



# CURRENT STATUS OF RISK ASSESSMENT METHODOLOGIES FOR SOIL ORGANIC MATTER DECLINE IN EUROPE

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# Risk assessment methodologies

Generally should consist of the following consecutive steps:

1. Definition of concept of risk regarding soil organic matter decline (with threshold/reference values etc.)
2. Data gathering (via direct measurements)
3. Data processing (via simulation models, pedo-transfer functions, regression statistics etc the data is processed into the targeted risk indicator).
4. Data interpretation (the risk indicator is compared to a certain threshold value)
5. Risk perception (the deviation of the risk indicator from the threshold value is assessed).



## **Status of (Risk) Assessment Methodologies on soil organic matter decline in the European Union**

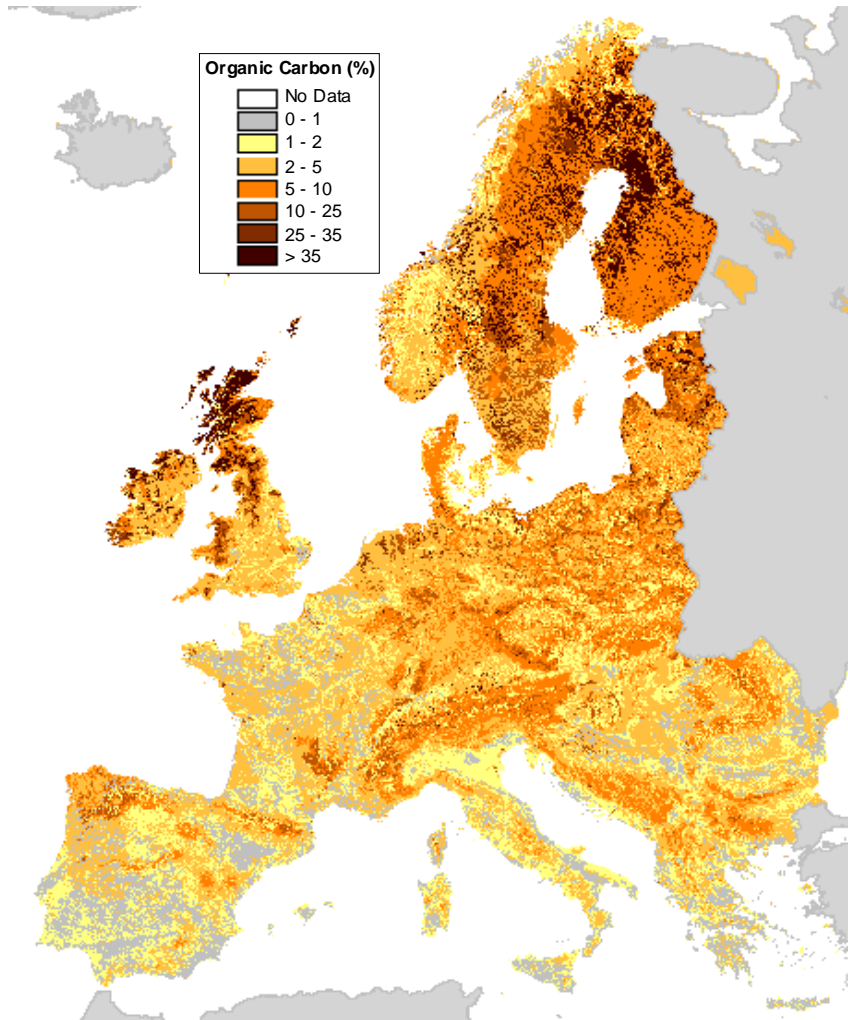
<b>Status Risk Assessment Methodologies</b>	<b>Countries</b>
<b>Official assessment in development</b>	<b>Belgium (Flanders), France, Slovak republic, Spain, United Kingdom</b>
<b>Assessment used by an institution</b>	<b>Belgium (Wallonia), Slovak republic, Slovenia, Slovak Republic</b>

\*Slovak republic reported an official RAM in development as well as RAM used by an institution.

Danmark, Greece, Germany indicated no assessment is being used or developed



# Organic carbon in soil: what can we learn?



Source: Hiederer *et al.*, 2004

**Lesson 1.** Soils are different in carbon content.

**Lesson 2.** Even good inventory soil data should be supplemented by user-friendly interpretation.



# Current status of RAMS: the problems

- Differ in design and scale
- The issue of threshold values:
  - No common method for deriving threshold values
  - Differ from each other, due to differences in
    - data collection, derivation method, scope of use, function
  - There is a debate about the necessity of threshold values



## Methods of assessment

- Empirical, observational
  - Transparent; simple; costs depend on the scale
  - Often no bulk density info; lack of threshold for critical values; changing methods over time
- Mechanistic models
  - (dynamic equilibrium models – towards a steady state)
  - Rate of change might differ as well as SOC/SOM level in steady state
  - More complex and less transparent
  - Differing time and spatial scale and data demand, but generally cost effective



## Components of RAMs for SOM decline

# 1. Data gathering

- Sampling schemes
  - Systematic schemes, monitoring,
  - Non-systematic schemes
    - General soil survey / for characterizing soil types
    - Non systematic grid, no regular monitoring
  - Data from advisory datasets
    - Usually field scale for fertilizer recommendations





## Components of RAMs for SOM decline

# 1. Data gathering

Scales of (systematic and non-systematic) sampling schemes

Country	Scale
Belgium (Flanders)	1:1,000,000
Belgium (Wallonia)	1:20,000, 1:25,000
France	1:250,000 to 1:1,000,000
Greece	1:5,000
Poland	1:10,000
Slovak republic	1:400,000
Slovenia	1:10,000, 1:20,000, 1:25,000
Spain	1:50,000
United Kingdom	1:250,000





## Components of RAMs for SOM decline

# 1. Data gathering

- Frequency and history of sampling
  - 3-5 years, earliest monitoring set up 15 years ago
- Determination of SOM/SOC
  - destructive/on-destructive methods (various)



## Components of RAMs for SOM decline

# 2. Data processing

- **Observational research, statistical analysis**
  - comparison to historical data
    - (problem of changing analytical methods over time)
- **Modelling approaches**
  - mono-component models (total SOC)
  - multi-component models (different fractions)



## Components of RAMs for SOM decline

### 3. Data interpretation

- Target specific
  - soil fertility, soil health, soil degradation, carbon sequestration etc.
- Various threshold values (*where exists*)
  - Most frequently used is 2% (SOC)  
(this threshold is developed for structural stability  
universal use of this value can be questioned )



## Components of RAMs for SOM decline

### 4. Risk perception

- No official RAM in the EU27
- Multiple thresholds are needed  
(diverse climatic, soil, land use systems in Europe)
- Research is needed to establish regional thresholds



# CONCLUSION

**Harmonization is possible  
(only) if based on an agreement about:**

- **Risk perception**
- **Method of derivation**
- **Reference values**
- **Use of threshold values (multiple thresholds)**



Thank you!