

AT A GLANCE

Title: Soil Transformations in European Catchments

Instrument: Collaborative Project FP7

Total Cost: 9,160,384 €

EC Contribution: 6,974,572 €

Duration: 60 months

Start Date: 01/12/2009

Consortium: 15 partners from 13 countries

Project Coordinator: University of Sheffield (UK)

Project Web Site:

<http://www.soiltrec.eu/>

Key words:

Soil, critical zone, soil processes, soil function, mathematical modelling, soil life cycle, sustainability, ecosystem services, observatories, policy



THE CHALLENGE

Through unsustainable land use practices, mining, deforestation, urbanisation and degradation by industrial pollution, soil losses are now hypothesized to be much faster (100 times or more) than soil formation – with the consequence that soil has become a finite resource.

The crucial challenge for the SoilTrEC project is to understand the rates of processes that dictate soil mass stocks and their function within Earth's Critical Zone (CZ). The CZ is the environment where soils are formed, degrade and provide their essential eco-services. Whilst our understanding of the CZ has increased over the last 100 years, further advance requires scientists to cross disciplines and scales to integrate understanding of processes in the CZ, ranging from the nano to the global-scale.

PROJECT OBJECTIVES

The aims of SoilTrEC are to address the priority research areas identified in the European Union Soil Thematic Strategy and to provide leadership for a global network of Critical Zone Observatories (CZO) committed to soil research.

The specific objectives are: to describe from 1st principles how specific soil parameters, e.g. soil structure, influence processes and functions of soil covers; to establish 4 EU CZOs; develop a CZ Integrated Model of soil processes and function; create a GIS-based modelling framework to delineate soil threats and assess mitigation at EU scale; quantify impacts of changing land use, climate and biodiversity on soil function and economic value; form with international partners a global network of CZOs for soil research; deliver a programme of public outreach and research transfer on soil sustainability.



METHODOLOGY

SoilTrEC has a focus on developing fundamental knowledge through detailed study of relatively well-constrained systems (soil profiles) under controlled laboratory conditions. These studies are then extended to progressively more complex systems (field plots, catchments, rivers basins) at increasingly larger scales.

Development of a Critical Zone integrated model for soil processes combines methods from physical hydrology and biogeochemical simulations with carbon transformation and ecosystem food web dynamics.

At the same time, higher-level analysis based on decision support tools being developed from Life Cycle Analysis and Economic Valuation approaches, feeds back to the fundamental studies. This helps identify the most urgent problems and targets the fundamental scientific research. This two-way transfer of knowledge is a strongly integrating activity that builds constructive engagement between all partners and disciplines.

The four SoilTrEC CZOs represent key stages in the life cycle of soils; from soil formation, through productive use, to severe degradation of soils. Understanding evolution of soil processes through this life cycle is a new aspect of soils research that the international community is currently not addressing.

SoilTrEC will utilise international dissemination and training as integrating activities that build engagement between consortium partners, and also between researchers and stakeholder partners who are involved. These include EC policy teams, national agencies, companies and land managers.

EXPECTED RESULTS

The focus of research activities on the CZOs creates an unprecedented critical mass of effort in soils research within a single project.

Laboratory data sets and mathematical modelling of soil processes will provide some of the most comprehensive data sets ever obtained on soil function from nano to soil profile scale.

Detailed process models of physical hydrology, biogeochemistry, carbon dynamics and the soil food web at the EU CZOs will provide the first ever evaluation of soil functions at different stages of the soil life cycle.

Soil processes will be evaluated with the CZ integrated model, from catchment to river basin scale. This includes prototype results for upscaling to assess European soil threats.

The 4 SoilTrEC CZOs will be integrated with additional EU, USA and Chinese field sites as the first global network of CZOs. This enables soil processes and threats to be studied along environmental gradients at planetary scale.

The CZ integrated model will be applied across the global network of sites. This will create a major, new evidence base for policy in the EU, EU member states as well as the US and China.

Pro-active engagement with stakeholders draws on the knowledge gained from the CZO network, the modelling and decision support. This will be extended by studying affiliated sites where land management is presumed sustainable and will provide evidence-based guidance for sustainable soil management practice.

PROJECT PARTNERS	
University of Sheffield, GB	N. Poushkarov Institute of Soil Science, BG
Technical University of Crete, GR	Deltares, NL
European Community represented by the European Commission – Directorate General Joint Research Centre, IT	University of Iceland, IS
Wageningen University, NL	University of Natural Resources and Applied Life Sciences (BOKU) Vienna, AT
Natural Environment Research Council – Centre for Ecology and Hydrology, GB	ETH Zurich, CH
Czech Geological Survey, CZ	Institute of Agricultural Resources and Regional Planning CAAS, CN
The Pennsylvania State University, US	Swedish University of Agricultural Sciences, SE
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