



# The regional soil organic carbon monitoring network in Flanders (Belgium)

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DEPARTMENT OF ENVIRONMENT & SPATIAL DEVELOPMENT



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# Who am I?

Dries Luts

- ▶ Soil data scientist

  - Database underground Flanders (DOV)

  - Flemish soil organic carbon monitoring network (Cmon)

- ▶ Department of Environment and Spatial Development

  - Flemish Government

  - Spatial planning, Soils, Geology, Environmental health, ...



# A SOC monitoring network?

- ▶ LULUCF (Land use, Land Use Change and Forestry)
  - Essential part of Flemish and EU climate policy
  - Heavy reliance in Flanders on limited data
  - Increase in the reporting requirements

- ▶ 4 per 1000 goal

- ▶ A monitoring gap of 50 years

=> Monitoring of Carbon stocks per LULUCF LU class

=> SOC change of  $\pm 5\%$  over 10 years



# Cmon

- ▶ Flemish soil organic carbon monitoring network
- ▶ A collaboration between a government department and 2 research institutes



- Nature and forest Soils
- Sampling and analyses
- Data processing

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- Coordination
- Regional soil information system
- Data processing



- Agricultural soils
- Sampling and analyses
- Data processing

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# Sampling Scheme

- ▶ Generalized Random Tessellation Sampling (GRTS)<sup>1</sup>
  - Random sampling (stochastic)
  - Samples spread evenly
- ▶ Stratification by land use



Cropland



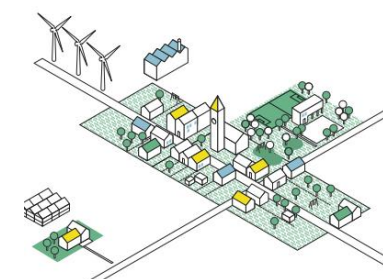
Permanent  
grassland



Forest



Nature

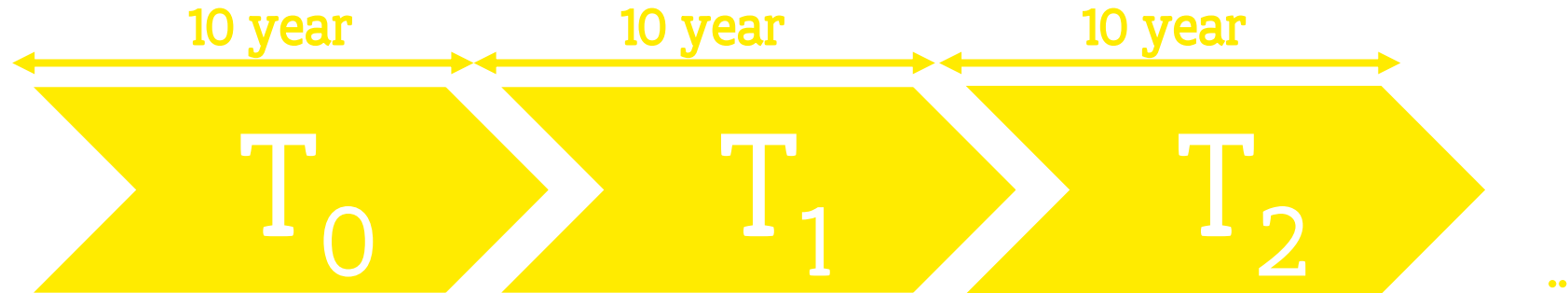


Land take

- Gardens
- Parks and recreation areas
- Verges
- Other land take

# Sampling approach

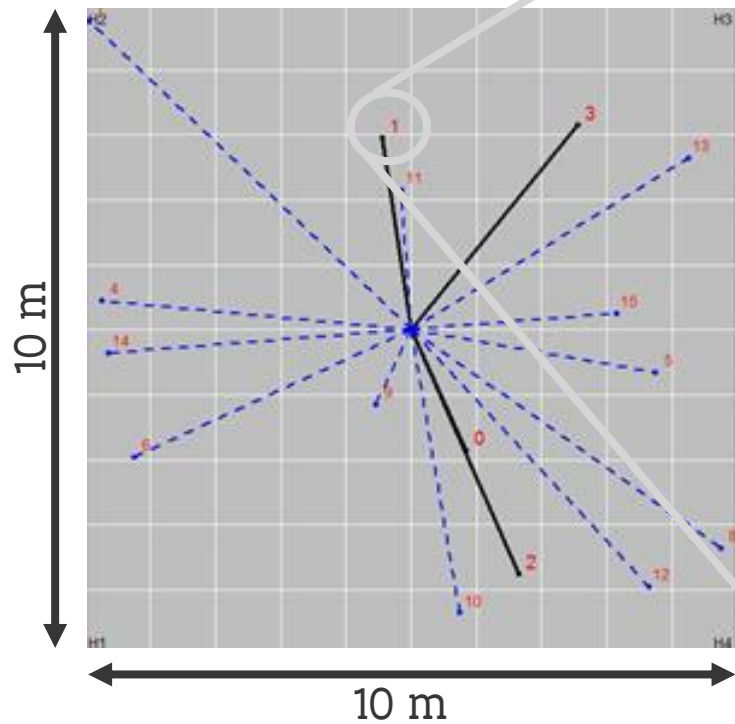
- ▶ Cycles of 10 years
  - 2594 plots spread across 10 years
  - Return to each plot after 10 year



- ▶ First 10 year cycle started in 2021

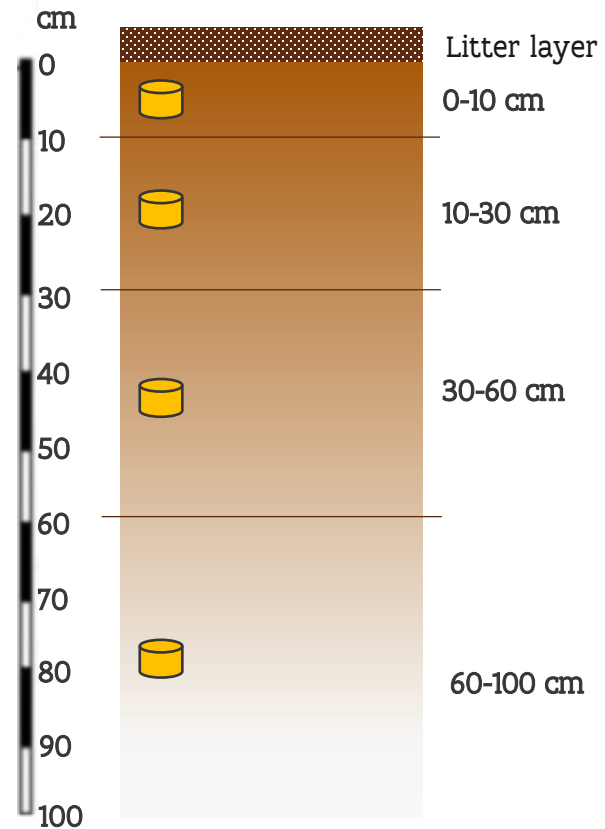
# Sampling approach

- ▶ Sampling plot 10x10m  
→ 16 random points per plot

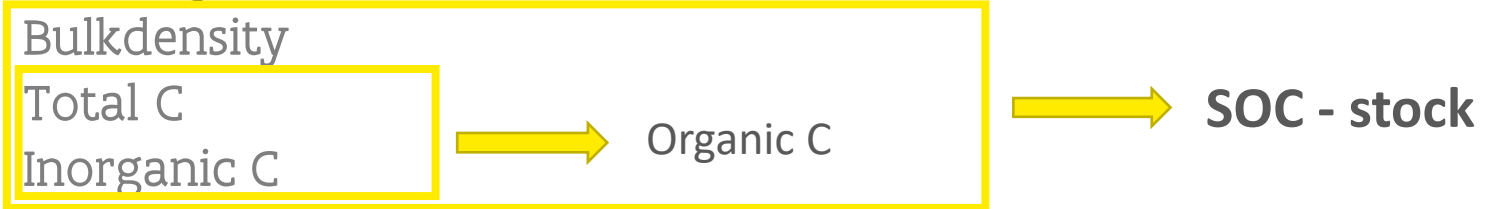


## ▶ 4 sampling layers

- 4 undisturbed samples for bulk density
- 16 disturbed samples for soil analysis



# Sampling approach

- ▶ Same sample and analysis protocol for all land uses
    - Reproducible, repeatable and comparable
  - ▶ Quality assurance
    - Shared reference samples, duplicate analysis, shadow measurement, ...
  - ▶ Soil analysis
    - Bulkdensity
    - Total C
    - Inorganic C
    - Total N
    - pH-KCl
    - Texture (laserdiffraction)
- Organic C
- SOC - stock
- + terrain observations
- 



# The results?

- ▶ Data brought together in the regional SIS
  - Time consuming process of data harmonisation between partners
  - First data published by the end of this year
- ▶ Storage of samples in Flemish Soil and geological sample library
- ▶ Reporting
  - Yearly reports in Dutch
  - First results in English at the online BESOLAN webinar (20<sup>th</sup> of June 2023)
    - × [‘Soil organic carbon monitoring in the Brussels-Capital, Flanders and Walloon Region \(Belgium\) and Luxembourg’](#)
  - First paper by the end of this year

# Conclusions Cmon

- ▶ A robust sampling approach to monitor for LULUCF and 4 per 1000
  - Random sampling and balanced geographic spread
  - 5 land use categories
  - Up to 1 m deep
  - 10-year cycles
  - Soil analyses and terrain observations in function of SOC-stocks

# More information

- ▶ Website + reports (in Dutch): <https://omgeving.vlaanderen.be/nl/klimaat-en-milieu/bodem-en-ondergrond/vlaamse-koolstofmonitoring-hoeveel-koolstof-zit-er-in-de-bodem>
- ▶ Preliminary study (in English): <https://researchportal.be/nl/publicatie/actualisatie-en-verfijning-van-de-onderbouwing-van-een-methodiek-voor-de-systematische>
- ▶ BESOLAN webinar 20th of June: <https://fao.zoom.us/meeting/register/tJcvde-vqjlqHdXP4WV8YmDCFz-ZQVVH4myU#/registration>
- ▶ Contact: [katrien.oorts@vlaanderen.be](mailto:katrien.oorts@vlaanderen.be)





# Thank you for your attention!

## Questions?

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