

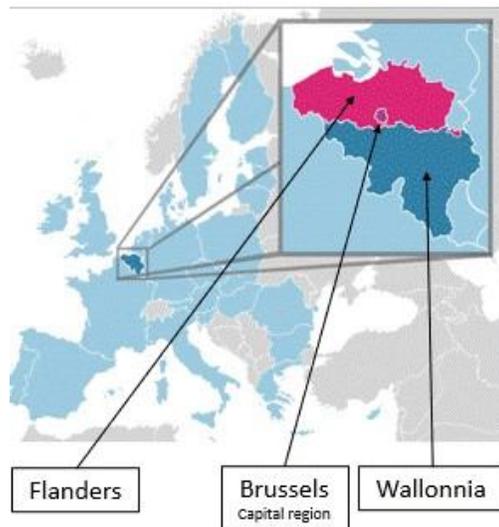
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Process and governance of megasites rehabilitation in Flanders

Eddy Wille,
Senior advisor – OVAM
Negotiator brownfieldcovenants – Flemish government

Contaminated megasites – TEF / RemTech – 25 May 2023

Flanders & OVAM



General information :

Flanders

- Population : 6,4 M inhabitants - Surface : 13.599 Km² - 472 inhab./Km²
- Industrialisation starts 19th century along riversystems; petrochemical cluster since 1950; end 20th century change to mainly service-oriented businesses
- Regional policies/authorities on economy, environment, education, transport & mobility, housing, ...
- 3 main harbours linked to North sea and gateway to the East (Antwerp, Bruges, Ghent)
- Limited natural resources (coal mines closed 1988 – 1992)

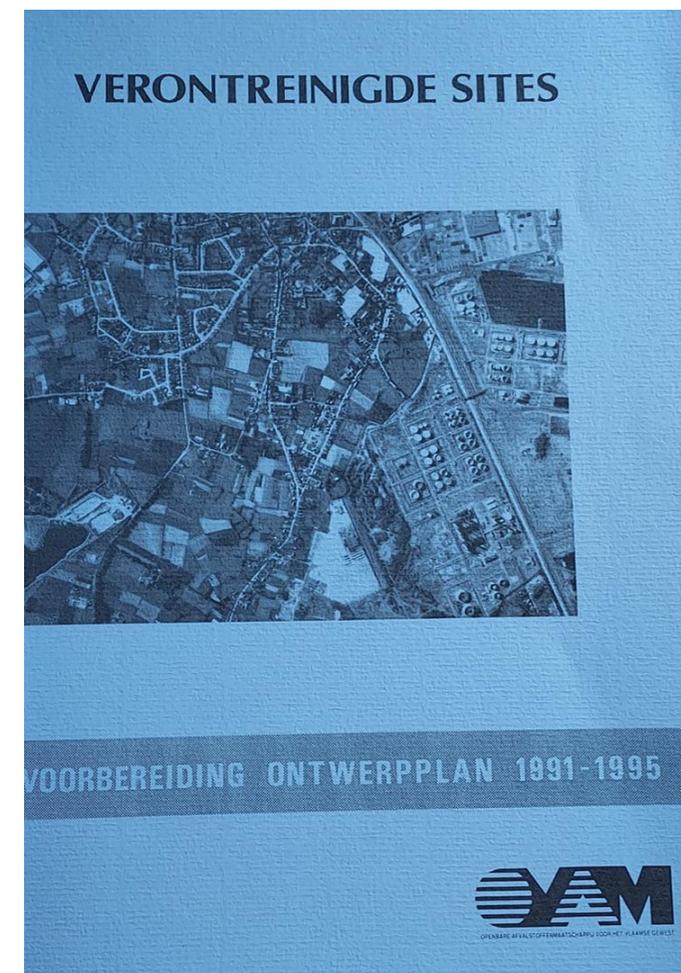
Public Waste Agency of Flanders (OVAM)

- Environmental Agency headed by the Flemish Minister of Environmental Affairs
- Established in 1981 (Belgian State reform of 1980)
- Competent Authority for:
 - Waste Management;
 - Sustainable Material Management;
 - Circular economy;
 - Soil Remediation.
- ovam.vlaanderen.be



Contaminated (mega)sites

- ▶ **Why should we be interested in contaminated sites ?**
 - USA – Love Canal ('70) -> RCRA / Superfund
 - Netherlands – Lekkerkerk ('80) -> Interimwet Bodemsanering
 - Germany – Schönberg ('80) -> Basel convention
- ▶ **What's the situation in Flanders ?**
 - Landfilling until 1990 most chosen option
 - Large number of landfills adjacent to production facilities
 - Seldom control of soil quality; groundwater monitoring at landfills (1984)
- ▶ **How was the response ?**
 - Waste management Act (1981): organizing safe evacuation & storage of waste
 - New Article 21§2,c (1990): OVAM appointed as competent authority for cleaning and remediating industrial facilities and landfills (a.k.a. megasites)
 - Report 'Contaminated sites' (1990): blueprint of a specific policy on contaminated sites -> Soil Remediation Act (1995)
 - Broadening the scope -> Soil Remediation and Protection Act (2006)
 - Redevelopment of brownfields -> Brownfield covenant Act (2007)



Report on Contaminated Sites (1990)

Megasites

Definition Megasites (TIMBRE-project) :

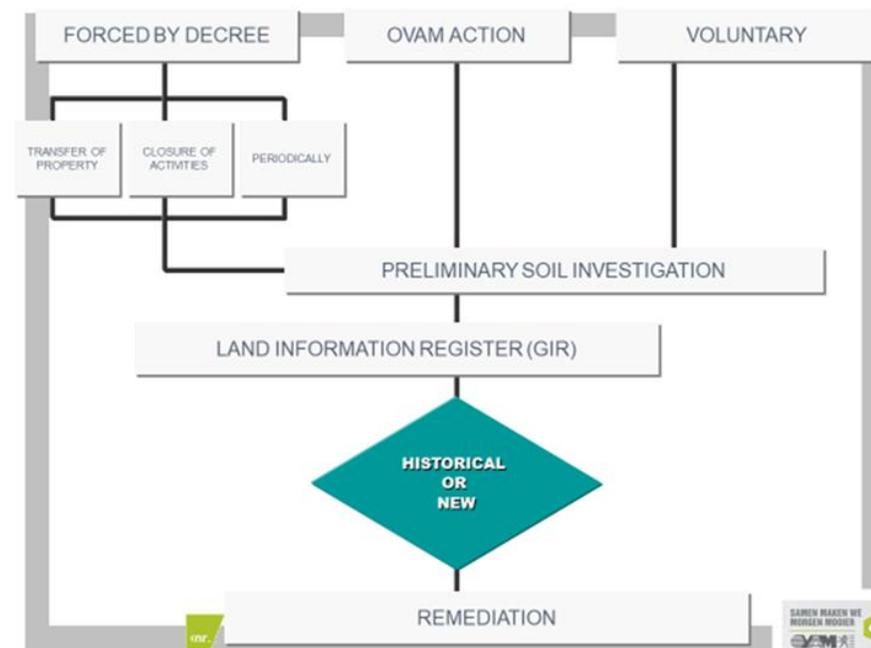
Megasites are characterised not only by their large size, but also by their complexity of soil and groundwater contamination, large residual above ground and underground buildings, and a heterogeneous mix of stakeholder interests.

Flanders : absence of legal definition 'Megasite' in Soil Remediation Act.

However: focus on facilities with high risk of causing soil pollution (i.c. megasites)

How ? Obligations to conduct preliminary soil investigation :

- Closure of activities
- Periodically (10 – 20 years)
- Before the start of the operations
- Transfer of land
- In case of bankruptcy



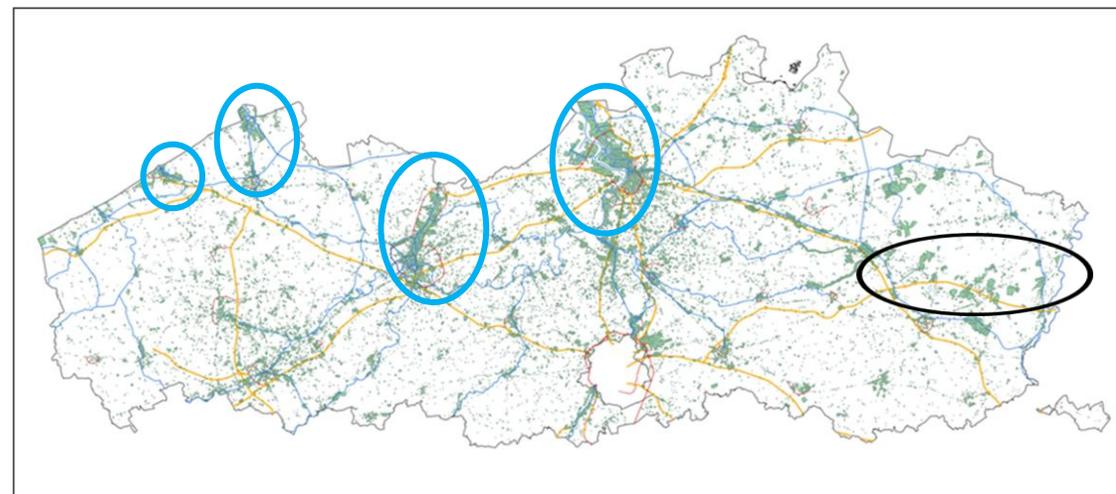
Data collection & mapping

First steps on mapping Potentially polluting operations/contaminated sites:

- estimated number of sites (1989) : 8.986
- estimated number of sites (1995) : 76.000 – 84.000

Some figures (1996 – 2022)

- > 5,5 mio soil certificates delivered
- 48.000 preliminary soil investigations evaluated
- 14.000 descriptive soil investigations evaluated
- 7.000 soil remediation projects approved
- 6.500 remedial operations started
- 4.500 remedial actions completed



Distribution of investigated sites in Flanders (2022)

- former coal mines
- harbours

Land register & Soil certificates

Emphasis on administrative and legal aspects with regard to the Soil (remediation) Act.

- Identification of land plot;
- Validated reports in LIR (1);
- Consequences of encountered contamination.

But:

- Not a detailed description of the site history and results of investigations/ remedial actions.
- Limited geographical data available (no systematic georeferenced sampling/analysis data).

Recent initiatives:

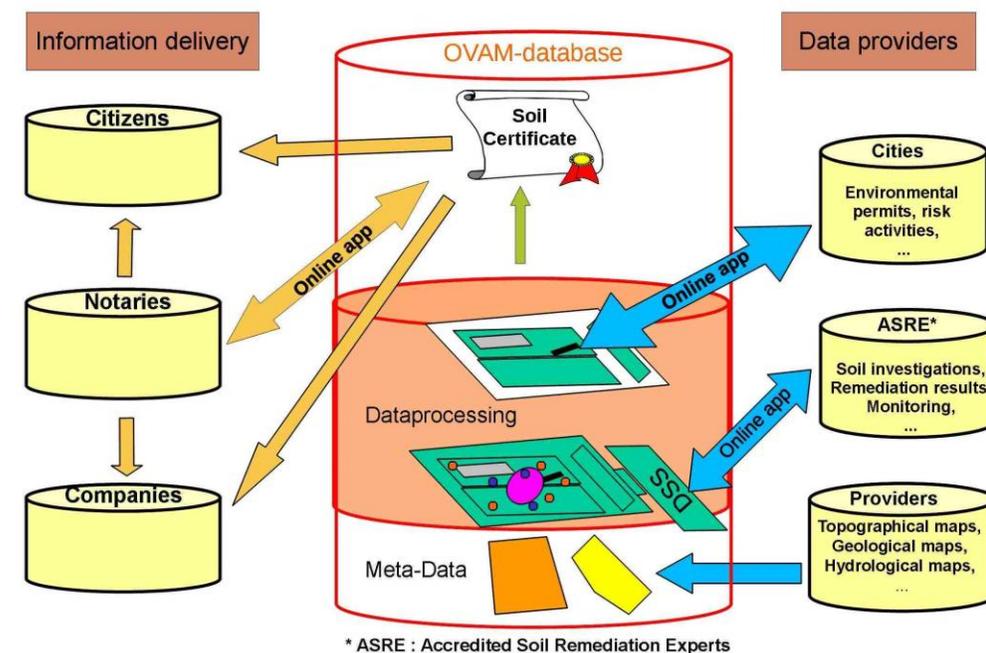
- Sharing more data online (web-based viewer);
- Opportunity maps;
- Regional patterns.

(1) Land Information register



Example soil certificate

KADASTER ID	XCOORD	YCOORD
11001B0038	D	151.28578
11002A0713	D	152.4697
11002A1191	C	152.33061
11003A0198	Y 2	154.32912
11003B0017	B 14	153.76539
11003B0017	W 13	158.74064
11003B0037	X	153.74013
11003B0037	Y	153.76849
11004A0032	K	158.53061
11004A0042	A 2	158.5787
11004A0141	B	158.77671
11004A0182	S 3	159.01571
11004B0226	C	160.66397
11004B0373	V	160.675
11004B0373	W	160.675
11004C0126	G	159.84809
11004C0520	E 3	159.98989
11004C0520	P 2	159.93021
11004D0058	H 5	158.97678



Data exchange & storage. Involved stakeholders.

Alphanumerical database of cadastral land plots





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(Re)Valorisation of megasites

From linear to circular

Revalorization = the act of thinking or stating again that something has value, especially when it has not been thought to have value in the past.

(Cambridge dictionary)

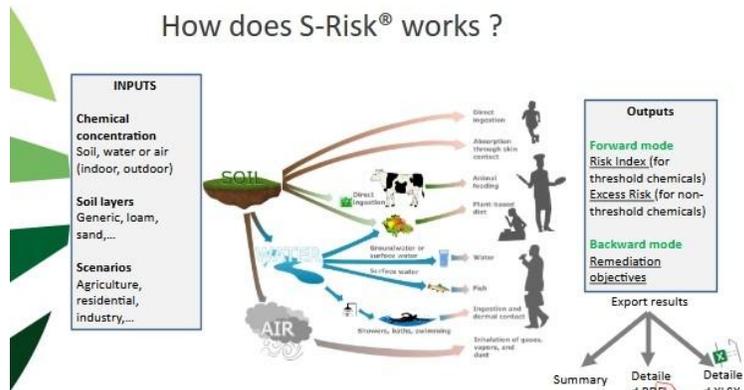
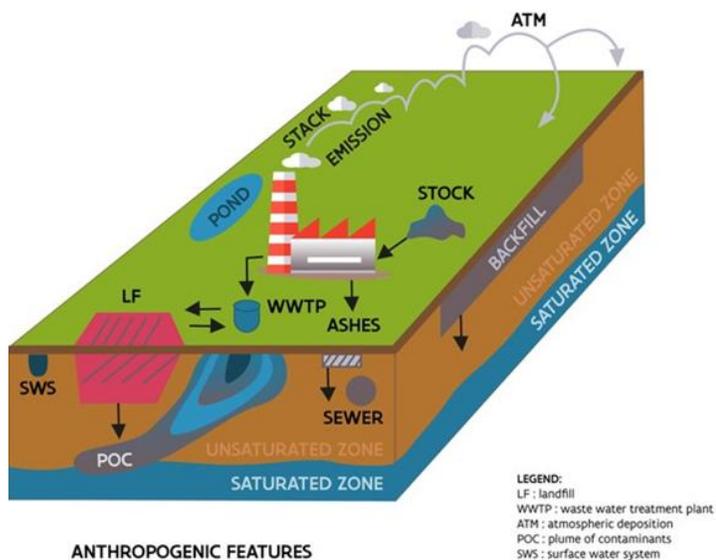
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(Re)valorisation of megasites

First steps during 1990s – Addressing the contamination problem

Site investigation – risk analysis – design remedial plan – remediation – aftercare & monitoring



(Re)valorisation of megasites

Recycling contaminated land and the legal toolbox

- Regulating :
 - Use of PCB no longer allowed
 - Permits (prevention)
- Enforcing:
 - Inspections
 - Taxes, levies
- Facilitating:
 - Agreements at sectoral level (95)
 - Site declaration (225 – 10.086 plots)
 - Brownfield covenants (263)
- Investing / Supporting:
 - Grants, Funding
 - Networking



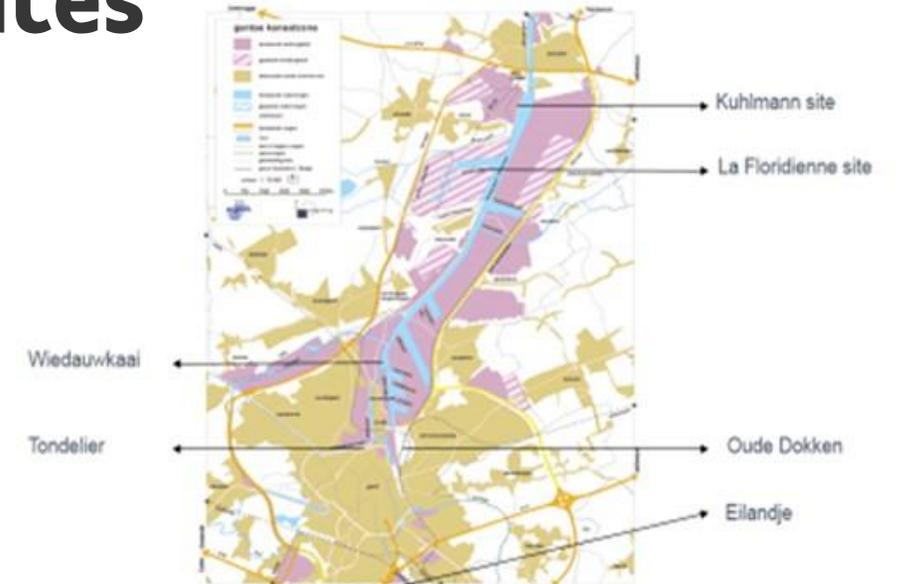
Contaminated Land Management in a 4D-perspective: the site within its time dimension is constantly interacting and changing. There is no one fits all solution and good practices should be as dynamic as the system.

(Re)valorisation of megasites

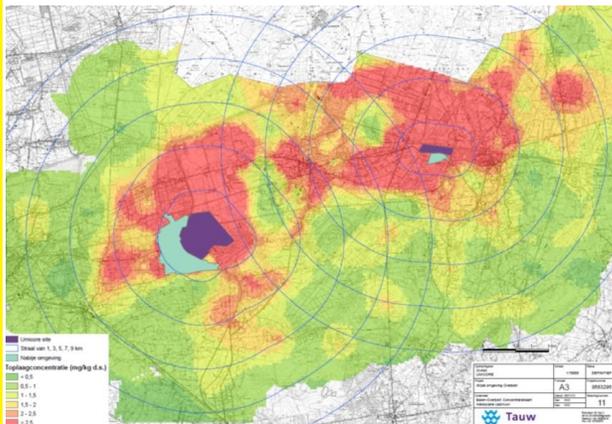
Efficient & efficiency

Doing the right things & doing the things right ?

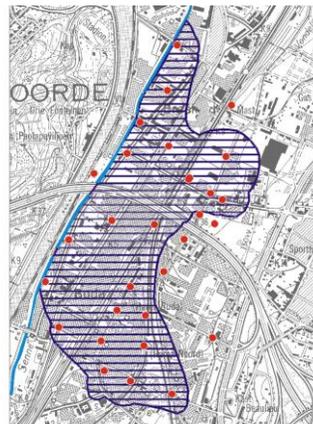
- Planning and remediation not in line with intended/future land use and sometimes limited to the megasite;
- Sustainability of the actions;
- Large scale contaminated land demands different approach;
- Limited or no participation;
- A lot of data but no relevant information;
- ...



Individual approach of megasites or regional masterplan ?



Heavy metals (Cd, Zn,...) in topsoil (> 50 Km²)



Regional groundwater plume



Excavation & redevelopment in line ?



Accessibility of the rehabilitated megasite ?

(Re)valorisation of megasites

First steps during 1990s – Addressing the contamination problem

Focus on high number of smaller sites – forgetting the lessons learned at former coal mine sites:

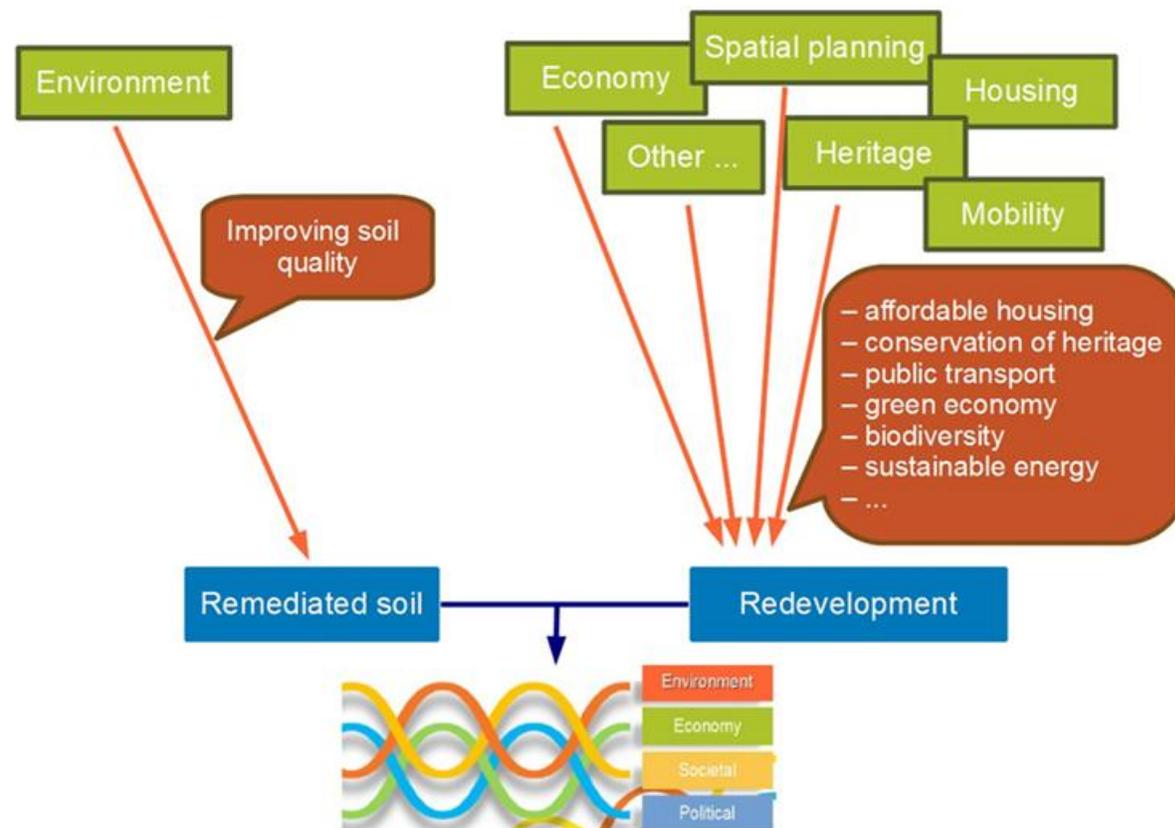
- Rehabilitation process started in 1993;
- Bringing stakeholders together;
- Building the future and remembering the past;
- ...



Megasites: content & context

Assessing the impact on and vulnerability of the vicinity.
But also detecting the demands and needs in the broader area of the megasite.

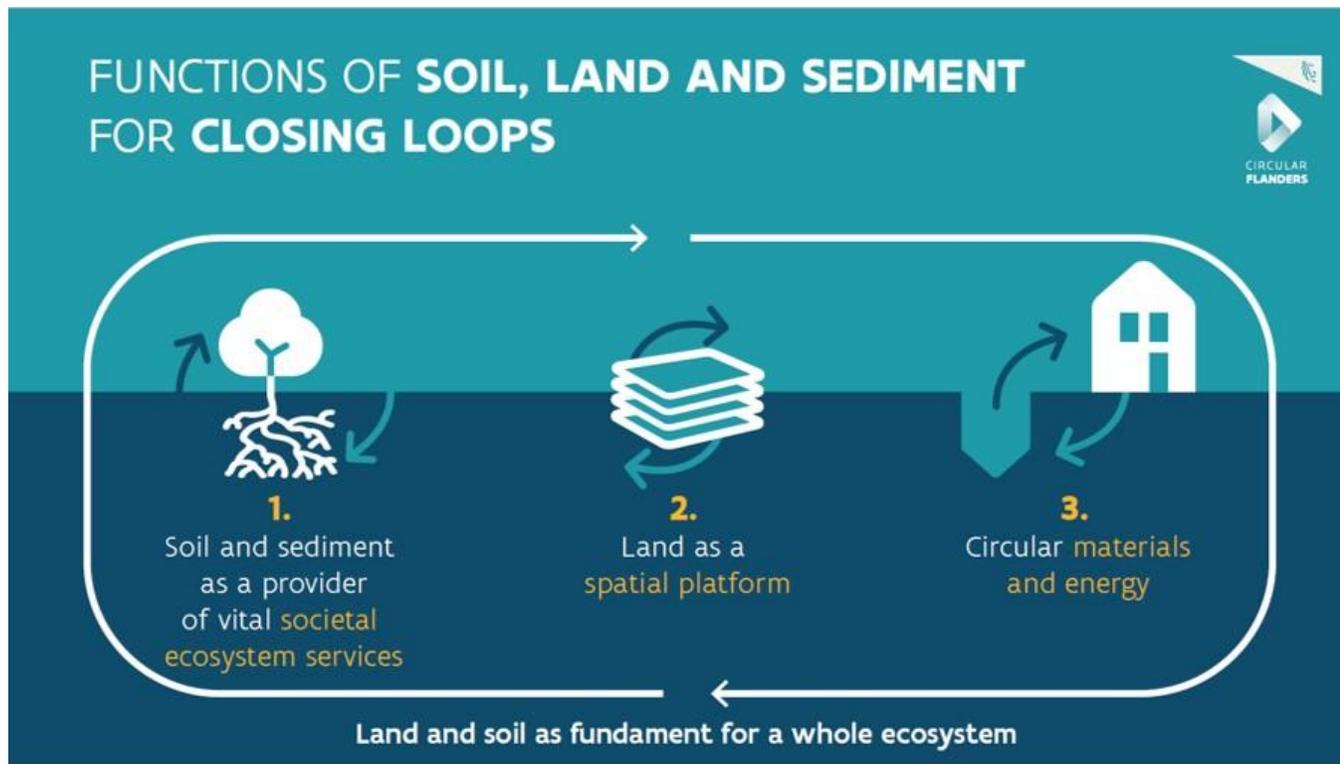
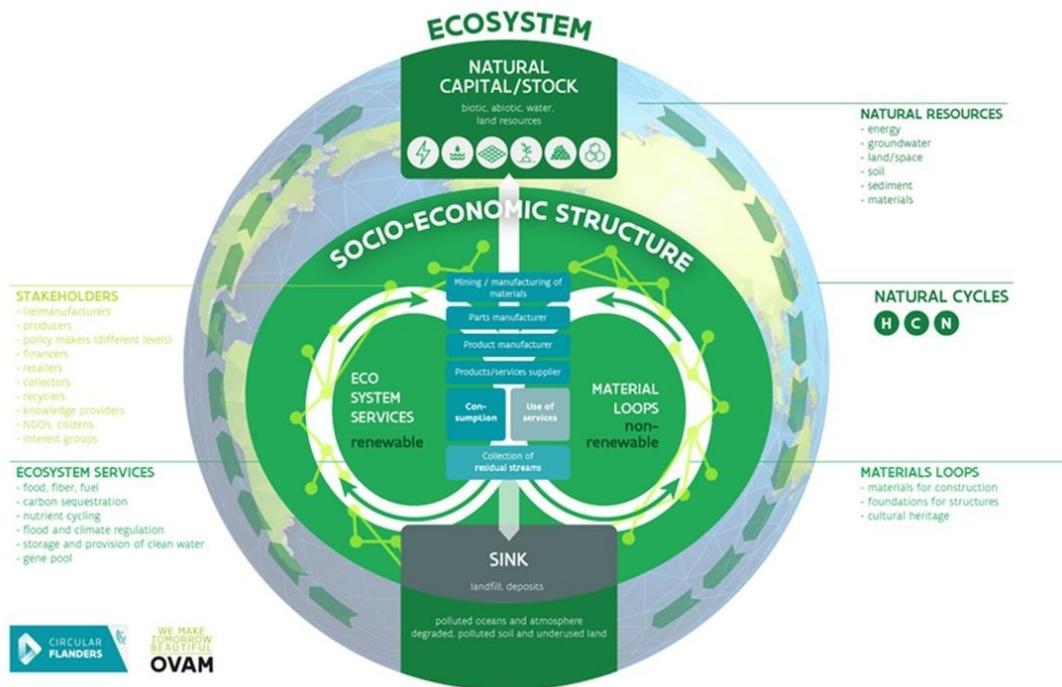
How can the megasite contribute to those demands and fit in SDGs ?



Megasites: content & context

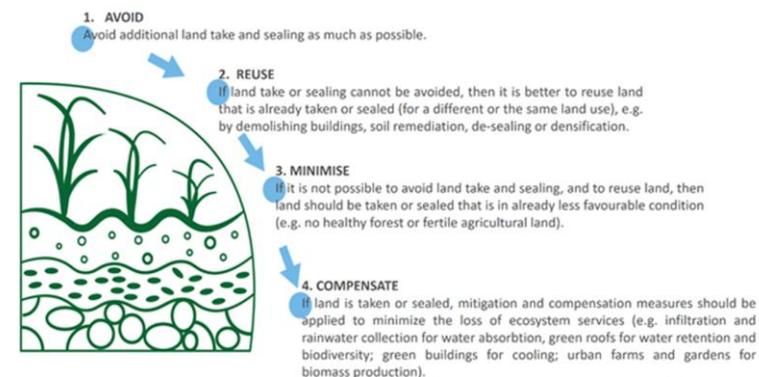
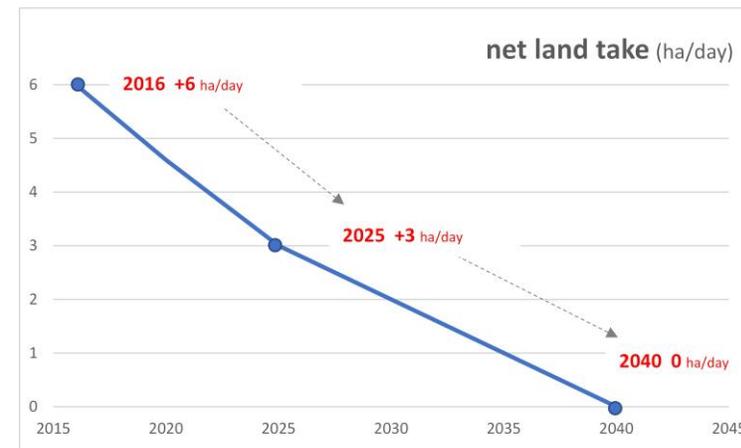
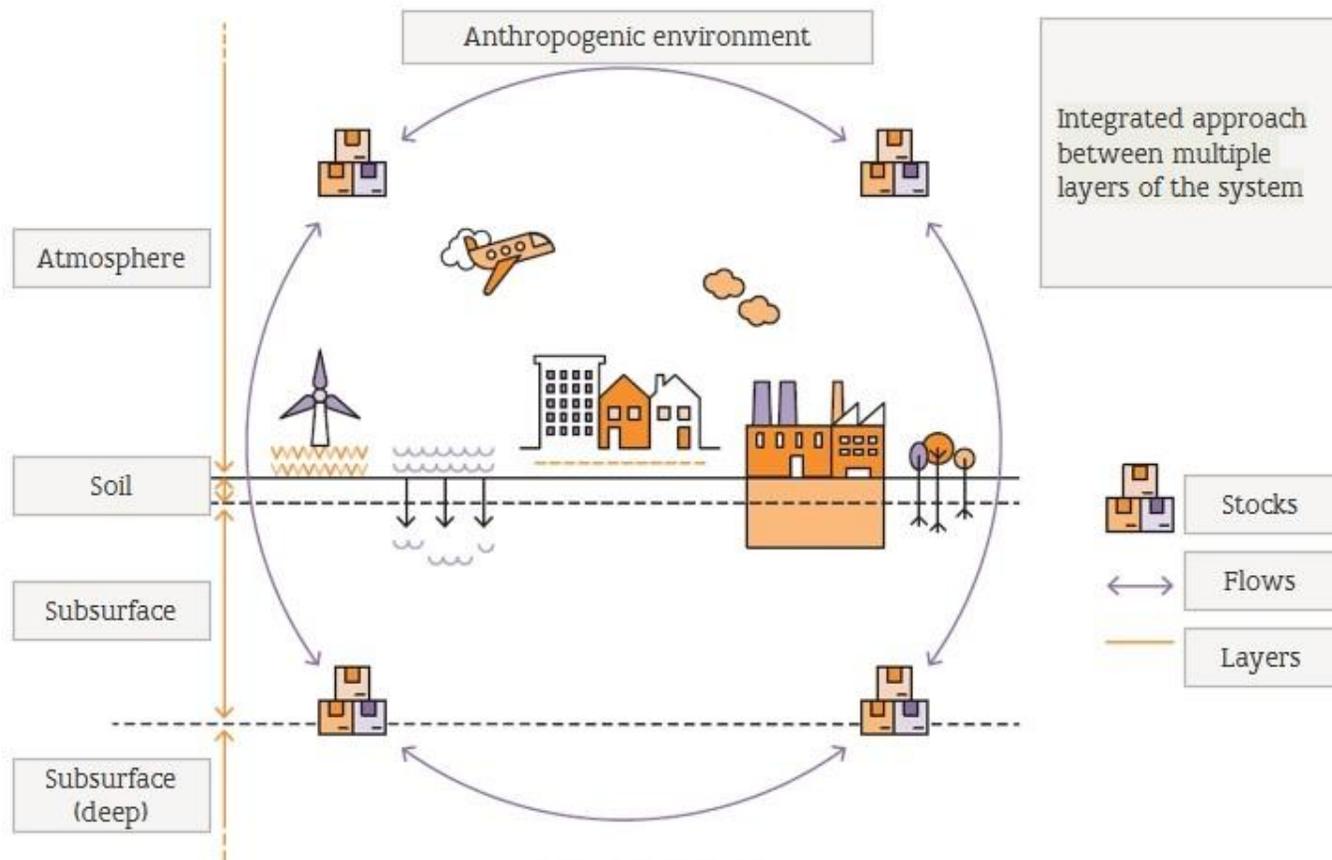
Land, resources & Circular economy

SOIL AND LAND IN THE NATURAL AND SOCIO-ECONOMIC CYCLES



Megasites: content & context

Spatial planning & Circular economy



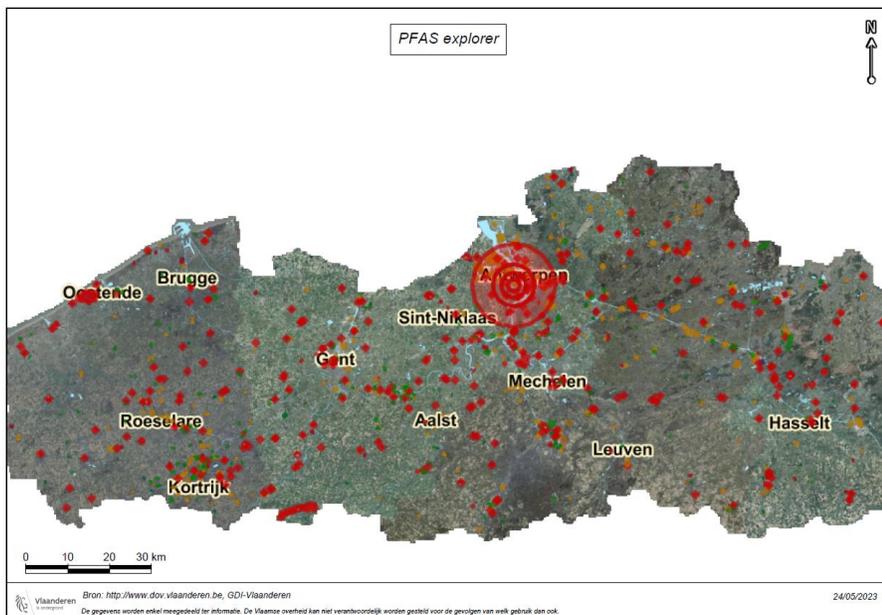
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DEPARTMENT OF
ENVIRONMENT
& SPATIAL
DEVELOPMENT

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Megasites : content & context

Data exchange and sharing



PFAS explorer. Mapping potential sites and indicating no regret areas (no drinkwater use; restriction on gardening).



Extract of Land Information Register. Each site has a color code reflecting the process (investigation, remediation, monitoring).

<https://services.ovam.be/ovam-geoloketten/#/bodemdossier?x=140410&y=198535&z=10>

Save the date:

Tackling PFAS pollution: a pro-active approach through systemic thinking &

Launch Knowledge Center Innovative Remediation Techniques

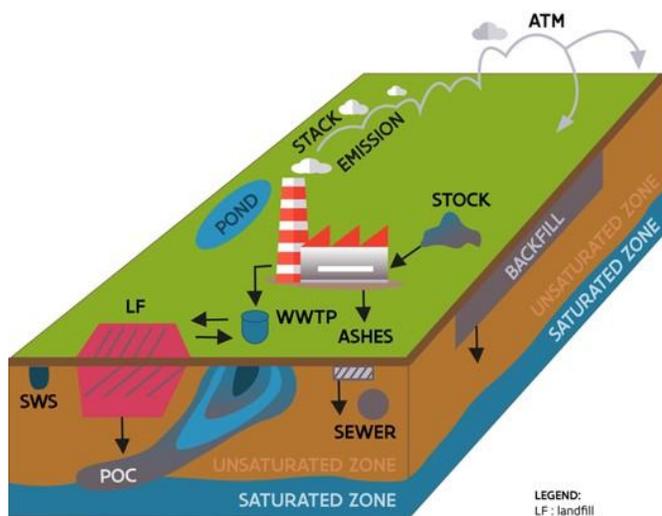
1 and 2 February 2024

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Megasites: content & context

Identification of the system dynamics:

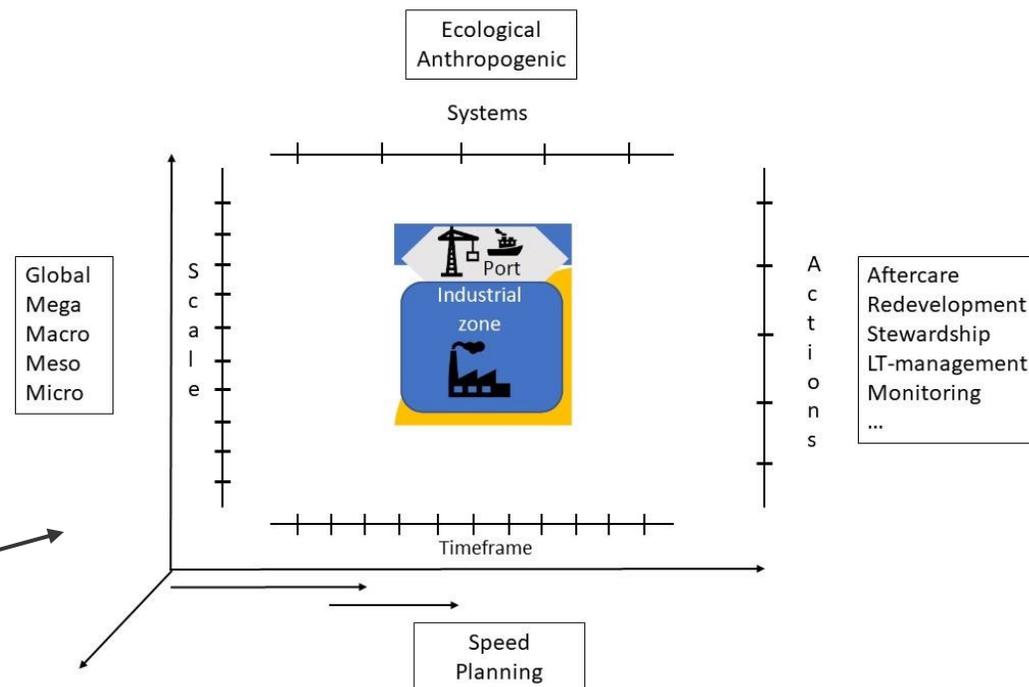
- Ecological and economic drivers;
- Ranging scales and their magnitude;
- Diversity of stakeholders;
- Uncertainties about causes, consequences & remedies;
- Different formal & informal laws and levels of government;
- Complex dependencies which constantly change;
- ...



LEGEND:
 LF : landfill
 WWTP : waste water treatment plant
 ATM : atmospheric deposition
 POC : plume of contaminants
 SWS : surface water system

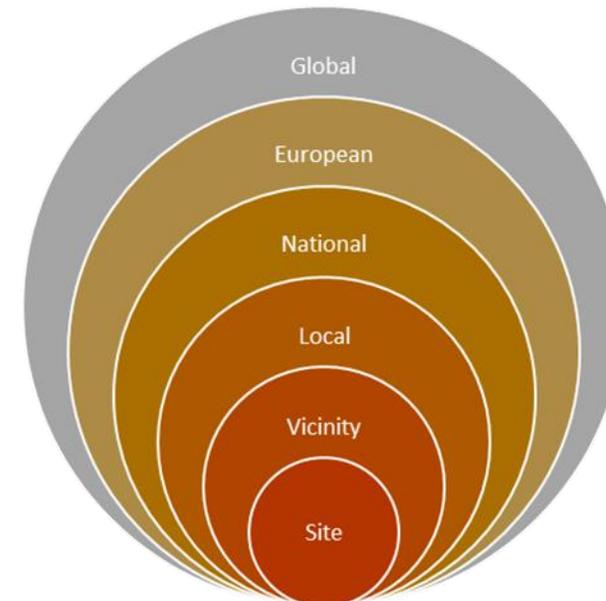
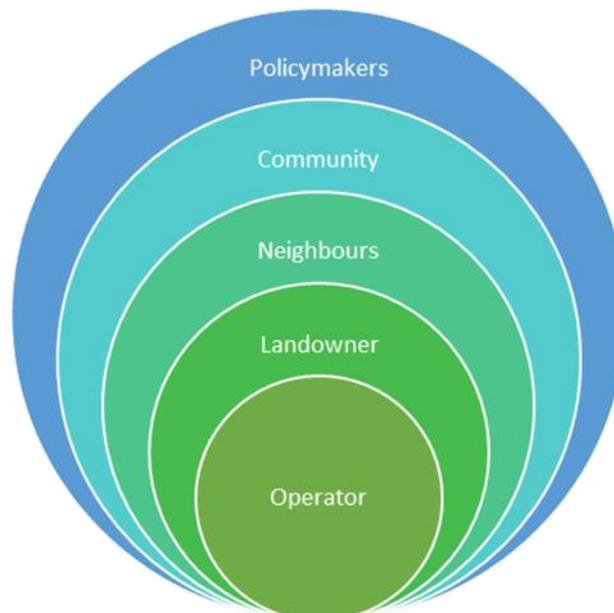
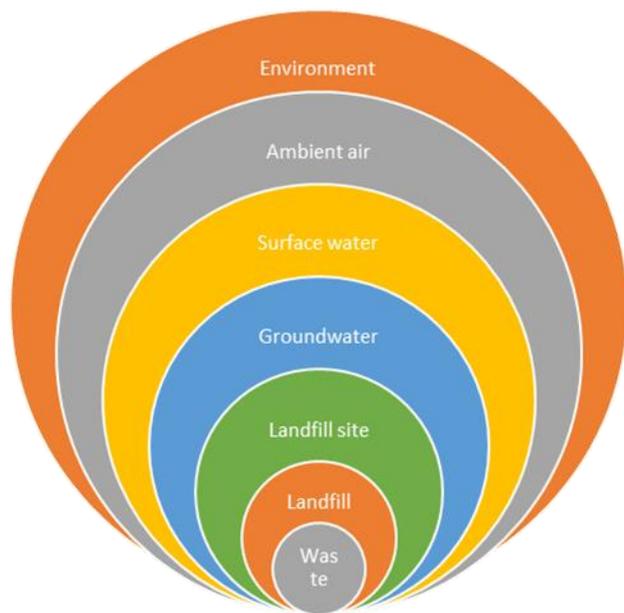
ANTHROPOGENIC FEATURES

Broadening our vision :
 site within its environment.



Megasites: content & context

Participation, (Risk)communication and governance



An Onion-diagram provides help in the identification of the site in its context in the broadest sense (environmental, legal, social,...).

Brownfield covenants

Brownfield Covenant Act : 30 March 20

- Legal base + definitions
- Procedure in general terms
- Minimal content of the covenant
- Facilitating framework

Definition of brownfields

A brownfield is a whole of neglected and/or underused grounds that have been degraded to such an extent that they can apparently only be used or reused by means of structural measures.

Any land or premises which has previously been used or developed and is not currently fully in use, although it may be partially occupied or utilised. It may also be vacant, derelict or contaminated. Therefore a brownfield site is not available for immediate use without intervention.

≠ contaminated sites



AGENTSCHAP
INNOVEREN & ONDERNEMEN



(1) Discussion platform chaired by negotiator with developers and relevant public authorities (regional, province, local)

(2) Follow up by representatives of parties who signed covenant; chaired by former negotiator

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Brownfield covenants

Integrated Evaluation - Group of officials



AGENTSCHAP
INNOVEREN & ONDERNEMEN

1. Rehabilitation options & decision-making

Take home messages

Communication & Landfills

COCOON
Interreg Europe



The redevelopment process has several stages and includes uncertainties and risks. Perception, resistance and support are part of the project. Recognize complexity and interaction from the start so necessary links can be made.



Geert De Geyter



When it comes to judging a risk, most people would rather trust the opinion of a friend than take the word of a scientist. (new scientist, 28.09.1996)

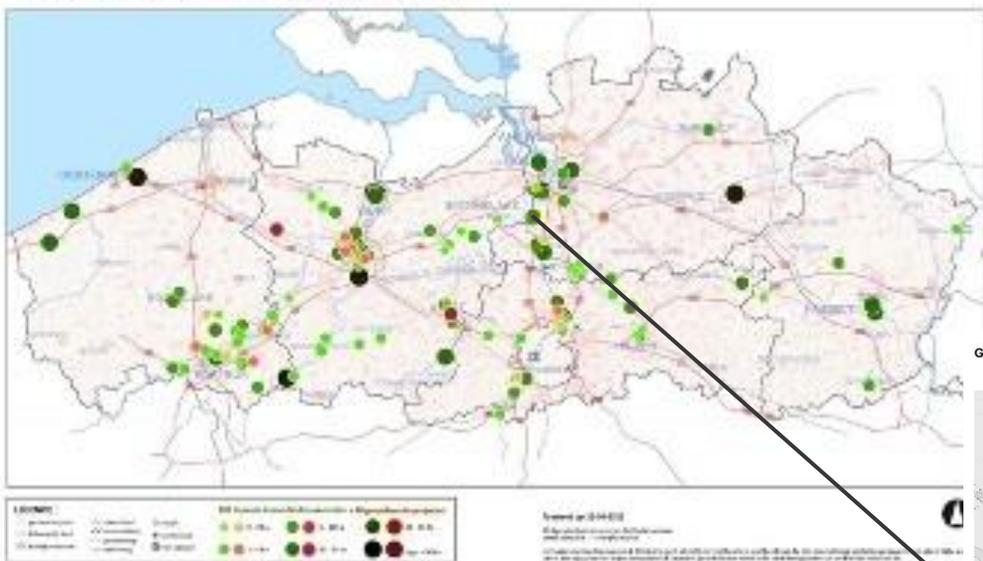


Expert support



Brownfield covenants

Map signed brownfield covenants (2022)



Local map

Geopunt-kaart Brownfieldconvenanten Mechelen



Bron: www.geopunt.be

29/11/2022

Geopunt-kaart Brownfieldconvenanten Mechelen

Projectgebieden brownfieldconvenanten rondom centrum Mechelen. Situatie november 2022.

Legende

Mijn kaarten

- Brownfieldconvenanten
 - Status: omschrijving
 - Gesubsidieerde convenant
 - Definitieve convenant
 - Ontwikkelpromissie / inspraakvergadering
 - Gegrond / onderhandelingen opgestart
 - Ingediend

Aangeklikte locatie

DICHTSTBUZUNDE ADRES
 Louis Neefsstraat 18, 2800 Mechelen

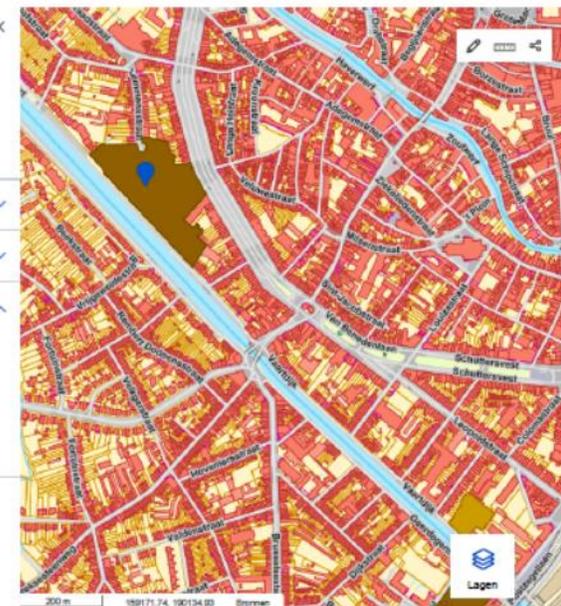
[Website van Mechelen](#)

[Kadastrale informatie](#)

[Coördinaten](#)

[Brownfieldconvenanten](#)

Projectnummer: 43
 Projectnaam: Comet Site Mechelen
 Gemeente: Mechelen
 Omschrijving status: Definitieve convenant
 Oppervlakte: 36 011,74 m²



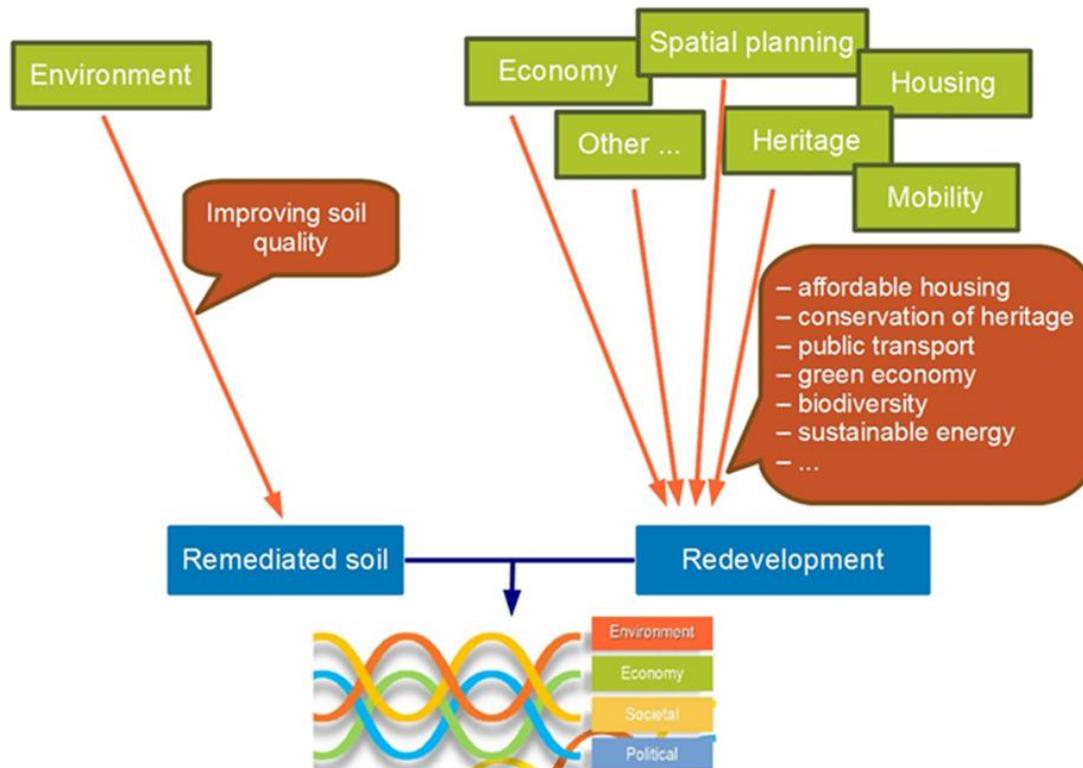
Geopunt is een officiële website van de Vlaamse overheid [Meer info](#)

Site information

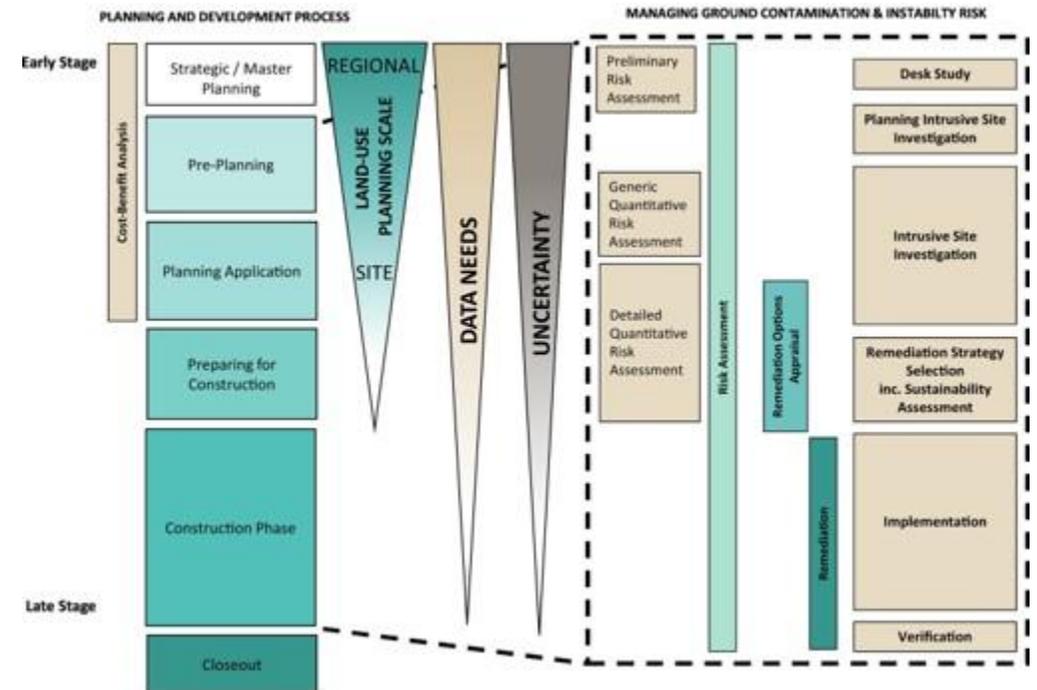
- 13 calls
- 263 proposals
- 42 negotiations (300 ha)
- 124 signed covenants (1600 ha)
- 23 projects realised

(Re)valorisation of megasites

Streamlining the process



The Typical Planning and Land Redevelopment Process for Brownfield Sites



A critical review of decision support systems for brownfield redevelopment.
 Ellis B.Hammond, Frederic Coulon, Stephen H.Hallett, Russell Thomas, Drew Hardy, Andrew Kingdon, Darren J.Beriro.
 Science of The Total Environment, Volume 785, 1 September 2021



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(Re)valorisation of megasites

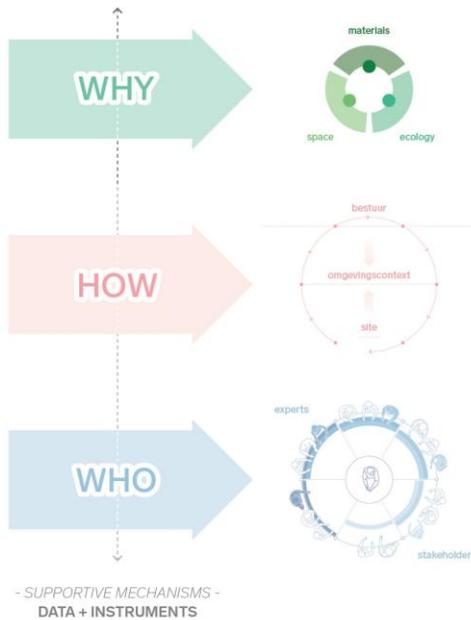
Streamlining the process

3. GUIDING PROCESS STRUCTURED BY INTERDEPENDENT TRACKS

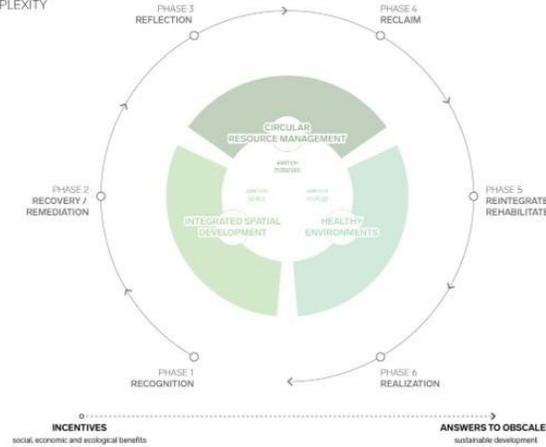
- TRACK A -
EVALUATION AND MONITORING
AMBITIONS

- TRACK B -
PLANNING AND DESIGN PROCESS
REDEVELOPMENT

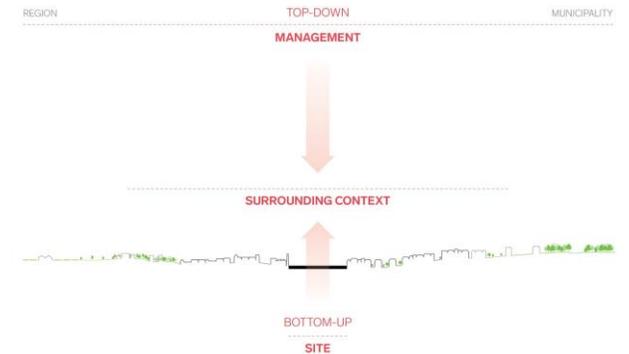
- TRACK C -
ITERATIVE PROCESS
co-production process
EXPERTS + STAKEHOLDERS
participation process
LOCAL ACTORS



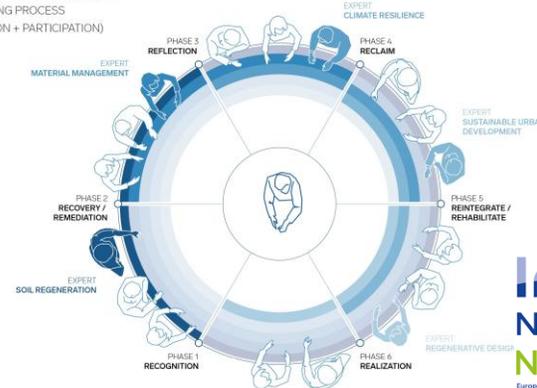
2. AMBITIONS GUIDING PROCESS AS A TOOL TO MANAGE THE COMPLEXITY



2. TRACK B SCALES AND APPROACHES



5. TRACK C - ITERATIVE PROCESS MULTIDISCIPLINARY AND MULTISCALAR DECISION-MAKING PROCESS (CO-PRODUCTION + PARTICIPATION)



Interreg
North-West Europe
NWE-REGENERATIS
European Regional Development Fund

SWECO

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(Re)valorisation of megasites

Redevelopment process

Step 4: Remediation strategy

Benefits of complex site management:

- Maintain protection of human health and the environment and fulfill regulatory obligations;
- Base decisions on robust conceptual site models;
- Streamline decision making and save costs;
- Demonstrate interim progress that leads to long-term results;
- Reduce barriers to using available remedial approaches;
- Return sites to beneficial reuse.

Broadening the area of redevelopment



Redevelopment process

Case Schotte - Aalst

Case Schotte as part of larger redevelopment programme of the historical industrial area along the river banks.

Broadening the conceptual site model to the surrounding system.



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



<https://www.bluegateantwerp.eu/>

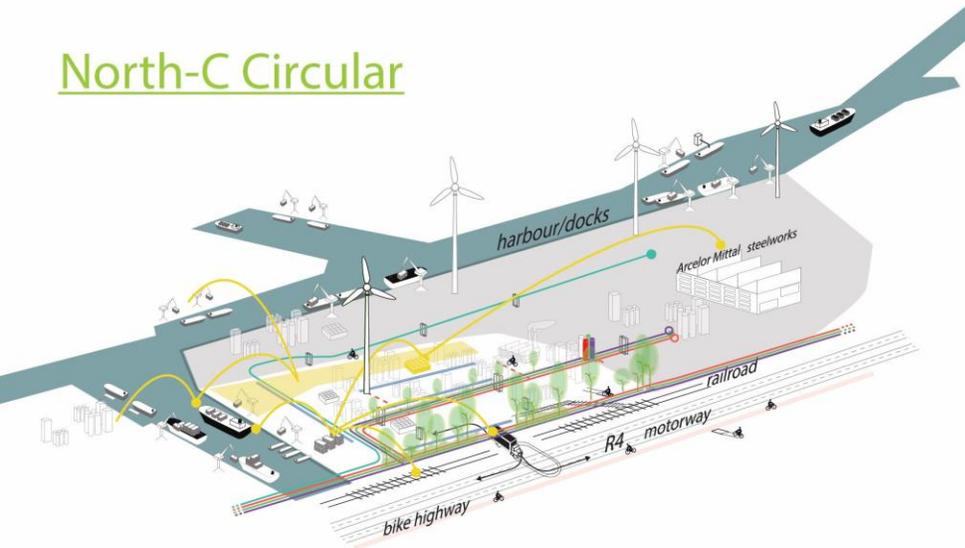


(Re)valorisation of megasites

Megasites & Landfills...

- an eternal loss of materials and land as result of linear economy
- OR
- an asset of materials and land as part of a circular economy?

North-C Circular



Integrated approach on a site and regional scale (Ghent region)

This complex block contains several images and diagrams illustrating an integrated approach on a site and regional scale in the Ghent region. It includes:

- Aerial views of industrial sites and landfills, such as 'Kortrijk site' and 'La Floridienne site'.
- A map of the Ghent region showing various sites and infrastructure.
- A detailed aerial view of the 'AcelorMittal Ghent' site, highlighting 'Brownfield Rodenhuis North-C Circular', 'Steelanol', 'Landfills Dredged sludges', and 'storage & transport ethanol en CO2'.
- A diagram of a circular economy process flow: 'BLAST FURNACE' → 'GAS TREATMENT' → 'WATER TREATMENT' → 'BIO REACTOR' → 'BIO ETHANOL' → 'FILTER MICROBIAL BIOMASS'.
- A URL: <http://www.steelanol.eu/en>
- The logo for 'MAKE TOMORROW BEAUTIFUL OVAM'.



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Opportunity mapping

Virtual reality or daily business?

Dealing with complexity

The Earth **system**—the atmosphere, ocean, cryosphere, biosphere, and geosphere that cycle energy, water, nutrients, and other trace substances—is a **large, complex, not linear, multiscale system in space and time that involves human and natural system interactions.**

Understanding and predicting such a system presents an enormous computing and analysis challenge. **Machine learning (ML) and artificial intelligence (AI) offer opportunities** to tackle these challenges.

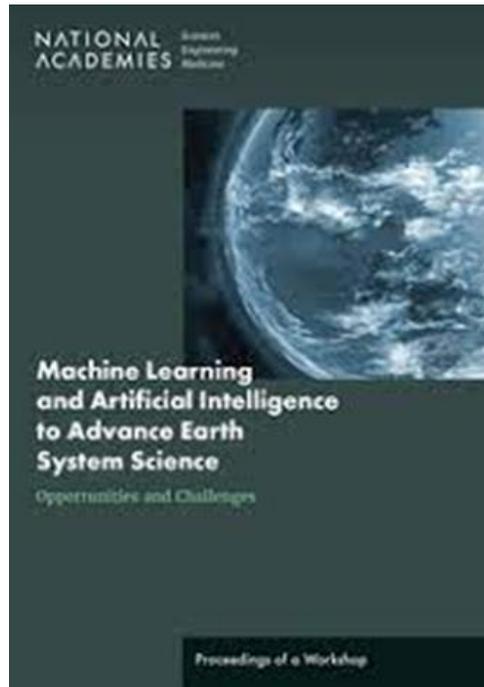


FIGURE 6 A vision for an integrated machine learning climate platform, bringing together these five domains. SOURCE: Jennifer Chayes presentation.

‘The only simple truth is that there is nothing simple in this complex universe. Everything relates. Everything connects.’
(Johnny Rich, The Human Script)

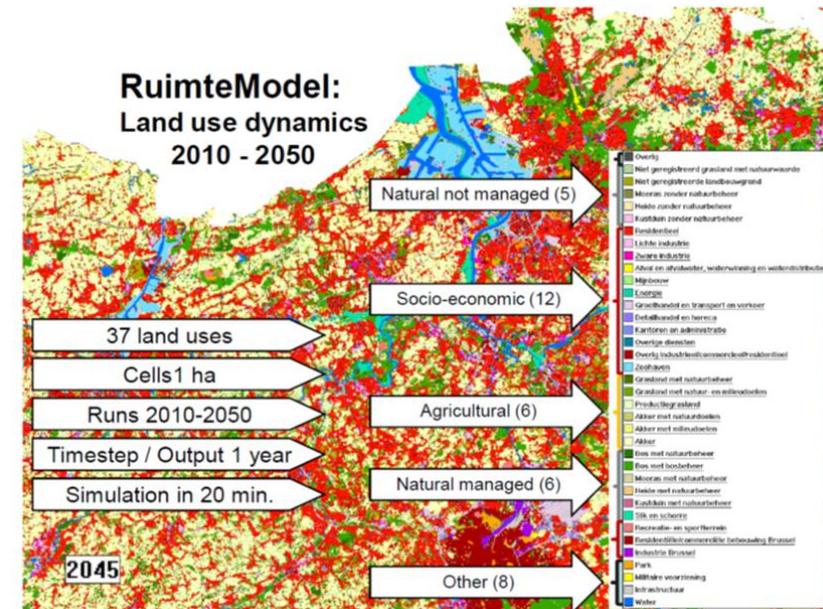
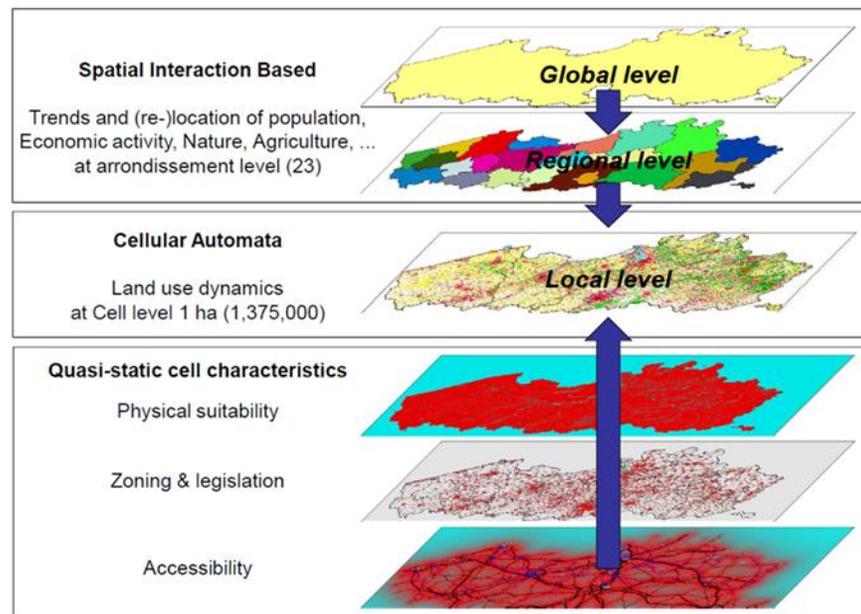


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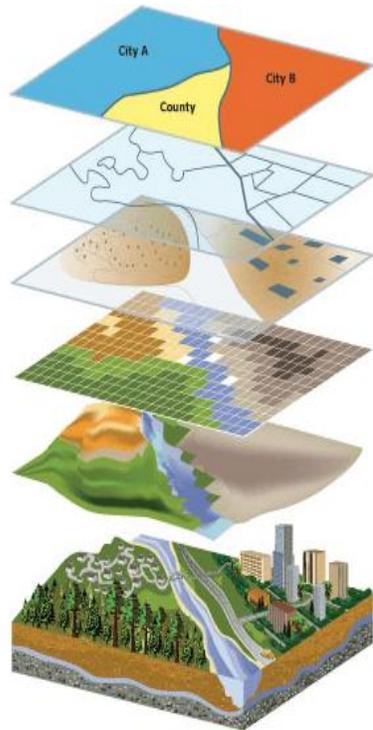
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SpatialModel Flanders - GeoDynamix

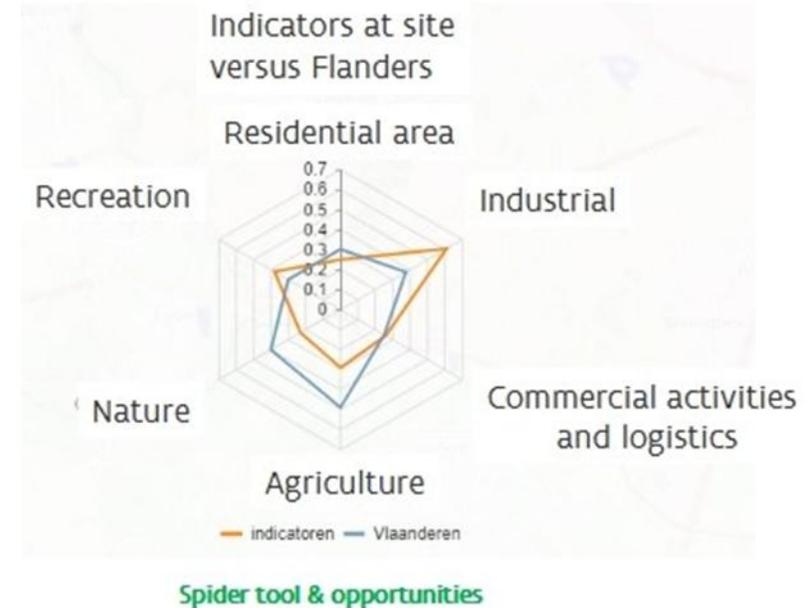
- A generic toolbox for spatial analysis, dynamic simulation and optimization for land-use dynamics
- Modeling spatial solutions for current and future spatial challenges at a regional scale
- Reports spatial data and results online and/or offline



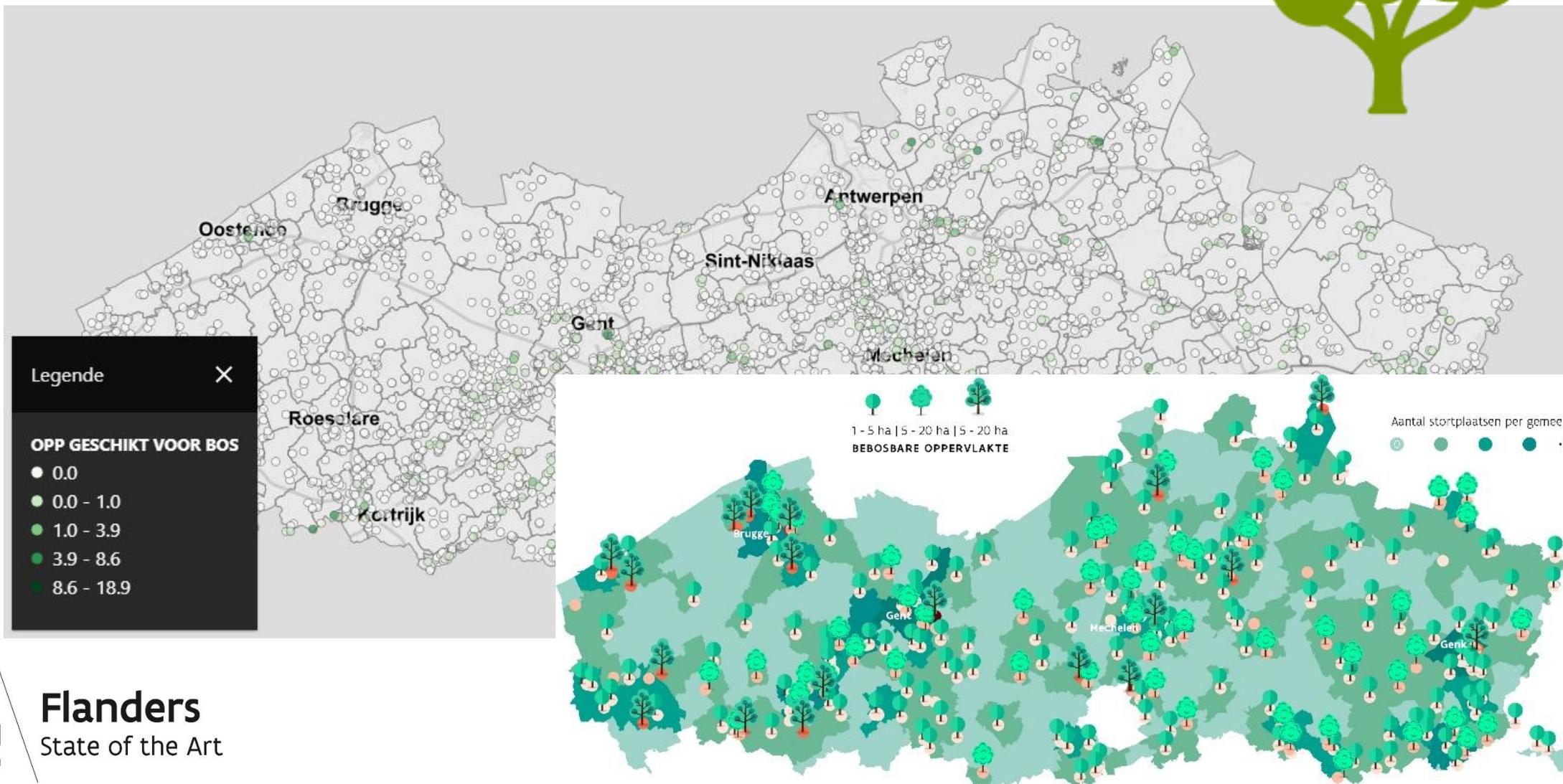
Case : detecting opportunities at landfills



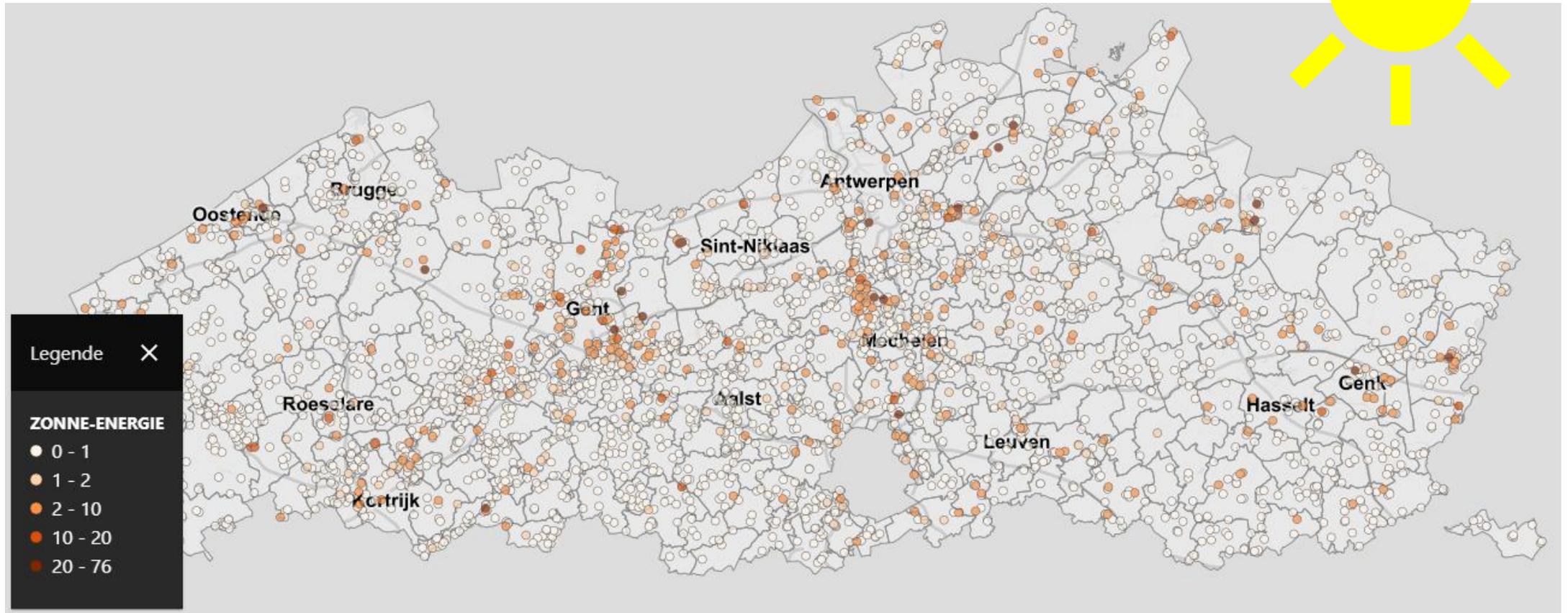
- Cedalion (landfill database, OVAM)
- Spatial Model of Flanders (VITO)
- Combining different spatial layers
- Defining spatial criteria and constraints
- Performing spatial analysis
- Calculating potentials



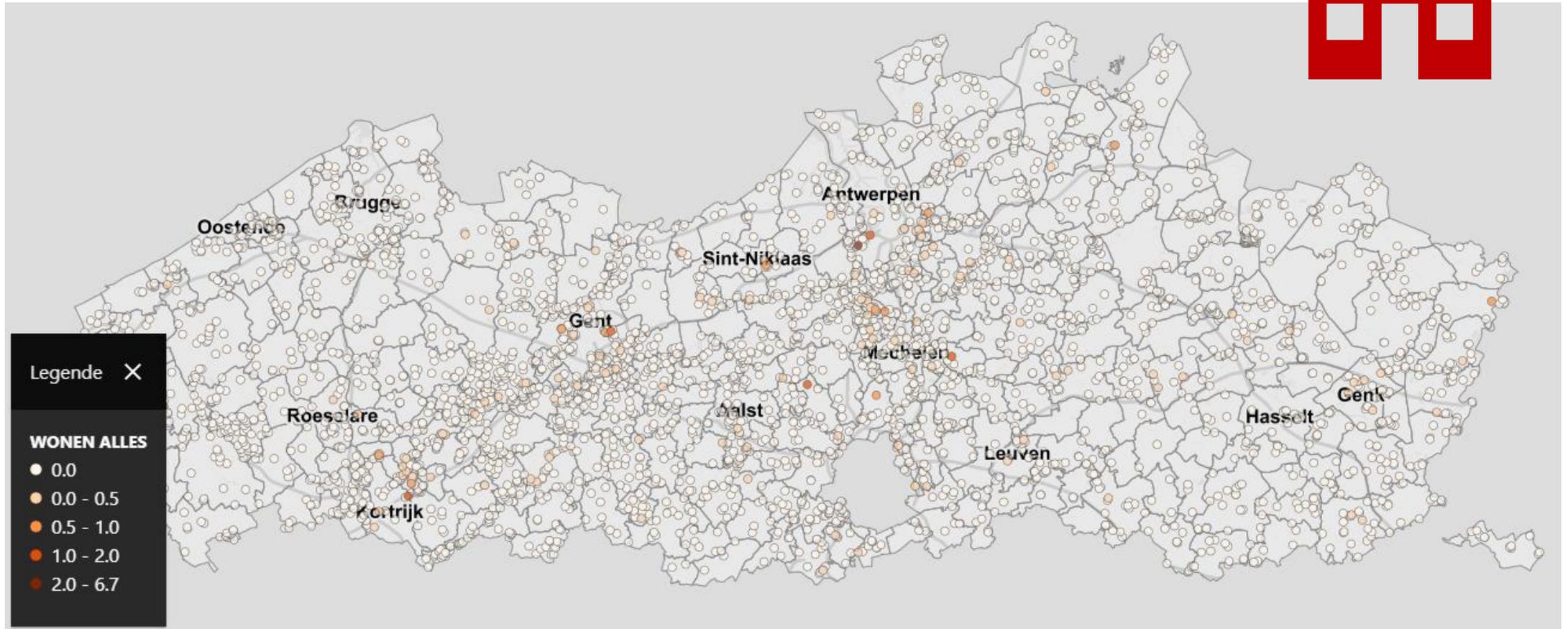
Opportunities for afforestation



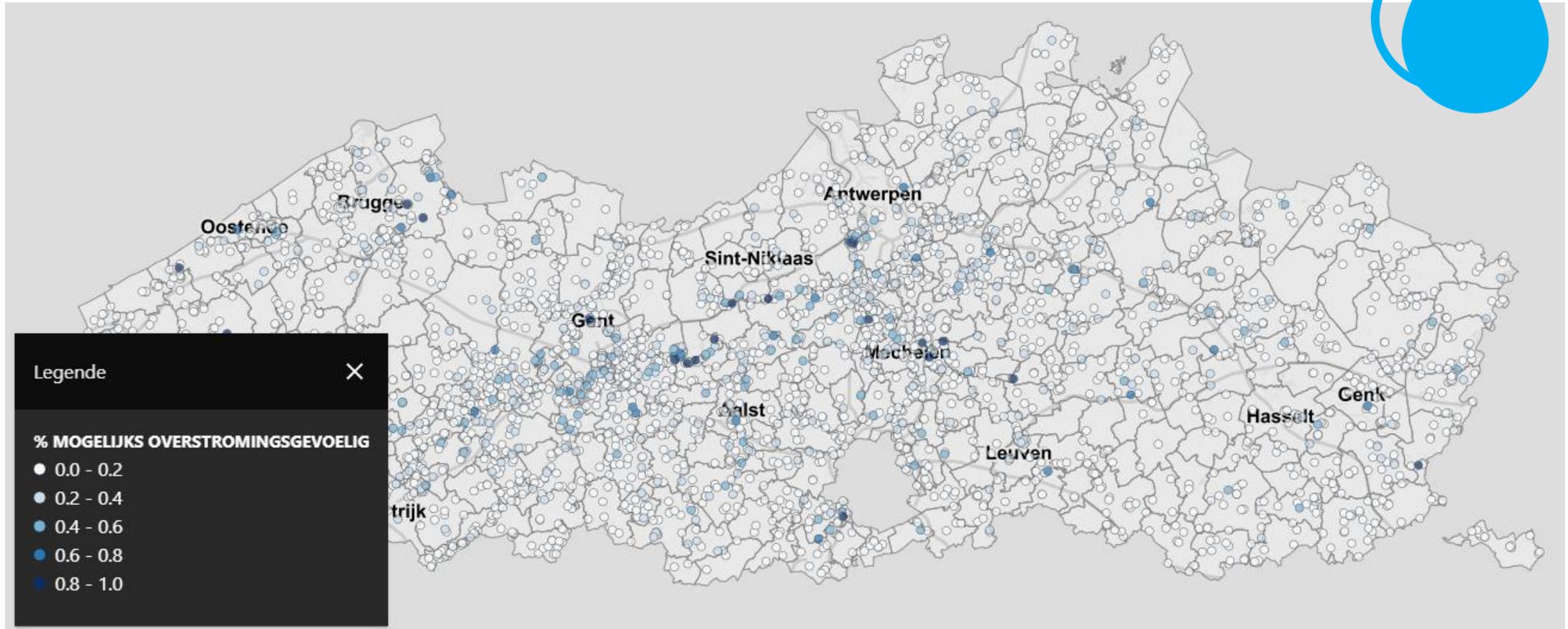
Opportunities for solar energy



Opportunities for residential areas



Opportunities for water management



No virtual reality!

And many more...



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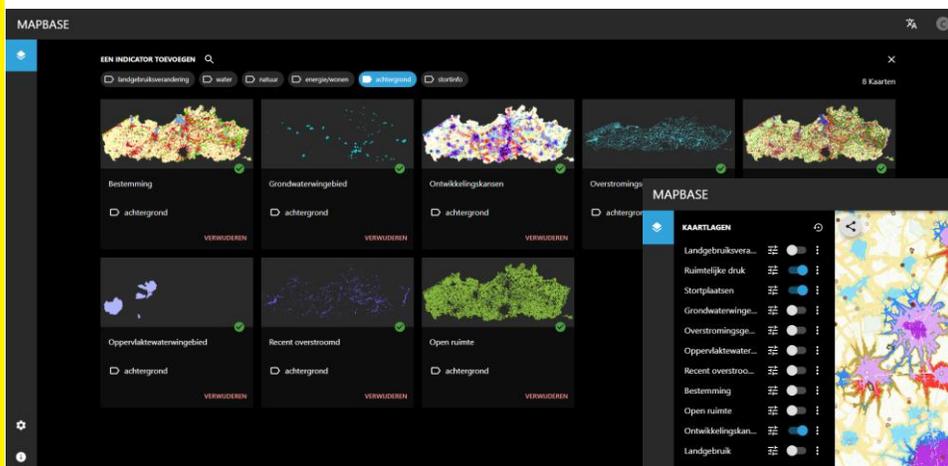
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Next steps on mapping

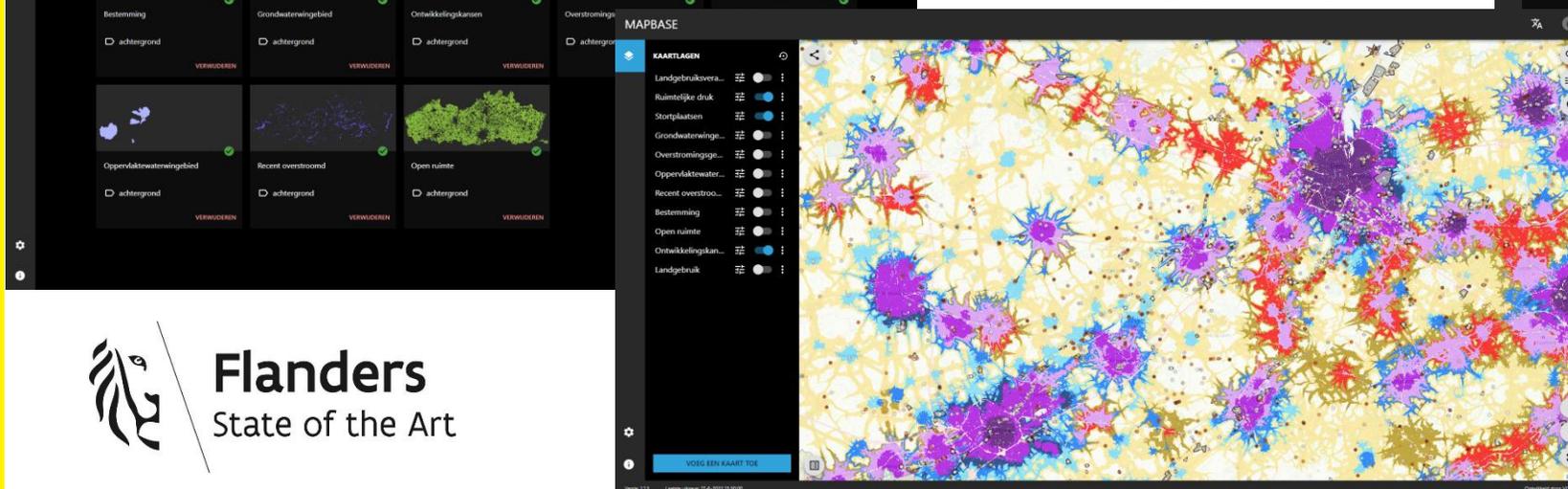
- More extensive collection of landfill data
- Broader communication of collected data
 - A more interactive format (webviewer)
 - Search for future options;
- Broader communication of good practices and inspiring examples
- ‘When my information changes, I change my conclusions.’ J.M. Keynes



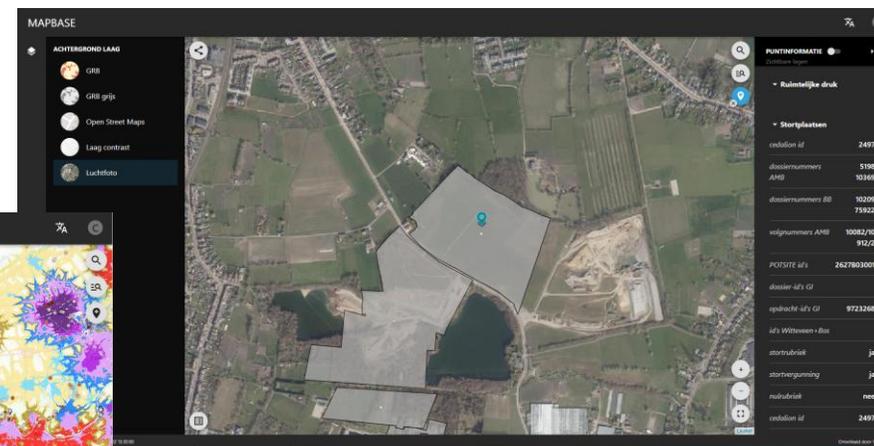
Background maps



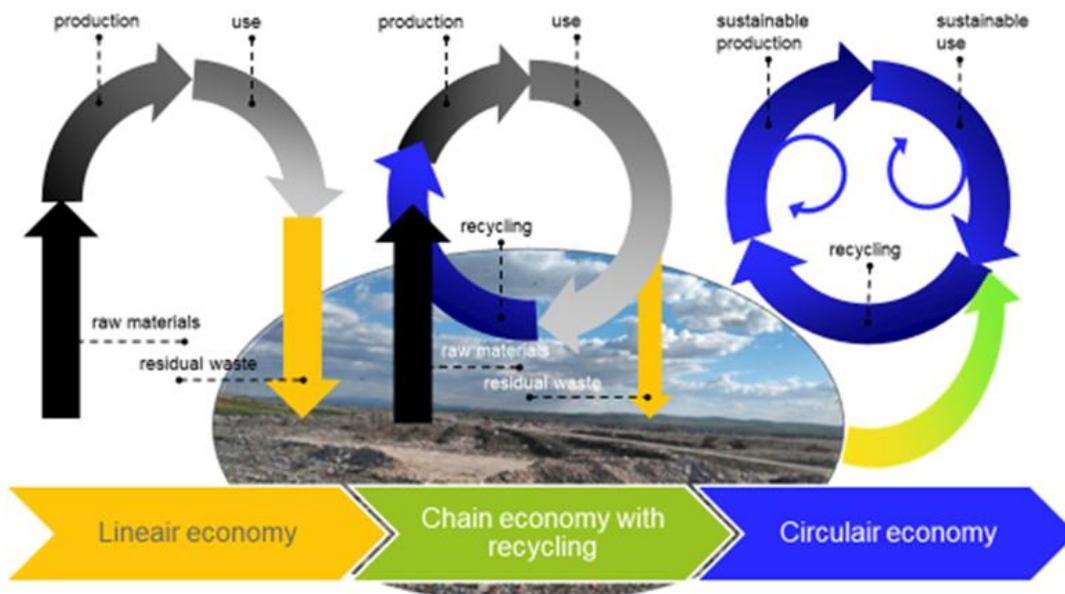
Combining spatial layers



Site-specific information



EU collaboration



THE NWE-REGENERATIS METHODOLOGY



Rehabilitation of Past Metallurgical Sites and Deposits: Metal, mineral soil and land valorization opportunities



STEP 1

MESIS
Metallurgical Sites Inventory Structure
Inventory structure adapted for resource recovery projects

SMART PHOENIX ✓
Is your site suitable for resources recovery?
Quick scan tool

STEP 2

SMARTIX
AI based decision support tool

- 1 Identify geophysical investigation methods
- 2 Civil engineering
- 3 Metal recovery
- 4 Mineral recovery
- 5 Ecocatalyst production

Recommendations for valorisation options

Innovative site investigation

Geophysical Survey
Electrical methods, Seismic methods, Electro-magnetic methods
Non invasive localisation of resources

+ Guided Sampling
Boreholes, Trenches, Lab tests

= RAPIDM
Site 3D Raw Material Distribution Model

STEP 3

BUSINESS CASES ✓
Cost-benefits analysis and societal aspects

DECISION PHASE ✓
Decision to launch the raw material valorization on site

Open Access platform
Find your partners: site owners, environmental valorization service providers here

E-Learning tool

Website & contact
Find the tools
nwe-regeneratis@spaque.be

RAWFILL

Supporting a new circular economy for RAW materials recovered from landFILLS

This project is co-funded by the European Union.



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Additional information :

OVAM : <https://ovam-english.vlaanderen.be/> <https://ovam.vlaanderen.be>

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

Brownfieldcovenants : <https://www.vlaio.be/en/subsidies/brownfield-covenant>

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

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

Soil contamination and data management :

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 :

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

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

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

Circular Economy Transition in Flanders. An Urban Landscape Design Contribution (J. Marin, KU Leuven, 2019)

https://www.dropbox.com/s/yrocy6cti40goei/Marin_PhD_15012019.pdf?dl=0

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

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Thanks for your attention

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