

**The Role of ISRIC in the Collection and Dissemination of
Baseline Information on Soils of the World**

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Position paper, prepared for the Working Group on Defining Environmental Information Needs Early in the Next Decade. December 16-17, 1992, World Resources Institute, Washington D.C.



INTERNATIONAL SOIL REFERENCE AND INFORMATION CENTRE

The Role of ISRIC in the Collection and Dissemination of Baseline Information on Soils of the World¹

by L.R. Oldeman²

The International Soil Reference and Information Centre (ISRIC), located in Wageningen, the Netherlands has a mandate "to collect and disseminate scientific knowledge of the soils of the world aimed at an improved assessment of land resources for the development and sustained utilization for various agricultural and non-agricultural purposes in a changing global environment". ISRIC, founded in 1966, was born out of an initiative of the International Society of Soil Science, and was adopted by Unesco as one of its activities. Advice on the programme and activities of ISRIC is given by a Scientific Advisory Council with members from the Dutch scientific community and from international organisations such as FAO, Unesco, UNEP and ISSS. Core funds (around \$ 900.000 annually) are provided by the Dutch Directorate General for Development Cooperation, while presently an additional \$ 250.000 annually comes from external resources to fund special project activities. ISRIC has 25 staff members (12 scientific and 13 non-scientific). ISRIC's programme is centered around three major themes:

- Assisting developing countries in the establishment of national soil reference collections and soil profile databases, in the development of georeferenced soil and terrain databases, and by providing advice on the establishment, organization, equipment and procedures of soil analytical laboratories. These activities will lead to a strengthening of the capabilities of national soil institutions to deliver accurate, up-to-date and useful information on soil and terrain resources.
- Serving as a documentation centre about the soils of the world, with emphasis on soils of the developing countries. ISRIC houses a large collection of thematic maps on soils and land resources, has a well stocked library on soils and land resources and has a unique collection of 500+ soil monoliths, a selection of which are permanently exhibited with full documentation on the description, analytical data, environmental and management information. All data are stored in ISRIC's International Soil Information System (ISIS).
- Contributing to a better understanding of the world's soil potential in a changing global environment by participating in international soil classification programmes, through the establishment of a World Soils and Terrain Digital Database (SOTER), through acting as a clearing house of the World Soil Reference Database (WRB), through participation in projects for the Global Assessment of the Human-induced Soil Degradation (GLASOD) and through the establishment of a World Inventory of Soil Emission Potentials of Greenhouse Gases (WISE). ISRIC has been appointed as ICSU's World Data Centre-C for soil geography and classification.

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Because of limited financial resources available ISRIC's efforts to collect baseline information on the condition of global soil and terrain resources are modest. Although there is an increasing demand for improved soil and terrain information both at national and at global level, the assembly and dissemination of this information has to be done on a restricted budget and with limited staff. In the following account a brief summary is given of some of ISRIC's project activities, that are of direct interest for national and global environmental monitoring.

1. The World Soils and Terrain Digital Database (SOTER)

At the initiative of the ISSS a project was conceived by ISRIC and endorsed by ISSS in 1986 for the development of a digital global database on soil and terrain conditions at a scale of 1:1M. The increasing demand for georeferenced information on natural resources for a wide range of studies, (e.g. for land evaluation, soil conservation, vulnerability of soils to all types of soil degradation, including soil pollution, and for the greenhouse gas emission potential of soils of the world) justified the creation of SOTER. In SOTER, georeferenced map units are linked with a digital database specifying the key attributes of the components of these mapping units. Under a special grant from UNEP, ISRIC developed a methodology for SOTER and tested this in pilot areas in South and North America. The results were discussed at the XIVth International Congress of Soil Science (Kyoto, 1990).

The ISSS working group on Soils Databases recommended that ISRIC continues the coordination of SOTER. In February 1992, UNEP invited an international panel of soil scientists to evaluate SOTER. As a result, recommendations were given for a final modification of the SOTER manual. This manual will be printed and distributed as a joint publication of ISRIC, ISSS, FAO and UNEP. In view of the fact that during the initial phase of SOTER, ISRIC provided the coordination and management functions for the project, the panel recommended that ISRIC continues to coordinate activities until adequate funding can be obtained for the main operational phase of SOTER to begin. So far donors, with the notable exception of UNEP, have been reluctant to provide financial support for SOTER activities, although proposals for SOTER activities have been tabled for West Africa, Central America, Central and Eastern Europe. Early 1993 a SOTER activity in Kenya will be launched (UNEP funding again).

2. Global Assessment of Soil Degradation (GLASOD)

Although soil degradation is recognized as a serious and widespread problem, its geographical distribution and the areas affected are only very roughly known. Sweeping statements on the fact that soil erosion is undermining the future prosperity of mankind do not help planners and policy-makers who need to know where the problem is serious and where not. While UNEP recognized the importance and potential of SOTER—a long term project with the potential for an assessment of the rate and risks of soil degradation—that organization indicated the need to produce, on a basis of incomplete knowledge, a scientifically credible global assessment of soil degradation in the shortest possible time. "Politically it is important to have an assessment of good quality *now*, instead of having an assessment of very good quality in 15 or 20 years". Within a period of three

years ISRIC was asked to implement and coordinate GLASOD. The World Map of the Status of Human-induced Soil Degradation and the accompanying statistics of areal extent of soil degradation types, their degrees and causative factors have attracted attention worldwide and fulfilled the objective: "To strengthen the awareness of policy-makers and decision-makers on the dangers of inappropriate soil and land management". GLASOD was prepared with the expert advice of over 200 soil scientists worldwide who were asked to provide their expert opinion on the types, degree, areal coverage and human-induced causes of soil degradation in their regions using general guidelines to ensure a certain degree of uniformity of interpretation. This GLASOD map is only a first approximation of the state of the world's soil resources. Since no systematic evaluation of the status of human-induced soil degradation worldwide has ever been made before, the current status could not be compared with any earlier observations. Because of scale limitations, and the qualitative nature of GLASOD, this database cannot serve as a base for monitoring further soil degradation in detail. However, a recent meeting of the Group of Soil Conservation specialists of the Council of Europe have recommended a plan to update and provide more detail upon the European section of the GLASOD map.

3. World Inventory of Soil Emission Potentials (WISE)

This activity deals with a Geographic Quantification of Soil Factors and Soil Processes, that Control Fluxes of Greenhouse Gases. It commenced in September 1991 within the framework of the Netherlands National Research Programme on Global Air Pollution and Climate Change. The project has a duration of three years. In order to assemble and handle the data required for an assessment of methane production from wetlands and/or irrigated rice soils a global soils database with a grid size of 30' latitude and 30' longitude is being compiled from the 'cleaned' digital version of the 1:5 Million Soil Map of the World in close collaboration with FAO's Land and Water Division.

4. IGBP-DIS Working Group for Soils Data Bases

This working group recently met to appraise the global coverage, nature and reliability of soils information, initiating a dialogue between global change modellers, soil scientists and soil database specialists, and to consider the strategy for creating a global, georeferenced database of soil profile (pedon) data suitable for global change modelling studies. Researchers interested in developing models for the purpose of predicting aspects of global change require information about soils of the entire world. "For better or worse, the gathering and interpreting of soils information for various modelling purposes has largely been done by individuals not trained in any aspect of soil science". However, several agencies have compiled international collections of soil profile information (e.g. USDA-Soil Conservation Services, ORSTOM, ISRIC, FAO), but their databases are not readily accessible, incompatible and incomplete. The recent IGBP-DIS initiative to bring these resources together is laudable and should be endorsed. ISRIC has a vested interest to participate in such a programme, not only because it is written into our mandate, but also because it would serve the needs of and further the SOTER and WISE programmes.

5. Development of a Cartographic and Bibliographic Information System of Soil and Terrain Resources (STRING)

The aim of this programme is to develop a systematic inventory of published bibliographic and cartographic documentation on soil and terrain resources, as well as on details about national and international institutions responsible for soil resources inventories. At the request of the Observatory of the Sahel and the Sahara (OSS) ISRIC is developing a STRING for some 20 countries in this region which would provide an orderly arrangement of soil and terrain resources in the form of a systematic, open-ended computerized information system, and which would form the basis of an operational network of institutions and individual specialists in the region.

Environmental Information Needs

Policy-makers, decision-makers and the scientific community need a ready access to natural resource databases in order to make an assessment of the productive capacity of the soils, to have a better understanding about the rate and risks of soil degradation, and to further improve estimates on global change.

While policy-makers and decision-makers need to be informed about these issues in the form of thematic maps and complementary statistics, the scientific community need actual data on a variety of soil and terrain attributes for use in their modelling research.

There is thus a need for a system which can store detailed information on natural resources of all kinds in such a way that this data can be accessed quickly and combined easily. It must be structured in such a way, that each combination of land, soil, water, vegetation and population which exists within a certain delineated area (be it a district, a country or a continent) can be rapidly analyzed. The lack of such a system in most countries, in particular in the developing countries, has been one of the most important constraints to the solution of fundamental problems and to the efficient use of resources. This has been felt both by the countries themselves, and by aid donors frustrated at the meagre results from their contributions. Such a system would consist of the following:

- A computerised digital database containing available and in most cases detailed information on topography, soils, climate, vegetation, land use; population (human, domestic animals, wildlife, etc.), and infrastructure, as well as the whole range of socio-economic factors such as food requirement attitudes, skills, labour, costs of inputs, and availability of markets.
- A so-called Geographic Information System (GIS), which ties each item of information to its precise geographical location, but which can display each separate type of information as a separate layer, or overlay. This makes it possible to display or print maps of any combination(s) of information required, virtually instantaneously.
- A set of crop yield models which could use combinations of soil and climatic attributes to calculate the level of agricultural production at a number of different input levels.

- Various environmental impact models, which allow the calculation of rates of erosion at pollution thresholds for a given land unit, land use, and production system.

The World Soils and terrain Digital Database —SOTER— is a computerized database system with detailed information on soils and terrain resources and is complemented with compatible files on climate, vegetation and land use. The databases are linked to its precise geographic location through a GIS. As stated in the project document on "Global Environmental Monitoring" (WRI, CIT, 1992): "These data would be invaluable to local and national planners and to those seeking to set priorities for global action and environmental assistance". The applicability and usefulness of SOTER has been confirmed by international organisations such as UNEP, FAO, ISSS, and the CGIAR. This recognition in itself is not a guarantee for the success of SOTER. The speed at which a worldwide coverage in SOTER can be achieved is directly proportional to the financial support received from donor agencies.