20th Brownfields Conference Detroit, Michigan 8-11 August 2023

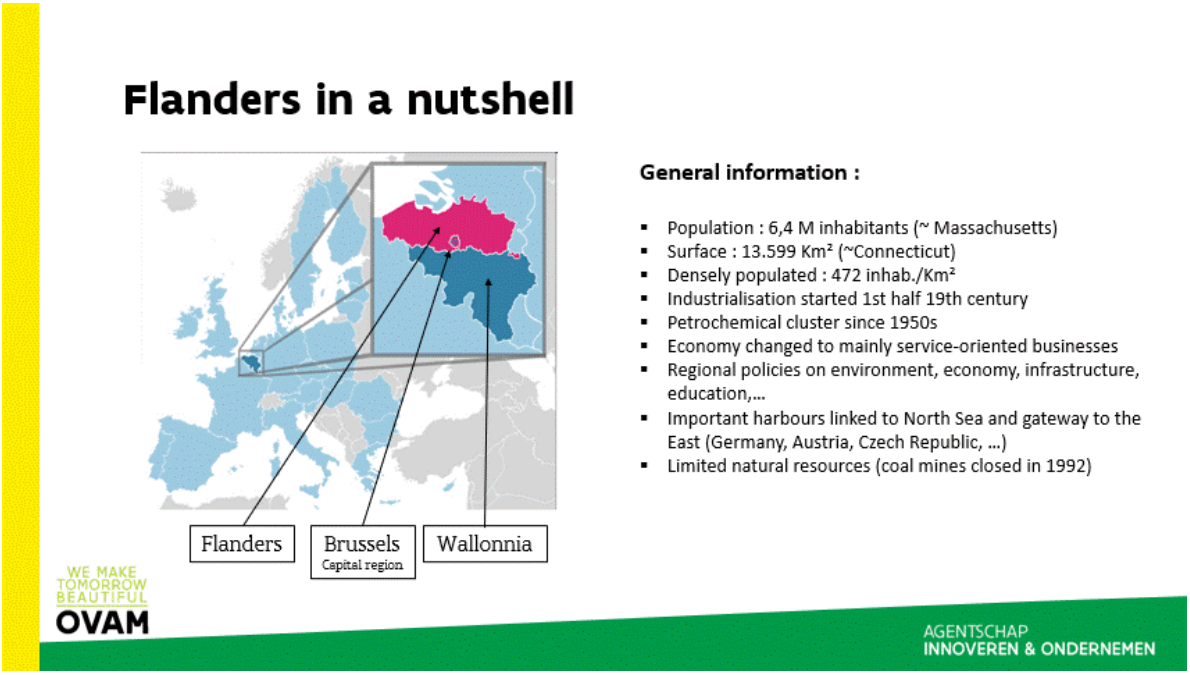
Track 3: Climate Change and Resiliency.

Additional information to the lecture 'Climate adaptation at brownfields sites in the region of Flanders – Belgium' by Eddy Wille, Government of Flanders – Belgium.

This contribution illustrates the policies related to climate adaption of the governmental departments and agencies in Flanders and how it is implemented in brownfield projects.

Introduction

Flanders is the region in the northern part of Belgium and developed, inspired by US EPA and EU Concerted Action on Brownfield and Economic Regeneration Network (Cabernet[1]), from the mid-1990s a brownfield policy. This resulted in the Brownfield Covenant Act, enacted by Decree on March 22nd , 2007. Like many European cities, the Flemish urban areas are affected by former industrial activities. In the second half of the 19th century industrialization took place. In many cases, the industrial facilities were situated nearby the historic city center.

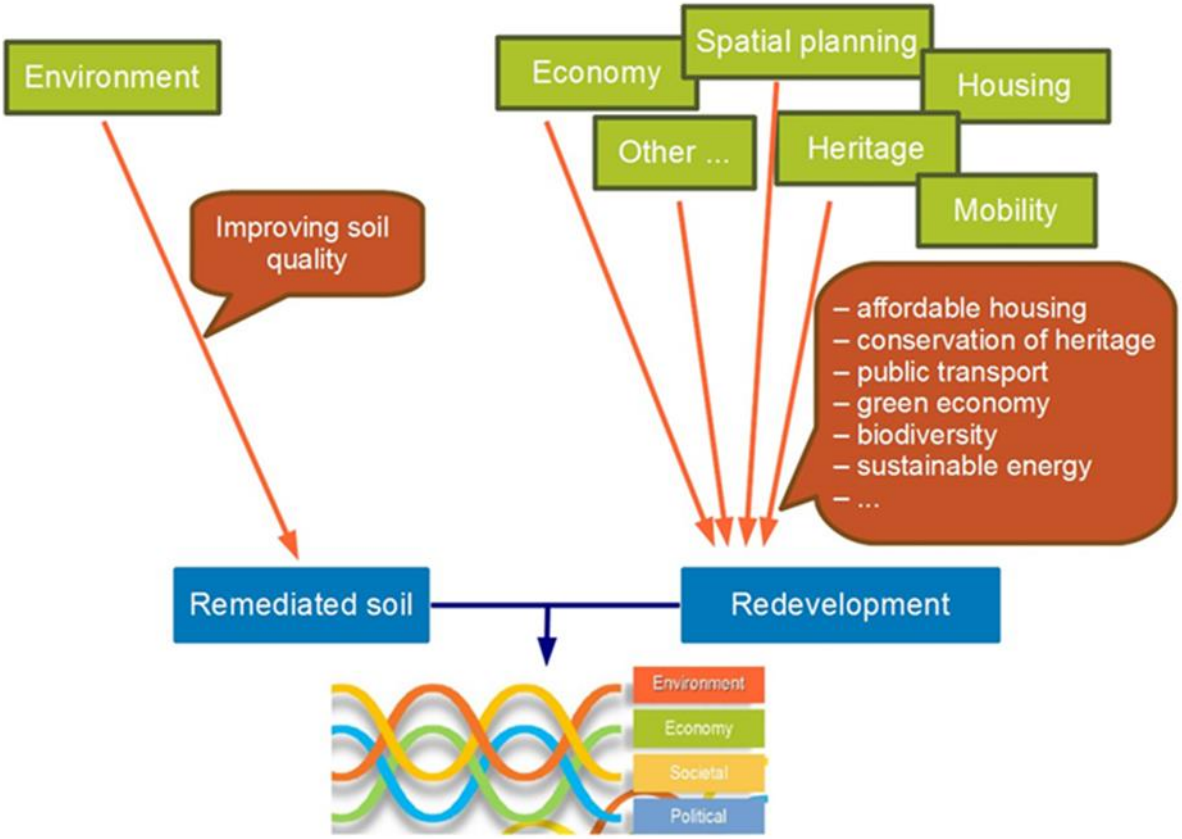


Rapid growth continued through the 20th century and the reallocation of industry took place in the 1960s. A dense population and urban sprawl resulted in a built-up surface of Flanders of 16,2 %. The Soil Remediation Decree (1995) had an important impact on the transfer of land and the control of

[1] https://www.yumpu.com/en/document/view/38906007/sustainable-brownfield-regeneration-cabernet-network-report

active industrial facilities. Still, abandoned sites were not addressed in an efficient way by this legal framework and these sites often remained dis-used or under-used.

The presence of contaminated sites near densely populated areas does not only pose a potential danger for public health, it also mortgages the further development and growth of the affected region. Because of their location, for instance in urban agglomerations or city centers, along water- and/or railways, etc…., such sites hold a tremendous potential for redevelopment and reuse. There was a growing consensus that these former industrial sites play an important role in the revitalization of the area. An encouragement of a productive reuse of such sites results of course in the protection of the scarce green and open spaces.



Taken into account the complex economic, environmental and social aspects, an integrated approach between cleanup, planning and redevelopment was required which resulted in the brownfield policy.

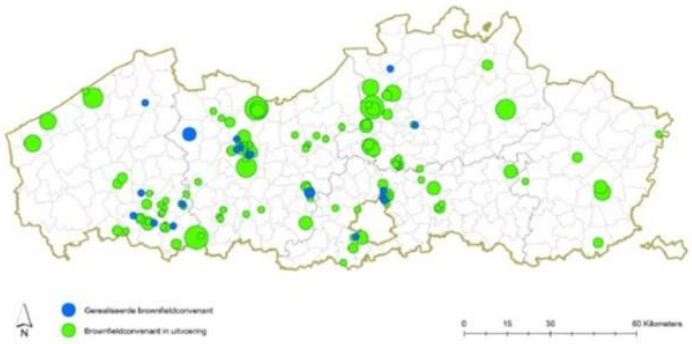
Brownfield covenant Act 2007

In 2007, a specific legislation to address the brownfield sites was enacted. The main focus was organizing a streamlined approach to tackle the variety of issues involved in brownfield redevelopment projects. The Brownfield Covenant Act offers developers the opportunity to sign a contract with the Government of Flanders and other private and public stakeholders containing mutual commitments to the realization of a brownfield project. This contract is the result of a process for gaining the (public) support and the cooperation of all the stakeholders involved. Once the contract is concluded, a steering committee monitors the redevelopment of the site.

To facilitate the entire process, the parties are supported by a brownfield covenant negotiator, an expert appointed by the Government of Flanders. From the early stage of the negotiations, the public sector is involved and discusses the proposed redevelopment plans. Public awareness is also an

important issue and official hearings are organized before the contract is signed. This multi-actor governance should be emphasized as it is a crucial element in policy making and implementation of various issues.

The first projects were approved in 2009 and currently nearly 150 projects provide a lot of experience in the field.



13 calls
263 introduced proposals
45 project in negotation process
122 signed covenants
23 convenants finalized
21 negotiations without success

Information on the Brownfield covenant Act is available at the website of the Flemish Agency for Innovation and Entrepreneurship (VLAIO): https://www.vlaio.be/en/subsidies/brownfield-covenant.

More details in dutch at https://www.vlaio.be/nl/begeleiding-advies/bedrijfslocatie/brownfield-herontwikkeling/wat-is-een-brownfield-en-brownfield

Introducing Sustainability

During the lecture, an overview was present and illustrated by several cases. It's important to note that these measures will vary depending on the specific brownfield and its characteristics, the local regulations and the type of the development. The approach is in line with 'Sustainable resilient remediation (SRR)' as promoted by US EPA, ERIS, ITRC (https://srr-1.itrcweb.org/introduction/). Sustainable resilient remediation (SRR) is an optimized solution to cleaning up and reusing a hazardous waste site that limits negative environmental impacts, maximizes social and economic benefits, and creates resilience against increasing threats. "…sustainability considers the remedy's impact on the environment, resilience considers the environment's impact on the remedy…" ITRC, SRR-1.

Following conditions on Extreme Weather Increasing in Frequency & Magnitude were distinguished:

- Flooding
- Hurricanes
- Tornadoes
- Droughts
- Wildfires
- Sea Levels Rising
- Inundation

- Erosion

In Flanders, especially drought, flooding and erosion are considered as highly risk full. Since 2017, specific agreements have been made in new covenants in the field of spatial quality, sustainability and climate change. Various sustainability actions can be taken in the redevelopment of brownfield sites, including:

- **Integrated approach and management**: no net land take, spatial efficiency, …
- **Environmental remediation**: cleaning up and removing hazardous waste and pollutants, including soil and groundwater remediation; introducing phytoremediation and low energy remedial actions; a specific program on redevelopment and optimal use of former landfills: dynamic landfill management;
- **Energy efficiency:** incorporating energy-efficient building design and materials, as well as renewable energy sources such as solar power and geothermal energy; introducing heat networks in collaboration with local industrial partners; setting up heat exchange on waste water infrastructure;
- **Water management:** implementing rainwater harvesting and greywater reuse systems, as well as stormwater management systems to reduce the risk of flooding; revitalizing watercourses and restoring natural riverbanks and buffer systems;
- **Green infrastructure**: incorporating green spaces and landscaping into the development, such as parks, gardens, and green roofs, to improve air and water quality and provide eco-corridors and natural habitats for wildlife; preventing heat islands in the cities;
- **Sustainable transportation:** on waterborne industrial sites promoting use of waterways for bulk and container transports; in rural areas promoting active transportation options such as biking and walking, and incorporating public transportation infrastructure into the development; upgrading old transportation infrastructure to modern multimodal transport hubs with emphasis on low carbon impact (railways, shipping);
- **Materials recycling and waste management, Circular economy:** promoting selective demolition and incorporating recycling and waste management systems into the development to reduce the amount of waste sent to landfills; reclaiming derelict land to provide sites for initiatives in circular economy;
- **Biodiversity enhancement:** creating or enhancing habitats for biodiversity;
- ….

Integrated approach and management

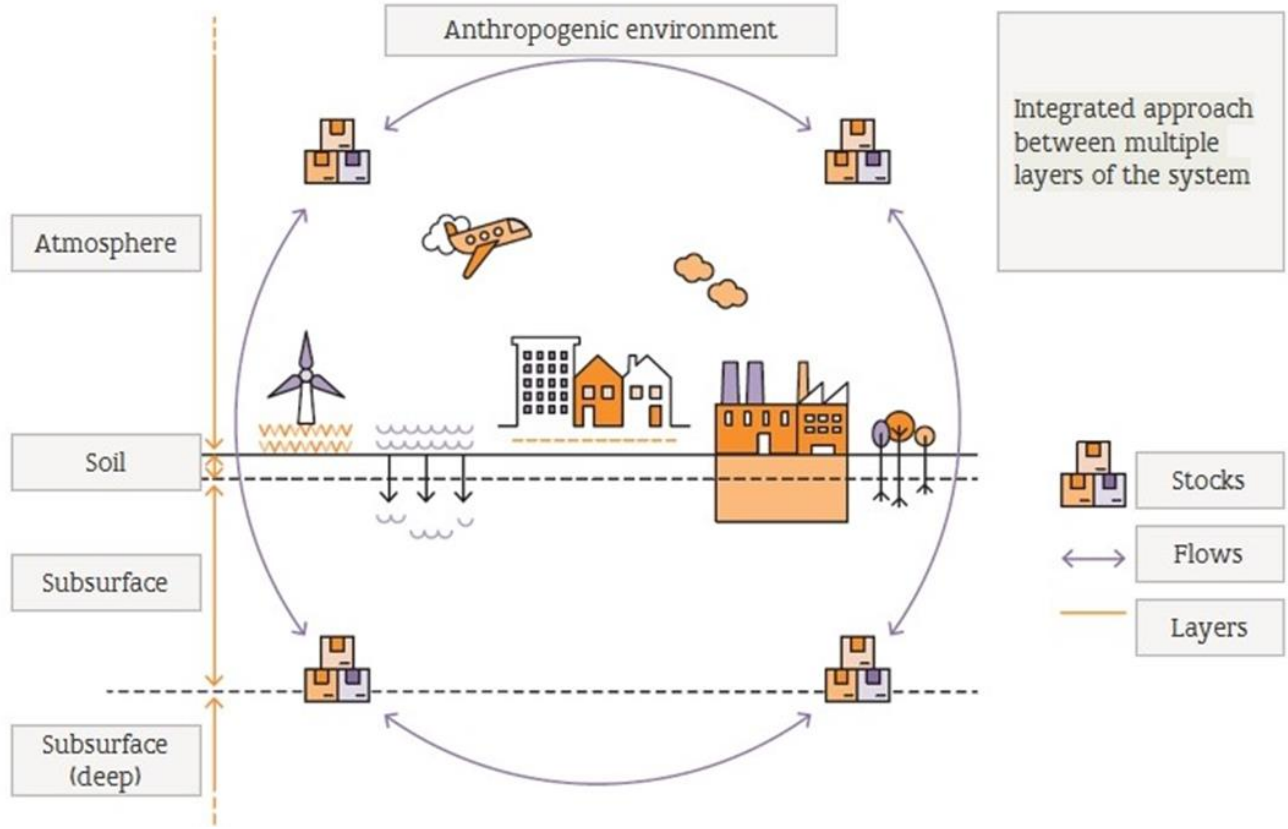
Spatial planning

Excerpt from: Diagnosis of the State of the Territory in Flanders. Reporting About New Maps and Indicators Differentiating Between Urban and Rural Areas Within Flanders. Ann Pisman and Stijn Vanacker.

“Within the several European analyses of spatial patterns, Belgium and Flanders take a specific position. The average ‘settlement area percentage’ (i.e., all land used beyond agriculture, semi-natural areas, forestry, and water bodies) for Europe is 4%, but 32% of the Flemish area is occupied with artificial land. Belgium has the highest score for urban-sprawl indicators, and within the European context, almost the entire area is considered urban. The aim of the research presented in this paper is to expand on the theme of indicators for spatial patterns by analyzing the Flemish area with detailed data across various scales. The results are collected in a report, the ‘*Ruimterapport*’—‘RURA’, published in 2018.

RURA is a bundling and compilation of research results from very diverse sources, amongst others studies from the Department of Environment and Spatial Development of Flanders and of Espon studies. This article presents the most important results from RURA and further positions them in international comparative literature. New maps and indicators are developed for the urban/peri-urban/rural dimensions of the human settlement area, urban sprawl, and settlement patterns by differentiating amongst others between urban centers, ribbon development, and scattered buildings. (…) The case of Flanders, with its specific sprawl pattern, illustrates the difficulties spatial planning policy makers currently are facing, dealing with the complexity of space and society."

Setting up an integrated approach to tackle the aforementioned complexity:



Environmental Outlook 2018: Solutions for a sustainable future

Issue 22-04-2019 – The Environmental Outlook 2018 describes and analyses solutions that can contribute to an (ecologically) more sustainable energy, mobility and food system.
Conventional climate policy is reaching its limits. Many environmental indicators are improving, but various positive trends are clearly slowing down. Other indicators illustrate the important impact on humans, nature and the economy. Moreover, megatrends such as demographic changes, increasing shortages of raw materials and resources, and climate change put today's societal systems under pressure. A system driven approach is needed to bring about the transition to a more sustainable Flanders. Such an approach looks at the behaviour of large societal systems in transition and then develops integrated solutions at system level.

Europe and Flanders want to evolve to an ecologically more sustainable society by 2050. How can we make that ambition come true? The Environmental Outlook 2018 presents an in-depth analysis of the energy, mobility and food systems. It looks at a broad range of solutions and innovations, with their environmental impact and possible trade-offs and co-benefits. It zooms in on potential levers: measures, innovations or trends that could support and speed up the desired solutions. Special

attention is given to the Flemish space, which, as a supporting and resilient platform, will have to facilitate the various societal transitions. The findings and insights of this report are meant to serve as a scientifically based source of inspiration for policy makers and all societal actors who are looking to help shape the transition to a sustainable society.

https://en.vmm.be/publications/environmental-outlook-2018-solutions-for-a-sustainable-future

Climate adaption tools (only in Dutch): https://klimaat.vmm.be/tools

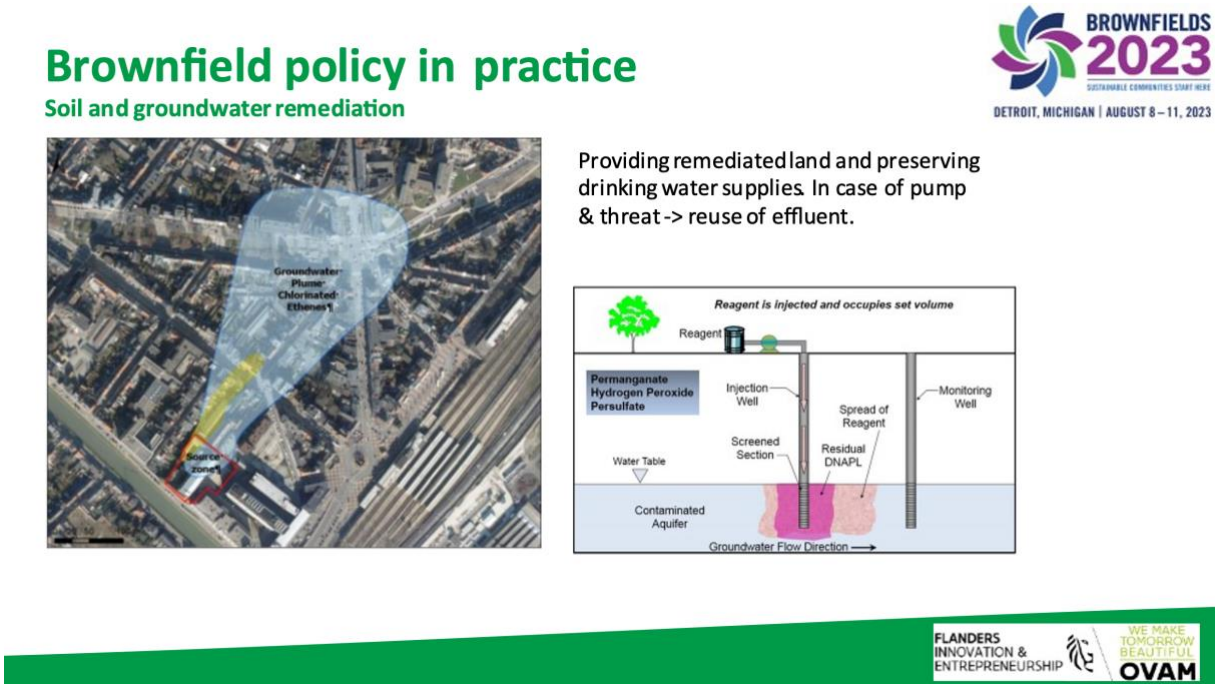
Environmental remediation

Remediation of contaminated sites

The Public Waste Agency of Flanders (OVAM), the regional competent authority on soil remediation, started in 1990 a comprehensive inventory of (potential) contaminated sites. By 1995, about 84.000 sites were listed as potentially polluted. In response to the need for remedial actions, the Soil Remediation Decree was enacted in 1995.

The presence of heavily contaminated sites near or in the middle of densely populated regions such as Flanders does not only pose a potential danger for public health, it also mortgages the further development and growth of the affected region. Because of their location, for instance in urban agglomerations or city centers, along water- and/or railways, etc…., such sites hold a tremendous potential for redevelopment and reuse. In Flanders a consensus was growing that these former industrial sites can play an important role in the revitalization of certain neighborhoods and areas.

https://ovam-english.vlaanderen.be/

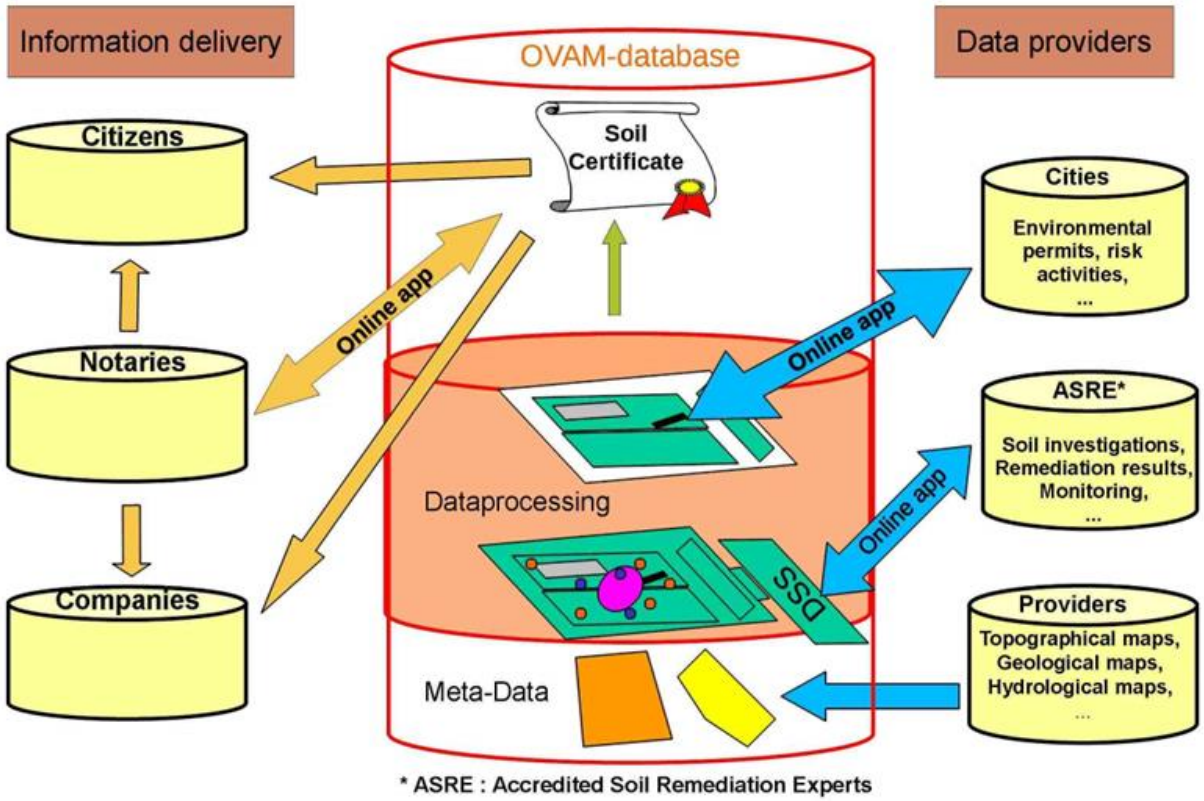


Covenant 38 Het Zegel -Mechelen: pollution of Chlorinated Hydrocarbons.

Soil contamination and data management :

Information about contaminated sites and the sample analyses are collected in the OVAM-database. In pursuance of the soil remediation decree of 1995, OVAM has started with the setting up of a Register of contaminated land. The OVAM-databases contain information on soil quality and so-

called soil threatening activities. To date, moreover 55.000 lots were identified and uploaded in this register. These data can be addressed by every citizen. There is a specific procedure and OVAM delivers soil certificates at demand. A web-based application is operational. Last years, efforts were made to enlarge the digital accessibility of former databases and archives. This allows OVAM and their partners to proceed to opportunity mapping in order to detect brownfields and their potential future use.



https://www.researchgate.net/publication/364323573_Data_collection_on_soil_contamination_in_the_region_of_Flanders_Belgium_Data_management_of_landfill_sites_Applicable_laws

Database Subsurface Flanders :

Databank Ondergrond Vlaanderen (Database Subsoil Flanders) or DOV in short, connects, develops and disseminates information and knowledge about the soil and subsoil of Flanders, according to the specifications of the European INSPIRE Directive (2007). DOV is a partnership of three divisions within the Flemish government. The products of DOV can be used free of charge. DOV offers data on the themes soil, geology, geotechnics, groundwater, mineral resources and geothermics for the Flemish region. The data are publicly available through the online DOV-Verkenner, a geoviewer capable of both accessing detailed geo and non-geodata and creating and editing data. Furthermore, the data are offered for internal use through read-only databases and for public (re-)use as Open Data in the form of over a thousand data layers. Most of the data are in Dutch, but some data products are also provided in English.

https://www.dov.vlaanderen.be/sites/default/files/pfiles_files/20191107_paper_Oorts%20et%20al_final.pdf

Soil+Land Stewardship

Stewardship is framed in a soil care approach for responsible use and conservation of our soils as natural resources taking account of the full range of societal interests.

Soil+Land Stewardship offers an action perspective for soil care. Stewardship is based on the sustainable and balanced use of our natural resources, explicitly imposing accountability for the (future) society and the ecosystems on everyone who has a role in relation to these resources. Within the current challenges of societal transition to a low-emission, resource-efficient and circular economy, the safeguarding of soil health plays an intrinsic part and will need a broader societal shift that requires systemic changes to fundamental principles, including liability and property rights and social innovation to effect changes in producer and consumer behaviour.

To make this transition, new governance models involving multi-stakeholder and cross-value chain collaborations will have to ensure that the intended system change achieves better economic, environmental and social outcomes. Examples exist in the bringing together of different actors in the landscape (managing forests, agriculture, water, etc.) and in innovative approaches to urban developments and brownfield projects.

https://ovam-english.vlaanderen.be/documents/177280/672916/20210606_booklet+FINAL_EN_no+marks.pdf/5c3224ed-cb55-c3e2-08c5-d433bcddd21e?t=1646422829201&download=true

Portfields

The ports of Flanders (Antwerp, Bruges and Ghent) are a nexus for international shipping and logistics. The Flanders Port Area is connecting the North sea with hinterland of Western Europe.

During the last decades, some sites were polluted and abandoned. Given the importance of our harbors, soil remediation of those sites was a leverage for new activities and traffic. This revitalization is also described as portfield redevelopment: sustainable development of brownfields in port areas.

Circular (City) Ports

From time to time, Flemish ports are called the 'gates to our prosperity' or the 'engine of our economy'. These large contiguous economic zones are undergoing radical transformation as a result of global market developments, which also entails an expectation that circularity will play a key role in that change. All Flemish port authorities have also made the circular economy a top priority.

https://circularports.vlaanderen-circulair.be/library/accelerating-the-circular-economy-transition-process-for-gateway-ports-the-case-of-the-port-of-zeebrugge/

How can contaminated sites in ports be reused for a circular transition? While the Flemish Public Waste Agency (OVAM) initially focused on the remediation and closure of landfill sites, it later diversified its services to include different types of contaminated sites and approaches, including brownfield and blackfield sites.

https://circularports.vlaanderen-circulair.be/a-view-on-port-area-regeneration-in-the-flanders-region-be/

Bruges harbor

The facility of Carcoke is located in the harbor of Bruges. In 1996, Carcoke, a metallurgical coke manufacturer, shut down his activities. After nearly a century of coal carbonization, the preliminary soil investigation indicated that the soil and groundwater was heavily contaminated with aromatic

hydrocarbons, tar and cyanides. The reuse of the site with a surface of 15 hectare was only possible if an extensive cleanup took place.

The first step was the selective demolition of the buildings and installations. A solid preparation ensured that the produced waste could be put to maximum reuse.

Large quantities of waste material has to be removed:

- 6.000 tons of hazardous waste;
- 70.000 tons of construction and demolition waste;
- 15.000 tons of fireproof stones (recycled after cleaning);
- 10.500 tons of asbestos containing waste;
- 20 Km pipes were cleaned.

After the demolition phase, the excavation of the contaminated soil was started up. At this moment, more than 400.000 tons of soil were recovered.

Due to the large quantities of contaminated soil, a thermal desorber was installed on site and so transport was reduced.

Ghent harbor

The La Floridienne-site is an abandoned industrial site of 10 hectare at the left bank of the Terneuzen canal in the harbor of Ghent. Till 1960, the company produced metal salt such as zinc sulfate and lead chloride, but also cyanide salts. The soil and groundwater were heavily contaminated with arsenic and cyanides.

A few years ago, the city of Ghent and OVAM agreed to remediate the site and bring it back to beneficial use. The remediation plan was a combination of containment, immobilization and groundwater treatment.

An important part of the vertical barriers were also functional as a quay of the new dock. The arsenic and cyanide waste was immobilized on site and reused as backfill. In order to avoid maximally dispersion and leaching, a liner of HDPE is covering the whole area.

Due to this portfield approach, an old industrial and heavily contaminated facility was remediated and the new development brings moreover 400 hectare docksides in the Port of Ghent. The total investment was nearly 250 million US dollar (soil remediation was 20 million dollar).

Antwerp harbor

The Port of Antwerp is the 7th largest harbor in the world and is part of the 2nd largest cluster of the petrochemical industry, after Houston. During the twentieth century, the expansion of the port of Antwerp was oriented to the northern part of the city. Due to this evolution, the site of a former petroleum refinery became partly abandoned. A brownfield covenant between the Flemish government and the local and regional agencies was signed in order to redevelop this area of 75 hectare.

This site is well connected by waterways, rail and motorway. A zone of 15 hectare will be developed as a distribution center. About 35 hectare is reserved for innovative and green enterprises.

At this moment, still a few oil related activities are ongoing at Petroleum South. Also relicts of the former refinery remain.

The largest problem is what we don't see at first sight. The former activities had an important impact on the soil quality. The soil investigations pointed out that the soil is heavily polluted by mineral oil. On the groundwater, floating layers of free product are found.

Harbours : https://en.northseaport.com/connect-2025-en https://www.bluegateantwerp.eu/

Energy efficiency

Incorporating energy-efficient building design and materials, as well as renewable energy sources such as solar power and geothermal energy; introducing heat networks in collaboration with local industrial partners; setting up heat exchange on waste water infrastructure;…

Covenant 24 Oude Dokken - Gent

DuCoop contributes to the climate ambitions of the city of Ghent by closing loops: energy (heating, electricity and mobility), water and raw materials (waste treatment).

Heating: All homes are connected to district heating. So you do not own own heating system, but a heat exchanger that draws heat from a collective piping network that heats the entire district.

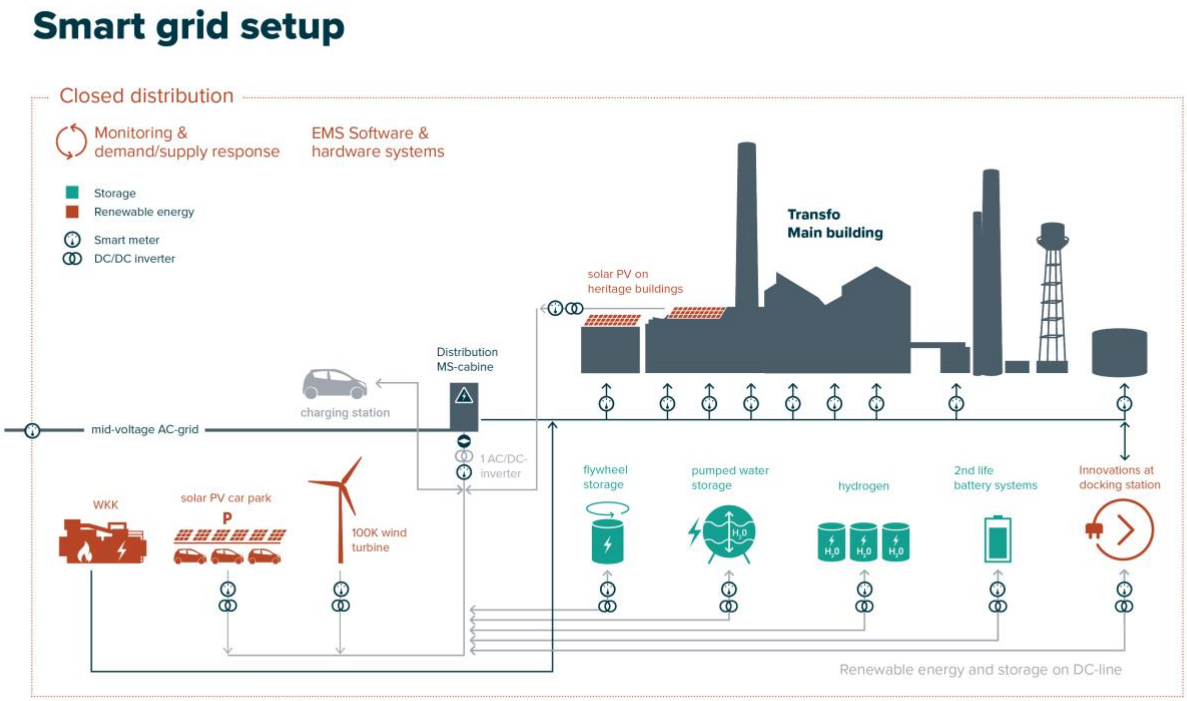
Water: The wastewater is collected and treated in the district. After purification, it gets a second life as process water at the neighboring company Christeyns.

Waste: Separate waste processing is of course the norm in the Nieuwe Dokken. DuCoop processes kitchen waste into biogas and a fertilization product that is recycled locally.

https://ducoop.be/en/

Leiedal – transfo / Resourced

https://www.leiedal.be/resourced



Covenant: 104 – Harelbeke-Volvo Nebim

Brief description of the project:

1/ repurposing the former repair workshop for truck bodywork into a climate-neutral business park.

2/ VLAIO subsidies are used that meet the requirements for a climate-neutral business park as included in the subsidy decree.

3/ Remediation of soil and groundwater pollution due to. mineral oil.

4/ Integration of a heat network in the business park in collaboration with. Local partner IMOG (waste processing).


https://www.brocap.be/project/klimaatneutraal-bedrijventerrein-de-stip-in-harelbeke/

https://destipharelbeke.be/

Water management

Implementing rainwater harvesting and greywater reuse systems, as well as stormwater management systems to reduce the risk of flooding; revitalizing watercourses and restoring natural riverbanks and buffer systems;…

Flanders Environment Agency (abbreviated VMM) is an agency of the Flemish government that adopts an even stronger position as a solution-oriented partner. As an organization, it sets out to have a positive impact on the living environment in Flanders and to help make it climate-proof. Together with our partners and stakeholders, we aim to achieve results on the ground and in our policy, so that we are able to respond quickly to the changing needs within society.

https://en.vmm.be/

Blue Deal:

An ambitious programme

To tackle water scarcity and drought, the Government of Flanders launched the Blue Deal. The Blue Deal is an ambitious programme that tackles water scarcity and drought in the field through a multitude of campaigns.

Rather than focusing on the causes, the Blue Deal aims to develop structural solutions. We will do this by collaborating on several fronts. Not only with a spade in the ground, but also through legislation, with research, monitoring, communication and awareness raising.

A shift in water management

First and foremost, the Blue Deal aims to encourage a mindset shift: we need a new approach to water management. Retaining water locally wherever possible. Use less water, reuse more water and tackle wasteful consumption. Often, the potential to preserve water is rather straightforward.

Wetter winters and drier summers are looming. We are aware of this. We are bearing witness to climate change, and it is irreversible. The Blue Deal is committed to taking action today that we will not regret in the future.

The Blue Deal focusses on concrete results

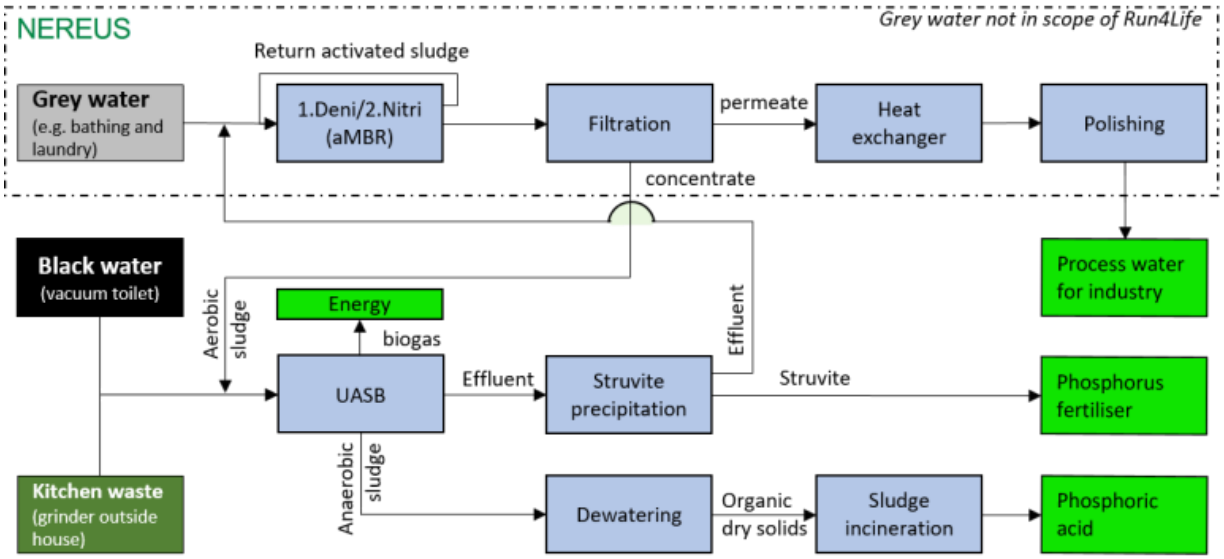
The Government of Flanders is investing in smart projects and actions in the field with the Blue Deal. Its approach is one based on collaboration. It encourages and supports companies, associations,

farmers, knowledge institutions and citizens to work together to infiltrate more water, to retain water longer upstream or to use water more economically, so that more water remains

https://bluedeal.integraalwaterbeleid.be/about-blue-deal

Covenant: 24 – Oude Dokken – Gent

https://ducoop.be/en/



https://run4life-project.eu/demosites/ghent-be/

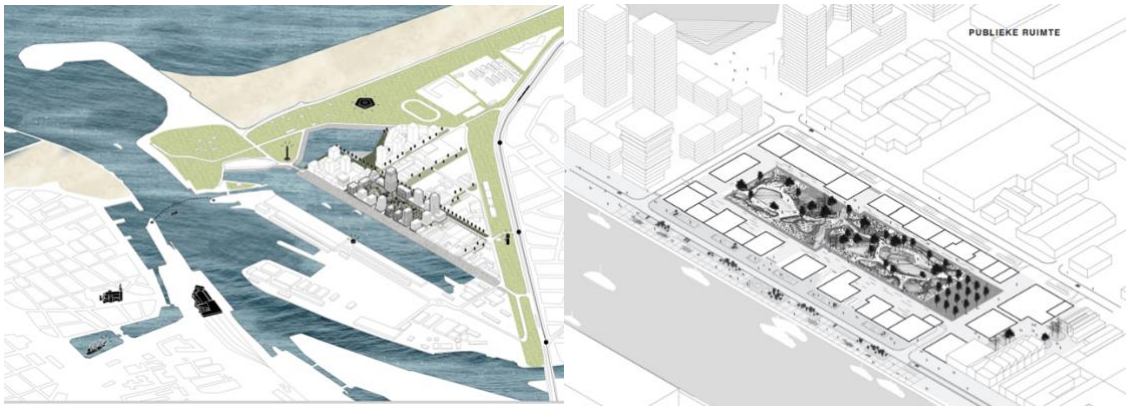
Covenant: 59 – Baelskaai – Oostende

The Spatial Plan of the Regional Urban Area Ostend (2009) designated the east bank (Oosteroever) as an urban development area. The aim was a fully-fledged urban district with a mixture of urban living and employment in a spatially coherent area.

In April 2012, a Global Master Plan was developed for the Oosteroever and this plan sets out the outlines of the desired development. It includes a plan for the development of the Oosteroever into a fully-fledged district and gives this district an individuality with regard to the overlying historic city center of Ostend. In the master plan, special attention is paid to the public domain, specifically the quay along the Hendrik Baelskaai as the main access road, prominent quay and face of the area.

The City River project integrates sustainable water policy in the development of the Oosteroever. City River refers to the special city river that will be realized in May 2019 near Victorialaan. In this city river, the surface water is used sustainably, for example through the realization of porous concrete pipes so that the rainwater can naturally infiltrate into the soil. The city river is designed as a wide central gutter that will collect all rainwater. This central gutter swells during heavy rain and returns to its original stream width after each downpour.

When the city of Ostend and Farys asked Burco Coast to participate in this sustainable project, we gladly accepted. Large concrete pipes of 1.60 meters are located under the part of the Central Park that has already been completed. These function as horizontal rainwater cisterns in which all rainwater from the buildings and the pavement between the buildings is collected. This rainwater will be reused for watering the park and the central pond. In dry periods, this water will be used for the City River so that there can be permanent water in the city river of the Victorialaan. Conversely, during very wet periods, the water from our project is drained naturally and delayed through the underground perforated concrete pipes under Victorialaan.



https://www.vlario.be/cityriver-oostende/

https://issuu.com/stad_oostende/docs/het_leidend_landschap/s/12417324

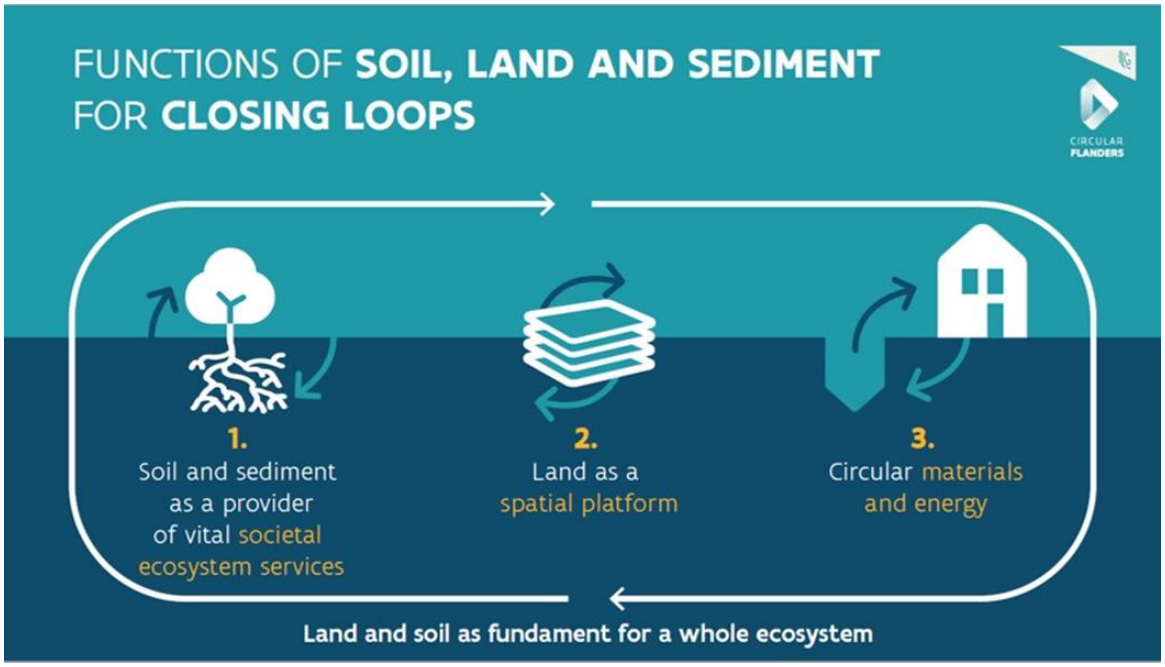
Covenant: 165 – Mechelen Inofer-Trapsite

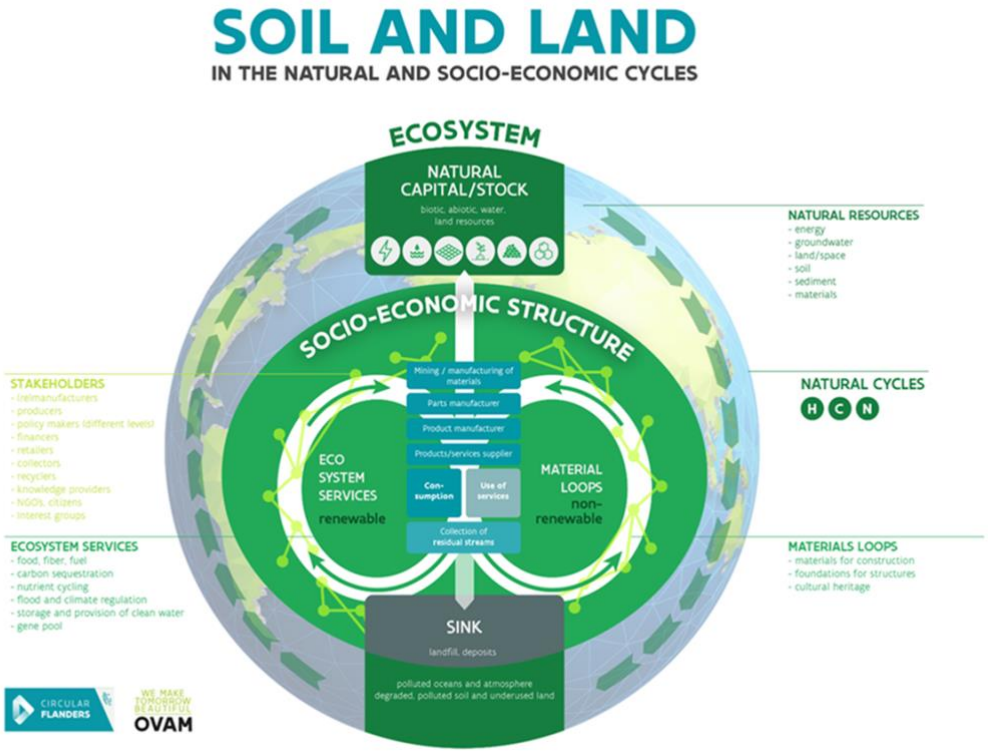
https://www.malt-mechelen.be/

Materials recycling and waste management, Circular economy

Promoting selective demolition and incorporating recycling and waste management systems into the development to reduce the amount of waste sent to landfills; reclaiming derelict land to provide sites for initiatives in circular economy;…

In a circular economy numerous strategies are applied in order to continue to use materials and products in the economy in as high-quality a manner as possible. They are repaired, have a high secondhand value, are upgradeable, and can easily be taken apart and turned into new products. The selected materials are recycled or bio-based at conception and are recyclable or biodegradable at end-of-life.





Circular Space(s)

OVAM is also constantly setting new standards for the brownfield and greyfield policy. This policy emphasizes the value of land as a resource, whereby remediation operations not only 'recycle space', but also provide soil and other services to maintain the city's health. Moreover, the remediation's interim period offers all kinds of cultural and social organizations an opportunity to experiment, in addition to 'changing the place' in terms of urban development.

European Topic Centre on Circular economy and resource use, 2022 (ETC CE Report 2022/5, Belgium)

https://www.eionet.europa.eu/etcs/etc-ce/products/etc-ce-products/etc-ce-report-5-2022-country-profiles-on-circular-economy/belgium-ce-country-profile-2022_for-publication.pdf

Circular Flanders : https://vlaanderen-circulair.be/en

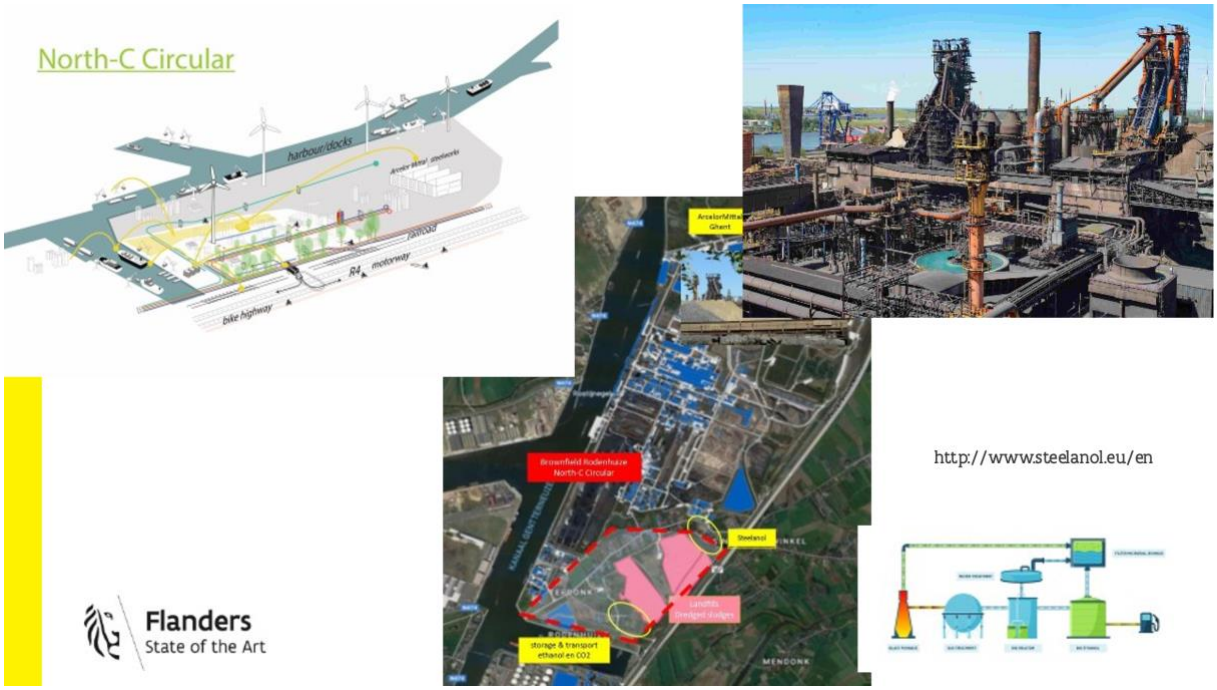
Circular Economy Transition in Flanders. An Urban Landscape Design Contribution (J. Marin, KU Leuven, 2019): https://www.dropbox.com/s/yrocy6cti40qoei/Marin_PhD_15012019.pdf?dl=0

Mineral resources in Flanders : https://www.vlaanderen.be/publicaties/mineral-resources-in-flanders-the-flemish-policy

Decarbonisation and Carbon storage

North-C Circular

A new industrial estate called North-C Circular is to be built on the north side of the Rodenhuizedok in a joint effort by ArcelorMittal Belgium and North Sea Port. It will open up 150 hectares for economic development with a specific focus: the site is intended to receive activities related to the circular economy, thus reinforcing the strong drive to more sustainability and climate neutrality that the port and the steel mill share.



ArcelorMittal Belgium

- https://belgium.arcelormittal.com/en/responsibility/
- Corporate Responsibility Report 2020-2021: https://sway.office.com/cRG4BxVNGUrKnUs6?ref=Link

ArcelorMittal Europe – Flat Products

- https://europe.arcelormittal.com/sustainability/climate-action-in-a-nutshell

ArcelorMittal Group

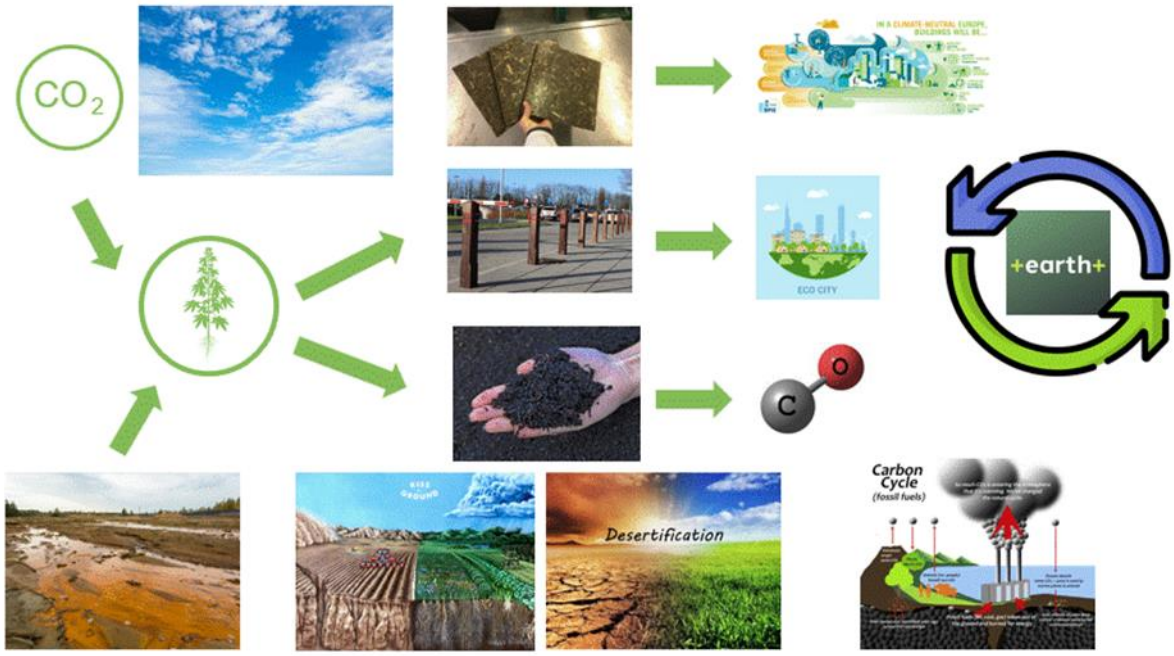
- https://corporate.arcelormittal.com/climate-action
- https://corporate.arcelormittal.com/sustainability/climate-action-reports

Hemp: combining Phytoremediation & circular economy

Industrial hemp: a versatile plant

Hemp can be used to make a wide range of products. Along with bamboo, hemp is among the fastest growing plants on Earth. It can be refined into a variety of commercial items, including paper, rope, textiles, clothing, biodegradable plastics, paint, insulation, biocomposites, wood, biofuel, food, and animal feed.

Due to its fast growth, it does not require any pesticides. Moreover, it uses up to 90% less water compared to other traditional agricultural crops, enhances biodiversity and helps to avoid evapotranspiration from soils.



Phytoremediation

Many plants acts as pumps to take water and nutrients from the soil. In the case of polluted soils, plants also take up this pollution, albeit at a slow pace, and store them in the leaf. Due to the fact that hemp is a fast grower, it takes up pollutants at a faster rate. Moreover, it has a pretty deep root system (up to a few meters), enabling it to reach pollutants that are present deeper into the soil. In this way, the plant is an ideal candidate for phytoremediation and, hence, cleanup of contaminated land. It is an ideal technique for land that has no immediate planned use for several years. Land waiting for environmental or construction permits or industrial land waiting for a new purpose are ideal candidates.

Carbon capture

Another interesting feature of industrial hemp is its carbon capture potential. It fixates 9-15 tonnes of CO2 per hectare. This is comparable to a young forest, yet it does this in just 90 days.

Biochar

One of the products that is made from organic streams through the process of pyrolysis of hemp is biochar. Biochar can be used as a soil improver and on polluted or industrial soils that typically do not have a good condition for cultivating crops.

Biobased materials

Another route to use the hemp biomass is to develop biobased materials from it like wood based on hemp and biocomposites.

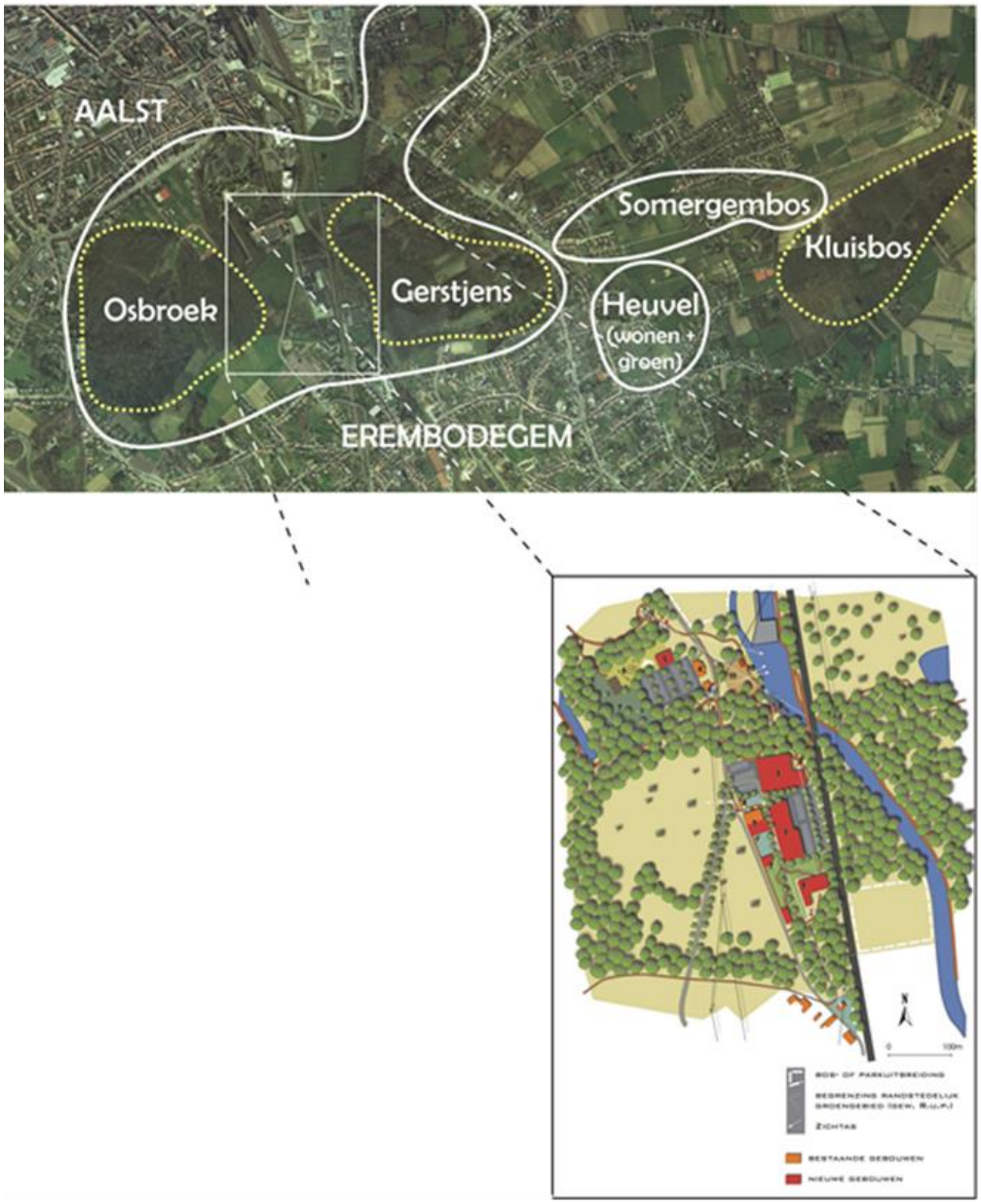
https://reports.cordeel.eu/report/impact-report-2023/

Green infrastructure

Incorporating green spaces and landscaping into the development, such as parks, gardens, and green roofs, to improve air and water quality and provide eco-corridors and natural habitats for wildlife; preventing heat islands in the cities;

Covenant 41: Schotte – Aalst

The tannery Schotte went bankrupt in the late 1990s. Due to former activities, the soil and grondwater was polluted. Old installations also contains a lot of asbestos. After the remediation, new functions were allowed on the site: nature area with a river, place for sport activities (volley ball, climing walls, fitness), restaurants, youth hostel etc. An important element was the connection between the green infrastructure at both sides of the river Dender.



1. Rehabilitation options & decision-making

Examples of rehabilitation projects (Aalst- nature conservation project)

Old industrial area at the border of the river Dender.
Brownfield redeveloped as sports facilities, hostel and youth infrastructure.
Former landfills (fly ash, construction & demolition waste, household waste) integrated in nature conservation project.

Expert support

Covenant: 229 AZ Delta - Roeselare

The master plan provides for large-scale unsealing of the site (>70% sealed) and contributes to both water management and green infrastructure.

In periods of normal rainfall, the park will serve as a sponge that slowly infiltrates the rainwater into the soil. On the other hand, the environment also serves as a water buffer and storage in extreme conditions: due to the specific relief, we can consciously direct and store/retain the water at locations that are not very harmful. The site, now completely paved, was flooded in 2016, as well as the adjacent streets. With the realization of 't Groen hart - commercial name of the project - we are doing better here.

The green infrastructure on the site, both the park construction and the provision of green roofs, not only contributes to the water management on the site, but will also benefit air quality. The smart placement of the buildings on the site ensures that the so-called street canyons in 2 surrounding streets are eliminated.

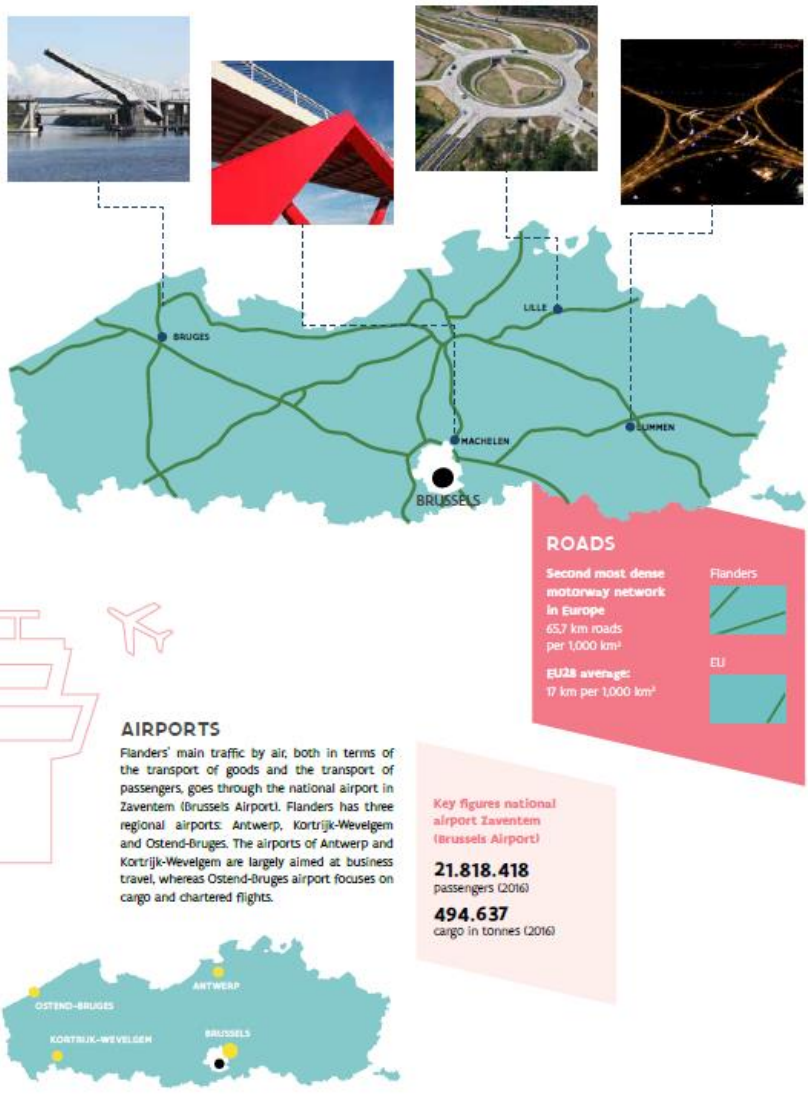
Website: https://tgroenhart.be/

Sustainable transportation

On waterborne industrial sites promoting use of waterways for bulk and container transports; in rural areas promoting active transportation options such as biking and walking, and incorporating public transportation infrastructure into the development; upgrading old transportation infrastructure to modern multimodal transport hubs with emphasis on low carbon impact (railways, shipping);…

Department of Infrastructure and mobility. This policy area of the Government of Flanders has well over 3,000 expert and dynamic members of staff who prepare new policies, administer and oversee major investment projects and deliver cutting-edge technical support.

Flanders is situated right in the middle of the beating heart of Western Europe. It is a crossroads of people, trade and culture that is home to a dense network of roads, waterways and railways, fine-meshed public transport and world-renowned ports. Brussels, cradle of the European institutions, is also the capital of Belgium and of Flanders itself. London, Amsterdam, the Ruhr Area and Paris are all situated within a mere 350 km. To assume its role as the gateway to Europe, Flanders has a broad range of cast-iron strong suits: hypermodern seaports, cutting-edge logistics and fast links by road, rail and inland waterway, plus one national and three regional airports.



https://www.vlaanderen.be/publicaties/way-to-go-flanders-experts-in-motion

Covenant 24 Oude Dokken – Gent

Mobility : DuCoop promotes sustainable mobility by offering a network of electric charging stations for cars and bicycles.

https://ducoop.be/en/initiatives

Annex 1: Large scale redevelopments

Blue gate – Antwerp

Old docks – Ghent

Oude Dokken is the collective name for an urban regeneration project in the area surrounding the former docks Houtdok, Achterdok and Handelsdok, which used to be where the city's port activities took place. For almost twenty years now, this part of the city has been evolving into a modern, lively district.

Years ago, the port of Ghent was located in the Old Dockyards area, to the east of the historical city centre. However, port activities gradually moved to the new municipal port, which is situated just north of the city. Gradually, the vicinity of the Old Dockyards fell into disrepair, becoming a real 'no man's land'. However, things are starting to change now. Thanks to the EU-funded Old Dockyards project, the area is being radically transformed into a brand new vibrant quarter, where citizens can live and work near the waterfront and in a green, sustainable environment. One of the first components to the project involved renovating the quay walls to ensure their safety and stability One of the first components to the project involved renovating the quay walls to ensure their safety and stability. The Old Dockyard's project aims to help Ghent solve its housing shortage by providing approximately 1 500 new housing units, along with a range of office and retail spaces, and recreational, cultural and natural areas. Public services include an elementary school, day care centre and neighbourhood sports hall. The entire area is connected to the city centre via an extension of the public transport network, bicycle and pedestrian bridges.

As the focus of the overall ERDF-funded project was redevelopment, special care has been taken to maintain the area's historical character by reusing elements of its architectural and industrial

heritage. For example, four historic cranes have been incorporated into the project skyline. A former concrete plant has been largely preserved, taking on a new function as part of the largest park in the area. Furthermore, a range of additional maritime industrial elements – from anchors to old train wagons – have been reintroduced into the Old Dockyards' public spaces. The goal is to create a touristic industrial route while, at the same time, providing recreational areas for children. One of the project's first components was renovation of the quay walls to ensure their safety and stability since this area was planned as a recreational strip for pedestrians and cyclists and will become the backbone to the future dockyard. Another important feature concerned renovation of a series of disused gravel tanks, formerly used for transferring gravel and sand between ships and trucks. Through limited interventions, a team of young architects and artists have transformed this area into a unique multi-purpose public space. Today, the setting is a hot spot for youth, artists and families from the neighbourhood.

Unlike many urban development projects, the focus here is not on financial aspects, but on creating a liveable, vibrant and green new city district able to respond to the needs of the city's inhabitants.

https://cor.europa.eu/en/news/Pages/Construction-Ghent-docks.aspx

https://visit.gent.be/en/see-do/old-docks

http://www.hub.eu/projects/Requalification-of-the-old-docks-Ghent#4

https://www.vai.be/en/buildings/andere/old-docks-of-ghent

Suikerfabriek – Veurne

The former Suikerfabriek (sugar beet processing plant) at Veurne is a good example of a sustainable brownfield development with a mix of living, working, recreation, nature and urban agriculture in which the West Flemish Intercommunale (WVI) carries out process and project management from its land position, in close cooperation with its partner, the city of Veurne and with project developer ION for the housing project.

The nature reserve, business park and 1st phase of the residential project (150 units) have been realized or approximately 2/3 of the area. Another 500 residential units need to be realized over the next 17 years (2040).

The integral sustainability of the project is monitored on the basis of the Flemish Sustainability Meter for neighborhoods. A tool that departs from the 11th SDG: Sustainable cities and human settlements, and has many interfaces with the other SDGs (mobility, energy, nature, water, well-being, etc.).

Based on the observation that integral sustainability is no longer sufficient to provide an answer to climate change and that we are also increasingly and more frequently confronted with extremes (too wet, too dry, too hot) in Europe/Belgium/Flanders, we are fully committed to on regenerative urban planning.

The natural city: integration of nature in every development can better absorb these extremes and produce a milder urban climate. Focus on the connected city, the 10-minute city where everything is within cycling distance and functions are interwoven again. Betting on the adaptable city, the only constant is change. Think about what our climate will look like in 10/20/30 years and prepare our cities for this (integrate green-blue networks). The circular city, close flows of food, water, energy, materials and ensure that waste becomes a raw material for the city. Finally, the participatory and inclusive city.

Sustainable urban planning will reduce the negative footprint of construction projects. Regenerative urban design is about looking for a positive handprint, where natural processes are restored, building materials are reused and/or the health of residents improves. Regenerative urbanism tries to make an active contribution to the restoration of places.

Highlights:

- Public land position and process management – long lead time
- 50 ha: mixed urban project with significant nature input
- integral sustainability ambition
- mobility – STOP principle, 10 minutes city, low-traffic area, car-free park

Closing cycles:

- Reconversion of a brownfield, not addressing a greenfield.
- Residential project heating network is fed by industrial waste heat chips factory PepsiCo via ESCO
- Recuperation of gray water at the Sugar Tower (70 apartments and 3000m² public program) for WC / washing machine
- 38,000m³ of concrete and mixed rubble broken and sieved on site and fully reused within the 1st phase of development
- Closed ground balance
- Functional remediation
- In research into recycling rainwater and domestic wastewater for industry and housing via a WASCO

www.suikerfabriek.be

www.suikerpark.be

https://mailchi.mp/vibe/voorbeeldenboek-stedenbouw-kan-ook-zo

Eiland – Zwijnaarde

Annex 2: a variety of brownfield redevelopments

https://www.revive.be/en/

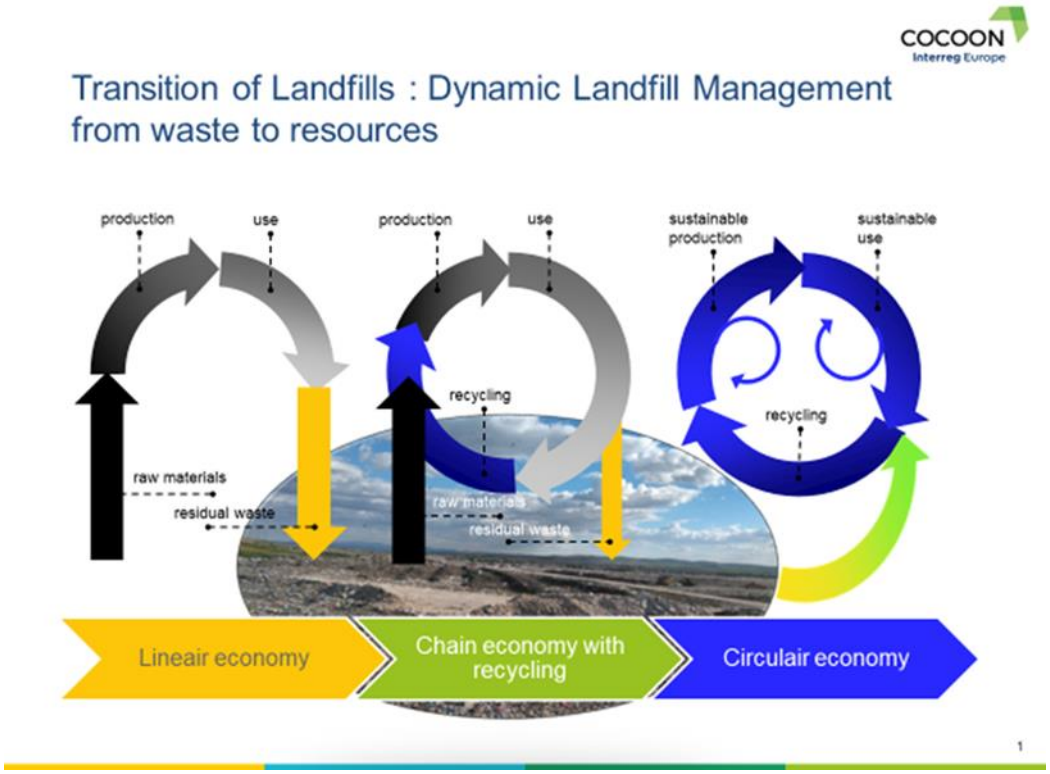
MG : https://www.mgrealestate.eu/en/about-mgre/making-it-green#msdynttrid=H2eks2eRhA3vkFoTfbToUxQ-pGNmyjdhsHXaJGB1HhQ

Annex 3 : Dynamic Landfill Management

In the transition to a circular economy we are confronted with the remnants of the linear economy: landfills. Instead of treating them as static objects, we opt for a dynamic management of landfills in which the content and context are taken into consideration.

Since 2019, Dynamic Landfill Management has been the all-encompassing term for the sustainable integration of resources (materials, energy and land) from landfill sites into the circular economy. This includes the safe storage of landfills with a high resource valorization potential, in view of enhanced landfill mining (ELFM), providing sustainable interim uses and bridging the gap to a final safe situation and thereby respecting the most stringent social and ecological criteria.

The objective of Dynamic Landfill Management is to bring landfills into harmony with their dynamic environment. On the one hand, this includes preventing or reducing negative effects like environmental and health-related risks as far as possible. On the other hand, DLM tries to maximize positive effects, so that old landfill sites can contribute to national as well as European policy goals in the broadest sense, e.g. concerning waste and resource management, climate change, the Blue Deal, the Green Deal, soil sealing and no net land take.



Dynamic Landfill Management : https://ovam-english.vlaanderen.be/dynamic-landfill-management

Covenant 186 Waterfront - Waregem

Mixed development (office building, hotel, 120 apartments and parking building) on a former landfill.

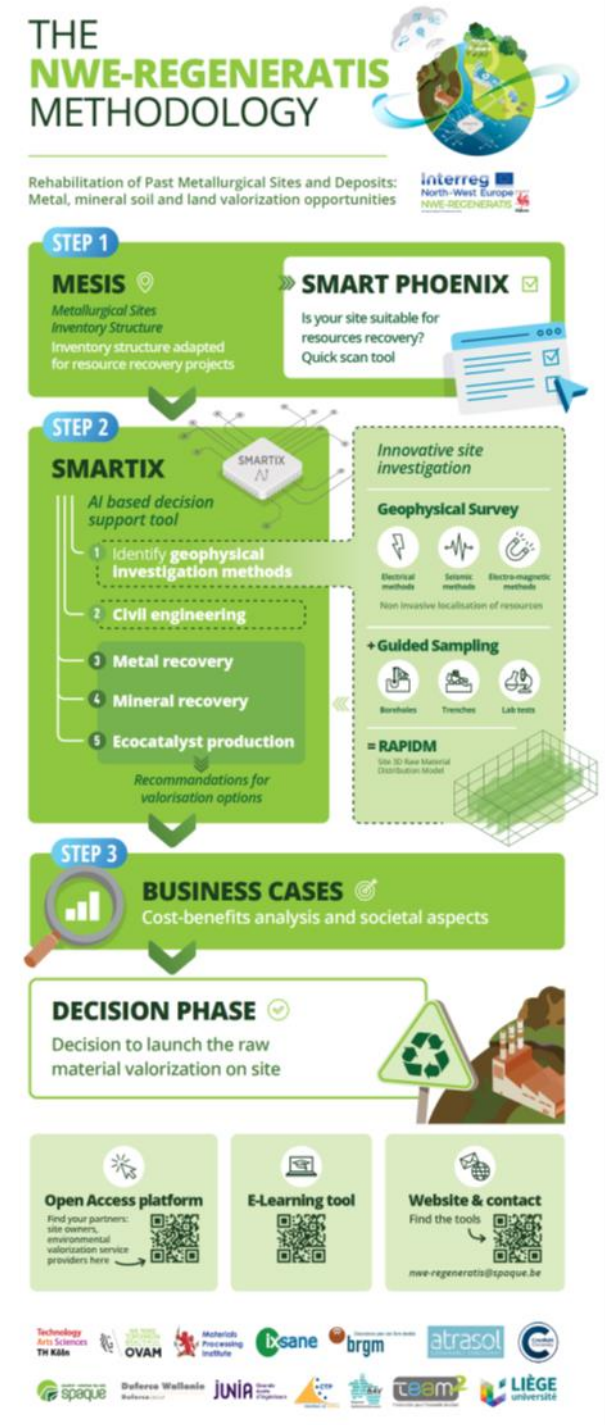
Website: https://waterfrontwaregem.be/

Interreg NWE-REGENERATIS - REGENERATIon of Past Metallurgical Sites and Deposits through innovative circularity for raw materials.

According to JRC (2013), metal working industry represents 13 % of the 2.5 mio Potential Contaminated Sites (PCS) in the EU. Consequently, a significant amount of their produced waste was deposited in landfills (37.2% of all PCS). Assessing these figures reveals approx. 100.000 sites with a recovery potential of metals.

While recent metallic waste streams are usually treated, older waste (aggregated material with high ferrous metal content, scrap, other metals, white and black slags and other streams) are considered as a source of pollution, expensive to manage/eliminate. REGENERATIS aims to transform this problem into an opportunity, as large volumes of resources (metals, materials & land) from Past Metallurgical Sites and Deposits (PMSD) can be recovered by urban-mining. In order to implement this in NW-Europe, REGENERATIS tackles the sectoral and contextual barriers. The main challenge for stakeholders is the environmental risk & the profitability of recovery processes. Currently all PMSD are managed within a remediation strategy focused on environmental impact/risk. In NWE region PCS inventories are inadequate, as they lack relevant data on the economic potential (quantity, quality & materials value). Traditional exploration methods are not focused on raw materials recovery.

REGENERATIS delivers an evidence-based solution implemented & tested on 3 sites (including innovative characterization by geophysics, innovative recovery processes guidance, artificial intelligence algorithm), promotes an Harmonized Inventory Structure, and supports new business models for resource recovery from PMSD, by using open source 4D Smart Tool (SMARTIX). Impact is guaranteed by long-term involvement of all REGENERATIS partners/ associated partners to convince stakeholders.



https://vb.nweurope.eu/projects/project-search/nwe-regeneratis-regeneration-of-past-metallurgical-sites-and-deposits-through-innovative-circularity-for-raw-materials/