountered in the Walloon Region are respiratory ailments and over 80 % of the causes are biological factors (moulds and mites). These data cannot be used to establish the regional position with regard to the problems of pollution in buildings, but they do underline the importance of the criteria for a healthy home environment, which have recently been strengthened (AGW dated 30/08/07). The criteria for a healthy home environment now exclude from the home CO, asbestos, moulds recognised as harmful to health (or any type of mould over an area of more than 1 m^2), lead and radon, at levels still to be specified (ministerial order planned for early 2009).

Hen houses, vegetable gardens and the risk of over-exposure to certain pollutants

Atmospheric deposits result in diffuse soil contamination. This is the cause among others of the presence of POPs and metallic trace elements (MTEs) in eggs from free range hens, as the CONTEGG study conducted in the three Regions of the country demonstrates. The risk of eggs containing elevated levels of POPs and MTEs is associated above all with farming practices, rather than with an emission source in the vicinity.

A few simple, low-cost measures can reduce this risk: for example maintaining a cover of vegetation over the ground where the hens are kept, or feeding them inside the hen house.

POPs and MTEs can also affect vegetables from the garden, as the LEGUMAP study conducted in Marchienne-au-Pont demonstrated. Here too, simple measures can be employed to reduce the risk of contamination: washing and peeling vegetables, applying organic improvers to the soil, choosing vegetables in which the pollutants in question do not accumulate, avoiding in bringing particles of soil into the house, etc.

These studies add to others (biomonitoring in the area surrounding the Thumaide incinerator (Fierens *et al.*, 2005), sperm quality associated with the consumption of garden vegetables in Flanders (Dhhoge *et al.*, 2007) for example) to underline the role played by the consumption of "home-grown" produce in over-exposure to certain pollutants. Unlike the products sold in shops, these are not subject to any controls. Nevertheless, it should be noted that the presence of pollutants in vegetables and eggs, provided they remain within the limits derived from the toxicological reference values, is certainly not a sufficient reason for ceasing to keep hens or grow vegetables; these activities in fact have a number of associated health benefits: the physical exercise and mental stability associated with gardening or keeping animals, the pleasure derived from eating one's own produce or from its distinctive taste, the forging of social links, etc.

Chlorinated swimming pools: risks wrongly perceived as low

There is often a disconnect between the importance the population, the media or the politicians attach to certain risks and that which would logically appear evident from the scientific data available. This is the difference between "subjective risks" or "perceived risks" and "objective risks".

The case of chlorinated swimming pools is a good illustration of this discrepancy. The strong relationship between exposure and effect, documented in numerous international publications, is not sufficient to call into question a process which has for many decades represented a satisfactory means of disinfecting water. Typically this is a familiar risk to which we have been exposed from a very young age, the effects of which are not feared and are socially acceptable, as they can be treated clinically and are not (allergic reactions) or no longer (asthma) life threatening. The effects are also not very specific, which makes it difficult for people affected to identify a link between cause and effect.

Exposure to chlorinated swimming pools does, however, affect a sizeable population, especially children: swimming lessons have long been part of the education programme and the number of private swimming pools has been increasing sharply for some years. The number of people exposed, together with the strong exposure-effect relationship and the costs of treatment of the ailments in question (asthma in particular), should lead the authorities to consider chlorinated swimming pools as a genuine public health problem. The lack of response from the public authorities is all the more surprising, given that proven alternative disinfection methods with no risk to health are available: Cu-Ag ionisation, for example, has been used successfully for 25 years at Louvain-La-Neuve. Stricter standards and monitoring of air and water quality in public pools disinfected using chlorine and a raising of awareness among the owners of private swimming pools of the risks of over-chlorination would appear to be the minimum measures required.

Biomonitoring: a valuable tool for monitoring exposure to multiple pollution sources and routes

Biomonitoring involves determining the amount chemicals and their metabolites in the blood, breast milk, urine, saliva or tissue of an organism. It provides an integrated assessment of the exposure to multiple sources of pollutants (road traffic, industry, foodstuffs, etc.) and multiple routes (inhalation, ingestion, skin contact). While the detection of xenobiotics in the organism is not in itself synonymous with a risk to health and cannot alone justify alarmist statements, it should however suggest vigilance: monitoring their development in space and over time, identifying their sources and conducting research into their potential biological effects.

Within the framework of its European environment and health strategy (2003), followed up in the European environment and health action plan 2004-2010, the European Commission approved in 2007 a human biomonitoring pilot project (HumanBioMonitoring) to provide Europe's decision-makers with a common legal framework and information based on a harmonised approach. The second phase of this project, which is underway, aims to create a European biomonitoring network(1).

In the Walloon Region, biomonitoring has only been conducted in the context of specific studies; there is no provision for a large-scale regional programme, such as that conducted in Flanders (*Vlaams humaan biomonitoringsprogramma 2002-2006*). Overall these studies show a reduction over time in the amount of several particularly toxic and persistent pollutants found in the body (Pb, Cd, PCBs, dioxins and furans, organochlorine pesticides). They also show the presence of substances found in our daily environment, the health effects of which are uncertain (brominated flame retardants, musk xylene). The opportunity to develop a global biomonitoring programme in the Walloon Region should be examined in light of experience elsewhere (cost/benefit, appropriate target substances and groups, etc.).

Responses to environmental health problems: some perspectives

Out of the 32 action points in the Cancer Plan launched by the Federal Minister of Health in 2008, two preventive measures are specifically aimed at environmental factors: measures to wean people away from tobacco and vaccination against papillomavirus. In the case of other environmental factors which may trigger certain cancers, the Plan refers to other measures or projects: the National Alcohol Action Plan, anti-smoking campaigns, the National Nutrition and Health Plan, the research project "Childhood cancers and the environment" conducted under the framework of the NEHAP (National Environment and Health Action Plan).

A number of environment and health workshops have been organised in the context of the *Printemps de l'environnement* programme initiated by the Federal Minister for Climate and Energy in 2008. Policy decisions have been taken on five groups of measures (some of which had already been implemented):

- the integration of environmental health aspects into the basic and further training of health and social care professionals and also of those in other sectors (construction, agriculture, food industry, etc.) and the development and promotion of awareness of tools for the identification of environmental health problems;
- the development of management and communication tools in relation to environmental health risks: co-ordinated communication in the event of pollution spikes, development of environmental health indicators focusing as a priority on respiratory disease and cancer, introduction of biomonitoring, effective integration of scientific knowledge into policy development, survey of the public perception of risk, assessment of the costs of inaction, identification of the impact of climate change on health;
- creation of an effective framework for the implementation of REACH and, in relation to pesticides and biocides: reduction in their use, training of professional users and raising of awareness among non-professional users, information through advertising, development of indicators, etc.;
- improvement in outside air quality through a federal Air Quality Plan, reduction in atmospheric emissions from heating systems and non-road vehicle engines, reduction in the VOCs content of leisure and household products;
- improvement in the quality of building environments, with particular focus on the following factors: construction materials, air fresheners, household products, electromagnetic waves, radon.

A political, scientific and social assessment of the content of the NEHAP and its implementation was carried out in 2007. Based on this, the objectives of the NEHAP were repositioned and the 2008-2013 Plan launched: this Plan includes measures targeted at reducing the incidence of respiratory problems, in children as a priority.

Little has changed at the Walloon regional level since 2006. The *Programme d'Actions Régionales Environnement-Santé* (PARES) has not been implemented, despite a consensus among experts, policy makers and representatives from associations. Environmental health problems are currently handled by the Environment and Health Task Force. Since 2006, there has been no interdisciplinary structure with sufficient human resources to produce real advances in environmental health, by employing in particular scientific methods of risk assessment.

[1] http://www.eu-humanbiomonitoring.org/index.htm

PART [5]

Environmental infringements and controls

PART [5]
Environmental infringements and controls

introduction

With regionalisation, the Regions were given the power to legislate on matters within their competence and the duty to ensure compliance with and administration of the regulations.

With regard to environmental matters, the control of the respect of the decrees and the repression of infringements is based on federal and local policies, as well as those of specialist departments. In the Walloon Region, these are in particular the *Département de la Nature et des Forêts* (DNF) and the *Département de la Police et des Côntroles* (DPC). The latter includes in particular a Direction des Côntroles and a *Direction de la Répression des pollutions et de l'anti-braconnage*, which covers the *Unité Anti-Braconnage* (UAB) and the *Unité de la Répression des pollutions* (URP). These units provide support on the ground, in particular in difficult and complex cases.

Ensuring respect of the regulations ideally requires raising awareness of the problem in question, clear legislation, which is easy to understand and implement, controls on the ground and the repression of infringements. In the Walloon Region, the focus above all is on prevention, since the repression measures require a court judgement and are generally used at a second stage, where prevention has failed.

The two indicators described in this section relate to the work to control compliance and identify infringements carried out by the DNF and DPC. The approach includes the work of agents on the ground and that of the two specialist intervention units (UAB and URP). These indicators give only a partial view of the subject of "environmental infringements and controls", but they are currently the only information held centrally and therefore easily available. They relate only to the work of the regional administration and combine several factors which it is impossible to dissociate: failure to comply with the legislation, the difficulty in identifying infringements, the importance of the controls employed, the diligence of the agents, etc. In future this section will be supported, where possible, by data from other departments involved, in order to give a more complete approach to the application of the legislation and ideally its development.

infr 1

Control of the respect of environmental legislation

The control of the respect of environmental legislation by the relevant departments of the DGARNE is based on the one hand on an inspection plan, and on the other on general monitoring of the land by agents from the external services.

Inspection plan

Control by the *Police de l'Environnement* (DPE)[1] is based on an inspection plan, the objectives of which are set annually. This plan has a number of elements, including

- the preliminary investigation of complaints (in the broad sense: calls to the *SOS POLLUTIONS* service, blatant violations causing serious damage, requests from the Minister or the municipalities, etc.);
- the inspection of companies covered by the IPPC and SEVESO directives;
- the control of the cross-border transport of waste;
- the control of conditionality in farms;
- operations on specific themes extending over one or more years[2].

Collaboration with the municipalities

In order to improve the effectiveness of environmental control and repression, a protocol has been drawn up for collaboration between the DPE and the local authorities. The municipalities in question (148 as of 31/12/2007) take charge of simple local problems (waste incineration by householders, fly-tipping of household or inert waste, etc.) and work with the DPE on repression in relation to problems caused by class 2 and 3 establishments (environmental permits, declarations). The DPE can thus give priority to the more serious cases where a high level of expertise is required.

Alert networks

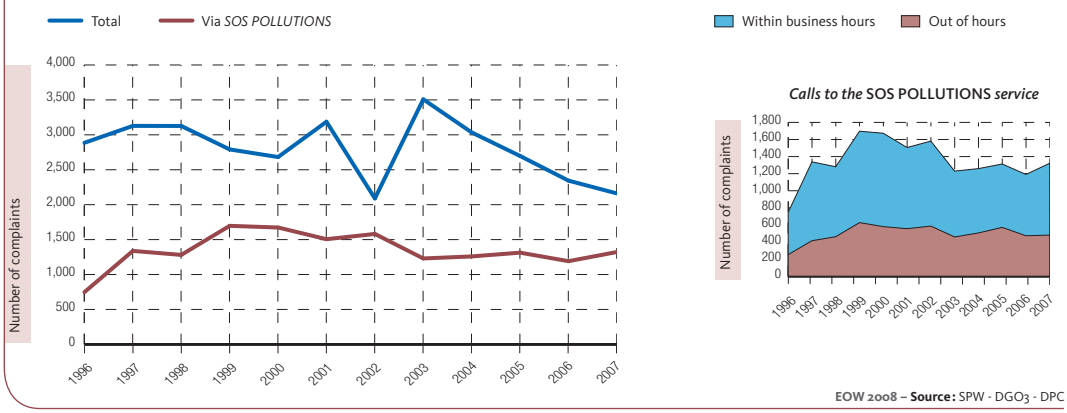
The DPE also runs a number of "alert networks" which detect on a continuous basis problems of water pollution or resulting from waste treatment. These are the Aquapol network (quality of water in the Meuse, the Escaut, the Sambre and the Semois), the CET monitoring network and two networks measuring atmospheric pollution from the valorisation and incineration of waste. A number of large firms and public swimming pools are also monitored (remote monitoring).

General monitoring of the land

Moreover, the presence of DNF agents throughout the land enables close monitoring. This presence on the ground is supported by the *Unité Anti-Braconnage* and the *Service de la Pêche*. The DNF concentrates on respect of the Forestry code, legislation on nature conservation, fishing and hunting and since 2004 compliance with the CWATUPE in zones not intended to be urbanised.

fig INFR 1-1

Complaints received by the *Division de la Police de l'Environnement* (DPE) in the Walloon Region



EOW 2008 – **Source:** SPW - DGO3 - DPC

[1] Currently included in the *Département de la Police et des Contrôles* (DPC) of the DGARNE
[2] These operations on specific themes are described in the DPE operational reports (http://environnement.wallonie.be)

Repression of infringements

The statistics compiled by the Police de l'Environnement *(DPE)*[1] *shed some light on the way in which infringements of environmental legislation are handled. For their part, the statistics compiled by the* Département de la Nature et des Forêts *(DNF) provide further information on the type of infringements in respect of which charges are brought.*

Focus on the most serious problems

The number of infringements identified by the DPE varies from year to year, but the general trend is downward. This decrease is the resulted of a reduction in the human resources available and the fact that the municipalities have taken charge of simple local problems. The fluctuations can be attributed in part to the type of operations conducted on specific themes (types of control, number of firms involved, etc.).

Persuasion before repression

The DPE has developed an approach which consists in first explaining, raising awareness and persuading offenders on the basis of warnings (injunctions coupled with a deadline for implementation). If the warning is not heeded, repression measures are instigated. Generally, more than 80 % of infringements are handled by warnings. The proportion of warnings did, however, decrease in 2005 and 2006, as the DPE concentrated on the most serious problems, following a reduction in staff numbers.

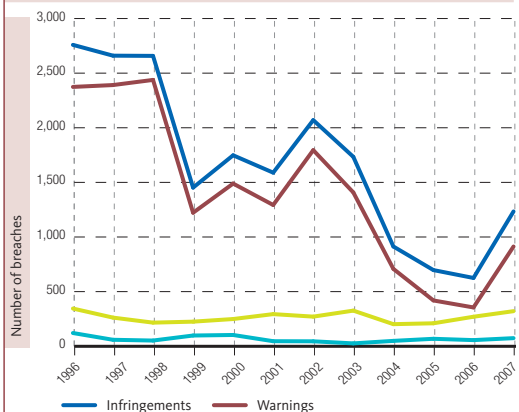
The repression measures available are in descending order: an order to cease operations (44 % of cases), the fixing of seals (34 %), a request for suspension of authorisation (12 %) and a request for withdrawal of authorisation (10 %).

Repression, very much dependent on available means

The *Unité Anti-Braconnage* (UAB) was set up in 2003 to assist local services where the problems require significant logistical support (poaching, driving motorised vehicles in woodland, etc.). This support translates in the statistics into an increase in the number of charges brought over the period 2003-2005. The UAB agents are DNF agents seconded on a voluntary basis for a period of three years. At the end of this period, a large number of these agents chose not to renew their secondment to the UAB. As a result the UAB was again understaffed, which contributed to the noticeable drop in repression in 2006 and 2007.

fig INFR 2-1

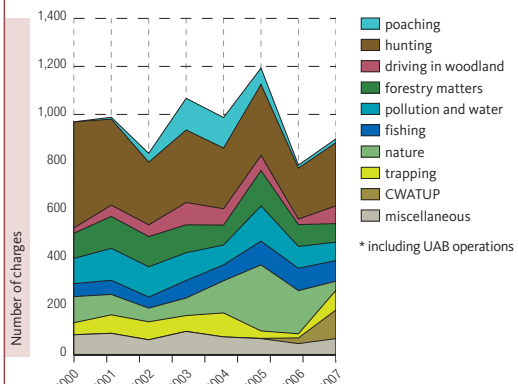
Action in respect of environmental infringements in the Walloon Region



EOW 2008 – **Source:** SPW - DGO3 - DPC

fig INFR 2-2

Charges brought by agents of the *Département de la Nature et des Forêts in the Walloon Region**



EOW 2008 – **Source:** SPW - DGO3 - DPC

[1] Currently included in the Département de la Police et des Contrôles (DPC) of the DGARNE

PART [6]

International framework

Transposition of and compliance with European directives

Around 80 % of Walloon environmental legislation is inspired by international law, which is largely dominated by the law of the European Community. The European Union legislates and imposes its regulations and directives in numerous environmental fields, such as Natura 2000, water and air quality targets, noise, waste management, operating permits and even environmental studies.

Duties and division of competence

The Walloon Region has an obligation to comply with European Community legislation. To this end, it has to transpose European directives into Walloon law within the specified deadlines. Regulations, on the other hand, apply from the date of publication in the Official Journal.

In Belgium, the transposition process requires identification of the levels at which the relevant powers lie. Very often, one text will involve competence at federal and regional levels. This is the case, for example, with directive 2006/66/EC on batteries and accumulators.

Delay in transposition recouped

Of the 25 most important directives adopted since 2000[1], 19 have already been transposed into Walloon regional law (situation as of 15/1/08). Moreover, the transposition deadline has not yet passed in the case of 3 of the 6 directives still to be transposed into regional law.

Generally, the texts have been transposed into Walloon law within an acceptable timeframe in relation to the legal due dates, with the exception of certain directives (e.g. Seveso), where transposition required

tab INT 1-1

Field of application of European directives adopted since 2000	Reference	Target date for transposition	Actual date of transposition
End-of-life vehicles	2000/53/CE	21/04/2002	21/04/2002
Limit values for benzene and carbon monoxide	2000/69/CE	13/12/2002	10/02/2003
Incineration of waste	2000/76/CE	28/12/2002	14/03/2003
Port reception facilities for ship-generated waste and cargo residues	2000/59/CE	28/12/2002	13/03/2003
Water framework directive	2000/60/CE	22/12/2003	23/09/2004
Large combustion plant (LCP)	2001/80/CE	27/11/2002	19/12/2002
Emission ceilings for certain atmospheric pollutants	2001/81/CE	27/11/2002	14/12/2002
Hexachloroethane	2001/91/CE	31/12/2002	27/02/2003
Environmental assessment of certain plans and programmes	2001/42/CE	21/07/2004	04/05/2005
Ozone in ambient air	2002/3/CE	09/09/2003	10/02/2003
Assessment and management of environmental noise	2002/49/CE	18/07/2004	12/07/2004
Waste electrical and electronic equipment	2002/96/CE	18/07/2004	18/04/2005
Greenhouse gas emission allowance trading scheme	2003/87/CE	31/12/2003	02/12/2004
Public access to environmental information	2003/4/CE	14/02/2005	16/03/2006
Control of major-accident hazards involving dangerous substances	2003/105/CE	1/04/2005	07/07/2006
Public participation	2003/35/CE	25/06/2005	31/05/2007
Packaging and packaging waste	2004/12/CE	30/10/2005	2nd reading 12/06/2008
Environmental liability	2004/35/CE	30/04/2007	22/11/2007
Atmospheric pollutants (Fourth daughter directive on air)	2004/107/CE	15/02/2007	16/05/2007
Bathing water quality	2006/7/CE	24/03/2008	17/04/2008
Management of waste from extractive industries	2006/21/CE	01/05/2008	final reading 11/09/2008
Batteries and accumulators	2006/66/CE	26/09/2008	in progress
Protection of groundwater	2006/118/CE	16/01/2009	1st reading 12/06/2008
Assessment and management of flood risks	2007/60/CE	26/11/2009	1st reading 12/06/2008
Ambient air quality and clean air	2008/50/CE	11/06/2010	to follow

EOW 2008 – **Source :** SPW - DGO3 - DPEAI

[1] All the directives adopted before 2000 are transposed in Walloon regional law

a co-operation agreement with other levels of power (federal, other regions and/or Communities). The balance sheet is, therefore, positive overall.

Fewer infringement proceedings

Alongside the transposition work, the Member States and the Walloon Region, with respect to matters which concern it, also have a duty to put in place measures to ensure and monitor compliance with European legislation. If this is not done, the Commission may institute infringement proceedings, where it finds that the Member States:

- ➜ have transposed European law incorrectly or incompletely;
- ➜ have not communicated the texts adopted because of delays in transposition;
- ➜ have not met their obligations.

In some cases, these infringements can result in referral to the Court of Justice and, ultimately, in the Member State being fined.

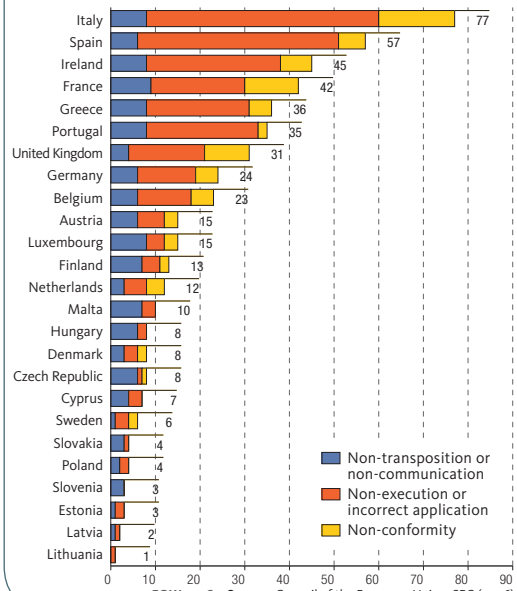
As of 31/12/05, Belgium was subject to 23 infringement proceedings, putting it slightly above the European average of 20. It must, however, be pointed out that the number of infringements of Community law has decreased significantly in recent years, as the federal and regional governments have given increasing priority to these cases. The new Member States of the European Union benefit from technical and legal assistance, which explains in part their current performance in this area.

Shared blame

Of the 22 disputed cases relating to the environment still open against Belgium on 15/02/08, 11 involve Wallonia, either alone or in association with other levels of power. Only 2 infringement proceedings (in the pre-contentious phase) were to be laid solely at the door of the Walloon Region. These related to application of directives 2001/42/EC (environmental assessment of certain plans and programmes) and 1992/43/EC (conservation of natural habitats and of wild fauna and flora).

fig INT 1-1

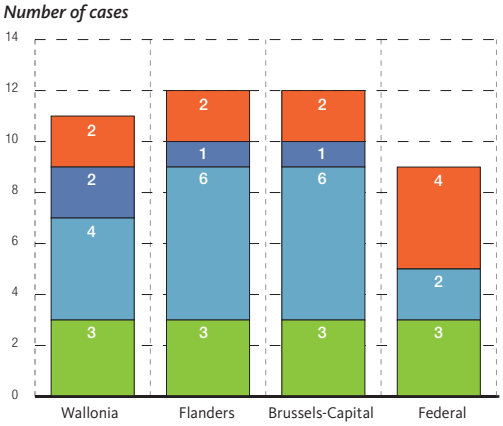
Number of infringement proceedings instituted by the European Commission *(situation as of 31/12/05)*



EOW 2008 – **Source:** Council of the European Union, SEC (2006)

fig INT 1-2

Assignment of European environmental legislation infringement proceedings in Belgium by level of power *(situation as of 15/02/2008)*



EOW 2008 – **Source:** *Comité d'avis fédéral chargé des questions européennes*

int 2

Environmental structural indicators

Within the framework of the Lisbon and Gothenburg strategies, the European Commission has drawn up a list of 20 structural indicators(1) which it can use to monitor and assess the environmental performance of Member States. The table below enables Belgium and the Walloon Region to be compared with the European averages and positioned with respect to other Member States and enables an evaluation of the progress made.

	EUROPEAN UNION				
ENVIRONMENTAL STRUCTURAL INDICATORS (liste 2006)	**NUMBER OF COUNTRIES FOR WHICH DATA ARE AVAILABLE**	**YEAR**	**AVERAGE VALUE**	**LOWEST VALUE**	**HIGHEST VALUE**
Greenhouse gas emissions (1990 =100)	27	2006	92.3	43.9 (LV)	166 (CY)
Energy intensity of the economy (kg oil eq/1,000 €)	27	2005	208	114 (DK)	1,582 (BG)
Volume of freight transport relative to GDP (1995 = 100)	26	2006	106.7*	48.3 (SK)	177.1 (PT)
Road share of inland freight transport (%)	27	2006	76.7*	34.7 (EE)	100 (MT, CY)
Volume of passenger transport relative to GDP (1995 = 100)	27	2005	105.4*	52 (SK)	171.2 (PT)
Car share of inland passenger transport (%)	24	2005	83.4*	63 (HU)	89.4 (LT)
Urban population exposure to air pollution by ozone (ozone surplus: µg/m³ of air)	21	2005	3,990	307 (LV)	9,625 (GR)
Urban population exposure to air pollution by particulate matter (PM_{10}) (average concentration: µg/m³)	21	2005	28	13.8 (IE)	42,8 (IT)
Municipal waste generated (kg/inhab)	27	2006	517	259 (PL)	804 (IE)
Municipal waste landfilled (kg/inhab)	27	2004	243	11 (NL)	659 (CY)
Municipal waste incinerated (kg/inhab)	27	2004	89	0 (8 countries)	379 (DK)
Implicit tax rate on energy (€/toe)	27	2004	180	55.4 (RO)	324.4 (DK)
Resource productivity (1,000 €/t)	14	2002	1.37	0.54 (GR)	1.76 (NL)
Electricity generated from renewable sources (%)	27	2005	14	0 (CY, MT)	57.4 (AT)
Combined heat and power generation (%)	27	2006	10.9	0 (MT)	42.6 (LV)
Fish catches taken from stocks outside 'safe biological limits' (%)	nd	2005	10	nd	nd
Sufficiency of sites designated under the EU habitats directive (% of total land area)	25	2007	84	17 (PL)	100 (BE, DK, NL, IT)
Farmland bird index (1990=100)	15	2005	78.8	60.3 (DK)	121.8 (ES)
Healthy life years at birth - women	15	2003	66*	56.5* (FI)	74.4* (IT)
Healthy life years at birth - men	15	2003	64.5*	53.5* (HU)	70.9* (IT)

int 2

WALLOON REGION			BELGIUM		
STATUS (INDICATOR VALUE)	POSITION (excluding Belgium)	CHANGE	STATUS (INDICATOR VALUE)	POSITION	CHANGE
87.5	11/27	- 12.5% between 1990 & 2000	94.8	13/27	- 5.2 % between 1990 & 2006
299	17/27	- 18.4 % between 1995 & 2005	206	11/27	- 14.6 % between 1994 & 2005
120.3	18/26	+ 20.3 % between 1995 & 2006	80.9*	5/26	- 19.1 % between 1995 & 2006
86.5	17/27	- 0.7 % between 2005 & 2006	71.2	12/27	- 8 % between 1995 & 2006
94.9	12/27	- 5.1 % between 1995 & 2005	83.7	4/27	- 16.3 % between 1995 & 2005
78.5	9/24	- 0.3 % between 2004 & 2005	80.3	11/24	- 3.4 % between 1995 & 2005
2,390	6/21	nd	2,688	7/21	- 30 % between 1999 & 2005
33.9	14/21	nd	30.9	11/21	- 10.9 % between 1999 & 2005
460	11/27	+ 5 % between 2000 & 2006	475*	13/27	+ 4.9 % between 1995 & 2006
75	5/27	nd	40	3/27	- 79.8 % between 1995 & 2004
135	20/27	na	153	22/27	na
na	na	na	119	16/27	+ 29.4 % between 1996 & 2005
0.79	11/14	+ 27.9 % between 1995 & 2002	1.60	5/14	+ 27.4 % between 1993 & 2002
3.5	22/27	+ 34.6 % between 1996 & 2005	2.8	24/27	+ 155 % between 1996 & 2005
5.1	23/27	+ 88.9 % between 1998 & 2006	8.7	17/27	+ 156 % between 1994 & 2006
na	na	na	nd	nd	nd
100 %	nd	nd	100 %	1/25	+ 9.9 % between 2003 & 2007
nc	nd	nd	67.6$	12/15	- 26 % between 1994 & 2005
nd	nd	nd	69.2*	5/15	+ 4.2 % between 1995 & 2003
nd	nd	nd	67.4*	3/15	+ 6.5 % between 1995 & 2003

(1) http://epp.eurostat.ec.europa.eu

na : not applicable
nd : data not available or methodology being developed
nc : not calculated
***** : estimate
$: index calculated on the basis of surveys in the Walloon Region and Brussels-Capital region

Status
- Indicator for the Walloon Region/Belgium better than the European average
- Indicator for the Walloon Region/Belgium worse than the European average
- Indicator for the Walloon Region/Belgium similar to the European average

Position
The position of the Walloon Region and of Belgium is calculated on a scale from the Member State with the environmentally best indicator value to the Member State with the environmentally worst indicator value.

Change from an environmental point of view
- Improvement
- Deterioration
- No change

Code for Eurostat countries:
Austria (AT), Belgium (BE), Bulgaria (BG), Cyprus (CY), Denmark (DK), Spain (ES), Estonia (EE), Finland (FI), Greece (GR), Hungary (HU), Ireland (IE), Italy (IT), Latvia (LV), Lithuania (LT), Malta (MT), Netherlands (NL), Poland (PL), Portugal (PT), Romania (RO), United Kingdom (UK), Slovakia (SK).

2007 was the warmest year on record in Belgium

According to the *Institut Royal Météorologique*, the average annual temperature reached 11.5°C at Uccle in 2007, beating the previous year's record of 11.4°C. 2006 and 2007 were the warmest years ever recorded in Belgium since 1833, when regular monitoring first began. These record figures are the result of a long period of higher than normal temperatures between September 2006 and June 2007. Spring 2007 was also marked by a period of 36 days without precipitation, making the month of April the first calendar month since 1833, in which not a drop of rain fell on Uccle.

Winter peaks in pollution: two exceptional occurrences in 2007

Winter 2007-2008 was marked by two occurrences of serious air pollution by particulates (PM) and by nitrogen dioxide (NO_2, an indicator of the overall level of air quality): the first from 18 to 24 December 2007 and the second from 11 to 21 February 2008. The accumulation of the pollutants in question, which came mainly from combustion processes, occurred when the weather conditions were particularly unfavourable for the dispersion of pollutants: thermal inversion and absence of wind. Such pollution occurs every year, especially to the north of the Sambre-and-Meuse river line, in the industrial basins and in the agglomerations. The peaks in winter 2007-2008 were exceptional in their duration and geographic spread and in the levels of pollution reached. On 20 June 2008, the three Regions of the country and the *Cellule interrégionale pour l'environnement* (CELINE) agreed a protocol for the co-ordination of information and monitoring in the case of pollution from PM (http://www.celine.be/).

Nuclear incident at Fleurus

On 22 August 2008, the *Institut des Radioéléments* (IRE) in Fleurus, the world's second largest producer of radio-isotopes for medical use, was responsible for the accidental discharge of radioactive iodine (131 I) into the atmosphere. The incident was classified as level 3 on a scale of 7 on the International Nuclear Event Scale (INES). Production was stopped four days after the leak, but it was not until six days after the incident, when it proved more serious than originally thought, that restrictions were imposed on the consumption of local products (fruit and vegetables from the garden, cow's milk, water from wells) and on the grazing of animals. These restrictions were lifted on 6 September 2008. Over 1,300 tests were conducted on local residents to check for radioactive iodine in the thyroid and all proved negative. The handling of the incident was widely criticised (delays in detection and response, communication problems, etc.). The enquiry did not identify human error as the cause, but a combination of exceptional circumstances at the point when the mixing of liquid discharges occurred. Investments (planned before the incident occurred) have been made in various measures to improve the filtering of discharges into the atmosphere and the detection of radioactivity in the vicinity of the site.

Reopening of Blast Furnace 6 (HF6) at Seraing: controversy over CO_2 quotas

A year after the takeover of Arcelor by Mittal in June 2006, and following in particular the rise in steel prices on the world market, the ArcelorMittal group announced the reopening of blast furnace 6 (HF6) at Seraing at a cost of 20 million euros, on condition that the CO_2 emission quotas required to resume operations were made available. After negotiations, it was agreed that the shortfall in emission quotas, for an equivalent of 4 million tonnes of CO_2 a year, would be made up jointly by ArcelorMittal (1.4 million tonnes) and by the Walloon Region (2.6 million tonnes). HF6 was symbolically reopened on 27 February 2008, before actually being restarted on 4 March 2008, date of the first flow. The refurbished plant was supposed to continue in operation for at least 10 years. Its temporary closure until the end of February 2009 was, however, announced by the steel group following a decline in demand for steel.

"Post-Kyoto" is launched

The 13th conference on the United Nations Framework Convention on Climate Change and the 3rd meeting on the Kyoto Protocol were held in Bali in December 2007. The 189 countries taking part agreed on a roadmap for the negotiation, between then and Copenhagen at the end of 2009, of a global agreement on the programme to combat climate change. This agreement will replace the Kyoto Protocol after 2012. For the first time China and the United States were party to the agreement, although no actual target was set for a reduction in greenhouse gas emissions. The international community has, however, recognised the need for major reductions in global emissions of greenhouse gases and the urgent need to act against climate change, based in particular on the outcome of the work by the Intergovernmental Panel on Climate Change (IPCC, http://www.ipcc.ch/).

The end of cheap oil?

In January 2008, the oil price on Wall Street went above the symbolic 100 dollars/barrel mark for the first time in its history; it reached 147 dollars in July. This six-fold increase in the oil price compared with 2002 was attributable the increase in demand for raw materials generated by world economic growth, with geopolitical tensions and a decline in global reserves also playing a part. Since September, however, the price per barrel has fallen again (to around 50 dollars in mid-November), following in particular worries on the market about the impact of the economic slowdown brought about by the financial crisis.

Walloon plan to promote photovoltaic electricity generation

On 1 January 2008, the Walloon region launched the SOLWATT Plan designed to promote the installation of photovoltaic cells on private homes and on buildings belonging to municipal authorities and private firms. The Plan aims to encourage consumers themselves to become generators of green electricity. It provides in particular for the exemption of *permis d'urbanisme* for the installation of photovoltaic cells, grants to households and businesses for such installation and the issuing of green certificates for electricity not consumed and supplied to the network (http://www.plansolwatt.be/index.php).

Energy performance of buildings

A new regulation on the energy performance of buildings (EPB) came into force in the Walloon Region on 1 September 2008. It applies to all buildings undergoing construction, refurbishment or conversion work which requires *permis d'urbanisme*. The aim is to reduce the primary energy needs and CO_2 emissions from buildings and at the same time improve the indoor climate. In concrete terms, the decree transposing directive 2002/91/EC, adopted by the Walloon Parliament on 19/04/07, replaced the CWATUP by the CWATUPE (*Code Wallon de l'Aménagement du Territoire, de l'Urbanisme, du Patrimoine et de l'Energie*). The requirements in terms of the EPB, the method of calculating energy performance and the penalties which apply are contained in the AGW of 17/04/08 (http://energie.wallonie.be).

The forms of public participation in environmental issues are being harmonised

Walloon legislation on public participation in environmental issues was strengthened in 2007 (DRW of 31/05/07 and AGW of 20/12/07). The changes are intended to harmonise the forms of public participation in the development of environmental plans, programmes and projects and to incorporate all international obligations in this field affecting the Walloon Region. These provisions simplify the task of the authorities and improve readability for the public, who will find all the common provisions in one single regulation (Volume 1 of the Environment code, Section III, Part III). In addition, the decree of 31/05/07 enables the municipal authorities to engage an environmental adviser, who will be the point of contact for all matters relating to environmental protection.

A new tool for applying the "polluter pays" principle to damage caused by professional activitiess

The "polluter pays" principle, which is already enshrined in Walloon law (Volume 1 of the Environment code, art. D.3,2°), helps to prevent infringements of environmental legislation. The decree of 22/11/07, transposing directive 2004/35/EC and amending Volume 1 of the Environment code in relation to the prevention and repair of environmental damage, completes the suite of existing legislation. In brief, the principle of liability applies to environmental damage and the imminent threat of such damage resulting from professional activities, from the point at which it is possible to establish a causal link between the damage and the activity in question. It is then up to the operator responsible to take the steps necessary to repair the damage.

The *Police de l'Environnement* reinforced by the *Unité de Répression des Pollutions*

In 2008, the *Division de la Police de l'Environnement* (DPE) of the DGARNE acquired a new *Unité de Répression des Pollutions* (URP) whose main function is to identify and pursue those responsible for serious infringements in relation to the environment (traffic, dumping, waste transport and treatment, deliberate release of pollutants, unauthorised incineration, etc.). The URP acts on its own initiative and also in response to complaints or at the request of the DPE. Its members have the powers of police prosecution investigators. The legislation provides for four levels of infringement from environmental crimes to anti-social behaviour and for URP agents to be able to impose immediate fines.

BOFAS fund more successful than expected

The *Fonds d'assainissement* des sols des stations-service (BOFAS) was set up in 2004 to provide financial assistance to service station owners, operators or managers undertaking soil remediation work. It is the result of a co-operation agreement between the Federal Government and the country's three Regions. It is financed 50 % by the oil industry and 50 % by motorists. Following extension of the conditions for participation to all former service stations, almost 1,500 applications had been submitted by the deadline of 20 March 2008, compared with an initial expectation of 450 (http://www.bofas.be).

Ban on disposing of unsorted household waste to landfill (CET)

Since 1 January 2008, the Walloon Region no longer permits the disposal of unsorted domestic refuse to CET (AGW of 18/03/04). This situation has, nevertheless, created problems for some inter-municipal waste collection and treatment companies, which do not have the necessary infrastructure to comply with this new legislation. It is possible to conclude agreements with other inter-municipal companies but this increases the cost of waste transport and handling. In view of this, two inter-municipal companies BEPN and IBW have initially decided against such an option and have continued to dispose of their waste to CET, at the risk of being liable for the fines provided for in the event of failure to comply with the legislation. They have also begun a court action to contest the application of the regulation, given the nature of the waste in question.

New decree relating to taxes on waste

The new decree relating to taxes on waste, adopted by the Walloon parliament on 22 march 2007, came into force on 1 January 2008. This decree is aimed at encouraging means of waste prevention and valorisation by introducing new taxes on the amounts of waste sent in particular for incineration and co-incineration. These new taxes particularly affect the disposal of hazardous waste. On the other hand, there is provision for tax reductions for the adoption of preventive measures which have proved effective.

New Forestry code

On 15 July 2008, the Walloon Parliament approved the new Forestry code, which replaced that of 1854. This code is aimed at new and dynamic forest management to strengthen the complementary social, economic and environmental roles of woodlands. It takes into account a number of current concerns, such as respect for the forests and their users, the economic role of Wallonia's woodland heritage and its role in combating climate change and the loss of biodiversity. By annulling the rights of succession and donation in the case of private woodland, the new code is designed to promote the production of quality timber and provide a concrete response to the dividing up of the Walloon forest.

ACRONYMS AND ABBREVIATIONS

AEF	Association pour l'Etude de la Floristique *(Floristic studies Association)*
AEM	Agri-Environmental Measure
AFCN	Agence Fédérale de Contrôle Nucléaire *(Federal Agency for nuclear control)*
Ag	Silver
AGW	Arrêté du Gouvernement Wallon *(bylaw of the Walloon Government)*
AM	Arrêté Ministériel (Ministerial decree)
AOT_{40}	Accumulated Concentration Over a Treshold of 40 ppb
APHEIS	Air Pollution and Health European Information System
AQUAWAL	Union Professionnelle des opérateurs publics du cycle de l'eau en Wallonie *(Professional Union of public operators dealing with the water cycle in Wallonia)*
a.s.	Active substance
As	Arsenic
AWAC	Agence Wallonne de l'Air et du Climat (*Walloon Agency for air and climate)*
B(a)P	Benzo(a)Pyrene
BAT	Best Available Technique
BAU	Business As Usual
BOD_5	Biochemical Oxygen Demand (after 5 days)
BEPN	Bureau Economique de la Province de Namur *(Economic Bureau of the Province of Namur)*
BFP	Bureau Fédéral du Plan *(Federal planning Bureau)*
BNB	Banque Nationale de Belgique *(National Bank of Belgium)*
BOFAS	Bodemsaneringsfonds voor tankstations *(Soil remediation fund for petrol stations*)
BSE	Bovine Spongiform Encephalopathy
C	Carbon
CAFE	Clean Air For Europe
CAP	Common Agricultural Policy
CART	Centre d'Analyse des Résidus en Traces *(Analysis Centre for trace residues)*
CAWW	Contrat d'Avenir pour les Wallonnes et les Wallons *(Contract for the future for Walloon women and men)*
Cd	Cadmium
CEEW	Cellule État de l'Environnement Wallon *("State of the Walloon environment" Unit)*
CELINE	Cellule Interrégionale pour l'Environnement *((Belgian) interregional environment Agency)*
CERVA	Centre d'Etudes et de Recherches Vétérinaires et Agrochimiques *(Veterinary and agrochemical research Center)*
CESRW	Conseil Économique et Social de la Région Wallonne *(Economic and social Council of the Walloon Region)*
CET	Centre d'Enfouissement Technique *(Landfill site)*
CFC	ChloroFluoroCarbon
CGT	Commissariat Général au Tourisme *(General Commissionership for tourism)*
CH_4	Methane
CIE	Commission Interrégionale de l'Emballage *((Belgian) interregional packaging Commission)*
CMR	Carcinogenic, Mutagenic and Reprotoxic substances
Co	Cobalt
CO	Carbon monoxyde
CO_2	Carbon dioxide
COD	Chemical Oxygen Demand
COV	Composé Organique Volatil *(Volatile Organic Compound)*
CPDT	Conférence Permanente du Développement Territorial *(Permanent Conference on territorial development)*
Cr	Chromium
CRIOC	Centre de Recherche et d'Information des Organisations de Consommateurs *(Research and information Centre on consumers organisations)*
CRNFB	Centre de Recherche de la Nature, des Forêts et du Bois *(Research Centre on nature, forests and wood)*
CRP	Comité Régional PHYTO *(PHYTO regional Committee)*
CSIS	Cavité Souterraine d'Intérêt Scientifique *(Subterranean cavity of scientific interest)*
CSWCN	Conseil Supérieur Wallon de la Conservation de la Nature *(Walloon Council for nature conservation)*
Cu	Copper
CVA	Coût-Vérité à l'Assainissement *(Actual cost of (water) sanitation)*
CWATUPE	Code Wallon de l'Aménagement du Territoire, de l'Urbanisme, du Patrimoine et de l'Énergie *(Walloon code on land use planning, urbanism, patrimony and energy)*
CWEDD	Conseil Wallon de l'Environnement pour le Développement Durable *(Walloon environmental Council for sustainable development)*
DATU	Département de l'Aménagement du Territoire et de l'Urbanisme *(Department of land use planning and urbanism)*
DCE	Débits Caractéristiques d'Etiage *(Characteristic low-water flows)*
DDE	DichloroDiphenylichloroEthylene
DDT	DichloroDiphenylTrichloroethane
DEAG	Département des Etudes et de l'Appui à la Gestion *(Department of studies and management support)*
DEBD	Département de l'Énergie et du Bâtiment Durable *(Department of energy and sustainable buildings)*
DEE	Direction de l'État Environnemental *(Direction of the state of the environment)*
DEMNA	Département de l'Étude du Milieu Naturel et Agricole *(Department of the study of natural and agricultural environment)*
DET	Département des Expertises Techniques *(Department of technical expertises)*
DET	Département de l'Exploitation du Transport *(Department of transport operation)*
DGA	Direction Générale de l'Agriculture *(General Directorate of agriculture)*

DGARNE	Direction Générale opérationnelle Agriculture, Ressources naturelles et Environnement *(General Directorate for agriculture, natural resources and environment)*
DGATLP	Direction Générale opérationnelle Aménagement du Territoire, Logement et du Patrimoine *(General Directorate for land use planning, housing and patrimony)*
DGO1	Direction Générale opérationnelle Routes et Bâtiments *(General Directorate for roads and buildings)*
DGO2	Direction Générale opérationnelle Mobilité et Voies Hydrauliques *(General Directorate for mobility and waterways)*
DGO3	Direction Générale opérationnelle Agriculture, Ressources naturelles et Environnement *(General Directorate for agriculture, natural resources and environment)*
DGO4	Direction Générale opérationnelle Aménagement du Territoire, Logement, du Patrimoine et de l'Energie *(General Directorate for land-use planning, housing, patrimony and energy)*
DGSIE	Direction générale Statistique et Information Economique *(General Directorate for statistics and economic information)*
DM	Débit Médian *(Median flow)*
DNEL	Derived No Effect Level
DNF	Département de la Nature et des Forêts *(Department of nature and forests)*
DPA	Département des Permis et des Autorisations *(Department of permits and authorisations)*
DPC	Département de la Police et des Contrôles *(Department of [environmental] police and controls)*
DPE	Division de la Police de l'Environnement *(Division of environmental police)*
DPEAI	Département des Politiques Européennes et des Accords Internationaux *(Department of European policies and international agreements)*
DRC	Département de la Ruralité et des Cours d'eau *(Department of rurality and waterways)*
DRW	Décret du Parlement Wallon *(Decree of the Walloon Parliament)*
DSD	Département du Sol et des Déchets *(Department of soil and waste)*
DSM	Département de la Stratégie de la Mobilité *(Department of mobility strategy)*
DSTTR	Département de la Sécurité, du Trafic et de la Télématique Routière *(Department of [road] safety, traffic and road on-line data processing)*
DVH	Département des Voies Hydrauliques *(Department of waterways)*
EC	European Community
EC	European Commission
EEA	European Environmental Agency
EEC	European Economic Community
EMAS	Eco-Management and Audit Scheme
EMEP	European Monitoring and Evaluation Programme
EMS	Environmental Management System
EOW	Environmental Outlook for Wallonia
EPB	Energy Performance of Buildings
EU	European Union
FEBIAC	Fédération Belge de l'Industrie de l'Automobile et du Cycle *(Belgian Federation of automobile and bike industry)*
FRW	Fondation Rurale de Wallonie *(Rural Foundation of Wallonia)*
FSC	Forest Stewardship Council
FUSAGx	Faculté Universitaire des Sciences Agronomiques de Gembloux *(Agricultural University of Gembloux)*
GAWI	Groupement d'Arboriculteurs pratiquant en Wallonie les techniques Intégrées *(Association of fruit trees growers implementing integrated [production] techniques in Wallonia)*
GDC	Gross Domestic Consumption
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GIREA	Groupe Interuniversitaire de Recherches en Écologie Appliquée *(Inter-university Research group in applied ecology)*
GVA	Gross Value Added
HBCD	HexaBromoCycloDodecane
HCFC	HydroChloroFluoroCarbon
Hg	Mercury
HORECA	Hôtels, Restaurants, Cafés *(Hotels, restaurants and cafes)*
^{131}I	(Radioactive) iodine
IBGN	Indice Biologique Global Normalisé *(Standardised global biological index)*
IBW	Intercommunale du Brabant Wallon *(Inter-municipal company of Brabant wallon)*
ICDI	Intercommunale pour la Collecte et la Destruction des Immondices *(Inter-municipal Company for refuse collection and destruction)*
ICEDD	Institut de Conseil et d'Études en Développement Durable *(Institute for advice and studies in sustainable development)*
ICN	Institut des Comptes Nationaux *(National accounts Institute)*
IgE	Immunoglobulin E
IGEAT	Institut de Gestion de l'Environnement et d'Aménagement du Territoire *(Institute for environmental management and land-use planning)*
INBO	Instituut voor Natuur en Bosonderzoek *(Research institute for nature and Forests)*
INERIS	Institut National de l'Environnement industriel et des Risques *(National Institute for industrial environment and risks)*
INES	International Nuclear Event Scale
INS	Institut National de Statistique *(National statistics Institute)*
IPCC	Intergovernmental Panel on Climate Change
IPF	Intergovernmental Panel on Forests
IPH	Institute of Public Health
IPPC	Integrated Prevention Pollution and Control
IPRFW	Inventaire Permanent des Ressources Forestières de Wallonie *(Continuous inventory of Wallonia's forests resources)*
IPS	Indice de Polluosensibilité Spécifique *(Specific index of sensitivity to pollutants)*

IRE	Institut national des Radioéléments *(Fleurus)* *(National Institute for radionuclides)*
IRM	Institut Royal Météorologique *(Royal meteorological Institute)*
ISO	International Organisation for Standardisation
ISPH	Intercommunale de Salubrité Publique Hennuyère *(Inter-municipal Company of the Hainaut province for public salubrity)*
ISSeP	Institut Scientifique de Service Public *(Scientific Institute of public service)*
ITR	Institut du Transport Routier *(Road transport Institute)*
ITS	Individual Treatment System
IUCN	International Union for Conservation of Nature
IWEPS	Institut Wallon de l'Evaluation, de la Prospective et de la Statistique *(Walloon Institute of assessment, forward-looking and statistics)*
IWTZ	Individual Waste water Treatment Zone
KUL	Katholiek Universiteit Leuven *(Catholic University of Louvain [Dutch speaking])*
LARES	Liste d'Actions Régionales Environnement-Santé *(List of environment-health regional actions)*
LPG	Liquefied Petroleum Gas
LRTAP	Long-Range Transboundary Air Pollution
LS	(Taux de) Liaison au Sol *(indicator of manure valorisation capacity at the farm scale)*
MAC	Maximum Allowable Concentration
MB	Moniteur Belge *(Belgian official journal)*
MET	Ministère de l'Equipement et des Transports *((Walloon) Ministry of equipment and transports)*
Mn	Manganese
Mo	Molybdenum
MRW	Ministère de la Région Wallonne *(Ministry of the Walloon Region)*
MTE	Metallic Trace Element
MWQ	Mouvement Wallon pour la Qualité *(Walloon Organisation for quality)*
N	Nitrogen
N_2O	Nitrous oxide
NACE	Nomenclature des Activités Economiques *(Classification of economic activities)*
NASA	National Aeronautics and Space Administration
NEHAP	National Environment and Health Action Plan
NH_3	Ammonia
Ni	Nicke
NIR	National Inventory Report
NO	Nitrogen monoxide
NO_2	Nitrogen dioxide
NO_{3^-}	Nitrate
NO_x	Nitrogen oxides
O_2	Oxygen
O_3	Ozone
ODS	Ozone-Depleting Substance
OECD	Organisation for Economic Cooperation and Development
OM	Organic Matter
OMB	Ordures Ménagères Brutes *(Unsorted domestic refuse)*
ONDRAF	Organisme National des Déchets Radioactifs et des matières Fissiles enrichies *(National Agency of radioactive waste and enriched fissile materials)*
OTW	Observatoire du Tourisme Wallon *(Walloon tourism Observatory)*
OWD	Office Wallon des Déchets *(Waste department [of the Public Service of Wallonia])*
P	Phosphorous
PAH	Polycyclic Aromatic Hydrocarbon
PARES	Programme d'Actions Régionales Environnement-Santé *(Regional actions programme for environment and health)*
PASH	Plan d'Assainissement par Sous-bassins Hydrographiques *(Sanitation plan per subwatersheds)*
Pb	Lead
PBDE	PolyBrominatedDiphenylEther
PBT	Persistent, Bioaccumulative and Toxic chemical
PCA	Plan Communal d'Aménagement *(Municipal land-use planning plan)*
PCB	PolyChlorinatedBiphenyl
PCDD/F	PolyChlorinatedDibenzo-p-Dioxin/Furan
PCDN	Plan Communal de Développement de la Nature *(Municipal plan for nature development)*
PCDR	Programme Communal de Développement Rural *(Municipal programme for rural development)*
PCM	Plan Communal de Mobilité *(Municipal mobility plan)*
PCT	PolyChlorinated Terphenyl
PDR	Plan de Développement Rural *(Rural development plan)*
PDS	Plan de Secteur *(Sector plan)*
PEFC	Programme for the Endorsement of Forest Certification schemes
PEnSa	Plateforme Environnement-Santé (Environment-health Platform)
PFC	PerFluoroCarbon
PGDA	Programme de Gestion Durable de l'Azote *(Sustainable nitrogen management programme)*
PLN	Potentially Leachable Nitrogen
P.L.U.I.E.S.	Prévention et Lutte contre les Inondations et leurs Effets sur les Sinistrés *(Preventing and combating floods and their effects on the victims)*
PM	Particulate Matter
PMC	Plastic, Metals and beverage Cartons
PMDE	Plan pour la Maîtrise Durable de l'Énergie [à l'horizon 2010] *(Plan for [horizon 2010] sustainable use of energy)*
PO_4^{3-}	Phosphate
POP	Persistent Organic Pollutant
PRPB	Programme de Réduction des Pesticides à usage agricole et des Biocides *(Programme for reducing agricultural pesticides and biocides)*
PUM	Plan Urbain de Mobilité *(Urban mobility plan)*
PWD	Plan Wallon des Déchets *(Walloon waste plan)*
RCU	Règlement Communal d'Urbanisme *(Municipal regulation for urban planning)*
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals
RF	Réserve Forestière *(Forest reserve)*

RISE	Réseau Intersyndical de Sensibilisation à l'Environnement *(Inter-syndical network for environmental sensitisation)*
RNA	Réserve Naturelle Agréée *(Registered nature reserve)*
RND	Réserve Naturelle Domaniale *(State-owned nature reserve)*
RRU	Règlement Régional d'Urbanisme *(Regional regulation for urban planning)*
RUE	Rapport Urbanistique et Environnemental *(Urbanistic and environmental report)*
RW	Région Wallonne *(Walloon Region)*
SAED	Site d'Activité Économique Désaffecté *(Disused site previously used for economic activity)*
SAMI	Service d'Analyse des Milieux Intérieurs *(Indoor environment analysis service)*
SAR	Schéma d'Aménagement Régional *(Regional land management scheme)*
SAR	Site à Réaménager *(Site to redevelop)*
Sb	Antimony
SC	Safe Concentration
SDER	Schéma de Développement de l'Espace Régional *(Regional space development scheme)*
Se	Selenium
SEQ-Eau	Système d'Evaluation de la Qualité de l'Eau *(Water quality assessment system)*
SEQ-ESO	Système d'Evaluation de la Qualité des Eaux Souterraines *(Groundwater quality assessment system)*
SETHY	Service d'Etudes Hydrologiques *(Hydrological studies Service)*
SF_6	Sulfur hexafluoride
SIG	Système d'Information Géographique *(Geographic information system)*
SNCB	Société Nationale des Chemins de fer de Belgique *(National railwayCompany of Belgium)*
SO_2	Sulfur dioxide
SPAQuE	Société Publique d'Aide à la Qualité de l'Environnement *(Public Company helping to environmental quality)*
SPF	Service Public Fédéral *(Federal public Service)*
SPF MT	Service Public Fédéral Mobilité et Transport *(Federal public Service mobility and transport)*
SPGE	Société Publique de Gestion de l'Eau *(Public Company of water management)*
SPW	Service public de Wallonie *(Public Service of Wallonia)*
SRPE	Site de Réhabilitation Paysagère et Environnementale *(Site aimed at rehabilitation for landscaping and environmental purposes)*
SS	Suspended Solids in water
SSC	Schéma de Structure Communal *(Municipal structure scheme)*
SWDE	Société Wallonne des Eaux *(Walloon water supply Company)*
TEC	[Société de] Transport en Commun *(Public transport [Company])*
Tl	Thallium
TMR	Total Material Requirement
TMVW	Tussengemeentelijke Maatschappij der Vlaanderen voor Watervoorziening *(Intermunicipal water supply Company for Flanders)*
TSP	Total Suspended Particulate
UAA	Utilised Agricultural Area
UAB	Unité Anti-braconnage *(Anti-poaching Unit)*
UCL	Université Catholique de Louvain *(Catholic university of Louvain [French speaking])*
ULB	Université Libre de Bruxelles *(Free University of Brussels)*
ULg	Université de Liège *(University of Liège)*
URP	Unité de Répression des Pollutions *(Pollution repression Unit)*
UVCW	Union des Villes et Communes de Wallonie *(Union of cities and municipalities of Wallonia)*
UWE	Union Wallonne des Entreprises *(Walloon business Federation)*
VITO	Vlaamse Instelling voor Technologisch Onderzoek *(Flemish Institute for technological research)*
VMW	Vlaamse Maatschappij voor Watervoorziening *(Flemish water supply Company)*
VOC	Volatile Organic Compound
vPvB	very Persistent, very Bioaccumulative
VRIND	Vlaamse Regionale Indicatoren *(Flemish regional indicators)*
WHO	World Health Organization
ZA	Zone Agricole *(Agricultural zone)*
ZACC	Zone d'Aménagement Communal Concerté *(Zone with concerted municipal development)*
ZAE	Zone d'Activité Économique *(Economic activity zone)*
ZE	Zone d'Extraction *(Extraction zone)*
ZF	Zone Forestière *(Forest zone)*
ZH	Zone d'Habitat et d'habitat à caractère rural *(Habitat and rural habitat zone)*
ZHIB	Zone Humide d'Intérêt Biologique *(Humid zone of biological interest)*
Zn	Zinc
ZN	Zone Naturelle, parcs et espaces verts *(Nature zone, parks and green areas)*
ZS	Zone de Service public *(Public service area)*

UNITS AND MULTIPLES

p	pico (10^{-12})
n	nano (10^{-9})
µ	micro (10^{-6})
m	milli (10^{-3})
k	kilo (10^{3})
M	Mega (10^{6})
G	Giga (10^{9})
T	Tera (10^{12})
€	Euro
Aeq	Acid equivalent
d	day
dB	decibel
CO_2 eq	Carbon dioxide equivalent
g	gram
h	hour
ha	hectare
Inhab	Inhabitant
J	Joule
kg	kilogram
kV	kilovolt
kWp	kilowatt peak (photovoltaic power)
kWh	kilowatt-hour
l	liter
m	meter
M€	Million of euros
mg	milligram
ppb	part per billion
P90	90th percentile
p.e.	population equivalent
t	tonne
TEQ	Toxic equivalent
toe	tonne oil equivalent
UCP	Unité de Charge Polluante (Unit of pollution load)
UI	Unités Internationales (units of measurement of IgE)
W	Watt
Wh	Watt hour
yr	year

REFERENCES

agr 1	MRW-DGA. 2008. *Evolution de l'économie agricole et horticole de la Région wallonne 2006-2007.* 141 p.
agr 3	BIOFORUM WALLONIE. 2005. *Le paysage de l'agriculture biologique en chiffres.* 10 p.
agr 6	MAROT, J., RIGO, V., FAUTRE, H. et BRAGARD, C. 2008. *Contribution à l'actualisation des indicateurs de l'état de l'environnement wallon relatifs à l'utilisation des produits phytopharmaceutiques.* Rapport de convention. MRW-DGRNE, UCL-FYMY. 47 p.
agr 8	ROSILLON, F., VANDENBORGHT, P., VANHEES, V., CAUSSE, E., GIOT, B. et LAMBERT, J. 2005. *Impact de l'abreuvement du bétail sur la qualité écologique des cours d'eau : étude de cas en Région wallonne de Belgique.* Cahiers de l'Association scientifique européenne pour l'eau et la santé, 10:1, 59-70.
agr 9	MRW-DGA. 2006. *Les nouvelles de l'automne* (4ème trimestre 2006).
tert 2	AQUAWAL S.A. 2004. *Etude relative à la caractérisation des consommations d'eau non domestiques par secteur d'activité en Région wallonne.* 86 p. ICEDD. 2007. *Estimation et localisation de la charge polluante émanant des établissements du secteur tertiaire et de l'industrie.* Rapport de convention. SPGE, ICEDD. 24 p.
ener 1	ICEDD. 2008. *Bilan énergétique de la Région wallonne 2006 – Bilan de consommation des transports. Rapport de convention.* MRW-DGTRE, ICEDD. 102 p.
trans 2	EEA. 2008. *Climate for a transport change – TERM 2007 : indicators tracking transport and environment in the European Union.* EEA Report. 2008:1. 56 p. SPF MOBILITE ET TRANSPORTS. 2007. *Recensement général de la circulation 2006.* Direction Mobilité, publication N°39. 112 p.
trans 5	EEA. 2008. *Climate for a transport change – TERM 2007 : indicators tracking transport and environment in the European Union.* EEA Report. 2008:1. 56 p.
trans L1	SPF ECONOMIE, PME, CLASSES MOYENNES ET ENERGIE. 2007. *La navette entre Régions et provinces.* Communiqué de presse du 19 juillet 2007. DGSIE. 10 p. SPF MOBILITÉ ET TRANSPORTS. 2007. *Recensement général de la circulation 2006.* Direction Mobilité, publication N°39. 112 p.
househ 1	BUREAU FEDERAL DU PLAN. 2008. *Perspectives de population 2007-2060.* BFP, DGSIE. 150 p.
househ 2	CRIOC. 2008. *Les consommateurs et la perte du pouvoir d'achat.* [Internet page]. http://www.oivo-crioc.org/files/fr/3882fr.pdf (Page viewed on 08/09/08).
househ 4	PREVEDELLO, C. 2006. *L'utilisation de l'eau de distribution en Région wallonne : Dossier scientifique réalisé dans le cadre de l'élaboration du Rapport analytique 2006-2007 sur l'état de l'environnement wallon.* AQUAWAL S.A. 110 p.
househ 5	SAMBORSKI, V. et VAN BELLEGEM, L. 2008. *De biologische landbouw in 2007.* Vlaamse Overheid, Departement Landbouw en Visserij, Brussel. 36 p. CRIOC. 2008. *9 ans d'éco-consommation.* [Internet page]. http://www.oivo-crioc.org/files/fr/3132fr.pdf (Page consultée le 11/09/08).
househ 6	CRIOC. 2008a. *9 ans d'éco-consommation.* [Internet page]. http://www.oivo-crioc.org/files/fr/3132fr.pdf (Page consultée le 11/09/08). CRIOC. 2008b. *Consumer Behavior Monitor 2008.* [Internet page]. http://www.oivo-crioc.org/files/fr/3896fr.pdf (Page consultée le 12/09/08).
househ 7	RDC-ENVIRONNEMENT et IGEAT. 2007. *Evaluation des performances des communes de la Région wallonne en matière de gestion des déchets ménagers au regard de leur cadre réglementaire et fiscal.* Rapport final. Février 2007. RDC-ENVIRONNEMENT. 2007. *Evaluation des objectifs fixés par le Plan Wallon des Déchets – Horizon 2010 en termes de prévention, de collectes sélectives, de valorisation et d'élimination des déchets ménagers.* Rapport final. Mars 2007.

waste 1	RDC-ENVIRONNEMENT. 2007. *Evaluation des objectifs fixés par le Plan Wallon des Déchets – Horizon 2010 en termes de prévention, de collectes sélectives, de valorisation et d'élimination des déchets ménagers.* Rapport final. Mars 2007.
air 2	MRW-DGRNE, VMM-FEA, VITO, IBGE, IRCEL et ECONOTEC. 2008. *BELGIUM'S GREENHOUSE GAS INVENTORY (1990-2006).* National Inventory Report submitted under the United Nations Framework Convention on Climate Change and the Kyoto Protocol.
water 7	SPW-DGO3. 2008. *Rapport visé à l'article 10 de la Directive Nitrates (91/676). Partie I : Bilan et évaluation de la qualité des eaux et des pratiques agricoles en Région wallonne.* Juin 2008.
water 8	SPW-DGO3. 2008. *Rapport visé à l'article 10 de la Directive Nitrates (91/676). Partie I : Bilan et évaluation de la qualité des eaux et des pratiques agricoles en Région wallonne.* Juin 2008.
water 9	SPW-DGO3. 2008. *Directive cadre européenne sur l'eau 2000/60/CE - Définition provisoire du "bon état" et de ses valeurs seuils provisoires pour les eaux douces de surface (cours d'eau) en Région wallonne.*
water 12	DELLOYE, F., PREVEDELLO, C. et HECQ, W. 2007. *Directive cadre de l'eau - Développement du volet économique. Évaluation des bénéfices marchands liés à l'usage eau potable pour les masses d'eau de Wallonie.* Résumé de l'étude.
water 15	GUYON, F., COGELS, X. et VANDERBORGHT, P. 2006. *Développement et application d'une méthodologie d'évaluation globale de la qualité hydromorphologique des masses d'eau de surface définies en Région wallonne.* Rapport final convention DGRNE-Aquapôle. Mars 2006. 74 p.
water 16	VANDEN BOSSCHE, J-P. 2008. *Evolution de la qualité biologique des cours d'eau de Wallonie de 1990 à 2007 (macroinvertébrés). Résultats des stations sélectionnées pour le réseau du contrôle de surveillance de la Directive Cadre pour l'Eau.* SPW-DGARNE-CRNFB.
water 19	SPGE. 2007. *Rapport d'activités 2007*. 119 p.
soils L4	SOHIER, C., DEGRE, A. et DAUTREBANDE, S. 2008. *Evaluation des mesures prises pour réduire les incidences de la pollution diffuse d'origine agricole et domestique sur la qualité des masses d'eau de surface et souterraines de la Région wallonne à l'aide du modèle EPICgrid. "Projet Qualvados"*. Rapport de Convention MRW-DGRNE, SPGE, FUSAGx-Unité d'Hydrologie et Hydraulique agricole. 145 p. PEREIRA, B., HOUBEN, D. et SONNET, P. 2008. *Etat des lieux du taux de saturation en phosphore des sols agricoles de la Région Wallonne et perspectives d'évolution compte tenu des apports de matière organique. Projet SATUPHOS.* Rapport de Convention intermédiaire - Janvier 2008. MRW-DGRNE, UCL-SOLS.
soils L5	GOIDTS, E., MEERSMANS, J. et VAN WESEMAEL, B. 2008. *Teneurs en matière organique des sols en Région wallonne. Méthodologie pour les cartes et figures réalisées à la demande de la DGRNE dans le cadre de la mise à jour des indicateurs de l'Etat de l'Environnement Wallon 2008*. Rapport final de Convention. MRW-DGRNE, UCL. CULOT, M. 2005. *Filières de valorisation agricole des matières organiques.* Document réalisé à la demande du Cabinet du Ministre Benoît Lutgen. FUSAGx-LEMEE.
soils L1	SONNET, P., BOMBAERTS, V. et PEREIRA, B. 2007. *Outil cartographique de la capacité des sols de la Région wallonne à accepter l'épandage d'amendements organiques conformes à la réglementation (acronyme : CAPASOL).* Rapport final de Convention. MRW-DGRNE, UCL.
FFH 1	HUNTLEY, B., GREEN, R.E., COLLINGHAM, Y.C. et WILLIS, S.G. 2007. *A Climatic Atlas of European Breeding Birds.* Lynx. 522 p.
FFH 4	SITEREM, CELINE et ISSeP. 2006. *Analyse spatio-temporelle du dépassement des charges critiques en polluants acidifiants en Région wallonne. Analyse selon le type d'écosystème et mise en relation avec les quantités émises de substances acidifiantes.* Rapport final de Convention. MRW-DGRNE. 193 p.
FFH L2	PONTON, E. et LECLERCQ, L. 2007. *Influence des pluies azotées sur les milieux de tourbières, de bas-marais et de landes tourbeuses : effets à court et moyen termes sur les algues (desmidiacées, diatomées) et à moyen terme sur les bryophytes et les phanérogames acidophiles et acidobiontes.* Rapport final de Convention. MRW-DGRNE, ULg. DOMMES, M. 2007. *Assemblages de thécamoebiens, de diatomées et de pollens comme biomarqueurs d'humidité, trophiques et stratigraphiques, en relation avec l'évolution des tourbières belges : caractérisation des niveaux pré- et postindustriels.* Mémoire de fin d'études. ULg.

health 2 VERSPORTEN, A., DE PLAEN, P., HESSE, E., BRASSEUR, O. et FIERENS, F. 2007. *La pollution de l'air par les particules en suspension. Impact sur la santé de la population de la ville et l'arrondissement de Charleroi.* IPH/EPI REPORTS Nr. 2007-037

REMY, S. et NAWROT, T. 2008. *Health impact assessment in three Belgian cities : Brussels, Antwerp and Liège.* Rapport réalisé dans le cadre du Projet "Ville et pollution" du NEHAP.

health L1 REMY, S. et NAWROT, T. 2008. *Health impact assessment in three Belgian cities : Brussels, Antwerp and Liège.* Rapport réalisé dans le cadre du Projet "Ville et pollution" du NEHAP.

health L2 LE BEL, M., DENGIS, P. et HALEN, H. 2008. *Qualité des légumes produits dans les jardins riverains de Marchienne-au-Pont (Charleroi).* SPAQuE. 159 p.

health L3 WIV-ISP, CODA-CERVA, Universiteit Antwerpen, CART-ULg et UGent. 2008. *Contaminatie van eieren afkomstig van kippen gehouden bij particulieren.* Onderzoeksproject RT-06/9-CONTEGG.

health L5 BERNARD, A., NICKMILDER, M. et VOISIN, C. 2008. *Outdoor swimming pools and the risks of asthma and allergies during adolescence.* European Respiratory Journal, 32, 979-988.

noise L1 BLUHM, G.L., BERGLIND, N., NORDLING, E. et ROSENLUND, M. 2007. *Road traffic noise and hypertension.* Occupational and Environmental Medicine, 64, 122-126.

DE KLUIZENAAR, Y., GANSEVOORT, R.T., MIEDEMA, H.M.E. et DE JONG, P.E. 2007. *Hypertension and Road Traffic Noise Exposure.* Journal of Occupational & Environmental Medicine, 49:5, 484-492.

WHO. 2007. *Quantifying burden of disease from environmental noise: Second technical meeting report.* [Internet page]. Bern. http://www.euro.who.int/Document/NOH/Noise_EDB_2nd_mtg.pdf (Page consultée le 6/10/08).

HARALABIDIS, A.S., DIMAKOPOULOU, K., VIGNA-TAGLIANTI, F., GIAMPAOLO, M., BORGINI, A., DUDLEY, M.L., PERSHAGEN, G., BLUHM, G., HOUTHUIJS, D., BABISCH, W., VELONAKIS, M., KATSOUYANNI, K. et JARUP L. ; HYENA Consortium. 2008. *Acute effects of night-time noise exposure on blood pressure in populations living near airports.* European Heart Journal, 29, 658-664.

COHEN, J.M. 2007. *Bruit et santé en Ile-de-France.* Etude réalisée par Open Rome. Rapport final. Région d'Ile-de-France, Direction de l'environnement. [Internet page]. http://www.iledefrance.fr/uploads/tx_base/Bruit_et_Sante_en_IDF__2007.pdf (Page consultée le 6/10/08).

ACKNOWLEDGEMENTS

ANTOINE Didier	SPW-DGO1
AUQUIERE Patrick	SPW-DGO3
BASTIN Bénédicte	SPW-DGO3
BERNARD Alfred	UCL
BIERNAUX Olivier	IWEPS
BIOT Pierre	SPF SPSCAE
BOMBAERTS Vincent	UCL
BOUCHAMA Hicham	SPW-DGO3
BOUILLON Jeanine	BNB
BOULAND Catherine	Bruxelles Environnement
BRANQUART Etienne	SPW-DGO3
BRASSEUR Daniel	SPW-DGO2
CADELLI Didier	SPGE
CASTAGNE Didier	SPW - Secrétariat général
CHABOT Caroline	SPW-DGO3
CLOSSET Olivier	SPW-DGO3
COLLIN-SCHOTS Danielle	SPF Economie
CONSTANT Sébastien	SPAQuE
COOLS Stéphane	SPW-AWAC
CORDONNIER Alain	SPW-DGO3
COSSE Véronique	SPW-DGO6
DAUTREBANDE Sylvia	FUSAGx
DE BACKER Hugo	KMI-IRM
DE BAST Benoît	SPW-AWAC
DEBUISSON Marc	IWEPS
DECKERS Patricia	Observatoire de la santé de la province de Luxembourg
DEFOUX Jacques	SPW-DGO3
DEFRISE Dominique	CEPAG
DEGBOMONT Frédéric	SPW-DGO3
DEGRE Aurore	FUSAGx
DELAITE Laurent	ICEDD
DELESCAILLE Louis-Marie	SPW-DGO3
DELLOYE Francis	SPW-DGO3
DEMARCIN Pierre	FUSAGx
DEMARETS Xavier	SPW-DGO3
DEROCHETTE Luc	SPW-DGO3
DESTREBECQ Michel	SPGE
DESENDER Konjev	IRScNB
DEWIL Paul	SPW-DGO2
DIDY Christian	SPGE
DONNAY-WOUTERS Jean-Pierre	SPW-DGO3
DUFRENE Marc	SPW-DGO3
DUMONT Michel	SPW-DGO3
DURAN Valérie	SPW-DGO3
ELOY Sara	ISSeP
ENGELS Patrick	SPW-DGO3
FAUTSCH Michel	SPW-DGO3
FIASSE Thibault	SPW-DGO3
FICHEFET Violaine	SPW-DGO3
FOURMEAUX Annick	SPW-AWAC
FRASELLE Nadine	UCL
FRERE Georges	SPW-DGO3
FRERE Rémy	SPGE
FRIPPIAT Gaëtan	Cabinet du Ministre Lutgen
GABRIEL François	SPW-DGO3
GATHOYE Jean-Louis	SPW-DGO3
GAUTHY Raymond	SPW-DGO3
GEORGES Jean-Pierre	SPF Economie
GERARD Pierre	SPW-DGO3
GHESQUIERE Philippe	CERTISYS
GILLET Martine	SPW-DGO3
GODFROID Serge	SPW-DGO3
GOFFART Philippe	SPW-DGO3
GOIDTS Esther	UCL
GUNS André	SPW-AWAC
HALEN Henri	SPAQuE
HALLEUX Etienne	SPW-DGO3
HAUREGARD Catherine	SPW-DGO3
HENNEBERT Patrick	SPW-DGO3
HIGUET Isabelle	SPW-AWAC
HOSPIED Marc	SPW-DGO2
HOUTAIN Alain	SPW-DGO3
IMERZOUKENE Saadia	SPW-DGO3
JACOB Jean-Paul	Aves-Natagora
JACQUEMART Pol	SPAQuE
JEROME Jean-François	BIOFORUM
JUPRELLE Julien	IWEPS
KEIMEUL Catherine	SAMI-Namur
KERVYN Thierry	SPW-DGO3
KEULEN Christine	SPW-DGO3
KRAFT Nicolas	SPW-DGO2
LABEEUW Gilles	SPF MT
LAMBOT Francis	SPW-DGO3
LAMOTTE Sandrine	SPW-DGO3
LANGE Stéphanie	ULg
LANNOY Jean-Pierre	SPW-DGO3
LAURENT Christian	SPW-DGO3

LAURENT Jacques	SPW-DGO2
LE ROI Alain	UCL (GIREA)
LEBBE Martine	SPW-DGO3
LEBECQUE Thomas	SPW-DGO3
LEBEL Maud	SPAQuE
LEBIZAY Fabienne	SPW-DGO3
LECLERCQ Louis	ULg
LECOMTE Hugues	SPW-DGO3
LEGROS Christian	BELGAQUA
LEJEUNE Jean-Luc	SPGE
LIBERT Pierre-Nicolas	SPW-DGO3
LIBERT Yves	SPW-DGO2
LIEGEOIS Sandrine	SPW-DGO3
LOPEZ Maria-José	ICEDD
LOROY Dominique	MWQ
MAHIEU Emmanuel	ULg
MARC Philippe	GAWI/FRUITNET
MARENNE Yves	ICEDD
MAROT Jean	UCL (CRP)
MARSIN Jean-Marie	SPW-DGO3
MASSART Viviane	SPF Economie
MASSET Roland	SPW-DGO3
MATERNE Frédéric	SPW-DGO3
MERCIER Jean-Yves	SPW-DGO3
MOKADEM Abdel Ilah	SPW-DGO3
MORELLE David	SPW-DGO4
MOUZELARD Thibaut	SPW-DGO2
NAVEAU François	SPW-DGO3
NICOLAS Alain	SAMI-Liège
NOERENS Laurence	SPW-DGO3
NOLLEVAUX Hughes	SPW-DGO4
PARKS Olivier	SPW-AWAC
PEREIRA Benoît	UCL
PETIT Fabian	SPW-DGO3
PETIT Pascal	SPW-DGO3
PETIT Paul	ISSeP
PETITJEAN Marianne	SPW-DGO3
PHILIPPART Jean-Claude	ULg
PIRLET Marc	SPW-DGO3
PLANCHON Anne	ICEDD
PONTON Etienne	ULg
POTS Annelies	SPF Economie
PREVEDELLO Cédric	AQUAWAL S.A.
PUSSEMIER Luc	CERVA
RAMANITRERA Stephanie	SPW-DGO3
RAMELOT Catherine	SPW-DGO2
RASUMNY Christophe	SPW-DGO4
REMY Suzanne	ISSeP
RENARD Pierre	SPW-DGO3
RENTIER Céline	SPW-DGO3
SAINTENOY-SIMON Jacqueline	AEF
SALMON Philippe	SPW-DGO3
SAMOY David	SPW-DGO3
SCHMIDT Anne	SPGE
SIMAR Jérémy	SPW-DGO3
SIMUS Pascal	ICEDD
SMOOS Augustin	SPW-DGO3
SOHIER Catherine	FUSAGx
SONNET Philippe	UCL
SPRENGERS Rudy	SPF Economie
STEELS Maryline	SPW-DGO3
TELLIER Véronique	Observatoire de la santé du Hainaut
TERNEUS Annick	SPW-DGO3
THEATE Pascal	SPW-AWAC
THIBERT Alain	SPW-DGO1
THIRION Marc	SPW-DGO3
THOMAS Guy	SNCB
TRICOT Benoît	SPW-DGO3
VAN DRIESSCHE Isabelle	SPW-DGO3
VAN EEGHEM Walter	SPW-DGO3
VAN OYEN Herman	ISP
VAN REETH Wouter	INBO
VAN WESEMAEL Bas	UCL
VAN WESEMBEECK Christelle	SPW-DGO3
VANDEN BOSSCHE Jean-Pierre	SPW-DGO3
VANDENDRIESSCHE Luc	SPW-DGO6
VANDERHEYDEN Vincent	SITEREM
VERTE Patrick	SPW-DGO3
VERTONGEN Sylvie	AQUAWAL S.A.
WADIN Paul	SPW-DGO3
WALOT Thierri	UCL (GIREA)
WITTEMANS Virginie	SPW-DGO3
WYLOCK Dominique	SPW-DGO3

Reviewing committee

DE WEIRELD Guy	FPMS
LEDANT Jean-Paul	Consultant
MERENNE Emile	ULg
THUNIS Xavier	FUNDP
TYTECA Daniel	UCL

COPYRIGHT (PICTURES)

© Barbier, Y.	p65 to 69
© Carpentier, J.-L.	p27 to 36
© Dozzi, J.	p41 to 46, p57 to 59, p89 (Air and climate), p91, p92 to 101, p104 to 125, p155
© Fourneau, B.	p177, p179 to 180
© Toussaint, P.	p139 (butterfly picture)
© Forêt Wallonne asbl	p37 to 40
© Intradel, PMC Sorting centre Sitel	p19 (Waste management), p75, p76 to 85
© Label s.a. :	
- Cuvelier, C.	p19, (Production), p23
- Devuyst, M.	Cover page, p9, p11 to 16, p19 (Households consumption), p24 to 26, p47 to 48, p61, p64, p70, p71 to 72, p73, p89 (Water and aquatic environment, Fauna, flora and habitats), p103, p137, p138 to 150, p162, p163 to 168
- Jacmin, L.	p62 to 63, p89 (Soils), p127, p169 to p172
© Photodisc	p53 to 56
© European Union (Audiovisual service)	p181, p182 to 185
© Walsols	p128 to 135
© http://cliketclak.skynetblogs.be	p49 to 52

Service Public de Wallonie

Direction générale opérationnelle Agriculture, Ressources naturelles et Environnement
(Direction générale opérationnelle 3)

Département de l'Etude du milieu naturel et agricole
Direction de l'Etat environnemental
Cellule Etat de l'environnement wallon

Avenue Prince de Liège, 15
5100 Jambes

Tel. DGARNE: 0032 81 33 50 50
Email: dgrne@mrw.wallonie.be
http://environnement.wallonie.be

Cellule Etat de l'Environnement wallon:
Environmental Outlook for Wallonia 2008
SPW-DGARNE(DGO3)-DEMNA-DEE

Editor-in-chief: C. Delbeuck, Managing Director
Free publication
D/2009/11802/20

Design and graphics: Label sa. Printed on recycled paper.