

**Implementation of a Soil Degradation and Vulnerability  
Database for Central and Eastern Europe  
(SOVEUR Project)**

*Executive summary of an international workshop  
(Wageningen, 1-3 October 1997)*

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## **ACKNOWLEDGEMENTS**

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## 1 INTRODUCTION

Environmental policies regarding air and water quality were well developed before soil protection became an important issue, possibly because effects of soil pollution are far less conspicuous. In Europe, the need to protect the soil against pollution was first proclaimed in 1972 in the European Soil Charter. Present concern about adverse effects of point-source and dispersed pollution is related to negative effects on crop quality and quantity, and ultimately on human health and biodiversity. The problems include pollution associated with the excessive application of nutrients, the heavy metal content of fertilizers and manure, human-induced acidification, loss of organic matter, decrease in soil biological diversity, physical degradation, and erosion by water and wind (Barth and L'Hermite, 1987; Stanners and Bourdeau, 1995).

Estimates of areas of land affected by specific types of human-induced soil degradation in Europe have been presented by Oldeman *et al.* (1991) and revised by Van Lynden (1995). Ter Meulen-Smidt (1995) reviewed regional differences in inputs and distribution of contaminants in Europe, describing broad regional trends in chemical loads. Csikos (1994) reviewed important 'hot-spots' of pollution in selected Central and Eastern European countries. These studies show that regional and continental estimates of the actual extent of degraded and polluted land, and of areas at risk, remain open to improvement as well as the need to harmonize procedures of measurement and threshold levels used.

Some countries in Europe have started systematic recording, monitoring and clean-up programmes of contaminated sites based on established reclamation methodologies, the implementation of which is often constrained by financial, legal and technical factors. Improved data on the extent of soil degradation and pollution, and establishment of monitoring networks to assess the effectiveness of measures that have been put in place, are seen as a pre-requisite to any further coordinated approach to soil protection in the whole of Europe. It is in this overall context that FAO and ISRIC initiated the project on Assessment of Soil and Terrain Vulnerability in Central and Eastern Europe (SOVEUR), within the Framework of the FAO/Netherlands Government Cooperative Programme.

The current SOVEUR project is a sequel to: (1) initial discussions during a workshop organized by ISRIC in the framework of the Chemical Time Bombs (CTB) project (Batjes and Bridges, 1993), and (2) the overall objective of the Food and Agriculture Organization (FAO) of the United Nations, International Society of Soil Science (ISSS), International Soil Reference and Information Centre (ISRIC) and United Nations Environment Programme (UNEP) to up-date the information on world soil resources in a uniform digital database (Oldeman and Van Engelen, 1993).

## 2 PROJECT OBJECTIVES

The SOVEUR project calls for the compilation of an environmental information system for 13 countries in Central and Eastern Europe, in close collaboration with specialist institutes in Belarus, Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Moldova, Poland,

Romania, Russia (west of the Urals), Slovak Republic and the Ukraine. Basically, there are three main activities in the SOVEUR project:

- 1) Development of a soils and terrain digital database, at 1:2.5 million scale for the 13 countries under consideration. The proposed, uniform methodology for this part of the work is one which ISRIC, FAO, UNEP and ISSS developed for the Global Soil and Terrain Database (Van Engelen and Wen, 1995), SOTER, with modifications necessary to accommodate for the 1:2.5 million scale (Batjes and Van Engelen, 1997).
- 2) The SOTER map, with its unique delineations of terrain units - consisting of uniform areas in terms of landform, surficial lithology and soils - is to be used as a geographic basis for an assessment of the status of soil degradation, with special focus on pollution (Van Lynden, 1997).
- 3) In the third activity, the full SOTER database is to provide the soil geographic and attribute data for an assessment of the vulnerability of soils to selected categories of pollutants. The ultimate aim of this part of the project is the identification of broad areas of soils considered at risk from re-mobilization of specific contaminants subsequent to environmental changes (Batjes, 1997), a phenomenon that has been referred to by the metaphor of "Chemical Time Bombs" (Stigliani, 1988, 1993).

In order to realize the SOVEUR project goals, methodologies for the three project activities enumerated above were prepared for discussion during an international workshop held at ISRIC from October 1-3, 1997. During the workshop, aspects of data availability, accessibility and comparability were discussed in relation to the stated project objectives and methodologies proposed for the various tasks. A central focus in the discussions was to arrive at a consensus on workplans for project implementation by country, through memoranda of understanding, under overall coordination by ISRIC.

### **3 STRUCTURE OF WORKSHOP**

The study of soil degradation and estimation of pollutant accumulation and migration under changing environmental and socio-economic conditions, which are key objectives of the SOVEUR project, is complex irrespective of scale. Relevant information at the continental or regional level will include data about climatic conditions, soil and terrain types, hydrology, contaminant loading in relation to human activity, and modifications in contaminant behaviour in relation to changing environmental conditions.

Confirming the existence and location of the various data, and identifying their content, is one of the first steps in accessing, processing and analyzing the data. Consequently, the focus during the first part of the workshop was on the presentation of "country-reports", in which the participants provided information on many of the above inter-related issues; these will be published as separate proceedings. In addition, representatives of the European Soil Bureau

(ESB) and the French Institut National de la Recherche Agronomique (INRA) provided information on complementary soil database development activities in Europe, notably with respect to the PHARE countries.

During the second part of the workshop, the focus of the presentations and discussions was on the methodologies proposed for the three main project activities. A leading theme in the three presentations was the need for uniform and explicit methodologies, based on clearly defined criteria, for subsequent application by the respective countries. Besides these largely technical issues, consideration was given in the discussions to the potential end-users, both at a national and regional level, and on increasing national and regional awareness about the SOVEUR project activities.

Subsequently, the working groups determined realistic goals for the project implementation phase, and this notably in terms of methodological approaches and feasible outputs in relation to overall data availability. Upon reaching a consensus on methodological issues, workplans for the implementation phase were developed. Parallel to this activity, a SOTER software demonstration was given and the draft physiographic (SOTER) base map for the region was presented with a view that participants refine, where necessary, the preliminary boundaries drawn.

## **4 WORKSHOP DISCUSSIONS AND RECOMMENDATIONS**

### **4.1 Discussions**

From the start, the workshop organizers clearly specified that in order to implement the SOVEUR project successfully 3 subsequent steps would have to be undertaken: (1) creation of a SOTER database, (2) documenting the soil degradation/pollution status, and subsequently (3) mapping the vulnerability of soils with respect to Chemical Time Bombs.

During the discussions participants were asked to discuss availability and accessibility of data, which are needed for use in the project, by country. Prior to the workshop, a proforma was completed by participants listing the background materials such as physiographic maps, soil maps, soil correlation tables, information on the main types of soil degradation and point sources of pollution, maps of contaminant loadings and criteria in use for pollution assessment. To assist with the subsequent assessment for vulnerability, participants were requested to supply details of any relevant historical land use or statistics, the net accumulated loading of soils from 1950 to the present day, fertilizer use and contaminant composition, and any information about contaminants removed from soils by crops. Information on maps of accumulated contaminant loads was collected also.

Following the plenary sessions where each country presented its information, discussion groups explored the main issues of soil degradation and pollution of regional concern which

were mappable at the scale of 1:2.5 million. The availability, accessibility and comparability of the primary and secondary data required were explored with a view to the possibility of model development and the preparation of soil vulnerability maps. Discussion also took place about the potential users of the information and the means whereby awareness of the project could be increased, especially in policy and administrative circles.

#### **4.2 Recommendations**

Each discussion group returned to the final plenary session with a short report on its findings. These may be summarised as follows:

- 1) Sufficient information is available and accessible for all participating countries on physiography, pedological data and soil degradation status necessary for project activities (1) and (2) at the scale of 1:2.5 million. At the moment a 1:500,000 SOTER database exists for Hungary. Other countries in the region have enough georeferenced information to develop a 1:2.5 million SOTER shortly. Soil data according the FAO Legend (ESB Soil Map of Europe, respectively correlation work carried out at Dokuchaev Institute for SOVEUR project) is already available and the background information needed on surficial lithology and soil profiles necessary to subdivide SOTER units into terrain components and soil components is easily accessible and as such can be compiled in the required format (see Batjes and Van Engelen, 1997).
- 2) The proposed SOTER methodology is adequate to handle the necessary soil geographic and attribute data. The SOTER system will be used to store the relevant information and participants indicated they were willing and able to enter the data into the system for their individual countries.
- 3) Careful boundary correlation will be necessary for the soil geographical data and the interpretation of current status of soil degradation, also because some of the standards may differ within countries and across the region.
- 4) Most analytical methods are broadly similar within the region and participants agreed they can be brought to a common system using expert knowledge. However, certain physical determinations on soils are made using fundamentally different criteria. Where these variations occur (as with determinations for particle-size class in former Soviet Union countries) these differences must be recorded in the database, as has been done in the European Soil Database, and data comparison may prove difficult. In this context, it would be useful for ISRIC, ESB and the participating countries to initiate joint comparative studies of commonly used soil analytical procedures. In addition there is a lack of measured data on soil physical parameters, such as bulk density, moisture retention and hydraulic conductivity for the region.
- 5) It has been agreed that maps demonstrating soil degradation status are needed prior to further development of soil vulnerability maps.



- 6) The group discussions stressed the need for consideration of as wide a group of contaminants as possible in the assessment of soil degradation status, consistent with the adopted 1:2.5 million scale of mapping, available time and finance. As it is often difficult to distinguish between natural and human induced soil degradation, this distinction is not considered critical by the workshop. However, in cases where this distinction is possible, human causative factors should be documented according to criteria to be defined in revised guidelines. The participants noted there will be regional differences in precision of information about different types of soil degradation, e.g. water erosion versus contamination by radionuclides.
- 7) Clear definitions are necessary for "slight", "medium" and "strong" degradation as perceptions of these terms may vary between countries; in the absence of such uniform criteria the interpretation of "severe" degradation by water erosion may not be the same in different countries, complicating boundary correlation between countries.
- 8) The workshop pointed out that criteria have not been given by Van Lynden (1997) for nitrates and phosphates and recommended that figures be given as "maximum permissible levels" rather than "pollution". Permissible levels are to be proposed, based on available literature data. Also, there seems to be no place (yet) for some inorganic pollutants in the guidelines.
- 9) It is not always possible to give the exact extent of soil pollution, even when the source of pollution is exactly known. In such cases, georeferenced information on point-source pollution should be included in the pollution section of the "soil degradation status" database, specifying the main source and type of pollutants.
- 10) The workshop agreed that the vulnerability assessment, in the first instance, should focus on one degradation factor (i.e. contaminant) and trigger mechanism. It has been proposed that the vulnerability of soils to cadmium mobilization, as induced by acidification should be the first vulnerability mapping exercise in the SOVEUR project.
- 11) Rating systems and models for specific soil vulnerability studies should be developed and refined by small groups of experts, by pollution scenario, once the necessary input databases have been created or accessed.
- 12) Initial project results in terms of the SOTER database and the database of soil degradation status in Central and Eastern Europe will be presented and discussed during an international workshop to be held (tentatively) in June 1998; participants were invited to suggest possible venues for this workshop. This second SOVEUR workshop may also serve to form the expert-groups needed to refine and test the procedures for assessment of soil vulnerability to delayed pollution.
- 13) As a general conclusion it was observed that working at the scale of 1:2.5 million is an excellent exercise for integrating data and expertise from a range of countries. However,

for the future more detailed systems need to be developed, especially for the smaller countries.

- 14) Copies of the integrated-databases, developed for the SOVEUR project, will be made available to all participating organisations.
- 15) In the first instance, the products derived from the project would be of interest to planners and policy-makers and civil servants of the Governments of the participating countries, as well as international organizations such as FAO, UNEP and the European Union. In addition, there is an important role in education as currently the soil is not seen as deserving protection from degradation and pollution by many authorities.
- 16) The group expressed a need for more information for example on reference literature on trigger systems and delayed pollution in relation to main capacity controlling properties of the soil; a practical solution could not be presented on increasing this availability.
- 17) There is a need to improve communication between different groups working on similar topics. Thus awareness on SOVEUR project activities should be increased through newsletters, publications and enhanced communication, both within and outside the SOVEUR group.
- 18) It would be useful to develop a meta-database on available data/information about soil degradation and pollution by country, in conjunction with a glossary of terms.
- 19) As more than one authority or institute in each participating country is concerned and has related information, data or maps, special institutional arrangements may be made to allow effective cooperation at country level. It is up to the country to decide on formation of such arrangements which may be the establishment of a coordination committee to ensure up-to-date information and data.

### **4.3 Project implementation**

Following agreement on the feasibility of developing a SOTER database and database of soil degradation status for the region, draft workplans and sub-contracts for the implementation phase were discussed and agreed upon, on behalf of the relevant institutes. It has been agreed that these two "outputs" would be completed before April 30, after which date ISRIC would merge the respective national contributions into a central database. The preliminary results of the "soil degradation status" mapping exercise will be presented and discussed during a workshop, tentatively planned for June 1998. All participating national institutes have been invited to propose a suitable venue in their respective countries, for evaluation by ISRIC. An important theme of the second workshop will be to refine further the methodological approach for soil vulnerability mapping, with focus on selected soil pollution issues.

## 5 CONCLUSIONS

The workshop concluded with the acknowledgement that:

- 1) Participants agreed that in order to rapidly achieve the project goals, full collaboration of all parties concerned with respect to the sharing of data and information will be essential. However, some data may be in the process of being collected and delays therefore may occur in collation, which in turn may affect the tight schedule of implementation tasks for the SOVEUR project.
- 2) Specialist institutes from the 13 participating countries will proceed with the compilation of a soil and terrain (SOTER) database.
- 3) This will be followed by a survey (database) of soil degradation and pollution status, in each country at a scale of 1:2.5 million.
- 4) Upon their completion, the national contributions for items 2 and 3 will be merged into one central database at ISRIC (April 1998). Eventual data gaps and border correlation problems recognized at this stage, will be re-solved by the institutes concerned in close consultation with ISRIC staff.
- 5) Staff at ISRIC will proceed with the development of simple models for assessment of the vulnerability of soils to selected pollution scenarios, in association with small groups of experts, which are to be identified during the second SOVEUR workshop (June 1998).
- 6) The SOVEUR project can play a significant role in enhancing scientific cooperation between European countries on issues of soil degradation and pollution.
- 7) The ultimate aims of the SOVEUR project are to strengthen regional awareness of the significant role soils play in protecting food and water supplies, and to demonstrate the need for environmental protection by the generation of land degradation and soil vulnerability maps.

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