



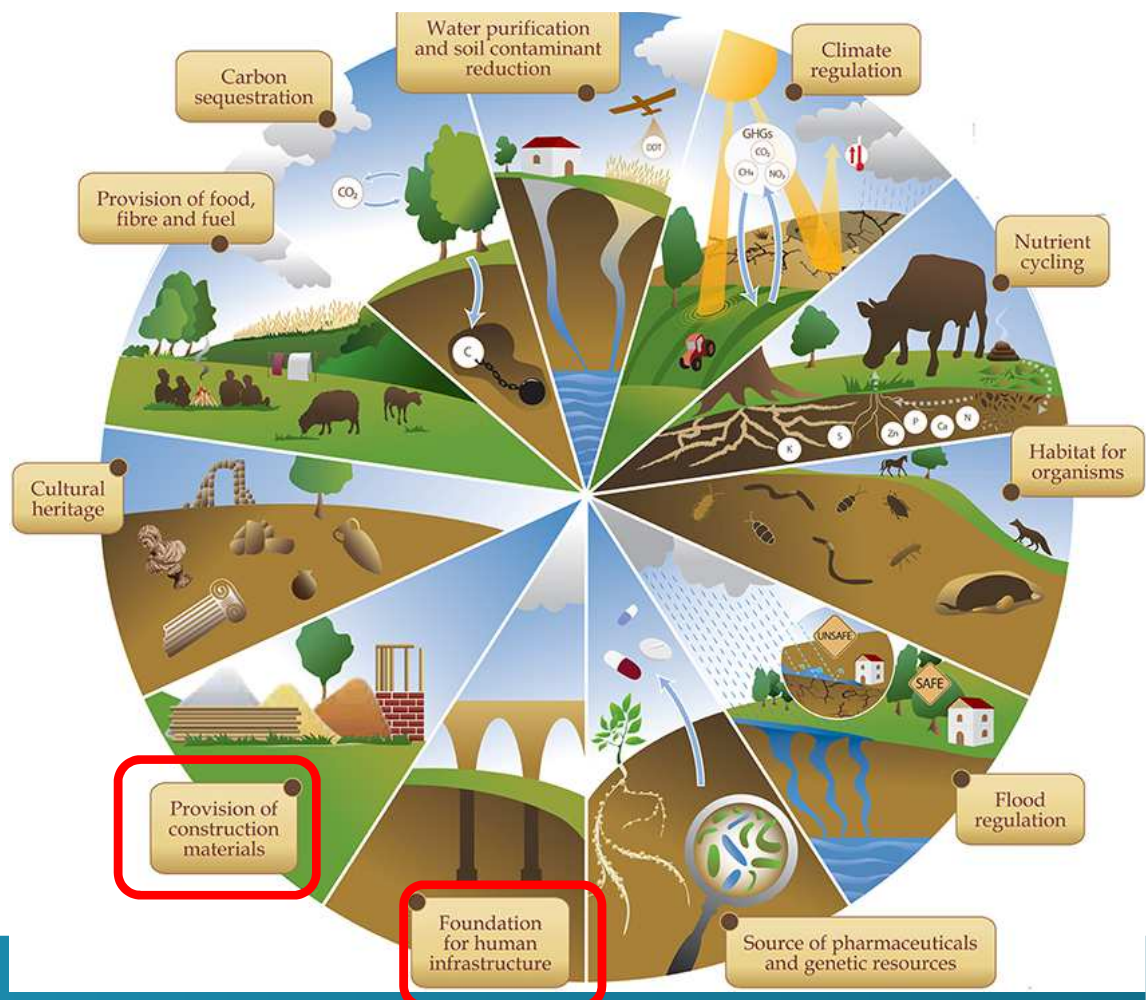
Excavated oil as a secondary resource

Valérie Cappuyns



Introduction

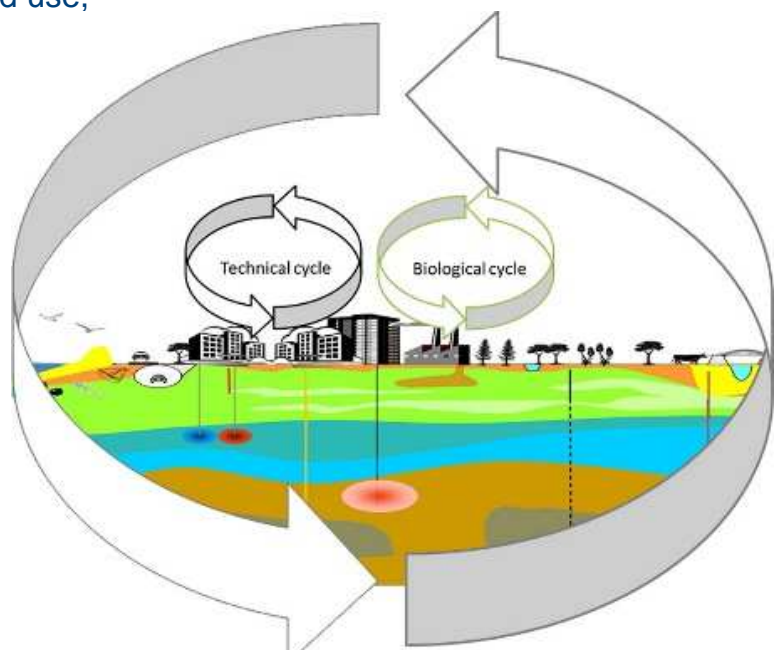
- Soil = non-renewable resource
- Important to deliver ecosystem services
 - **Provisioning services** : material and energetic outputs from ecosystems from which goods and products are derived.
 - **Regulation & maintenance services** : ecosystems can mediate the environment in which people live or depend on, and benefit from them.
 - **Cultural services**: immaterial characteristics of ecosystems that contribute to, people's mental or intellectual well-being.



Introduction

Soil / land and circular economy

- Land use, e.g 'intermediate' land use, brownfield rehabilitation
- Soil as a 'material'
 - Excavated soil
 - Green waste compost
 - Dredged material



Introduction

Excavated soil in a circular economy

Reuse of excavated soil and rocks on site

- Less transport to landfill
- Less use of quarry materials
- Sometimes (chemical stabilization) can improve the quality of the soil (e.g. soft soil stabilization)
- Need for space at the construction site

Reuse of excavated soil and rocks on other sites

- Transport of excavated materials is necessary
- Transport of contaminated soil that is first cleaned, and then transported again to a construction site
- Good coordination is required- information exchange

Magnusson et al. (2015). Sustainable management of excavated soil and rock in urban areas-A literature review. Journal of Cleaner Production 93, 18-25

Aim

- Overview of beneficial reuse of excavated soils in engineering and building applications.
- current status of the generation and reuse of excavated soils in different European countries
- Analysis of issues, challenges, and good practices (Europe, but also outside Europe)

Excavated soil as a resource

Recycling at a facility

- For soils classified as waste
- Transport distances are crucial=> choose appropriate locations for recycling facilities



<https://www.deme-group.com/>

Magnusson et al. (2015). Sustainable management of excavated soil and rock in urban areas-A literature review. Journal of Cleaner Production 93, 18-25

Excavated soil as a resource

Use of excavated soil to make bricks

- Soils with 12-25% clays
- “Stabilised soil blocks “ or “Compressed Earth Block”
- Soil is moistened (with or without additives), and compressed with a manual/motorized press
- low cost, sustainable alternative that uses local soil and clay



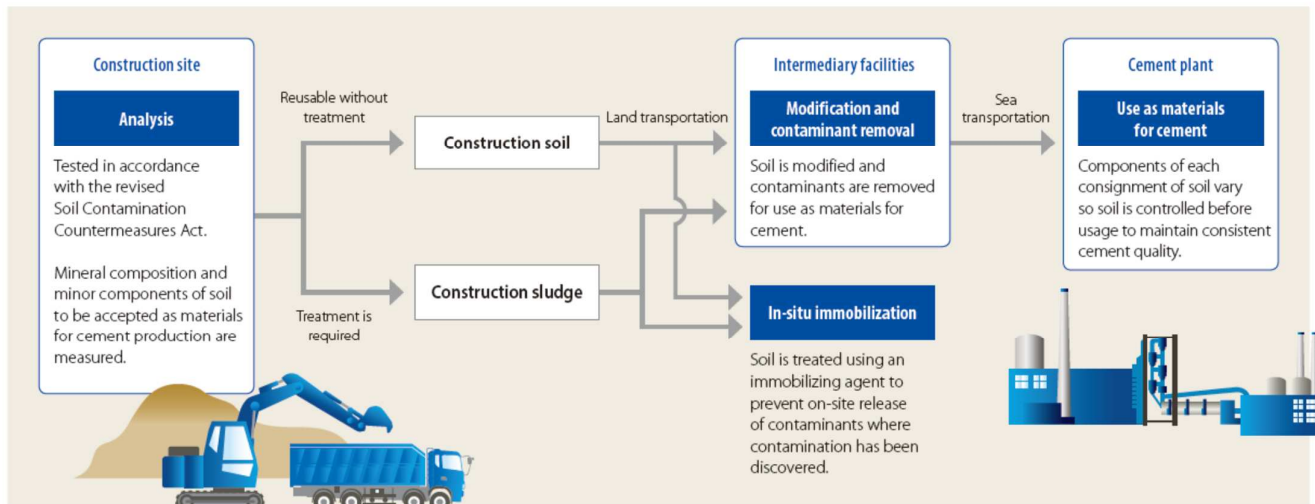
Use of excavated soils/dredged materials to partly replace clay in fired bricks

Use of excavated to construct dikes, sound barriers, road foundations

Excavated soil as a resource

- e.g. cement factory (Japan)

Recycling Process for Construction Soil by the Taiheiyo Cement Group



KU LEUVEN

Legislation: soil versus waste

European Directive 2008/98/EC on waste

Not within the scope:

uncontaminated soil and other naturally occurring material excavated in the course of construction activities where it is certain that the material will be used for the purposes of construction in its natural state on the site from which it was excavated;

*The waste status of uncontaminated excavated soils and other naturally occurring material which are used on sites other than the one from which they were excavated should be considered in accordance with the definition of waste and the provisions on by-products or on the **end of waste status** under this Directive.*

Annex II sets out a non-exhaustive list of recovery operations
=> Recycling/reclamation of other inorganic materials (3)

KU LEUVEN

Legislation: soil versus waste

Soil

- Excavated soil that is non-contaminated
- Excavated soil that did not leave the site where it was extracted
- Excavated soil used on site
- Non-contaminated soil used on site
- Dredged materials
-

Waste

- Construction and demolition waste
- Excavated contaminated soil
- Soil containing stones

KU LEUVEN

European Directive 2008/98/EC on waste

“.... preparing for reuse, recycling and other recovery of 70% of construction and demolition waste.”

Brownfield redevelopment in the EU (Brussels, 5 April 2019)

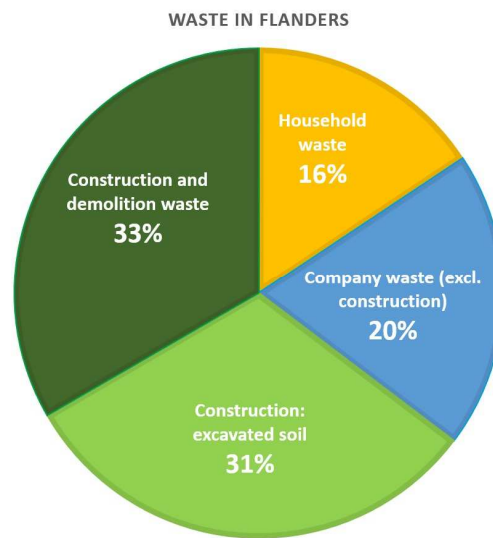
the European Commission wants to promote brownfield redevelopment as a solution to limit urban sprawl, land take and soil sealing

- ⇒ *Circular use of contaminated or clean soil*
- ⇒ *Soil manager to coordinate the reuse of soil*

KU LEUVEN

Quantities of excavated soil?

Flanders



<https://www.circulairebouweconomie.be>

KU LEUVEN

Quantities of excavated soil?

	Excavated soil (in 10 ⁶ ton per year)	Reference
Flanders	16.7	Le Bacq, (2019)
Walloon region	10	Gouvernement Wallon (2018)
The Netherlands	40 to 45	Bodem+ (2018)
United Kingdom	58,7	Defra (2019)
Ontario (Canada)	25,8	RCCAO (2017)
Japan	140	Katsumi (2015)
New York	1,7	Walsh et al. (2018)

KU LEUVEN

Guideline values for reuse of excavated soil

In several European countries and regions guideline values for heavy metals and organic contaminants, among other parameters, determine whether a soil can be reused or not in a given application.

- Guidelines values
 - Total concentrations
 - Every country/region adopts its own threshold values
 - For different contaminants
 - Sometimes threshold values depend on the intended use: shaped or non shaped construction material, use as 'soil', use inside/outside cadastral work zone, etc.
 - Leaching tests
 - Batch leaching tests (e.g. L/S : 10 l/kg, 2 l/kg)
 - 'Availability test'
 - Tank leaching
 - ...

KU LEUVEN

Traceability of excavated soil

- E.g. Flanders: well-established procedure
 - Technical report
 - Study of receiving land
 - Permit allowing transport of soil from location to another

Soil management by **Grondbank**

- system to track the transport of excavated soil.
- safeguarding soil environmental quality. => regular sampling
- Safe and quick transport of excavated soil from one place to another.

KU LEUVEN

UK: CL:AIRE Code of Practice (CoP)

- framework which allows the re-use of excavated materials on-site or their transfer between sites, without being classified as waste.
 - provides an alternative to the use of Environmental Permits or exemptions.
- *The direct transfer of clean uncontaminated soil from one development site to another*
 - *The re-use of both contaminated and uncontaminated excavated materials on their site of origin*
 - *The establishment of a network of sites within a Hub and Cluster arrangement, between which both contaminated and uncontaminated material can be transferred*
 - *The operation of fixed soil treatment facilities to produce a non-waste product*

=> Materials Management Plan

KU LEUVEN

• France

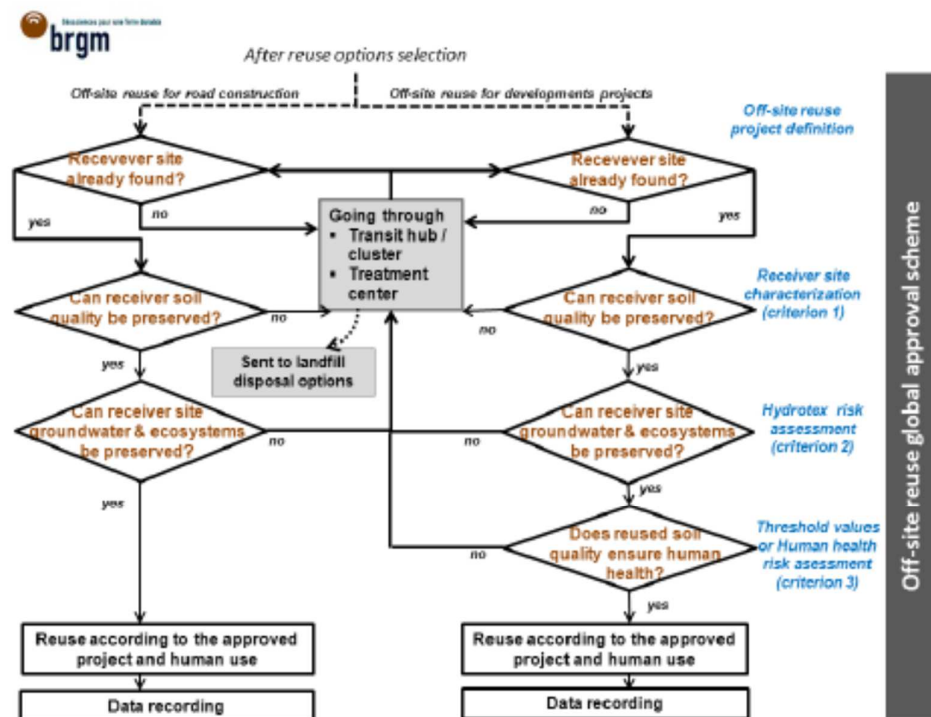


Fig. 5: Contaminated excavated soil off site reuse global approval scheme

Blanc et al. (2012). Excavated soil reuse tools developed as part of the French soil management framework. 6th Conference on Innovative Solutions for Revitalization of Degraded Areas ; 3rd CABERNET Conference on Managing Urban Land, Oct 2012, Ustron, Poland. 12 p.

Supply versus demand of excavated soil

Information on

- quantities of excavated soil
- grainsize distribution, organic matter content, => influences reuse possibilities
- amount of excavated soil that is reused/ available

is not always available

=> Soil data management, is absolutely necessary

KU LEUVEN

Optimal alignment of demand and supply of excavated soil

- United States: **Clean soil banking**
 - e.g. New York City : exchange of surplus soil via the '**Clean Soil Banking**'.
 - 1.7×10^6 ton of excavated soil is produced every year by construction works (Walsh et al. 2018).
 - direct exchange of excess soil from construction projects with projects with a shortage of soil



- UK: **register of materials**

- CL:AIRE keeps a Register of Materials and services which might fall within the DoWCoP. This Register helps to link material holders with projects requiring materials.
- Organisations involved in the management of development sites are urged to register key information to be held confidentially and presented by CL:AIRE.
- For example - which sites are being or are due to be remediated/developed? What treatment options are in use or available in an area of the country?
- Where there are site imbalances of soils or fill materials CL:AIRE will review the information provided against the register and contact organisations where we see possible project partnerships.

21



- Canada: **SOiil** (Supporting Ontario Infrastructure Investments and Lands)
 - web-based electronic database (similar to soil-matching registry in the UK through CL:AIRE).
 - intended to create a leading-edge soil-matching service.
 - launched in 2013 to support the responsible movement of excess soils from construction projects in Ontario through the use of recognized industry excess soils best management practices
 - excess "clean" soils
 - = soils that are generated in the course of development and infrastructure projects
 - ≠ impacted or contaminated soils typically found at brownfield-type sites.



23

KU LEUVEN

France: **TERRASS** database



- Registering and follow-up of valorisation of excavated soil ex situ
- Traceability of operations is achieved through recording of data (location, origine, quality of the soil material, characteristics of the receiving site, quantities,...)

24

KU LEUVEN

Aanvulgrond gevraagd
117 afzetlocaties / 1 651 869 m³

Toon alle beschikbare
bestemmingen voor:

aanvulgrond

bouwstof

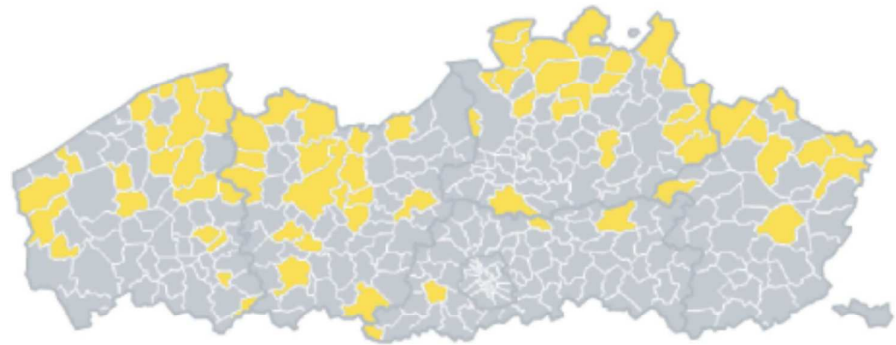
teelaarde

puingranulaten

Toon enkel km

rond postcode

ZOEKEN



Hoeveelheid (m ³)	Type	Postcode	Gemeente	Details
250m ³	aanvulgrond	9130	verrebroek	
15000m ³	aanvulgrond	3680	maaseik	
800m ³	aanvulgrond	9051	Sint Denijs Westrem	
5000m ³	aanvulgrond	9700	Oudenaarde	
70m ³	aanvulgrond	9270	Laarne	
193m ³	aanvulgrond	2180	Ekeren	
450m ³	aanvulgrond	2382	Poppel	

Walloon region: **Walterre**

1st May 2020 : certification and traceability of soil transport in the Walloon region.

- Certification of control on soil quality
- Trace the transport of excavated soil
- Data collection and management
- Via an online platform, adapted to the needs of different stakeholders .



L'arrêté du 25 octobre 2019 modifiant l'arrêté du Gouvernement wallon du 5 juillet 2018 relatif à la gestion et à la traçabilité des terres postpose l'entrée en vigueur de l'AGW Terres au 1er mai 2020

Conclusion

- In the context of circular economy, the **local application** of excavated soils should be preferred, although soils with a specific composition may be suited for beneficial application at more remote locations, asking for a harmonization of the conditions for reuse of excavated soils.
- much emphasis goes to **soil quality** in relation to its potential **risk for humans and ecosystems**. Parameters that describe the civil-technical quality of the soil are not systematically recorded, although they are necessary to determine whether a specific application (e.g. certain construction purposes) can be envisaged.

Conclusion

- In some countries and regions, all relevant aspects of management of excavated soils (supply and demand of excavated soil, certification, transport, temporary storage, etc.) are already **coordinated by a central organization**.
- In contrast, in some other countries, information on quantities of excavated soil, as well as on quality of the excavated materials, is not available, and a **systematic approach** for the management of excavated soil should be implemented
- Is there a market for excavated soil?
 - Quality assurance is essential
 - Economic benefits should be clear
 - Acceptance

Thank you for your attention!

valerie.cappuyns@kuleuven.be

Valérie Cappuyns

KU Leuven, Campus Brussels
Warrmoesberg 26
1000 Brussels
Belgium

