

Developing SoilML as a global standard for the collation and transfer of soil data and information.



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Abstract

There is an increasing need to share soil data and information within countries, across regions and globally. Timely access to consistent and authoritative data and information is critical to issues such as food production, climate change, water management, energy production and biodiversity.

Soil data and information is managed by numerous organisations using a plethora of processes, scales and standards. A number of national and international activities and projects are currently dealing with the issues associated with collation of disparate data sets. Standards are being developed for data storage, transfer and collation like, for example, in the *GlobaSoilMap.net* project, e-SOTER and the EU Inspire GS-SOIL.

Individual projects will not provide a single internationally recognised and adopted standard for soil data and information exchange.

There is a need to develop a global soil information standard, to be called SoilML, that would allow access and use of data across a broad range of international initiatives (such as GEOSS and INSPIRE) as well as supporting national, regional and local data interoperability and integration.

There is agreement to adopt the interoperability approaches of formalising the information model in UML with XML encoding for data transfer as well as re-using existing features and patterns where appropriate such as those found in GeoSciML and Observations and Measurements. It is proposed to establish a formal Working Group on Soil Information Standards under the International Union of Soil Science to give the SoilML information model both scientific credibility and international standing. A number of meetings and workshops are being planned to progress the draft SoilML information model.

Proposal to establish an IUSS Working Group on Soil Information Standards

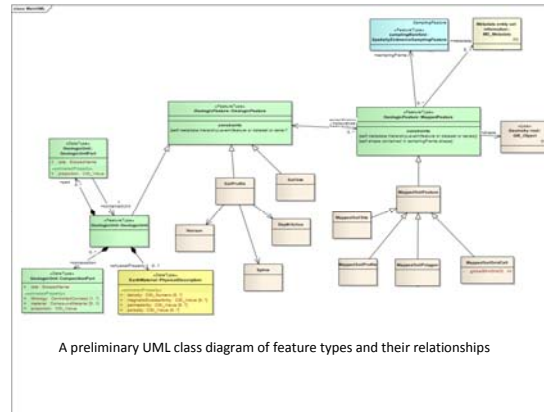
The Working Group goal is:
To provide collaboration and coordination of soil information standards efforts worldwide.

This will be achieved by:

- Developing an abstract UML information model for soil called SoilML (considering existing information standards such as ISO, Observations & Measurements, GML, GeoSciML etc) to be promoted as an International Standard for soil data transfer and collation
- Considering and promoting the role of soil information and standards in GEOSS the Global Earth Observation System of Systems and other key user forums.
- Developing an international soil sample numbering system to avoid data translation and duplication errors
- Holding annual meetings or workshops in conjunction with IUSS Commissions and national soil science societies
- Providing training in Soil Information Standards to support capacity building (in conjunction with academic institutions and national and international agencies).

The specific objectives of the Working Group are to:

- develop a conceptual model of soil information drawing on existing data models
- implement an agreed subset of this model in an agreed schema language (UML)
- implement an XML/GML encoding of the model subset
- develop a test-bed to illustrate the potential of the data model for interchange
- identify areas that require standardized classifications in order to enable interchange.



Rational for an IUSS Working Group

The development and adoption of information standards for soil data is critical. Individual projects will not develop a widely applicable international soil data standard and may not have longer-term, enduring, non-project responsibilities.

Development of standards requires a strong governance arrangement to ensure coordination and consolidation of effort.

An IUSS working group will provide international scientific credibility as well as a focus for the soils community and others dependant on soil data and information. This follows a similar approach adopted by the International Union of Geological Sciences (IUGS) in the development and governance for GeoSciML (see <https://www.seegrind.csiro.au/twiki/bin/view/CGIModel/WebHome>).

Current related soil information activities

Over the last few years, there has been a rapid growth in interest in this topic worldwide. A number of activities are individually developing harmonized approaches to managing soil data and information for specific project outcomes, including:

eSOTER - <http://www.esoter.net/>

The e-SOTER project started in 2008 and will last until February 2012. It will develop a data dissemination portal for e-SOTER based soil maps on the INSPIRE Directive and applying GEOSS Data Sharing Principles. Activities comprise the analysis of data specifications and exchange rules (XML) as well as the development of the SoTerML, closely linked with GeoSciML.

Harmonized World Soil Database http://www.fao.org/nr/lan/abst/lan_080701_en.htm

The Land Use Change and Agriculture Program of IASA (LUC) and the Food and Agriculture Organization of the United Nations (FAO) have developed a new comprehensive Harmonized World Soil Database (HWSD). The work was carried out in partnership with:

- ISRIC-World Soil Information, together with FAO, were responsible for the development of regional soil and terrain databases and the WISE soil profile database;
- the European Soil Bureau Network, which had recently completed a major update of soil information for Europe and northern Eurasia, and
- the Institute of Soil Science, Chinese Academy of Sciences, which provided the recent 1:1,000,000 scale Soil Map of China.

The HWSD is a 30 arc-second raster database with over 16000 different soil mapping units that combines existing regional and national updates of soil information worldwide (SOTER, ESD, Soil Map of China, WISE) with the information contained within the 1:5,000,000 scale FAO-UNESCO Soil Map of the World (FAO, 1971/1981).

GS SOIL - <http://www.gsoil.eu/>

Assessment and strategic development of EU INSPIRE compliant Geodata-Services for European Soil Data. Initial meeting held June 2009.

Seven working packages are defined - including: WP2 Content Provision Framework; WP3 Data Management and Meta-Data; WP4 Harmonisation and Semantic Interoperability.

Recently completed a review of requirements and context existing for harmonised soil datasets at a scale larger than 1:1 million - extended through online "Stakeholder Questionnaire on Soil Data Requirements". GS SOIL registered as Spatial Data Interest Community (SDIC) on the INSPIRE website (<http://inspire.jrc.ec.europa.eu>)

GlobalSoilMap.net - <http://www.globalsoilmap.net/>

A consortium that aims to make a new digital soil map of the world using state-of-the-art and emerging technologies for soil mapping and predicting soil properties at fine resolution. This new global soil map will be supplemented by interpretation and functionality options that aim to assist better decisions in a range of global issues like food production and hunger eradication, climate change, and environmental degradation. This is an initiative of the Digital Soil Mapping Working Group of the International Union of Soil Sciences IUSS.

Key Points

- ❖ Individual project focused activities will struggle to develop a widely agreed international standard for soil data and information sharing
- ❖ There is much to learn from other communities of practice - e.g. the development of GeoSciML
- ❖ It is important that the most authoritative soil scientific community establishes a strong, scientifically credible governance arrangement for development of data standards - that is why we are recommending the IUSS working group
- ❖ A body such as IUSS provides high level links to other related scientific communities (such as the IUGS and the water community) and to key users such as GEOSS, Inspire, OGC etc
- ❖ To maximize re-use of data and information, the core meta-data, attributes, vocabularies etc need to be common to all soils data and the IUSS should control what these core elements need to be and maintain the vocabularies used to describe them
- ❖ The outcome should be a core soil information model (SoiML) which allows interoperability and integration of consistent soils data and information products worldwide.