

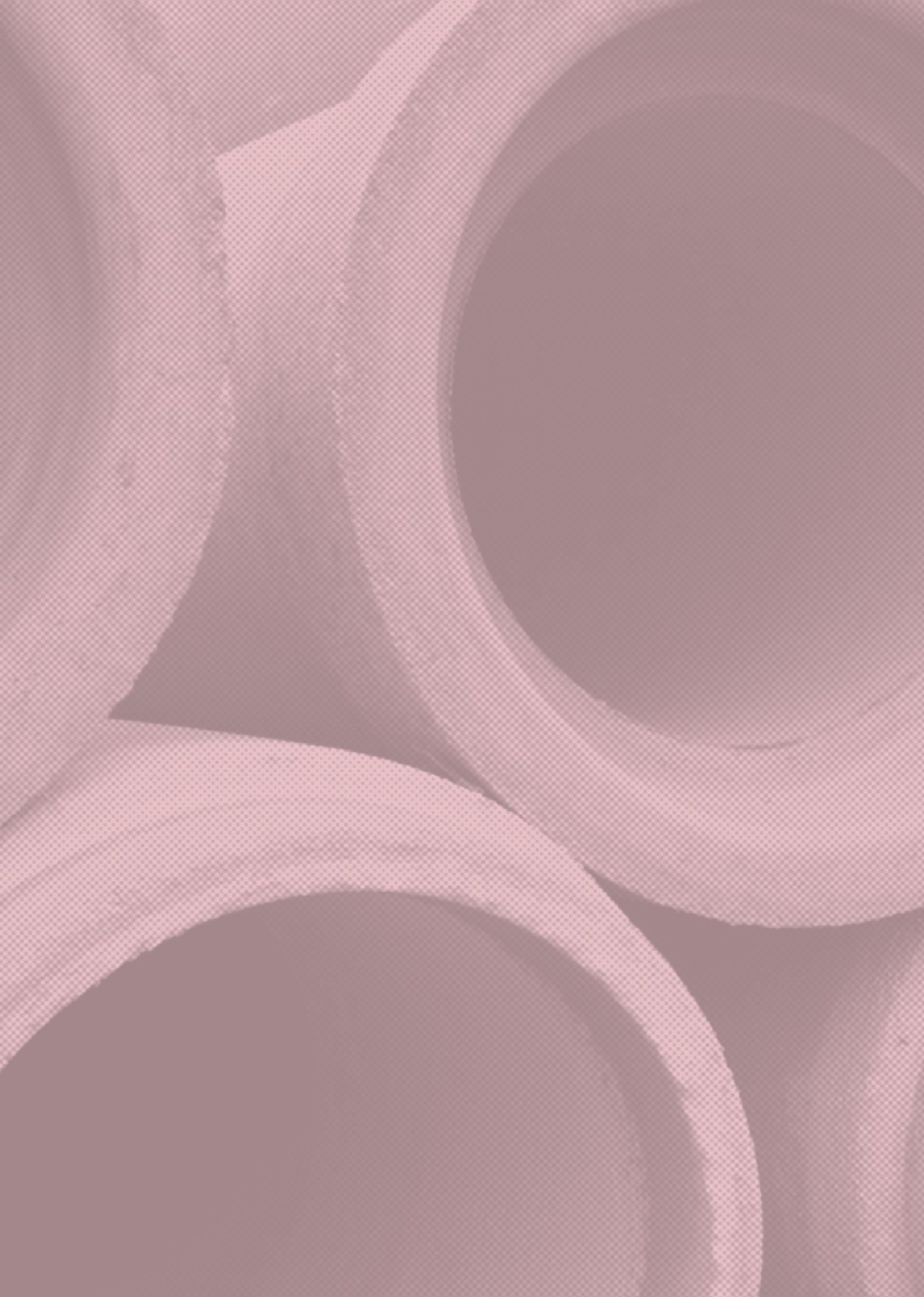
# Mineral Resources in Flanders

The Flemish  
Policy

**lne**

Environment,  
Nature and  
Energy  
Departement





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# Intro- duction

In Flanders, near-surface mineral resources, such as clay, sand, loam and gravel, are all exploited by means of the open pit method. A special Flemish Parliament Act has therefore been drawn up formulating a sustainable mineral resources policy for these minerals. These mineral resources are widely used in the building and infrastructure sectors and thus hold important economic potential for the further development of Flanders.

Recently, great efforts have been made to develop the long-term sustainable planning of extractive industrial needs in Flanders. Long-term needs were established for each of the available mineral resources, whilst the possibility of using secondary raw materials was also taken into account. This resulted in the General Surface Mineral Resources Plan.

To determine the relation with land use planning, Specific Surface Mineral Resources Plans were worked out for the different resources. These plans define the needs for the different resources during the following years on a more regional scale.

Finally, this brochure also elaborates on the policy on the rehabilitation of exploited quarries as well as on some initiatives to inform the general public about the mineral resources in Flanders.

Jean-Pierre Heirman  
Secretary-General  
Environment, Nature and Energy Department

# Mineral Resources in Flanders

## Resources in Flanders

The subsoil in the Flemish Region is mainly composed of sedimentary deposits of Tertiary and Quaternary formations. Hence, natural resources include construction and industrial minerals like clay, loam, sand and gravel. Since the discontinuation of coal-mining operations, these construction minerals have now become the only extracted and commercialised mineral natural resources in the Flemish Region. Construction minerals are essential resources for the economically and socially important building and infrastructure sectors. Bricks, tiles, argex granules, glass, mortar, concrete and glazed stoneware pipes are all fabricated with Flemish surface raw materials. Quartz sand and its derived products, such as cristobalite, silicon and water glass (sodium silicate), have numerous high-grade applications. They are used as important additives or fillers in paints, detergents, good-quality plasters, paper, toothpaste, automobile tyres, tile cements, transparent plastic films, et cetera. Silicon is also the main base material for the production of semiconductors like chips and solar cells.

Direct employment in the extraction industry amounts to about 3,500 jobs in the Flemish Region. In general, approximately 152,000 people work in the Flemish construction industry, which is dependent on a continuous supply of construction minerals.

Some of the main resources exploited in Flanders are clay and loam deposits. These deposits are exploited in open pit mining above the water table. The abundance of clay and loam makes



Flanders a net exporter of baked end products such as bricks and roofing tiles. Clay and loam are found over a vast area of Flanders. Loam is mostly found in the southern parts of the region as an aeolian deposit dating back to the last ice ages. However, the main clay deposits of the region are the result of Tertiary marine deposits. The most important deposits are the Ypres clay in West Flanders and the Boom clay in the Rupel and Waasland region. Apart from these marine deposits, Quaternary alluvial clays are found in the valleys of the main rivers and in the Campine area.

Another important Flemish mineral resource is represented by the abundance of sands in the region. Depending on their quality, these sands are used as filler sand, building sand or masonry sand. They are extracted in open pit surface mines above the groundwater table as well as by dredging techniques below the water table.

Silica sands constitute an important and very valuable sand deposit. They occur in the eastern part of the Province of Limburg and the northern part of the Province of Antwerp. These pure silica sands formed the basis of a thriving glass-making industry in the areas concerned. Nowadays, these sands are also used to produce higher value end-products, such as tridymite and cristobalite, which are exported across the world.



The gravel deposits in East Flanders form the last important Flemish mineral resource. Two different types of gravel deposits are distinguished. The oldest terrace gravel deposits were deposited on the Campine plain at the beginning of the ice ages. They consist of relatively unclean gravel deposits which occur above the current water table. As a result, they are extracted in dry open pit mines. Because the gravels contain impurities, these gravel deposits get washed before they can be commercialised. The second gravel deposits occur in the current alluvial plain of the River Meuse (valley gravel). They consist of very clean gravels which were deposited during the later stages of the ice ages. Only a limited amount of these gravels can be extracted through dry open pit mining. The majority is extracted from below the water table. Because of the limited extent of these gravel deposits in the Meuse Valley area, former and current extractions have had a big impact on the environment of the area. For this reason, the extraction of valley gravel is gradually discontinued.

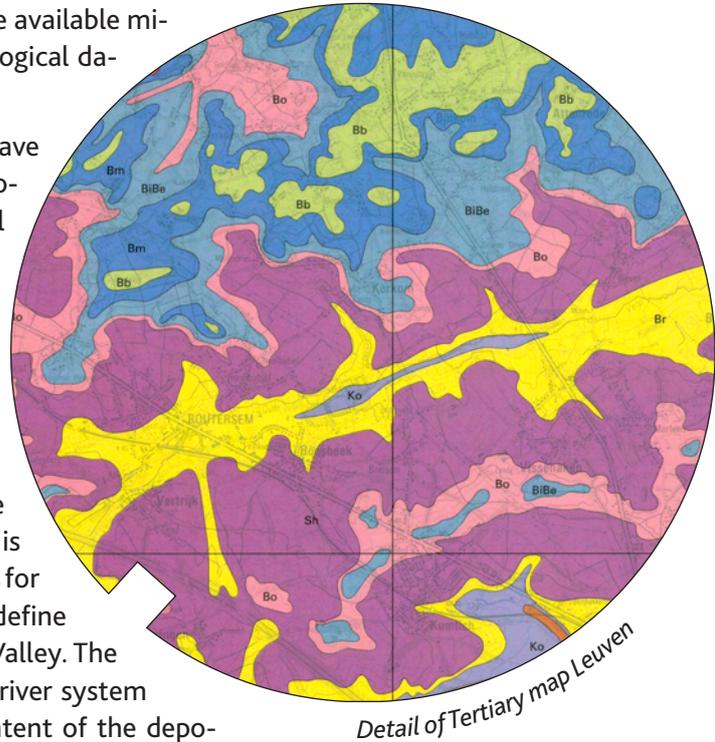


## Geological Maps and Models

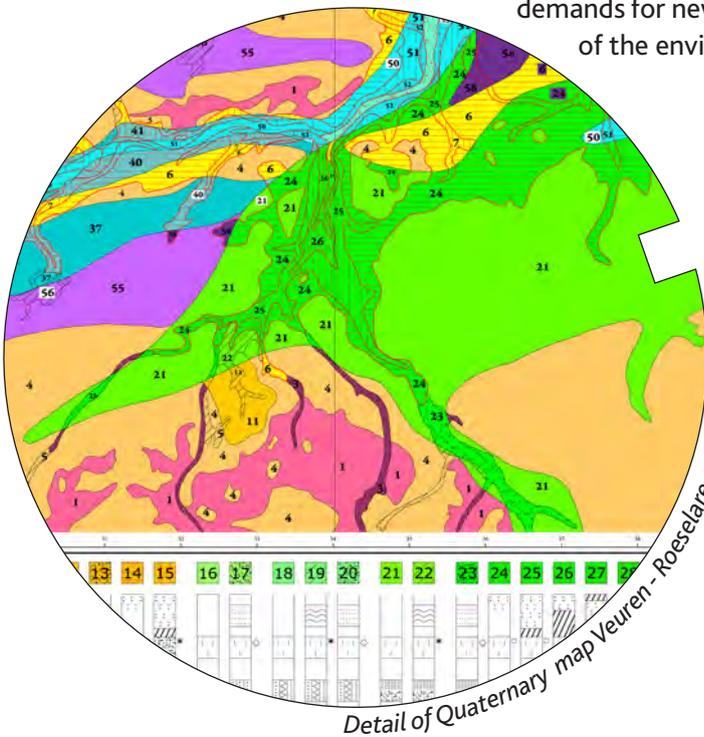
In order to define the best locations to exploit the available mineral resources, an up-to-date and detailed geological database is available.

Recently, the Tertiary subcrop maps of Flanders have been revised in cooperation with the Belgian Geological Survey. Since plenty of the Flemish mineral resources are of Tertiary age, this map combined with the thickness map of the overlying Quaternary strata allows for the definition of areas which are suitable for mineral extraction from the Tertiary strata.

Flanders also has profile-type geological maps of the Quaternary strata. However, some of these profile-type maps are difficult to interpret, which is why Flanders ordered the design of thematic maps for specific purposes. One of these maps aimed to define the sand occurrence in the Quaternary Flemish Valley. The Flemish Valley was deposited by a huge braided river system during the ice ages. Consequently, the sand content of the deposits can vary considerably in thickness, quality and average content over very short distances. The design of this map allows the authorities to better judge on the merits of demands for new exploitations and to reduce the surface area of the envisaged exploitations.

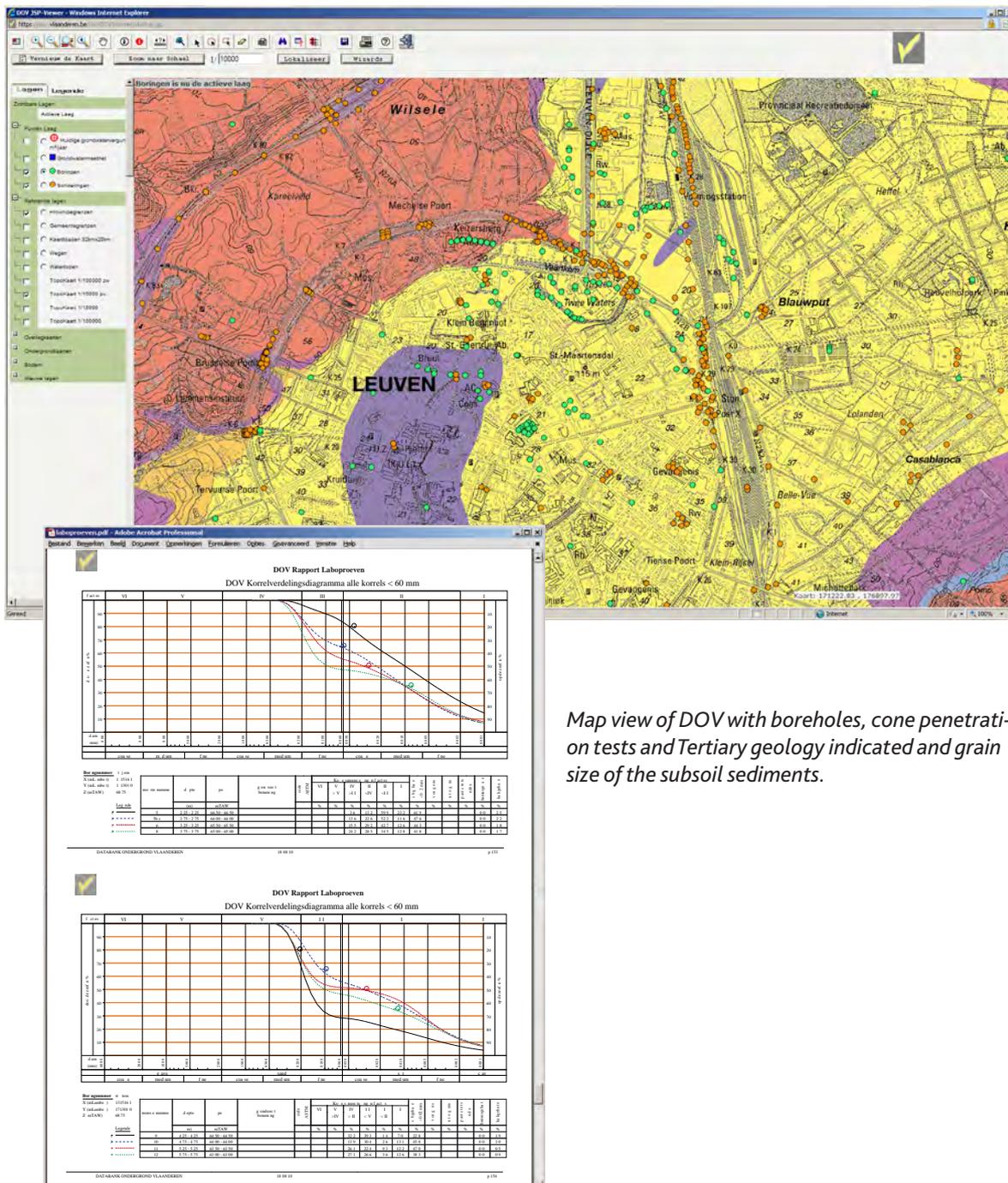


*Detail of Tertiary map Leuven*

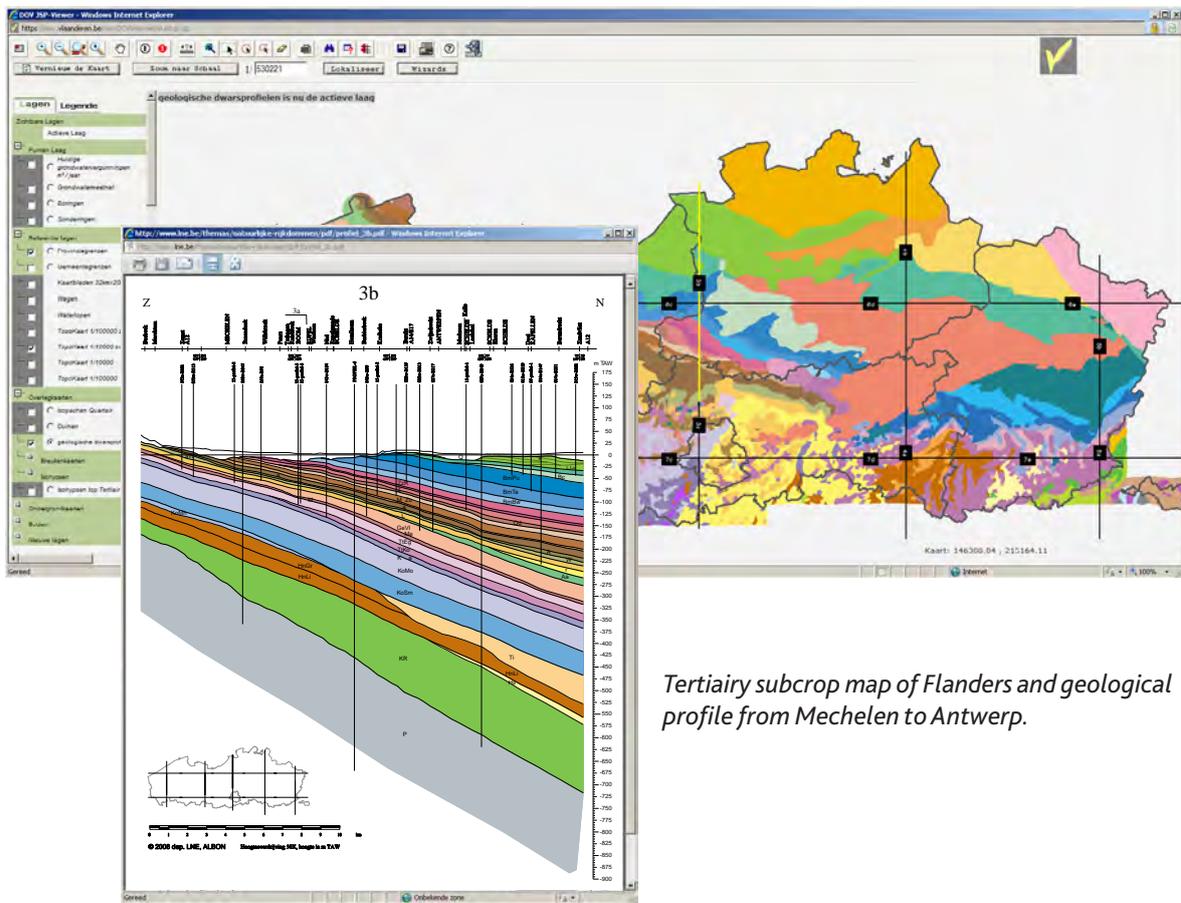


*Detail of Quaternary map Veuren - Roselare*

A very important tool for designing thematic maps and models is the Database of the Soil and Subsoil of Flanders (DOV, <http://dov.vlaanderen.be>). This database, which is free of charge, is available to the public at large and contains any available geological information, such as bore-hole and cone penetration tests as well as Tertiary subcrop and Quaternary geological maps. Most of the borehole and cone penetration tests also contain an interpretation of the geology encountered. The database is continuously updated and extended as more information becomes available. It is the result of a cooperation agreement between the Environment, Nature and Energy Department, the Mobility and Public Works Department and the Flemish Environment Agency.

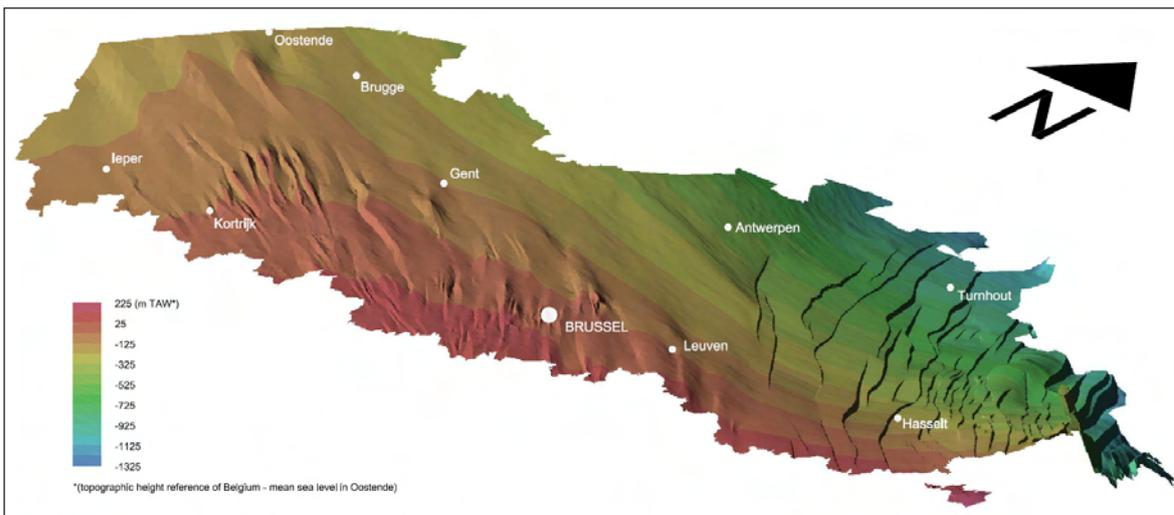


Map view of DOV with boreholes, cone penetration tests and Tertiary geology indicated and grain size of the subsoil sediments.



*Tertiary subcrop map of Flanders and geological profile from Mechelen to Antwerp.*

For several years now, Flanders has been building a geological 3D model from the most recent top sediments to the deep solid subsurface on the basis of DOV data. This 3D model will give a clear insight into the structure of Flanders' subsoil. This will increase the understanding of the subsoil and will promote the sustainable use thereof. This 3D model will serve as input for educational purposes, research for infrastructure works and storage provision, geological knowledge building, an estimation of natural resources,...

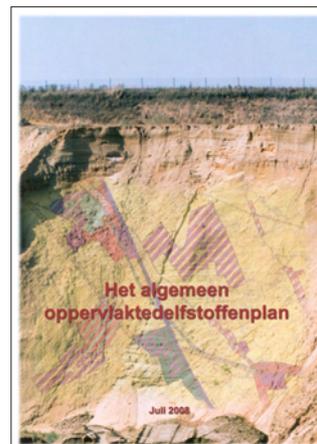


*Geological concept guided computer generated 3D model: SE-view of the top of the pre-Cretaceous sediments in Flanders. (Matthijs, VITO 2008)*

## Sustainable Mineral Resources Strategy

The competition for land use is very pronounced in Flanders. Due to the dense population, the area available for minerals extraction is very limited. In order to facilitate the need for raw materials, Flanders has developed a legal framework.

The Flemish Sustainable Mineral Resources Strategy is based on the General Surface Mineral Resources Plan. On 4 April 2003, the Flemish Government ratified the Flemish Parliament Act on Surface Mineral Resources. This act defines the basic objective of the policy regarding the management of surface mineral resources as follows: "To sustainably meet the needs for surface mineral resources of current and future generations".



This basic objective is further put into practice by:

- ★ *Extracting in such a way as to allow the economic, social and environmental components to mutually reinforce each other to the maximum extent;*
- ★ *Guaranteeing development perspectives for the sector, taking account of the business economic security, in view of long-term socio-economic acceptable extraction opportunities, in order to meet society's needs;*
- ★ *Using surface mineral resources in an economical and efficient manner;*
- ★ *Extracting optimally within extraction areas on the basis of an economical use of space;*
- ★ *Promoting the use of fully-fledged alternatives for primary surface mineral resources and the maximum re-use of waste, in order to curb the needs for primary surface mineral resources;*
- ★ *Taking the maximum preservation and development of nature and the natural environment into account in extractions.*

The General Surface Mineral Resources Plan supplies a number of concepts and indicators regarding a sustainable extraction policy. Furthermore, the general plan analyses the needs for surface mineral resources for the next five years on the basis of economic studies, market research and consultation. The bottlenecks and actions which are highlighted by this analysis and which are necessary to implement the sustainability objectives are described in great detail. Finally, it is also examined which impact the General Surface Mineral Resources Plan has on the environment and agriculture and which are the socio-economic consequences and financial implications of a sustainable extraction policy.

A Flemish Parliament Act has been drawn up, specifically for the extraction of gravel in the Province of Limburg. This Act on Gravel allocated a fixed quota of gravel to the different extractors and introduced a levy on the production of the gravel, in order to secure the realisation of the rehabilitation and social consequences of the future reorganisation of the sector. The levies are also being used to search for alternatives for gravel production. On 15 July 2005, the Flemish Parliament Act on Gravel was amended. This amending Act confirms the allocated tonnages but also allows consultations to be started on the future of gravel extraction with all Limburg parties involved. The latest important modification of the Act on Gravel (the amendment of the Gravel Flemish Parliament Act of 3 April 2009) makes extraction of gravel possible in certain specific cases and lays the foundation for a project-based approach. This project-based extraction of gra-

vel will only be allowed when it leads to an improvement of the ecology and biodiversity of local nature. It has to be evaluated in the future to which extent this project-based gravel extraction is meeting the demand for gravel in the Flemish Region.

The surface mineral resources plans are based on development perspectives for a period of at least 25 years and comprise actions for the next five years. As such they lay the foundations for the sectoral proposals regarding spatial planning (regional spatial implementation plans) and for the drafting of other specific policy plans. They are evaluated every five years on the basis of the aforementioned objectives.

The Flemish Spatial Structure Plans recognise

19 regions as extraction areas. Spe-

cial Surface Mineral Resources

Plans are drafted for all regions

recognised as extraction area.

These Special Mineral Resources

Plans examine the current and

future needs for the considered

mineral resource. On the basis of

this evaluation and in consultati-

on with local authorities and the

general public, existing extrac-

tion zones can be extended, re-

duced, sustained or given a new

land use destination. In some cas-

es new extraction areas are pro-

posed to ensure the future needs

of the considered mineral resource.

Once consensus is reached, the

Special Mineral Resources Plan is presented to the Flemish Government for ratification.

Several measures have been taken to guarantee a sustainable and efficient extraction of mine-

erals.

For this reason mineral extractions are governed by the VLAREM regulation. VLAREM is the envi-

ronmental regulatory process in the Flemish Region of Belgium for any activities and/or projects

that have an impact on the environment. The strengths of VLAREM are that:

- ★ *it creates one clear framework for any activities that may affect the environment;*
- ★ *it is composed of different conditions for specific activities e.g. minerals extraction;*
- ★ *the permitting procedures have fixed time-frames;*
- ★ *it is flexible, allowing additional conditions to be formulated by the Government if required, e.g. where conditions are not specific enough for certain sites.*

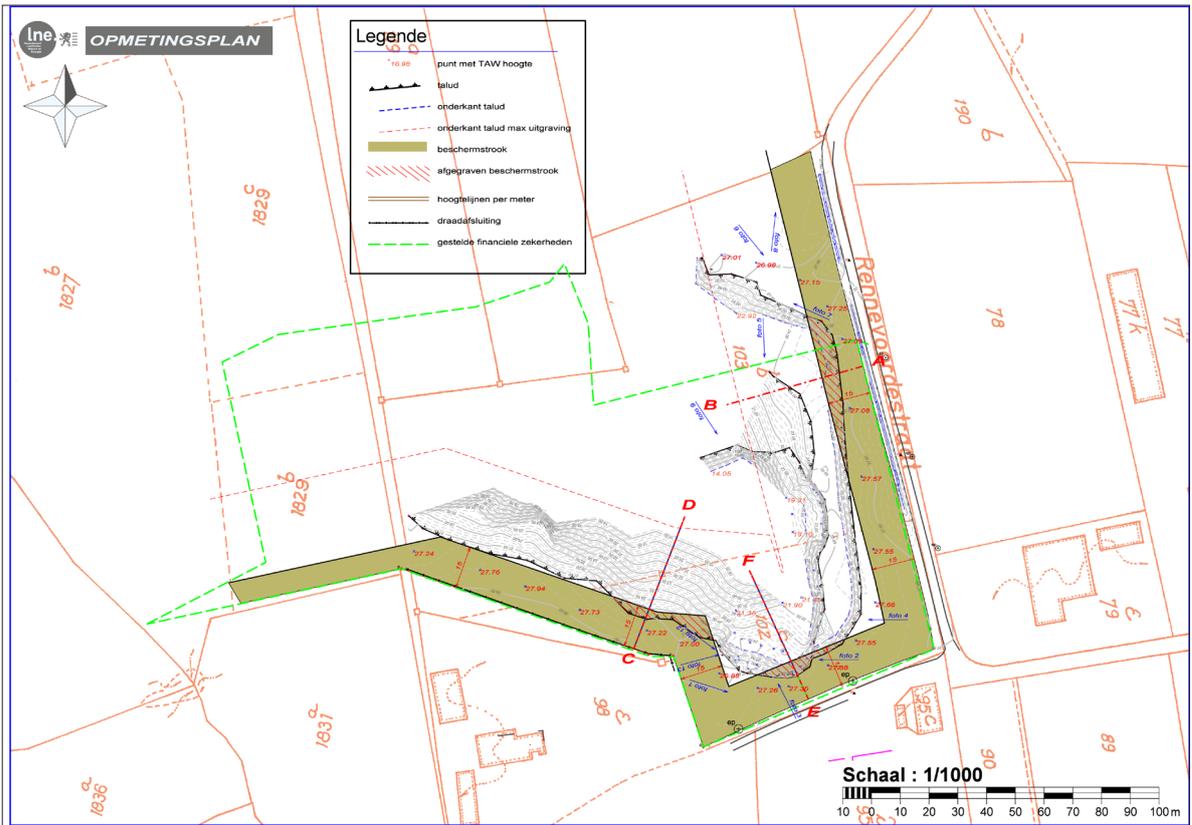


An example in which the VLAREM process has been used in practice is slope failure. The conditions for minerals extraction (section 5.18 of VLAREM II) contain specifications for slopes resulting from mineral extraction, such as slope inclination to prevent slope instability. Recently, the Flemish Government has commissioned an extensive study to investigate the problem of slope instability. This study can lead to recommendations for the slope specifications contained within VLAREM.

Other initiatives have also been taken by the Flemish authorities in order to produce the available mineral resources as sustainably as possible. Within this framework the extraction sector has to produce the available mineral resources through cautious and optimal extraction. This means that in case a sand body is overlain by clay, the administration will impose the selective production of the clay layer, after which the sand body can be exploited. Moreover, the administration encourages selective production outside the extraction areas so that mineral resources, which become available in big earthworks, can also be validated effectively.

In order to make sure that the exploited mineral resources will not pose any threat to the environment, the Act on Surface Mineral Resources also introduced the certificate of origin. This certificate is issued to the extracting companies after they have filed a report which contains several chemical analyses of the extracted minerals, amongst other things. The certificates prove that the extracted minerals have a natural composition and that their use will not pose an environmental threat.





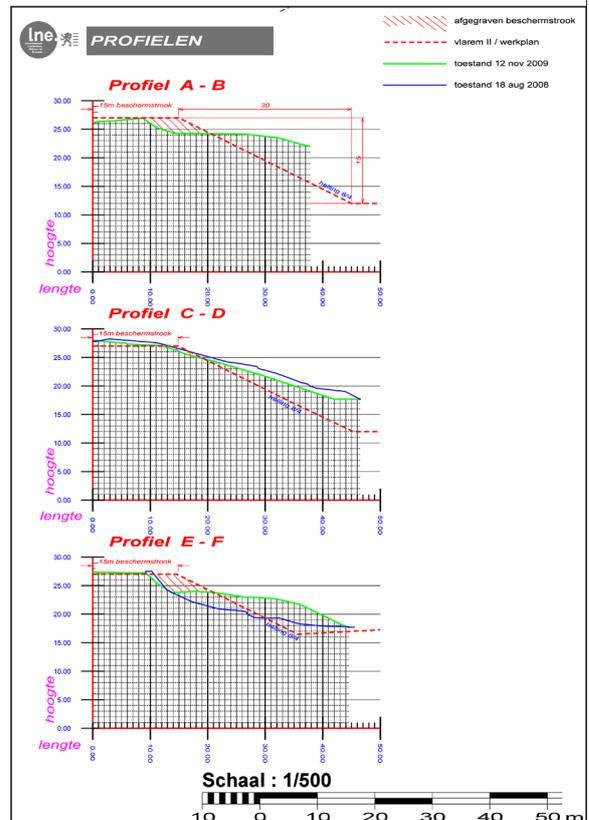
**FINANCIËLE ZEKERHEDEN**

**BOSSIE:**  
Financiële instelling  
Bekrag: 1000000  
Agnostiek: 2000

**lne.** Vlaamse Overheid  
Dienst Natuurlijke Rijkdommen

Zone	Oppervlakte	Bekrag	Werk-profiel bekrag	Status	Eind datum
ZONE A	4.900	1.029.000	1.029.000	100%	10/10/2011
ZONE B	201	424.710	424.710	100%	10/10/2011
ZONE C	2.711	2.289.310	2.289.310	100%	10/10/2011
ZONE D	2.980	1.427.000	1.427.000	100%	10/10/2011
ZONE E	800	979.200	979.200	100%	10/10/2011
ZONE F	1.205	1.039.000	1.039.000	100%	10/10/2011
ZONE G	1.480	1.794.000	1.794.000	100%	10/10/2011
ZONE H	1.500	1.954.000	1.954.000	100%	10/10/2011
ZONE I	600	1.109.000	1.109.000	100%	10/10/2011
ZONE J	1.194	1.444.000	1.444.000	100%	10/10/2011
ZONE K	1.800	1.779.000	1.779.000	100%	10/10/2011
ZONE L	2.140	2.036.000	2.036.000	100%	10/10/2011
ZONE M	2.200	1.769.000	1.769.000	100%	10/10/2011
<b>Totaal</b>	<b>24.500</b>	<b>21.447.000</b>	<b>21.447.000</b>		

Gewestplan:  
Gemeente:  
Delfstof: Baksteenklei  
Kaartblad NGI:





# Monitoring System

The drafting of Special Mineral Resources plans and the Surface Mineral Resources Plan is dependant on the availability of reliable basic data, such as the total needs for primary mineral resources in the different industrial and building processes. It is also important to know the import and export movements of the different mineral resources as well as the application and potential of possible alternatives as substitutes to primary minerals.

Therefore, the Flemish Government developed in 2010 a “monitoring system for a sustainable surface mineral resources policy” in cooperation with the Public Flemish Waste Materials Company (OVAM) and the Flemish Institute for Technologic Research (VITO).

Producers, traders and consumers of mineral resources and alternatives are inquired each year after three elements that are required for the design of a sustainable mineral resources planning. These elements are:

1. *the total need of primary surface minerals;*
2. *the import and export flows of surface minerals;*
3. *the use of alternative materials.*

The combination of all these inquiries will provide an overall picture of market developments on an annual basis. The collected results are published in a publicly accessible annual report.

The results are also useful in the framework of sustainable materials management, which is an important subject in Flemish environmental policy. Sustainable materials management seeks to reduce the use of natural resources throughout the life-cycle of materials (independent of whether they are resources, finished products, or waste).



# Rehabilitation of Abandoned Quarries

In Flanders, site rehabilitation and restoration is ensured in the Flemish Parliament Act on Surface Minerals through the granting of extraction permits and financial guarantees to ensure correct rehabilitation, and the development of a remediation or restoration plan.

If the rehabilitation purpose is use as agricultural land, the restoration process is advised by a steering committee. This committee is at least composed of the mineral resources department, the agricultural department and the Pedological Survey of Belgium. This steering committee develops a restoration strategy which leads to a detailed design plan for each site.

In other cases, nature will be the final rehabilitation destination. Several projects have been realised which resulted in special micro-ecosystems which had a very positive impact on the value of local nature.

In some cases the final rehabilitation will be recreation. Several of these projects resulted in provincial recreational domains which are open to the public. These domains offer different types of recreational possibilities, such as open air swimming pools, sport facilities, the organisation of festivals, etc.





# Flanders and the European Raw Materials Policy

Not only Flanders experiences great difficulties in terms of land access. Other European Member States are also facing a difficult accessibility to domestic raw materials due to an increased competition for different land uses. Moreover, the EU is highly dependent on imports of important raw materials, which are increasingly affected by market distortions. A reliable and undistorted fair access to raw materials both from within and outside the EU is increasingly important for the EU competitiveness.

Consequently, the European Commission launched the Communication "The raw materials initiative – Meeting our critical needs for growth and jobs in Europe" in November 2008. In this Communication it is proposed that the EU should agree on an integrated raw materials strategy which should be based on the following three pillars:

- 1. ensure access to raw materials from international markets under the same conditions as other industrial competitors;*
- 2. set the right framework conditions within the EU in order to foster sustainable supply of raw materials from European sources;*
- 3. boost overall resource efficiency and promote recycling to reduce the EU's consumption of primary raw materials and decrease the relative import dependence.*

Two ad-hoc working groups were created under the umbrella of the Raw Materials Supply Group. This Raw Materials Supply Group is a stakeholder group comprising industry, environmental NGOs, trade unions, Member States, candidate countries, and the Commission. The first working group was mandated with the task to identify a list of critical raw materials for the European economy. The second working group involves identifying actions to promote the exchange of best practices in the area of minerals policy, land use planning and administrative conditions for exploration and extraction. Moreover, better networking between geological surveys with the aim of increasing the EU's knowledge base, and the need to develop a medium to long term strategy to integrate subsurface information into the GMES Land service, are addressed. By the end of 2010 the European Commission will publish an updated Raw Materials Initiative. This Communication is foreseen to include the state-of-the-art after two years working on an integrated EU strategy on raw materials. It will also include recommendations for a sustainable raw materials supply.

The Flemish mineral policy is to a large extent in keeping with the advice of the second working group concerning best practices. In the future, Flanders will continue to be committed to learn from best practices in other EU Member States and include them - when appropriate to the local context - in its mineral policy.

# Public Outreach

The Flemish Government is taking action to inform the general public about the natural mineral resources of the Flemish subsoil. The Government also communicates about the importance of the sector for the Flemish industry in general and the building industry in particular.

One of the communicative actions taken was the development of an educational tool to inform youth in secondary schools on natural mineral resources and the different aspects of the exploitation of these resources. The potential uses of the deep subsoil, such as gas and radioactive storage, and geothermics are highlighted as well. This tool consists of a website (<http://www.ikdoorgroondvlaanderen.be>) which can be used during geography courses, but which is also instructive for others who are interested in the subsurface of Flanders.



It is hoped that the use of this website will increase pupils' awareness of the importance of primary mineral resources, and the extractive industry, which in the long term could lead to a more positive attitude of the general public towards mineral extraction in Flanders.

By exploring the website, pupils gain a good insight into the geology of the Flemish Region and become aware of the importance of natural mineral resources and their applications.

# Colophon

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