



## Soil monitoring schemes in Wallonia

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*SOILveR online workshop on soil monitoring schemes, 12/4/2022*

# Outline

1. Soil and land data
2. Monitoring schemes
3. Thematic examples
  1. Climate change and adaptation: carbon storage in soils and water regulation
  2. Preventing and remediating soil pollution: dealing with both point-source and diffuse pollution
  3. Circular economy: which data for reducing soil sealing? Or to determine the monetary value of biodiversity?
4. Conclusions

# 1 – Soil and land data in Wallonia

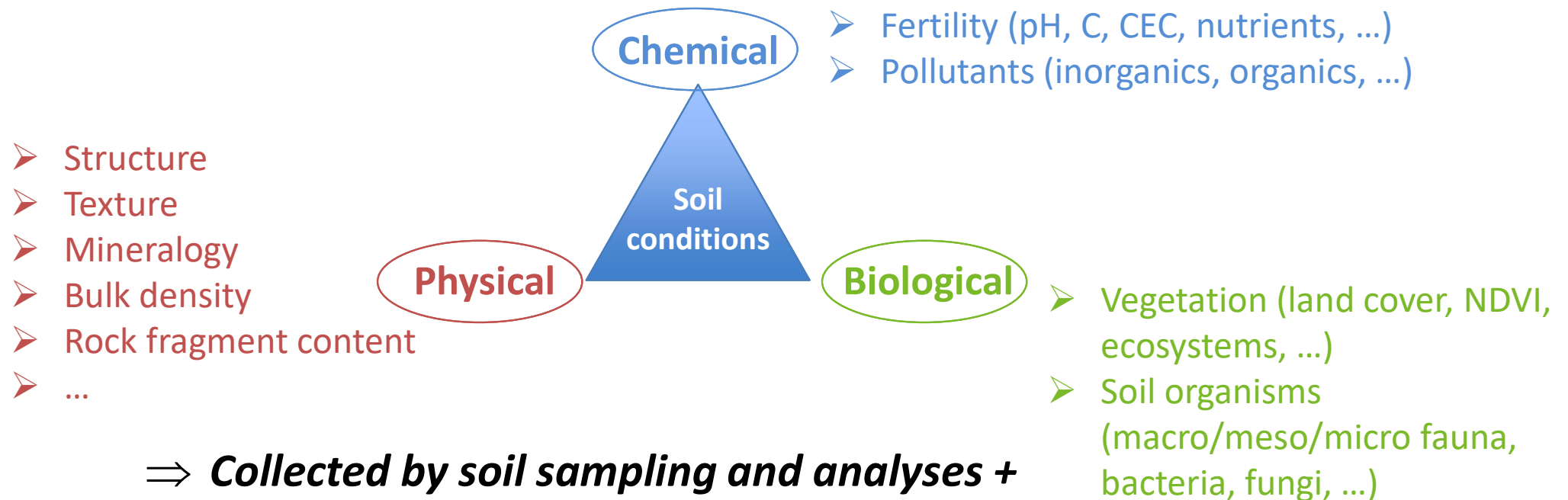
- **Soil health ?**

Soils are healthy when they are in **good chemical, biological and physical condition**, and thus able to continuously provide as many of the following ecosystem services as possible:

- ✓ *provide food and biomass production, including in agriculture and forestry;*
- ✓ *absorb, store and filter water and transform nutrients and substances, thus protecting groundwater bodies;*
- ✓ *provide the basis for life and biodiversity, including habitats, species and genes;*
- ✓ *act as a carbon reservoir;*
- ✓ *provide a physical platform and cultural services for humans and their activities;*
- ✓ *act as a source of raw materials;*
- ✓ *constitute an archive of geological, geomorphological and archaeological heritage.*

# 1 – Soil and land data in Wallonia

## • Which type of soil and land data?



⇒ ***Collected by soil sampling and analyses + remote sensing***

⇒ ***Most of data available but with unequal spatial and temporal coverage***

# 1 – Soil and land data in Wallonia

- General availability of data in Wallonia ?

- Geoportal (INSPIRE directive) <https://geoportail.wallonie.be/home.html>



- Some dedicated website for specific applications
- Or upon request to the data owner (research projects, ...)

# 1 – Soil and land data in Wallonia

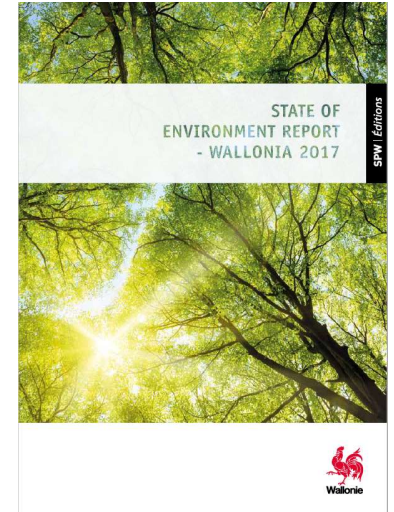
- Data as input for indicators

- State of the Environment Report (SOER) for Wallonia since 1993

- <http://etat.environnement.wallonie.be/home.html>

- Soil chapters

- 1994 : **soil types**, pressures, management
    - no dedicated soil chapter in 2000 but information indirectly through air, agriculture, waste section
    - 2003 : **local pollution, acidifying substances & metallic trace éléments - MTE, N critical load in forest soils**
    - 2004 : local pollution, acidifying substances & MTE, **water erosion**
    - 2005 : local pollution, acidifying substances & MTE, **soil organic carbon - SOC**
    - 2006-2007 : **soil fertility & biodiversity, SOC, water erosion, diffuse & local pollution, soil sealing, soil compaction**

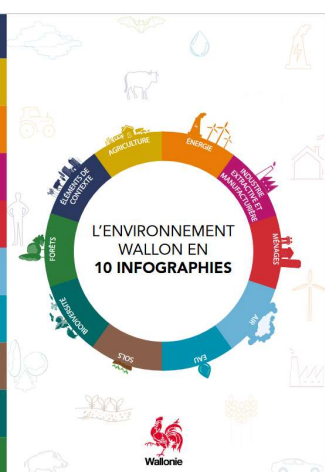


# 1 – Soil and land data in Wallonia

- **Data as input for indicators**

- Soil chapters

- 2008 : local pollution, atmospheric deposits of dusts & MTE, **N & P soil enrichment**, SOC, water erosion, **diffuse erosion risk areas**, **capacity of agricultural soils to receive MTE**
- 2010 : local pollution, atmospheric deposits of dusts & MTE, N & P soil enrichment, SOC, water erosion, **P soil saturation**
- 2012 & 2014 : local pollution, N & P soil enrichment, SOC, water erosion
- 2017 : local pollution, atmospheric deposits of dusts & MTE, N & P soil enrichment, SOC, water erosion, soil sealing, soil compaction, **soil biodiversity** (+ concept of ecosystem services beyond soils)
- 2018 onwards : types of soils, atmospheric deposits of dusts & MTE, SOC (2020), water erosion (2019), N & P soil enrichment (2019), soil sealing, soil compaction, soil biodiversity, local pollution (2022)
- 2021 : Thematic publication - **Infographics for 10 topics including soil**



## 2 – Monitoring schemes in Wallonia

- Sources of data in Wallonia ?

- Belgian **soil map** (1947 – 1991, 1/20 000, from 1 to 2,5 observations/ha)

- => 15.000 georeferenced soil profiles, physico-chemical parameters

- ⇒ Strong punctual commitment with focus on natural / agricultural / forest areas

- ⇒ World exception

- ⇒ High public cost

- ⇒ No direct biological parameters

- ⇒ Unlikely to be reiterated... but partial re-sampling of locations feasible

- (CARBIOSOL)







## 2 – Monitoring schemes in Wallonia

- **Sources of data in Wallonia ?**

- **Remote sensing** (since 1990's, satellite images, LIDAR, ...) => thematic maps (topography, land use, NDVI, soil organic carbon, ...)

- Regularly available data (CLC, Sentinelle, ...)
    - Punctual assessment (LIDAR, WALOUS, WORLDSOIL, ...)

- ⇒ Driven by dedicted research projects or data availability from specialised institutions

- ⇒ Costs function of the level of details / resolution

- ⇒ Validation with field samples still needed

- ⇒ Land surface is the focus (not so much soil, limited parameters), but data can be used in modelling processes linked to soil

## 2 – Monitoring schemes in Wallonia

### • Sources of data in Wallonia ?

- Soil investigations & land management data driven by **legal obligations**

=> thematic maps

Level of  
digitalization



- Waste legislation, environmental permit, land planning (direct & indirect data for local soil pollution)
- Sewage sludge directive, air and water protection (direct & indirect data for diffuse soil pollution)
- Agricultural code (indirect data for soil erosion)
- Soil Decree (soil investigations for local pollution + excavated soils)

- ⇒ Diverse level of commitment
- ⇒ Difficult use of old non-digitized data
- ⇒ Variable distribution through space / time
- ⇒ Costs borne by private sector with possible public funding

## 2 – Monitoring schemes in Wallonia

- Sources of data in Wallonia ?

- Database of **soil routine analyses** made by the public laboratories of REQUASUD network (georeferenced since 2005) => **basic soil fertility maps for agricultural soils, vegetable gardens (soil-plant transfer)**

- ⇒ Thousands of data
- ⇒ Specialised (geo)processing needed
- ⇒ Costs borne by private sector with possible public funding
- ⇒ Easy update if exchange procedure in place



<http://sanisol.wallonie.be>

c de Wallonie | SPW Agricul

[https://www.requaconsult.requasud.be/requaconsult\\_sol](https://www.requaconsult.requasud.be/requaconsult_sol)

## 2 – Monitoring schemes in Wallonia

- Sources of data in Wallonia ?

- Thematic soil sampling for research projects (diverse strategies) => thematic maps

- Soil pollution (N critical load in forest soils, N & P enrichment in soils, metallic trace elements in soils, ...)
    - Water erosion (diffuse erosion, water run-off axes, ... )
    - Soil Organic Carbon – SOC (content, stocks, fractions, ...)
    - Soil sealing and land take
    - Soil compaction
    - Soil biodiversity (indicators for soil biological quality)
  - ⇒ Punctual assessment
  - ⇒ High skills involved
  - ⇒ Good data quality
  - ⇒ Costs borne by public sector

## 2 – Monitoring schemes in Wallonia

- Sources of data in Wallonia ?

- EU soil surveys ? => complementary to national/regional data

- LUCAS soil sampling

- ⇒ Regular assessments

- ⇒ Issue of data quality and local authority involvement

- ⇒ Costs borne by public sector

## 2 – Monitoring schemes in Wallonia

- **Which soil monitoring scheme for Wallonia?**
  - **Combinaison** of various approaches to collect soil and land data :
    - **Legal commitments** : systematic monitoring (public funding) + triggers for soil investigations with reporting obligations (private funding)  
*=> reinforcement foreseen along with EU soil strategy, issue of various DB structuration*
    - **Public funding** : researchers, laboratories, land managers  
*=> reinforcement foreseen along with Recovery Plan for Wallonia (« soil » actions)*
    - **Joint monitoring actions** with institutions (LUCAS, ...)  
*=> current discussion for LUCAS 2022 within EJP soil*
  - Towards an indicator for **soil quality**?  
*=> Current proposal to elaborate some soil quality index to facilitate decision-making process*

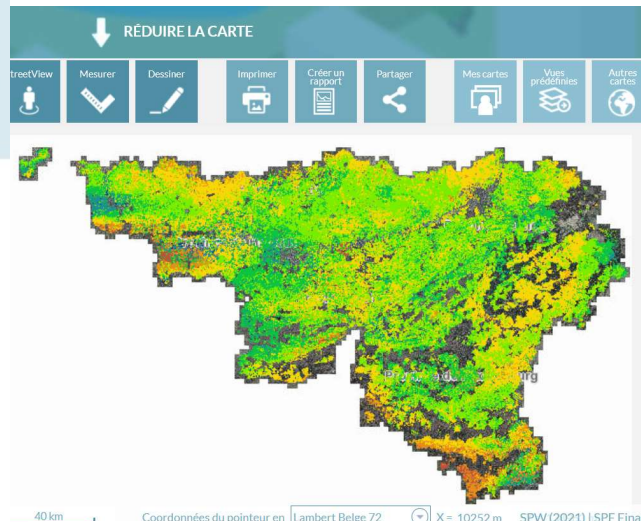


### 3 – Thematic examples

#### 1. Climate change and adaptation: carbon storage in soils

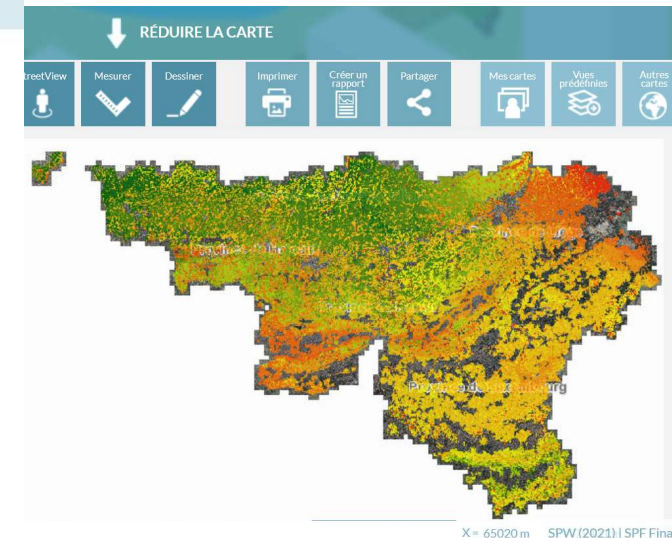
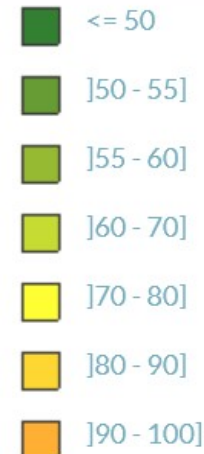
SOC content in agricultural soils (1949-1972, 2004–2014, 2015-2019, + $\Delta$  +  $\epsilon$ )

Différences temporelles des teneurs en Carbone organique total (%) entre 2015 – 2019 et 2004 – 2014



SOC stocks in agricultural soils (2005-2014, +  $\epsilon$ ) + use of PTF to estimate stocks for other periods

Stocks en Carbone organique total des sols (MgC/ha) - période : 2005 - 2014



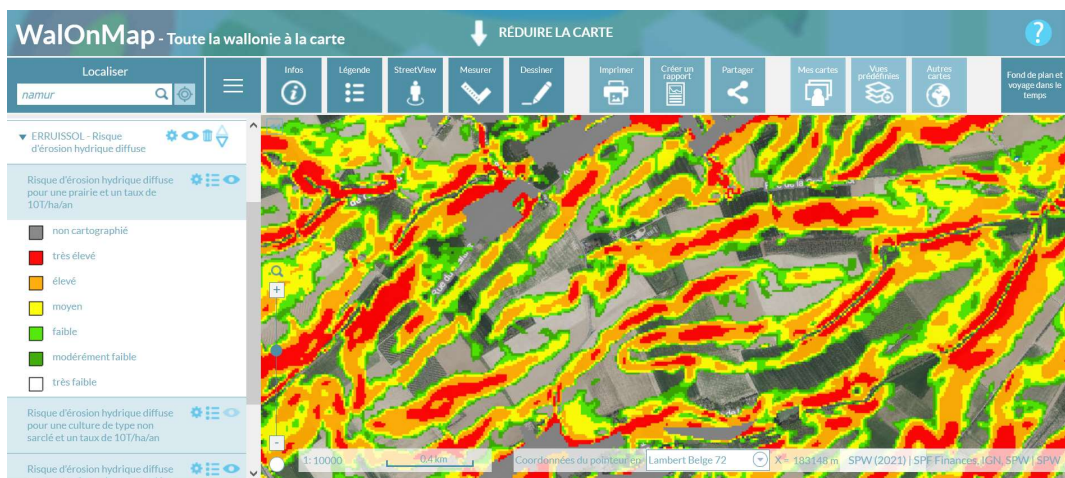
⇒ Combination of BE soil map, research project CARBIOSOL (re-sampling + geoprocessing procedure) and soil routine analyses (REQUASUD)



## 3 – Thematic examples

### 1. Climate change and adaptation: water regulation

#### Diffuse water erosion risk (ERRUISOL)



⇒ Combination of BE soil map, research project ERRUISOL

#### Run-off axes (LIDAXES)

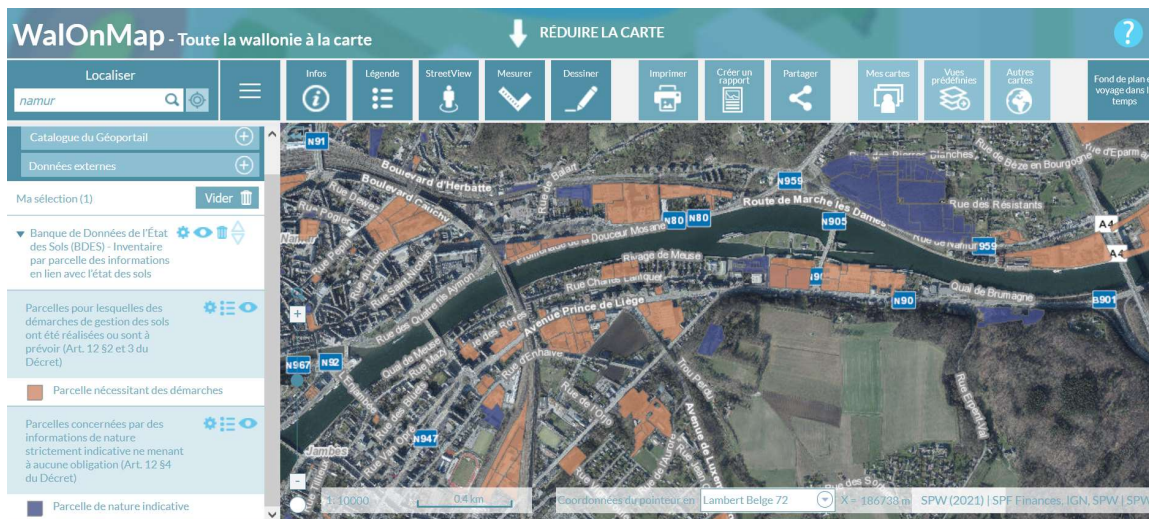


⇒ Use of accurate remote topographical data, legally binding consultation when delivering urbanism permits

## 3 – Thematic examples

### 2. Preventing and remediating soil pollution (point-source and diffuse)

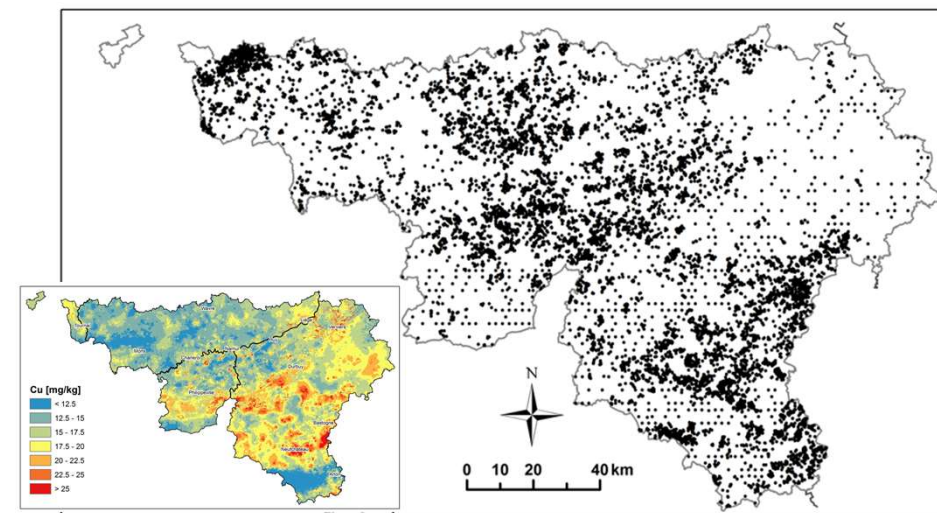
#### Point source pollution (BDES)



⇒ Legal tool of the Soil decree, more information on the dedicated Soil Status DB (BDES) portal

SPW

#### Diffuse pollution (CAPASOL)



Surveys (research projects, sewage sludge DB – 18.000 points, forest soil network – 660 points) – As, Cd, Cr, Cu, Hg, Ni, Pb, Zn



# Soil Status Database (BDES) : Administrative data on soil available on web [bdes.spw.wallonie.be](http://bdes.spw.wallonie.be)

12/04/2022  
19



Version 4.0.7.2

CARTE

BDES : L'état des sols



FR / DE |

Extract of BDES mandatory  
when transfer of  
land/environmental permit

Limites administratives

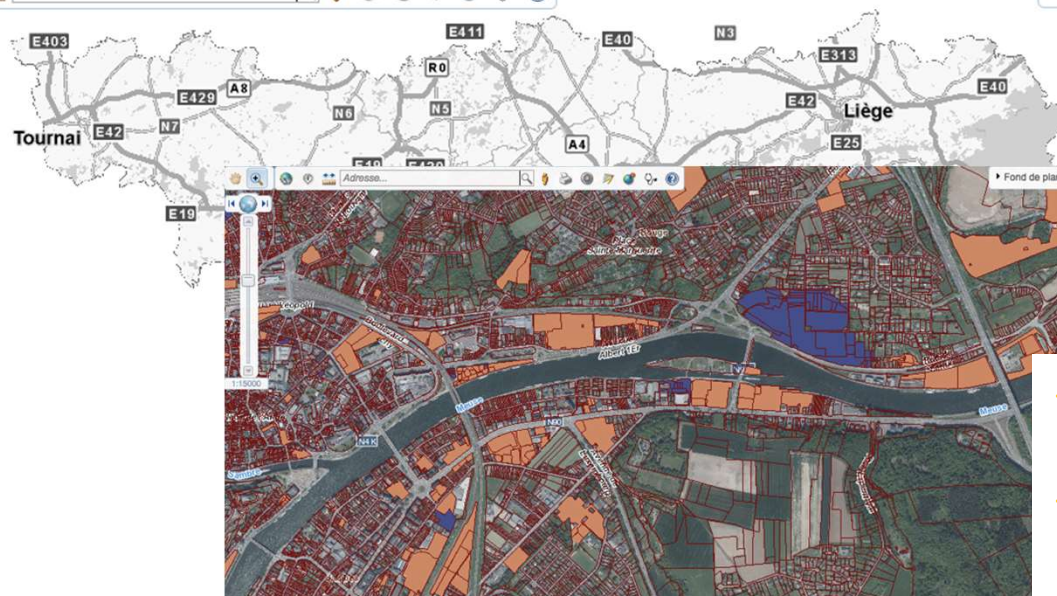
☒ Parcelles cadastrales  
☒ Bâtiments

Statut à l'inventaire

☒ Statut à l'inventaire  
☒ Parcelle pour laquelle  
des démarches de  
gestion des sols ont été  
réalisées ou sont à  
prévoir (Art. 12 §2 et 3  
du Décret)

☒ Parcelle concernée par  
des informations de  
nature strictement  
indicative ne menant à  
aucune obligation (Art.  
12 §4 du Décret)

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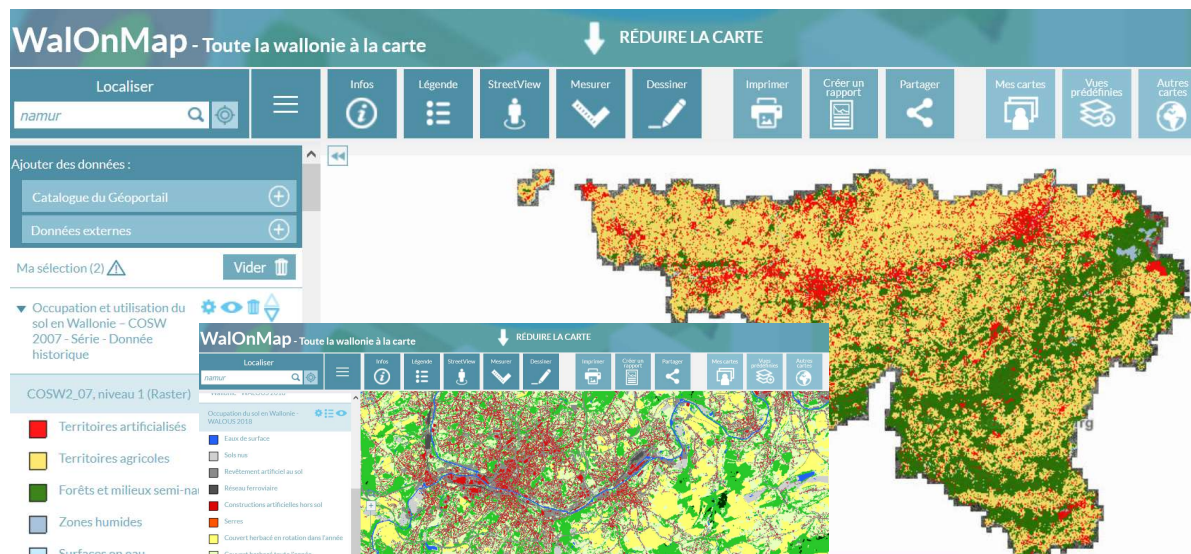
- Soil investigations by experts (Soil decree & previous legal bases)
- Permit delivered for potentially polluting activities
- Soil pollution reports from controls
- Historical information
- Backfilled locations
- Suspected pollution

Around 52.000 parcels out of 3,8 M are colored in BDES  
(27% of artificial areas)

## 3 – Thematic examples

### 3. Circular economy: soil sealing ? Value of soil biodiversity?

Land use/cover: COSW (2007) / WALOUS (2018)



- ⇒ Use of high resolution remote sensing layers
- ⇒ Further improvement needed (in line with typology defined for Wallonia)

Marginal/sensitive ecosystems for biodiversity - Soil biodiversity indicators



- ⇒ Identification of soil ecosystem services for nature/biodiversity (combination of BE soil map, DEM and flooding areas)
- ⇒ Development of biological soil quality indicators (research project CARBIOSOL)

## 4 – Conclusions

- ✓ Combination of various monitoring schemes is needed (systematic and punctual soil surveys, triggers for soil analyses - legal or not, joint actions, ...) => fit for purpose principle
- ✓ Political will required as cost may be significant
- ✓ Data quality (uncertainties), collection of new parameters, frequency of update and structuration of various DB sources are challenging
- ✓ Data access and provision of indicators for soil quality (« soil health ») assessment and decision-making processes are key issues

# Thanks for your attention !

