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Soil Organic Carbon Status Indicators

**Vladimir Stolbovoy, Luca Montanarella, Filippi
Nicola, Ezio Rusco and Gergely Toth**
Land Management and Natural Hazards Unit, Joint
Research Center EC

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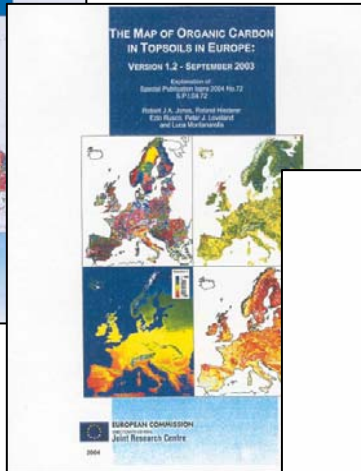
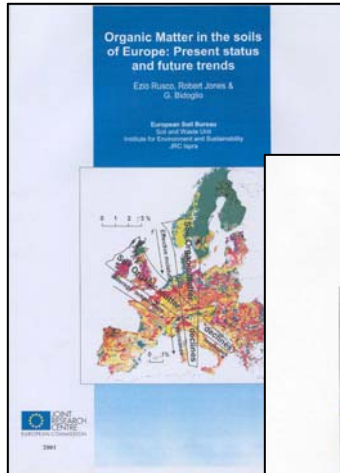
Outline

- SOC research at JRC EC;
- SOC Status Indicators:
 - Background;
 - Semi-quantitative approach (continental/country scale);
 - Quantitative approach (regional scale);
- Conclusions and further steps.



SOC research at JRC EC

Inventory



Good News

The SGDBE allows for SOC inventory.

Gap Identification

The need of mapped details (1:250 000 scale) and more samples was identified (ESDAC).

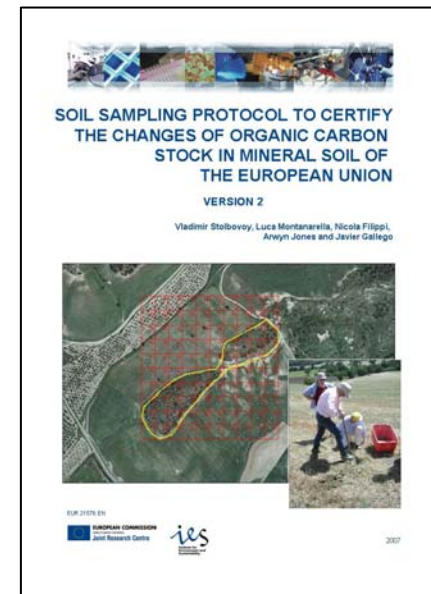
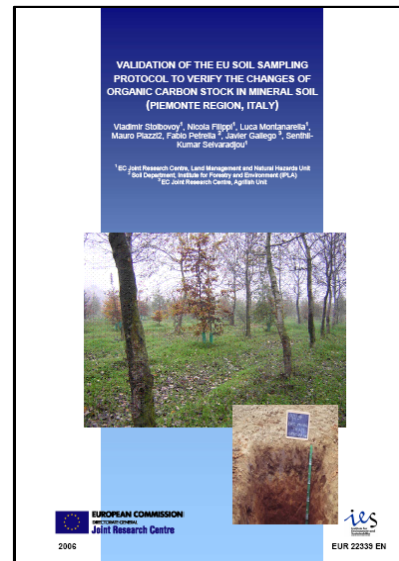
Doubts

Applicability to some need is difficult due to data coarseness.



SOC research at JRC EC, cont.

Verification



Good news

A new Area-Frame Randomized Soil Sampling allows for measurable, transparent and cost-effective verification of the SOC changes.



SOC Status Indicators research

Problem: *SOC is a key parameter driving different soil functions and having numerous practical applications. The multidisciplinary needs can be met by a complex SOC characterization which is covered by SOC Status Indicators.*

Goal: *develop a set of status indicators to support the EU policies related to SOC.*

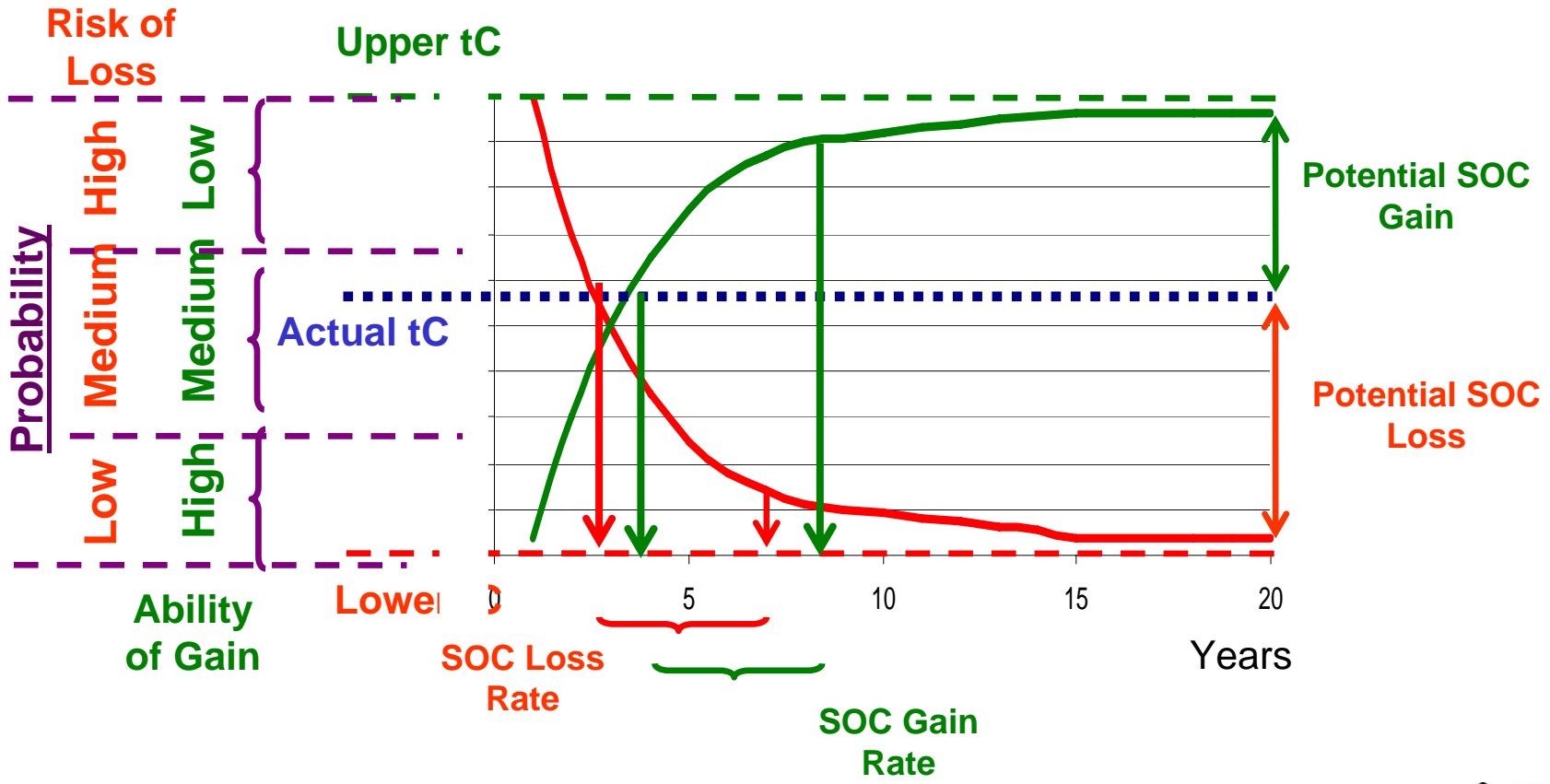
Method: *knowledge-based interpretation.*

Implementation: *agriculture, rural development, Thematic Strategy for Soil Protection; global MEA's (climate, biodiversity, desertification) ratified by the EU.*



SOC Status Indicators: Concept (based on Turin, 1937; Jenny, 1941; Kononova, 1963; Stevenson, 1994)

STU specific margins





Set of SOC Status Indicators

Indicators

Content
Upper margin
Lower margin
Actual

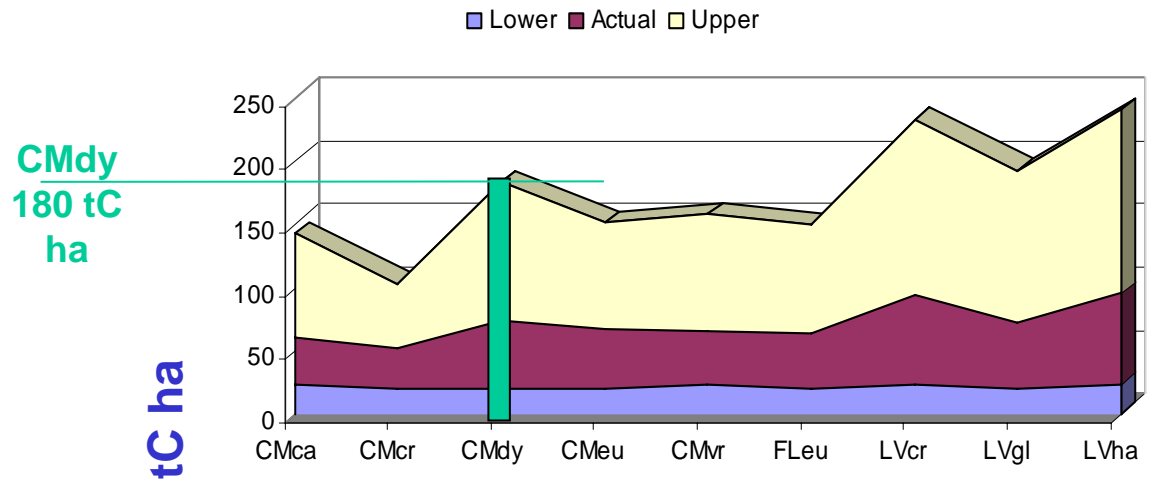
Probability of change
Risk of Loss
Ability to Gain

Potentials of change
Loss
Gain

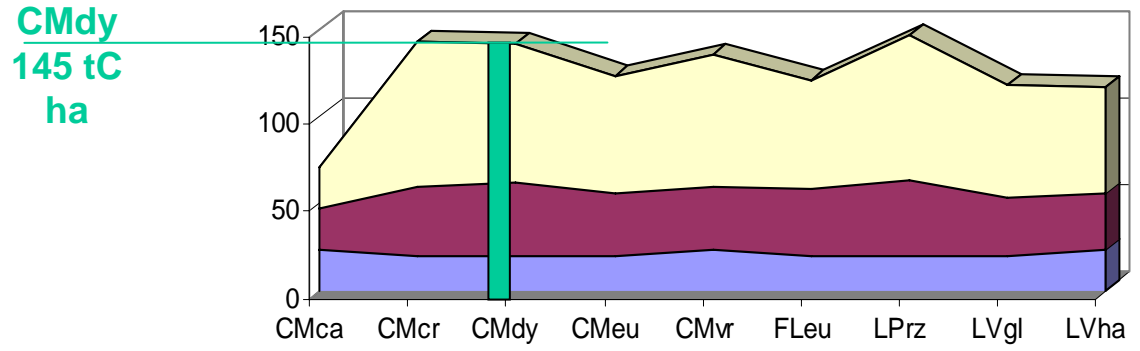
Rate of change
Initial
imminence



SOC Contents Indicators at different climates



Temperate-suboceanic

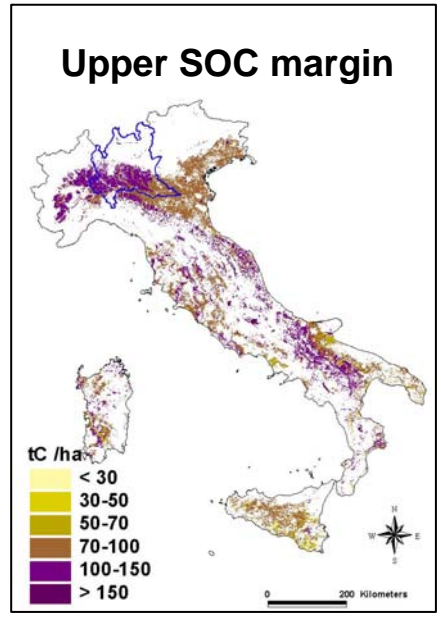
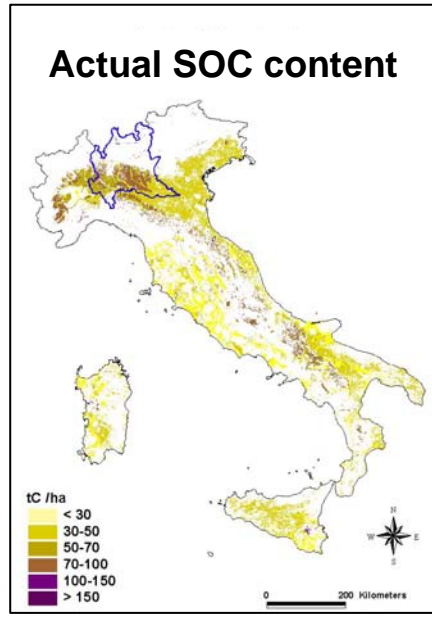
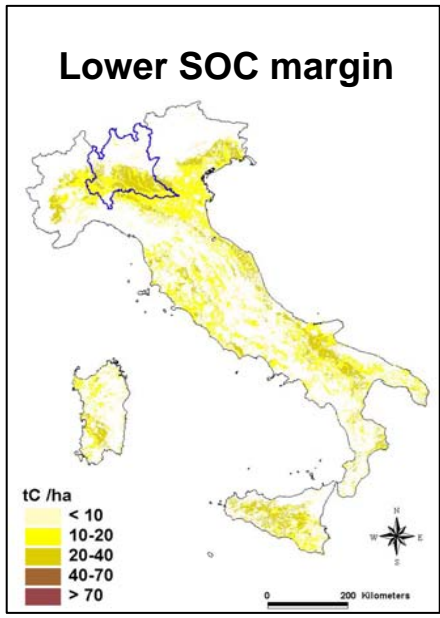


Mediterranean to subtropic

STU, WRB second level



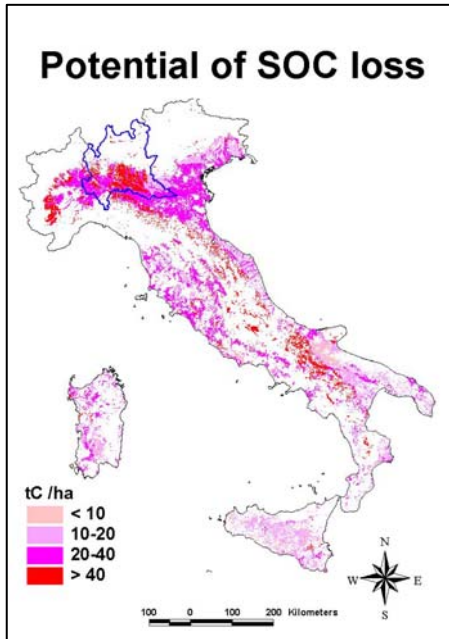
SOC Content Indicators (Italy)



Deeply dehumified agricultural soils is a specific feature of Italy.

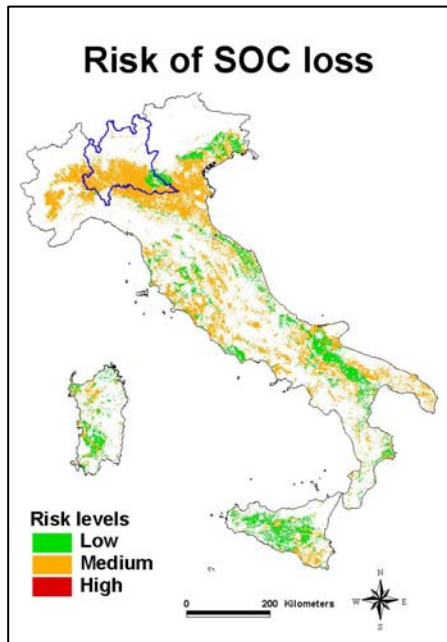


SOC Change Indicators (Italy)



Historical cultivation resulted in **limited potential** (~20 tC ha) for further **deterioration** of the SOC level in Italy.

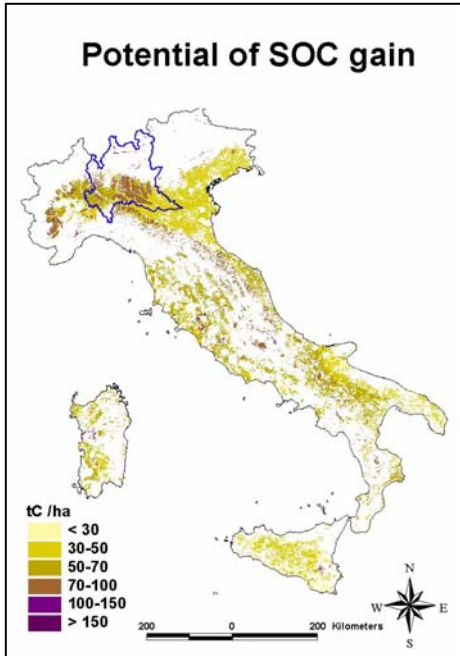
Soils with the **same amount of SOC** may have **different risk levels**.



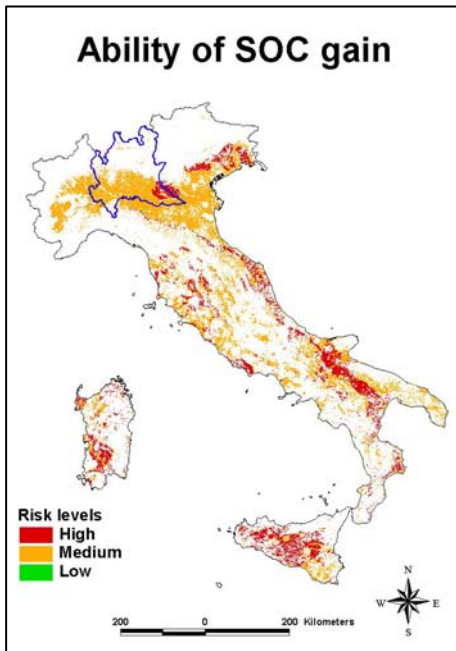
Imminence to the Lower margin makes SOC resistant to the further degradation and keeps the **Risk of the SOC loss** at **low-medium** levels.



SOC Change Indicators (Italy), cont.



Deeply dehumified soils bring **considerable potential** (~50 tC ha) for SOC **gain** in Italy.



Imminence to the **Lower margin** keeps the **ability** of SOC **gain** at **medium-high** levels.

Soils with **different** amount of **SOC** may have the **same ability** to gain C.

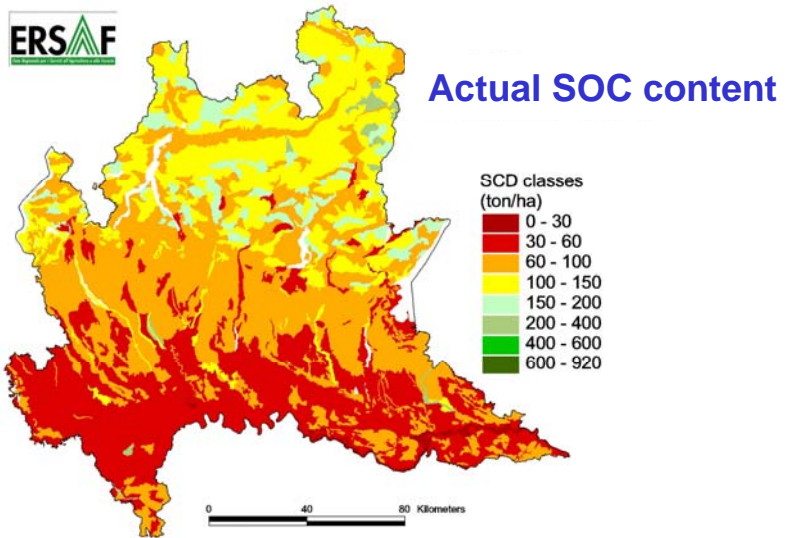
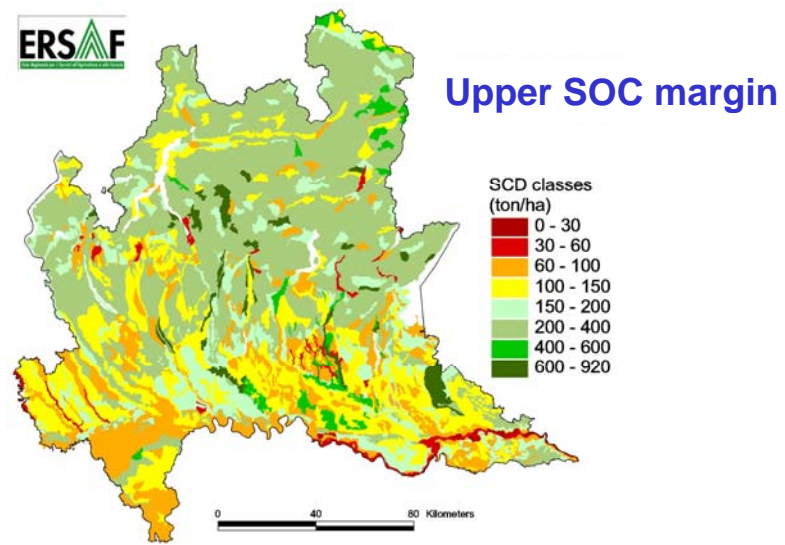
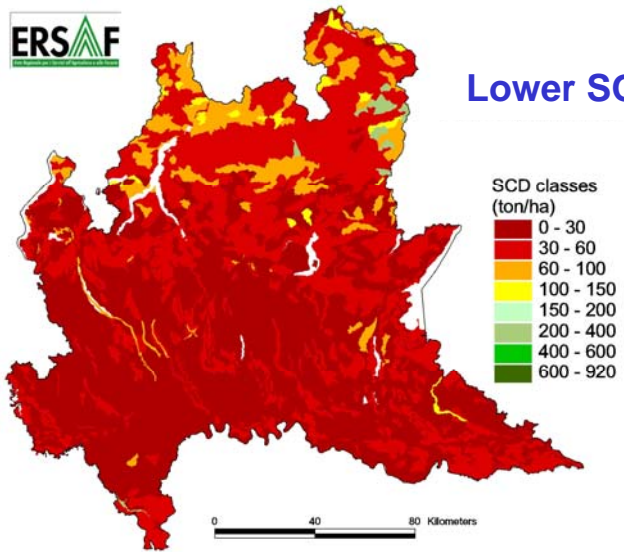


Quantitative approach: regional level (Lombardia, Italy)

STU	SOC content Indicators*, tC ha ⁻¹			Potential change indicators Loss/Gain, tC ha ⁻¹	Probability thresholds tC ha ⁻¹			Risk of Loss/ Ability of gain
	Min	Med *	Max		LOW/ HIGH	MEDIUM	HIGH/ LOW	
profondic LV	35	61	102	26/41	< 57	57-79	> 79	M / M
orticalcic LV	23	66	175	43/109	< 74	74-125	> 125	L / H
hipercalcic LV	51	70	90	19/20	< 64	64-77	> 77	M / M
haplic CL	25	52	85	27/33	<45	45-65	>65	M / M

*total amount of available soil profiles for region is about 1700.

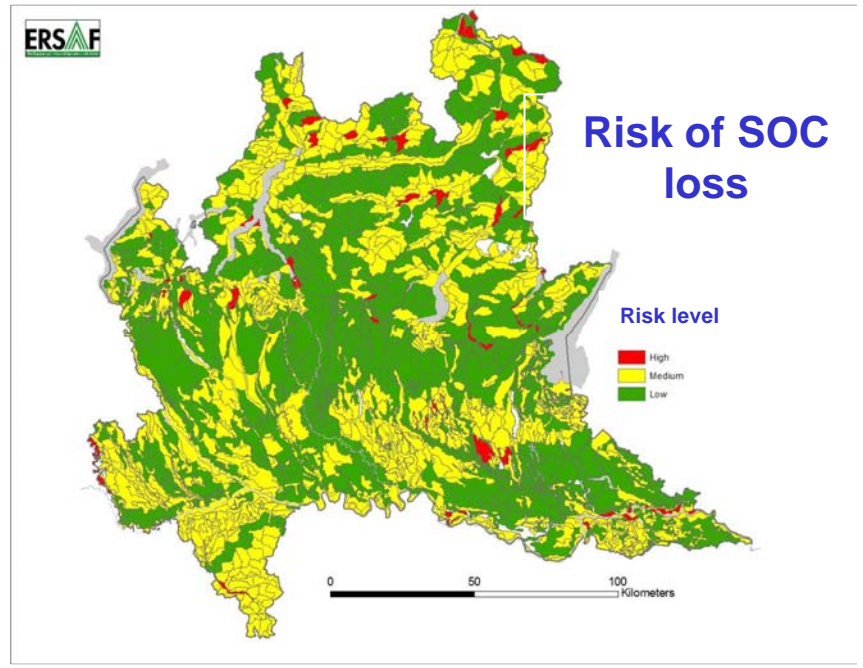
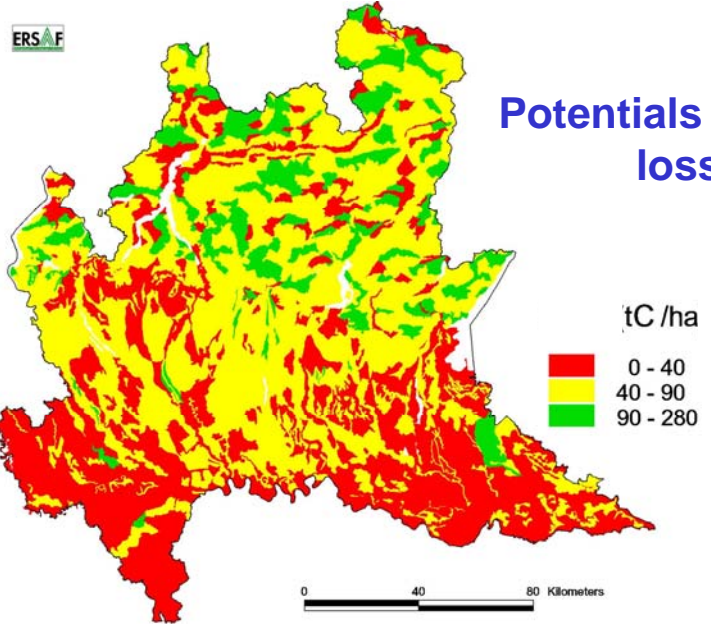
SOC Content Indicators (Lombardia, Italy)



Local data allows picturing
detailed SOC Content Indicators.



SOC Change Indicators (Lombardia, Italy)



Quantitative approach **distinguishes** regions with higher potentials of SOC loss which are at high risk level. These **details** are **missed** at the **country scale**.



Conclusions

To support the EU policies, a variety of SOC Status Indicators is needed. It includes:

Content

Potentials of change

Rate of change

Probability of change

The SOC Status Indicators can be derived from available data at the country/continent and regional scales

Further research should be focused on the specification of the SOC Status Indicators for deferent soil environments of the EU

There is an urgency to make the SOC Status Indicators instrumental for the EU policy/decision formulation.



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Thank you