WG 3 Delineation of priority areas for soil risk - mandate

- Evaluate the criteria proposed during discussions on the Soil Framework Directive and propose to the JRC further studies and projects to test the results of this evaluation
- Provide added value information compared to report of SIWG and projects like RAMSOIL and ENVASSO
- Consider socio-economic aspects such as the impact of societies and land use effects on threats
- Produce report about delineation of priority areas at risk

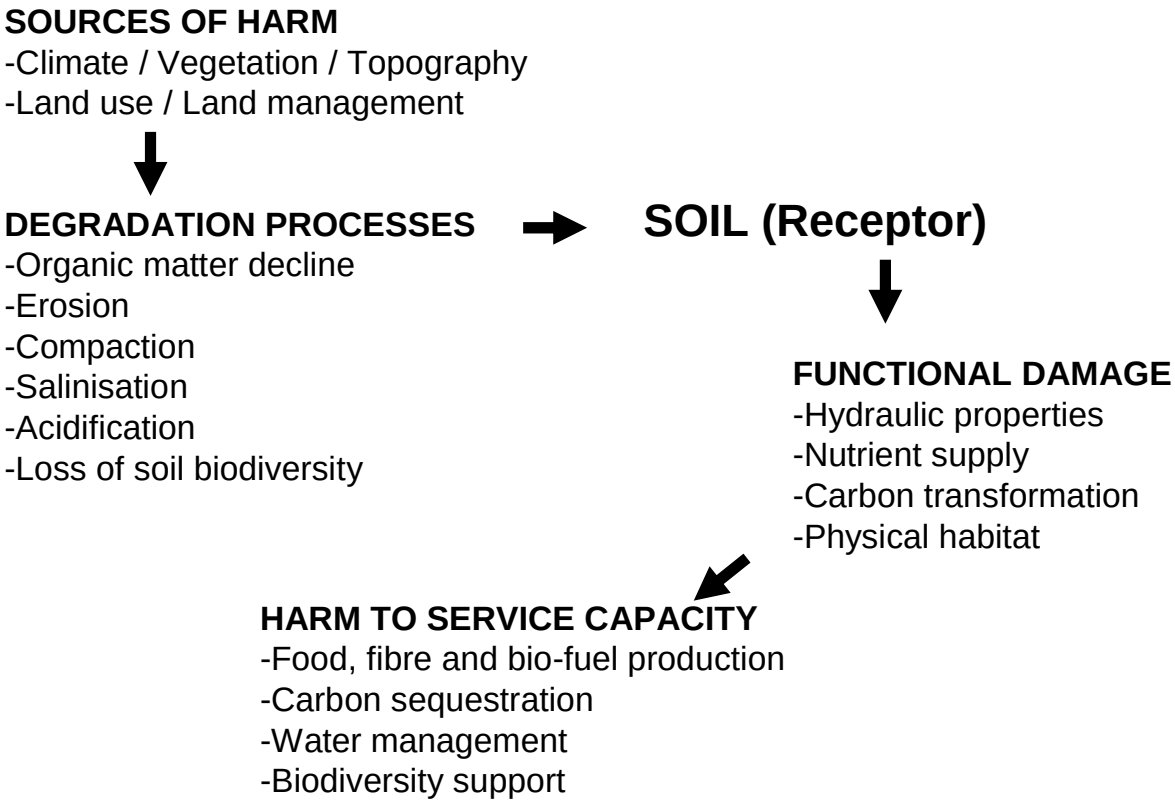
WG 3 members

- Mark Kibblewhite (Chair)
- Stanislaw Bialousz
- Pavol Bielek
- Vit Penizek
- Sigbert Huber
- Maria da Conceição Gonçalves
- Pandi Zdruli
- Costas Hadjiparaskevas
- György Várallyay
- Olaf Düwel
- Gergely Tóth

Progress since last plenary

- Discussion paper prepared by chair

A conceptual model for risk assessment of soil resources



A step-wise framework is proposed for determining risk areas

- Qualify a spatial inventory of soil types and transform this in to polygons within which there are dominant soil types with common receptor characteristics
- Define key sources of harm and qualify spatial inventories of these sources (e.g. climate, slope, land cover)
- Model the spatial intensity of the degradation processes
- Interpret the effects of degradation in terms of lost functionality and resulting harm to the delivery of services
- Test outputs from the above steps against an agreed definition of acceptable harm to identify polygons at risk of unacceptable harm.

Receptor (soil) characterisation

Reference Soil Group	Dominant features	% of European land area (EC, 2005)	General or local specific risk assessment
1. Histosols	Thick organic layers	5	General
2. Leptosols	Shallow or gravelly	9	General
3. Fluvisols	Flooding	5	General
4. Gleysols	Shallow groundwater	5	General
5. Chernozems, Kastanozems & Phaeozems	Organic matter accumulation, high base status, depth	14	General
5. Podzols	Fe illuviation	14	General
6. Calcisols	Secondary calcium carbonate	5	General
7. Albeluvisols & Luvisols	Clay enriched subsoil	21	General
8. Umbrisols & Cambisols	Weakly to moderately developed profile	14	General
9. Arenosols	Sandy, weakly developed profile	1	General
Anthrosols, Technosols, Cryosols, Solonetz, Solonchaks, Andosols Gypsisols, Vertisols, Acrisols, Arenosols, Regosols		2 or < 2 although they may be locally dominant	Local specific

Degradation processes and resulting harms

- Organic matter decline
- Erosion (including soil loss by rill, inter-rill and gully erosion and soil loss by wind erosion)
- Compaction (increased packing density)
- Salinisation / sodification
- Acidification
- Loss of soil biodiversity

Diffuse soil contamination from sources such as aerial deposition and waste spreading to land is also an important degradation process but its occurrence is not related directly to soil types or other landscape properties, so a risk area approach is inappropriate. The threat of landslides is not covered here.

Critical soil degradation processes and resulting harms

Reference Soil Group	Most critical degradation processes	More important harms
1. Histosols	Water erosion; wind erosion; loss of soil organic matter	Lost carbon sequestration; compromised water cycle
2. Leptosols	Water erosion	Lost food and fibre production; compromised water cycle
3. Fluvisols	Water erosion, salinisation	Lost food and fibre production
4. Gleysols	Soil organic matter decline; compaction, salinisation	Lost food and fibre production; lost carbon sequestration; compromised water cycle
5. Chernozems, Kastonozems & Phaeozems	Soil organic matter decline; compaction; salinisation	Lost food and fibre production; lost carbon sequestration; compromised water cycle
5. Podzols	Water erosion; soil organic matter decline	Lost carbon sequestration; compromised water cycle
6. Calcisols	Water erosion	
7. Albeluvisols & Luvisols	Water erosion; compaction	Lost food and fibre production; lost carbon sequestration; compromised water cycle
8. Umbrisols & Cambisols	Water erosion; soil organic matter decline	Compromised water cycle; lost carbon sequestration
9. Arenosols	Water erosion; wind erosion; soil organic matter decline	Lost food and fibre production; lost carbon sequestration

Note: Loss of biodiversity may arise from all degradation processes acting on all soil types.

Sources of harm, degradation processes (threats) and data requirements for continental-level risk assessment

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Source of harm	Natural			Anthropogenic	
	Climate	Vegetation	Topography	Land use	Land management
Degradation Process (Threat)					
Soil organic matter decline	Precipitation (10km) Temperature (1km)		Digital elevation (<100m)	NUTS 3	
Soil loss by rill, inter-rill and sheet erosion	Precipitation, rain days, storms, potential evapotranspiration Temperature (1km)	Land cover (100m)	Digital elevation (<100m)	NUTS 3	
Soil loss by wind erosion	Wind velocity and duration, evapotranspiration Rainfall	Land cover (100m)	Digital elevation (100m)	NUTS 3	
Soil compaction (increased packing density)	Precipitation, potential evapotranspiration (monthly) 10km?	Land cover (100m)	Digital elevation (100m)	NUTS 3	Typology of farming systems in relation to land use
Salinisation	Precipitation, potential evapotranspiration (annual?) 1 km				Irrigated area and intensity, irrigation water chemistry

Key receptor (soil) properties required to assess degradation and harm

Receptor (soil) properties	Soil type	Texture	Soil organic carbon %	Bulk density	Water retention at field capacity	Infiltration rate	Depth and salt content of groundwater and irrigation water
Soil organic matter decline	✓	✓	✓				
Soil loss by rill, inter-rill and sheet erosion	✓	✓	✓	✓	✓	✓	
Soil loss by wind erosion	✓	✓	✓	✓			
Soil compaction (increased packing density)	✓	✓	✓	✓	✓		
Salinisation	✓	✓					✓

Acceptability of levels of harm

- Levels of acceptable harm that could be considered are
  - no absolute loss of capacity for delivery of identified services
  - no loss of capacity at a higher rate than that recoverable via natural processes
  - no loss of capacity beyond that can be mitigated at given economic cost.

Area allocation

- The output will need to be informed by quantitative modelling but qualitative, placing polygons in to broad categories with descriptions such as
  - Considerable risk
  - Identified risk
  - Low expectation of unacceptable harm

Recommendations

- Agree
  - which Reference Soil Groups should be included as the main soil types
  - A method for establishing soil type polygons, bearing in mind that boundaries will need to be delineated with a sufficient and known confidence appropriate to a continental scale
- Review
  - models for degradation processes, in the context of available spatial data on sources of harm and soil properties, leading to recommendations about which models can and should be used and the anticipated confidence that can be assigned to their outputs
- Agree
  - a framework for linking the extent of different forms of degradation to changes in soil functional performance and interpreting these changes to describe potential harm to services
- Prepare and evaluate a set of options for acceptable harm, related to each degradation process and soil type