



International symposium

Urban wastelands: a form of urban nature?

Soil functions and associated services

Raising awareness on their importance within brownfield redevelopment projects in urban areas

Case studies considering “green options”

D. Monfort, E. Limasset (BRGM)





Context

Artificialisation rate on Lille agglomeration (MEL) on « natural and agricultural areas »

- 2001/2008 = 302 ha/ year
- 2008/2013 = 211 ha/ year

⇒ Annual average is lowering but still happening!

According to the planning document (SCOT/DOO)

- Developments to be planned (20 years trend) :
130 000 dwellings / 2630 ha of economic activity/ 140 ha of infrastructure
- Willingness to limit to 135 ha/year





Context

- Potential of urban redevelopment : 4000 ha (SCOT)
- 800 ha of industrial brownfields recorded in 2018,
- 400 ha of them recorded as « secteur pollué » within the PLU (indice n)

=> MEL department of « stratégie foncière » in need of

➔ Better understanding and communicating on the importance of soil functions and associated benefits (e.g. ecosystem services) that society get from them (directly and indirectly), especially before, during and after redevelopment of degraded land.

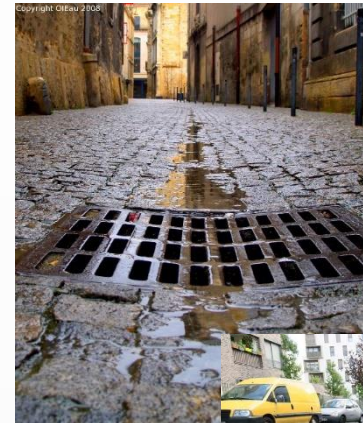




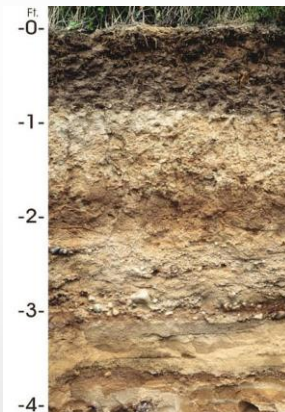
Urban Soils and their functions



Supporting functions:
geotechnical properties



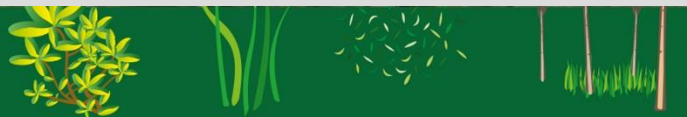
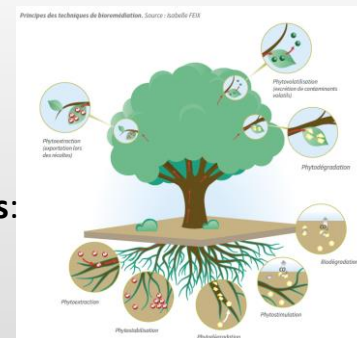
Biological functions: species habitats, ecological connectivity



Bio-geo-chemical functions: euration, capacity to degrade organic matter (fertility), carbon stock



Hydro-geo-morphological functions : attenuation of run off, recharge to the unsaturated zone





Urban Soils and their functions

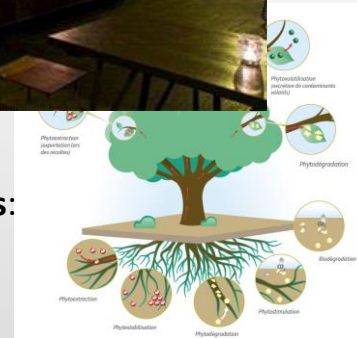


Biological functions: species habitats, ecological connectivity



-4-

Bio-geo-chemical functions: euration, capacity to degrade organic matter (fertility), carbon stock



Hydro-geo-morphological functions : Fonctions hydro-géo-morphologique : attenuation of run off, recharge to the unsaturated zone





Services provided by soil & urban nature



@ Google maps

Provisioning services

- ① Fruits and vegetable production
- ② Secondary materials (green waste)
- ③ Supporting buildings and infrastructure

Regulation services

- ① Runoff water
- ② Local climate: îlot chaleur
- ③ Stocking and fixing carbon
- ④ Noise, odours

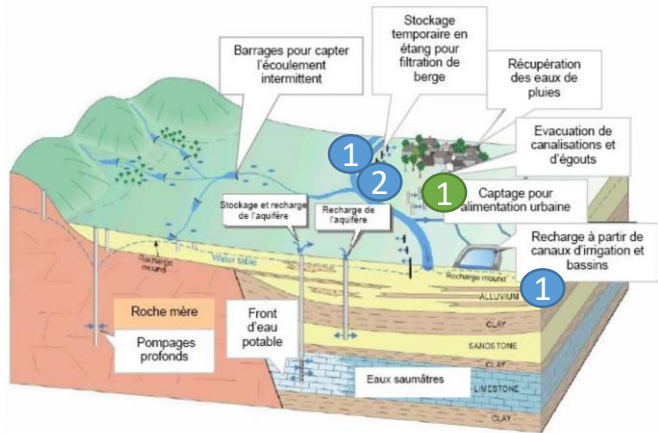
Cultural services

- ① Landscapes
- ② Recreational
- ③ Spiritual

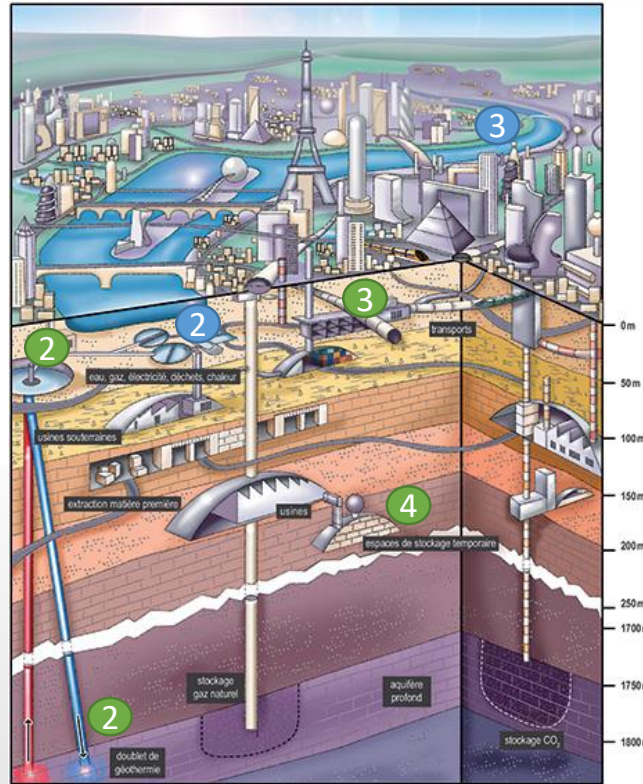




Services provided by the subsurface



d'après Gale et al., 2002, Pettenati, 2007



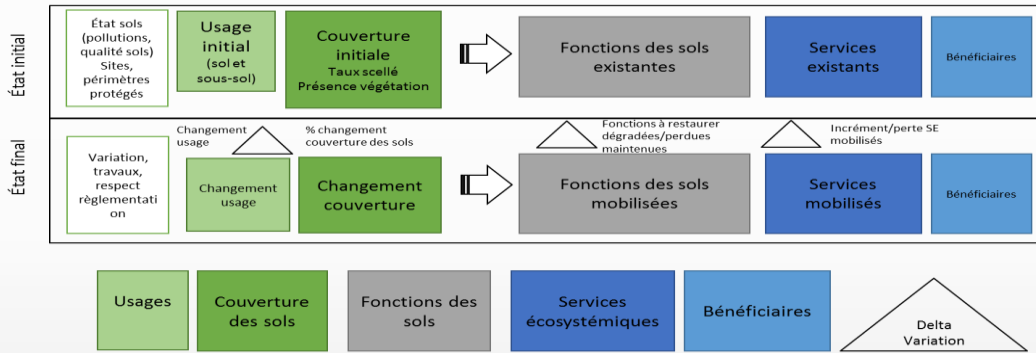
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- **Services d'approvisionnement**
 - 1 - Drinking water: stock and abstraction
 - 2 - Energy – Geothermy
 - 3 - Support of underground infrastructures
 - 4 - Materials
- **Regulating services**
 - 1 - Water quality
 - 2 - Flooding
 - 3 - Soil quality (phyto remediation/pollution)
- **Cultural services**
 - Recreational
 - Spiritual





Conceptual model + check List



Environnement du site	Représentativité ~ accessibilité
Historique du site	Comprendre l'état actuel Présomption pollutions
Topographie	Sol et gestion des eaux pluviales (cycle de l'eau)
Sols et couverture	% scellé et % végétalisé Caractère filtrant des sols → cycle de l'eau
Eaux souterraines	Une goutte d'eau infiltrée dans le sol, vers où elle peut aller ? Nappes, forages AEP...
Pollutions, déchets et matériaux d'apport	Dégradations Fonctions à restaurer ?
Végétation	Fertilité des sols Production fruits & légumes Bienfaits liés à la nature en ville (régulation nuisances, régulation climat local, global, ralentissement des eaux pluviales...)
Faune	Valeur paysagère Fertilité des sols Habitat Biodiversité
Espaces verts proches	Connectivité entre espaces verts
Patrimoine architectural, archéologique et naturel. Esthétisme	Valeur patrimoniale/paysagère/culturelle à préserver




Site visits were carried out at on a selection of existing brownfield sites within Lille agglomeration + desktop studies
 => to identify in a qualitative manner soil functions and associated services at different time period for a given plot





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Services	Service 1994	2002	Service delta	2016	Service delta	Scenario	Final service	
Flood control/hydrological regulation	●		▲		▲		●	
Control of erosion	●		▲		▲		●	
Regulation of local climate	●		▲		▲		●	
Regulation of global climate	●		▲		▲		●	
Regulation of soil and water quality								
Food production								
Biomass production (wood, heating, textile)								
Groundwater Stock								
Provisioning drinking water supply								
Provisioning geothermal energy								
Provisioning supporting services								
Landscape diversity and aesthetics							▲	●
Leisure and recreation	●				▼		▲	●
Natural and architectural heritage preservation	●				●			
		<p>Industrial site. Situation before cessation of activity and demolition Land use: sportsground, park and several buildings in a industrial site. Land cover: ~90% unsealed soil, green cover.</p>		<p>After cessation of activity. Diagnostic : Pollution on soils (metals). Development of vegetation. Land use: brownfield (urban forest). Land cover: 100% unsealed, spontaneous vegetation.</p>		<p>Preservation of the urban forest and construction of a walkway.</p>		





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Flood control/hydrological regulation					▲		●
Control of erosion							
Regulation of local climate					▲		●
Regulation of global climate					▲		●
Regulation of soil and water quality					▲		●
Food production							
Biomass production (wood, heating, textile)							
Groundwater Stock							
Provisioning drinking water supply							●
Provisioning geothermal energy							
Provisioning supporting services	●		▼		▲		●
Landscape diversity and aesthetics					▲		●
Leisure and recreation					▲		●
Natural and architectural heritage preservation	●						●
		 <p>Industrial site. Situation before cessation of activity and demolition Old abbey in the north of the parcel. Land use: chemical industry. Land cover: ~90% sealed soil, .</p>		 <p>After cessation of activity, demolition of buildings, first soil depollution works. Development of spontaneous vegetation. Land use: brownfield. Land cover: ~50 sealed (old storage surface) and compacted soils.</p>		 <p>Residential construction.</p>	





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Services	Service 1994	1994	Service delta	2016	Service delta	Expected development in 2025	Final service
Flood control/hydrological regulation	●				▼		
Control of erosion	●				▼		
Regulation of local climate	●				▼		
Regulation of global climate	●		▼				
Regulation of soil and water quality			▲		▼		
Food production	●		▼				
Biomass production (wood, heating, textile)			▼				
Groundwater Stock	●		▼				
Provisioning drinking water supply			▼				
Provisioning geothermal energy			▼				
Provisioning supporting services			▼				
Landscape diversity and aesthetics	●						
Leisure and recreation	●				▼		●
Natural and architectural heritage preservation					▲		
		Land use: urban vegetable gardens, light buildings Land cover: ~80% unsealed, crops		Development of brownfield between 1994 and 2016. More bio-agriculture in 1994: Land use: urban vegetable gardens, light buildings and brownfields Land cover: ~80% unsealed, crops		Urban Masterplan development from 2016 to 2025: Land use: sport ground (artificial turf) Land cover: artificial turf (compacted soil)	





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Services	Service 1994	1994	Service delta	2016	Service delta	Expected development in 2025	Final service	
Flood control/hydrological regulation			▲		▲		●	
Control of erosion					▲		●	
Regulation of local climate			▲		▲		●	
Regulation of global climate			▲		▲		●	
Regulation of soil and water quality			▲		▲		●	
Food production								
Biomass production (wood, heating, textile)					▲		●	
Groundwater Stock					▲		●	
Provisioning drinking water supply								
Provisioning geothermal energy								
Provisioning supporting services	●				▼			
Landscape diversity and aesthetics							▲	●
Leisure and recreation							▲	●
Natural and architectural heritage preservation	●				▼			
			Land use: Industrial activities/brownfield sites, roads Land cover: estimation 90% sealed (buildings and roads)/10%unsealed (scattered vegetation)				Following demolition and depollution works from 1990s to 2016: Land use: industrial brownfield site Land cover: ~100% unsealed with spontaneous vegetation and plantations	





Conclusions and perspectives

“What comes out from our simplified qualitative evaluation and relative comparison of delta services?”

- ✓ If **site is strongly degraded** (sealed soils, polluted): any classic redevelopment project with a minimum of green space will generate benefits in term of ecosystem services
- ✓ In the case of **degraded sites that already have vegetation**, production of existing service may be high initially, so importance to identify them if willingness to preserve or increase them (or increase number of benefits receivers)
- **Ecosystem services” can be used as a global approach** to evaluate benefits from nature in town considering land use/land cover (soil functions)/ compare redevelopment scenarii
- Focus was on degraded land/brownfield, but approach is **transferable to any land** of Lille agglomeration
- Great satisfaction from MEL stratégie fonctière department. Discussions on next stages: needs **pedagogic approach to integrate the concepts** on a daily basis (fact sheets, evaluation kits...)





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Thank you for your attention!

Projet R&D MEL fonctions du sol

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