Water & Soil – Soil

European Commission

Global Monitoring for Environment and Security

GMES

geoland

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geoland Soil Observatory

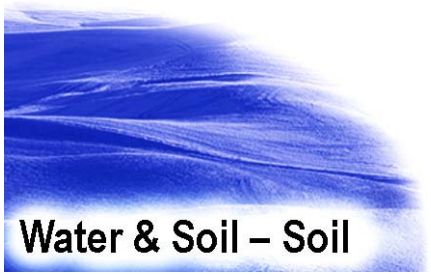
Soil, the weathered material between the atmosphere at the Earth's surface and the bedrock below the surface, is a vital, largely non-renewable resource which ensures a number of environmental, economical, social and cultural key functions. A mature, fertile soil is the product of centuries of physical and chemical weathering of rock, combined with the addition of decaying plants and other organic matter. However, drought coupled with natural or human-induced reduction in vegetation cover and poor agricultural practices lead to soil aggregate breakdown and soil organic matter losses while poor irrigation practices lead to salinization. Soil erosion, a natural geological phenomenon resulting from the removal of soil particles by water and wind, affects both agriculture and the natural environment and is one of the most important (yet probably the least well-known) of today's environmental problems. Soil erosion together with vegetation cover changes are involved in all desertification processes.

Although soil erosion has been occurring for some 450 million years, since the first land plants formed the first soil, 'accelerated' soil erosion is a much more recent problem. It is always a result of mankind's unwise actions, such as overgrazing or unsuitable cultivation practices, which leave the land vulnerable during times of erosive rainfall or windstorms. Many centuries of severe human pressure coupled with the local climatic (long dry periods are usually followed by intensive rainfall) and physical (steep slopes, tiny top-soil layers) conditions make the Mediterranean an EU region that is particularly affected by soil erosion phenomena caused by water.

In response to concerns about the degradation of soils in the EU, the European Commission has outlined the first steps in a strategy to protect soils by publishing a communication "Towards a Thematic Strategy for Soil Protection", where erosion has been identified as one of the major threats to soil in Europe. This is the first occasion on which the Commission has addressed soil protection for its own sake and therefore the Communication is both broad and descriptive in approach as well as charting the way forward. Moreover, the strategy is one of seven 'thematic strategies' foreseen under the EU's 6th Environment Action Programme.

It is widely agreed on international level that greater understanding of the occurrence, processes and impacts of soil erosion by water, wind and tillage is needed in order to enhance mankind's ability to tackle the resulting environmental problems. For example, future rates of water erosion are likely to be affected both by climate change, as well as by land use change. More specifically, rates of water erosion are likely to respond to increases in rainfall in a non-linear manner, with disproportionately greater increases occurring in wet years. Consequently, further research is required since there are still large gaps identified in our knowledge on soil erosion.

Since soil erosion processes by water are both varied and complex, several modelling approaches like USLE (Universal Soil Loss Equation), RUSLE (Revised Universal Soil Loss Equation) and PESERA (Pan-European Soil Erosion Risk Assessment) have been developed for a range of temporal and spatial scales. The development of related input datasets involves the measurement of baseline variables (e.g. rainfall and wind intensity, soil moisture, surface roughness, soil erosion rates) over several years. However, in order to identify which approaches are most robust to be used at different scales, existing models need to be compared using datasets from a wide range of environments. In that sense, long-term observations from space



provide a practical way of implementing a monitoring system in order to derive broadly applicable and cost-effective information related to soil erosion over large areas.

Based on the above, it seems that there is a general lack of suitable soil degradation monitoring methods and services that are robust and precise enough to assist future action in planning and guiding anti-soil-erosion activities either at a national or international level.

The Soil Observatory which is a part of the Geoland project aims at the development of such pre-operational tools for soil erosion risk assessment services which are in line with current EU policies and are based in the use of Earth Observation data, image analysis techniques and GIS models.

More specifically the Soil Observatory focuses in the comparison of different soil erosion models at different scales (1:10.000, 1:50.000 and 1:100.000) in order to identify which approach is the most suitable to be used at each scale by taking into account the data availability in the selected test sites (Greece and Italy).

Moreover, since accurate information on the land cover seems to be invaluable in any soil erosion model, the observatory focuses on the following:

- the preparation or the identification of a land cover base map suitable to be used in all the selected erosion risk models for testing and benchmarking;
- the development of methods for the mapping of unexpected events such as forest fires and landslides that affect the cover and the use of the land (hot spot mapping)

The following partners and users constitute the Soil Observatory currently:

The Mediterranean Agronomic Institute of Chania (MAICh), the Aristotle University of Thessaloniki (AUTh) and the University of Trieste contribute in the development of the Soil Observatory while European Topic Centre on Terrestrial Environment (ETC-TE), Agenzia per la Protezione dell'Ambiente e per i servizi Tecnici (APAT) and National Agricultural Research Foundation – Forest Research Institute (NAGREF-FRI) have been identified so far as being the key users operating at European, national and regional-local level.

Apart from the aforementioned users the Soil Observatory is in close collaboration with the Agricultural University of Athens that was heavily involved in the development of the PESERA model and the Greek Ministry of Environment and Public Works who is involved in the implementation of all environmental policies in Greece.

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