

The European System of Soil Data and the Relevance for Soil Protection

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Themtic Strategy for Soil Protection (COM2006/231)

Preservation of soil functions

- biomass production, humans

- physical and cultural environment for

 biodiversity pool heritage - archive of geological and acheological

- source of raw material

- acting as carbon pool
- storing filtering and transforming nutrients, substances and water

Prevention of threats to soil

- erosion,

- landslides

- soil organic matter decline,
- salinization compaction,
 - (soil sealing, contamination)

Environmental data centers of the EU

European Commission



Pan-European soil datasets

European Commission

I. Spatial datasets of basic soil properties

II. Thematic Pan-European soil maps

I. Spatial datasets of basic soil properties

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i. European Soil Database v2.0

ii. Biosoil data

iii.European Hydropedological Data Inventory

iv.LUCAS topsoil database

I.i. The European Soil Database

European Commission

- Soil Geographical Database of Eurasia (1:1M)
- Soil Profile Analytical Database
- Pedotransfer Rules database
- Database of Hydraulic Properties of European Soils

Soil Geographical Database of Eurasia (1:1M)

European Commission

 \sim 40000 individual polygons as basic spatial units

- Soil type (FAO 1974, WRB 1998)
- Parent material
- Depth of an obstacle to roots
- Dominant slope class
- Depth to a textural change of surface texture
- Dominant surface textural class
- Secondary surface textural class
- Dominant sub-surface textural class
- Secondary sub-surface textural class
- Annual average soil water regime of the soil profile



Soil Profile Analytical Database (SPADBE/M)

European Commission

496 profiles(385 with geographical coordinates)

Texture (& PSD) Organic matter content (C, N) Structure Total nitrogen content pН ESP or SAR Calcium carbonate content Calcium sulphate content Electric conductivity CEC and exchangeable bases Soil water retention Bulk density Root depth

Groundwater level

Parent material



Pedotransfer Rules Database (PTRDB)

European Commission

Topsoil mineralogy

Subsoil mineralogy

Topsoil cation exchange capacity

Subsoil cation exchange capacity

Topsoil mineralogy

Subsoil mineralogy

Topsoil cation exchange capacity

Subsoil cation exchange capacity

Subsoil easily available water capacity

I.ii. Biosoil data

European Commission

4030 plots data mainly from 2006-2007



- Plot identifiers
- Date of assessment
- Latitude
- Longitude
- Elevation code
- Water availability (estimate)
- Moisture content
- Coarse fragments
- Texture class
- Measured bulk density
- Estimated bulk density
- Carbonate content
- Exchangeable acidity
- Organic carbon content
- Humus form

Hiederer et al 2011.

I. iii. European Hydropedological Data Inventory (EU-HYDI)

European Commission

6014 profiles 18682 samples



	Description
GENERAL	General profile properties
BASIC	Basic and physical data at the sampling layer level
CHEMICAL	Chemical data at the sampling layer level
PSIZE	Measured particle size distribution data at the sampling layer level
RET	Measured soil water retention data at the sampling layer level
COND	Measured soil hydraulic conductivity data at the sampling layer level
METHOD	Measurement methods
TSERMETA	Time series metadata
TSERDATA	Time series data
HPSD	Harmonized particle size distribution
HMVG	Harmonized Mualem-van Genuchten parameters



I. iv. LUCAS Topoil data LUCAS = Land Use / Land Cover Area Frame Survey

European Commission



LUCAS Topsoil sampling



LUCAS 2009 Topsoil samples by countries and land uses

European

Country	Total number of samples	Cropland Annual crops	Cropland permanent crops	Woodland	Shrubland	Grassland
Austria	420	145	3	121	6	134
Belgium	71	35	1	15	14	18
Cyprus	90	25	9	14	2	25
Czech Republic	431	227	6	88	2	95
Denmark	232	166	27	25	5	34
Estonia	220	54	-	103	22	54
Finland	1716	314	1	1261	53	94
France	2952	1525	88	380	3	830
Germany	1947	928	27	410	60	549
Greece	491	150	100	64	4	88
Hungary	497	314	6	60	9	104
Ireland	233	11	-	19	39	174
Italy	1333	549	268	127	8	285
Latvia	349	78	1	126	2	132
Lithuania	356	137	-	69	11	141
Luxembourg	3	1	-	2	52	9
Malta	19	1	1	22	7	88
Netherlands	211	88	-	304	3	446
Poland	1648	829	21	193	105	99
Portugal	476	45	71	83	47	64
Slovakia	268	111	2	68	21	32
Slovenia	112	8	1	215	6	350
Spain	2696	1321	419	1802	14	146
Sweden	2254	185	-	72	2	458
UK	942	354	-	121	2	134
Total	19967	7601	1026	5643	475	4449

I.iii. LUCAS topsoil database

European Commission

22000 points in 27 EU countries

Coarse fragments	Coarse	fragments
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Particle size distribution (FAO, 1990a)

Clay content

Silt Content

Sand Content

pH(CaCl2)

pH(H2O)

Organic carbon

Carbonate content

Phosphorus content

Total nitrogen content

Extractable potassium content

MULTISPECTRAL Properties (with diffuse reflectance measurements saturation)

Cation exchange capacity



LUCAS topsoil: texture



Topsoil organic carbon content at LUCAS sites



LUCAS topsoil: pH (H2O)



LUCAS topsoil: pH (CaCl2)



Balabbio et al 2013.

CaCO3 – analythical method

European Commission

7. Die Methoden der Bodonanalysen der Kgl. Geologischen Preussischen Landesanstalt.

Von Dr. F. Schucht, Berlin.

Meine Herren, wenn ich ihnen heute über die Methoden der Bodenanalyse, wie sie im Laboratorium für Bodenkunde der Preuß. Geol. Landesanstalt zur Aufführung gelangen und in Wahnschaffes Wissenschaftlicher Bodenuntersuchung" ausführlich beschrieben

Carbonate content

(g/kg)

ISO 10693. 1994



ISN 28113

CaCO₃ content at LUCAS sites



CaCO₃ content in croplands in EU Member States (mineral soils) CaCO₃ <= 0.1 (g/kg); 2: >=0.1 and < 50; 3: >=50 and <100; 4: >=100



European

CaCO3 categories

LUCAS topsoil: Sites showing liming need (approximative; sites where pH _(CaCl2) < 5.6)



II. Thematic Pan-European soil maps

European Commission

i. Maps of basic properties (derived)
i. LUCAS Topsoil organic carbon map
ii. LUCAS Particle size distribution map
iii. Map of salt affected soils
iv. pH map of Europe

ii. Maps of soil functions and threats i. Soil productivity ii. Soil erosion iii.Map of natural susceptibility to compaction



Protection of soil resources of the EU

The Thematic Strategy for Soil Protection

Threats to soil resources

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- erosion
- soil organic matter decline
- salinization
- compaction
- landslides
- soil sealing
- contamination

Themtic Strategy for Soil Protection (COM2006/231)

Impact of human activities on soil





Erosion

Estimated Change in Erosion Rate for Europe (1990 - 2000)



Change in Erosion Rate



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Unique: Limnates 207

Compaction



Salinisation, sodification

Furonean



Contamination



Rodrigues et al. 2008

Human Impact in Europe Rapid urbanization of the rural population





Competing land uses between agriculture, infrastructure, housing and nature protection will more and more become a key topic in future policy development: Soils are a limited non-renewable Natural Resource

Loss of agricultural land due to land take in EU countries

(in % of the total agricultural land; 2000-2006)

European



(Toth, 2012)

The quality of lost agricultural land



Land take in regions

Expansion on prime land Expansion on poor land

Land take in metropolitan areas

Expansion on prime land Expansion on poor land

(Toth, 2012)

Annual soil productivity loss kg wheat equivalent per capita and per country



Danmark Cyprus Ireland Netherlands Spain



Czech Republic France Litvania Hungary Sweden

Austria Belgium, Estonia, Finnalnd, France, Germany, Italy, Luxembourg, Poland, Portugal, Slovakia, Romania, Spain



Bulgaria, Latvia, Slovenia



(Toth, 2012)



Further info at http://eusoils.jrc.ec.europa.eu

Thank you!