Support to EU Danube Strategy
Danube Land and Soil Nexus

Workshop to develop 250,000 soil database for Danube Basin using e-SOTER methodology

JRC, Ispra, Italy, 5-6/Feb/2015

e-SOTER Informatics Framework
Key lessons learnt

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Towards a standard for soil and terrain data exchange: SoTerML

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A R T I C L E   I N F O

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A B S T R A C T

Soil and landform information is needed for a wide range of applications but available data are often inaccessible, incomplete, or out of date. Within the European FP7 project e-SOTER, following recognised harmonisation principles, we developed an XML schema to serve as an exchange format for soil and terrain data derived from e-SOTER methodologies (SoTerML). It encompasses existing SOTER database conceptual modelling as well as the WRB (World Reference Base of soil resources) and the FAO soil data structures and classifications, therefore covering major soil and terrain databases such as the European Soil Database (ESD). The flexibility of the modelling achieved is demonstrated from legacy data integrated in the new scheme and made available using an OGC Web Feature Service. Along with the description of SoTerML, the paper aims at pointing out the modelling approach and the modelling principles used for soil and terrain observations, which extracted from our proposal, could prove useful for emerging initiatives towards defining an exchange standard framework for the soil theme.

e-SOTER - Work Package 6
Development of an e-SOTER Dissemination Platform
e-SOTER Work Package 6 Research Partners

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e-SOTER Work Package 6 (WP6) sought to effect the development, implementation, commissioning and execution of the data dissemination portal for the SOTER project, providing the basis for a global soil observation system based on INSPIRE standards and principles.

WP6 constructed a dissemination web portal to house and serve the various sources, scales and types of primary, intermediary, descriptive and output data required by SOTER. This portal represents the core information source and reference for e-SOTER data.

The research investigated practicability and feasibility of architecture to allow a ‘clearinghouse’ approach whereby web mapping services (WMS) and web feature services (WFS) could be generated distinct from the main global portal, for instance by discrete project data sources, and integrated, or consolidated, into the common standards-based web services API of the central portal. This will serve to facilitate future SOTER users who seek to implement information systems or draw upon the e-SOTER portal.
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WP6 – Tasks and Deliverable

• Analysis of **data specification and exchange rules** (XML) and development of concept rules for SoTerML (OGC)

• Soil profile and analytical **data management** (Global Pedon Database; Semantic Map Database)

• Development, setup and implementation of a **global/ European e-SOTER portal**

• Transfer of methods developed by WP1-3 into **Algorithm Database** and Incorporation into e-SOTER Portal

• Publication of European Dataset as DVD or **Publication** as an EU-Report

**Deliver:** Freely accessible e-SOTER operational **Web services and relational DBMS** including an algorithm database containing methods developed in WP1-6
Premis: The e-SOTER Portal will hold existing soil spatial and semantic information, plus the means to transform (via methods), integrate and apply to user application requirements.

e-SOTER portal outputs can be used to develop thematic and zonation mapping, data interrogation and as the basis for computerised modelling.
Key Activities: Data specification and encoding

- Preparation of the SoTerML 5.2, including data dictionary for nomenclatures and various data sources (metadata)
- Development of WRB 2006 XML exchange format
- Development of SoTerML for SOTER model, compliant with ISO/TC190/SC 1 N140 Recording and Exchange of Soil-Related Data
- Still a work-in-progress, but a sound basis from which to develop approach for Danube basin initiative
Database and e-SOTER Portal
http://portal.esoter.net/

- Transfer pre-existing and new soil data into a Postgres object-relational database
- Creation of a global/European e-SOTER Portal, including RDBMS structures, algorithm database and data dissemination services
- Testing of methods for data dissemination to global e-SOTER
System Architecture

Client Applications
- WMS/WFS
- Metadata
- Data Download
- Reporting

e-SOTER Portal and functionality

DMZ
- Web Server
  - Services
    - WMS/WFS
    - KML/XML Export
    - Metadata
    - SotTerML Import

Data loading
- Application processing

SOTER Database

Spatial Server

http://portal.esoter.net/
Lessons: Methodological approach

| Server Preparation                      | • Confirm server specification  |
|                                       | • Confirm root user and login; accessing server |
| Key software installation             | • Install database management system  |
|                                       | • Install web services systems  |
| Software configuration                 | • Database configuration |
|                                       | • Integration of web services and schemas  |
| Sample data and services               | • SoTerML data |
|                                       | • Simple Objects Services |
|                                       | • Complex Object Services |
Lessons: Use Cookbook

Cookbook
Procedures and guidance for implementing a SOTER Portal
http://www.esoter.net/
http://portal.esoter.net/
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About the Project

E-SOTER: Regional pilot platform as EU contribution to a Global Soil Observing System

Regional pilot platform as EU contribution to a Global Soil Observing System. Soil and terrain information is needed for many interpretations for example in the field of agriculture, environment, watershed management, infrastructure, etc. but available data are often inaccessible, incomplete, or out of date.

The Group on Earth Observations - GEO plans a Global Earth Observing System and, within this framework, the e-SOTER project addresses the felt need for a global soil and terrain database. As the European contribution to a Global Soil Observing System, it delivers a web-based regional pilot platform with data, methodologies, and applications, using remote sensing to validate, augment and extend existing data.

Users can visualize data in the viewer application as simple web mapping service and download data after registration. Advanced user are able to use complex web feature services using e.g. GAIA software for executing specific algorithm. Any data presented in the portal is described using a meta data record and algorithms to create these datasets are described in the algorithm database. Outstanding issues can be reported in the e-SOTER portal project management.

http://www.esoter.net/  http://portal.esoter.net/
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### Active Tickets

1. **Ticket #1**
   - **Summary:** WFS - Complex Web feature services
   - **Component:** WFS - Model Applications
   - **Version:** 1.0
   - **Milestone:** Task
   - **Owner:** WPS Team
   - **Status:** Assigned
   - **Created:** 01/31/13

2. **Ticket #2**
   - **Summary:** WPS - T&D Subtask Compaction Application
   - **Component:** Scripts
   - **Version:** 1.0
   - **Milestone:** Task
   - **Owner:** WPS Team
   - **Status:** Assigned
   - **Created:** 01/21/13

3. **Ticket #3**
   - **Summary:** The E-Soter Webservices Cookbook
   - **Component:** WPS - WPS Team
   - **Version:** 1.0
   - **Milestone:** Task
   - **Owner:** WPS Team
   - **Status:** New
   - **Created:** 03/19/13

4. **Ticket #4**
   - **Summary:** The E-Soter Webservices Cookbook
   - **Component:** WPS - WPS Team
   - **Version:** 1.0
   - **Milestone:** Task
   - **Owner:** WPS Team
   - **Status:** New
   - **Created:** 02/05/13

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*Note: See [TracReports](http://www.tracreports.com) for help on using and creating reports.*
e-SOTER Parser - 1

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MS Access DB
GIS Shapefile

Create / Obtain SOTER Legacy database
Run parser to create SoTerML file
Load into new SOTER database structure
Web mapping toolkits

Activity Log:
MDB selected: C:\esoter\eSOTER_ONEFULLRECORD.mdb
* Auto-detect: SOTER schema for the current data file is SOTER 2009
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e-SOTER Parser - 2
Shapefile attribute used to link to Soter database (usually SUID)

Select MDB file
Select Shapefile

AREA
PERIMETER
Country
Class_Name
Percent
SUID

Select Shapefile attribute used to link to Soter database 'SOTER.ONEFULLREC'. 1 Soter Units were processed. With 1696 warnings. Finalising output SoterXML file ... finished
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e-SOTER Parser - 4

Introduction
The work presented here is a direct output and deliverable of the EU Framework 7 project e-SOTER – Regional Pilot Platform in EU Contribution to a Global Soil Observing System. Grant Agreement Number 211578 (see http://www.esoter.net). The work described here was conducted under Work Package 6 of this project.

One of the key issues for the e-SOTER project was the transferring of any of the large set of legacy data files from the old SOTER format to the new SOTER-MF SOTER XML Synchronized markup language. The e-SOTER tool documented here has been written by the Cranfield University team as a common utility able to define or take an existing SOTER data source and transforming it.

Prerequisites
In order to run the utility, you should have a Java version 1.7 JDK or later and the Java SDK already installed and working correctly on the PC.

To test that Java is correctly installed (e.g. all the paths and environment variables are set up correctly) type at the command prompt "Java". If you then receive a popup full of Java help text, then all is well. If not, consult your Java Installation notes.

This code has been tested and runs successfully on standard Windows 7, XP and Vista computers.

Notes: If you wish to edit the code etc., we would recommend using the free IDE toolkit 'Netbeans' (http://netbeans.org). The Netbeans project file is included in the distribution.

Instructions on use
1. Download and unpack the compressed folder "eSOTERParser.zip" to a location of your choice.
2. At compiled binary files are required to run the tools are contained within this folder (the distribution code was compiled in Java). The source code is also provided.
3. Sample SOTER databases are provided in the "SampleDatabases" subfolder. The "output" folder contains the outputs created by the eSOTER project for the two sample cases (see http://www.esoter.net) for more details. The data files are in a legacy SOTER format comprising a shapefile and fixed ISO Access database.
e-SOTER Database

CREATE TABLE project {
    project_id SERIAL PRIMARY KEY,
    project_name VARCHAR NOT NULL
}

CREATE TABLE attribute_entry {
    attribute_id SERIAL PRIMARY KEY,
    name VARCHAR,
    description VARCHAR NOT NULL,
    source VARCHAR NOT NULL,
    value VARCHAR
}

CREATE TABLE value_entry {
    value_id SERIAL PRIMARY KEY,
    attribute_id REFERENCES attribute_entry(attribute_id) ON UPDATE CASCADE ON DELETE CASCADE,
    description VARCHAR,
    full_term VARCHAR,
    short_term VARCHAR NOT NULL,
    value VARCHAR
}

CREATE TABLE value_type {
    type_id SERIAL PRIMARY KEY,
    attribute_type VARCHAR
}

CREATE OR REPLACE FUNCTION cu_add_attribute(xml, text, integer) RETURNS integer AS $^$

DECLARE
    attribute ALPHA FOR #1;
    att_w xml;
    columnname ALPHA FOR #2;
    p_key ALPHA FOR #3;
    att_name text;
    method text;
    att_name_key integer;
    att_typeof text;-- varchar(20);
    att_numtype text;
    att_num_key integer;
    att_type_key integer;
    ns text[] := ARRAY[
        ARRAY['gml', 'http://www.opengis.net/gml'],
        ARRAY['gco', 'http://www.isotc211.org/2005/gco'],
        ARRAY['xsi', 'http://www.w3.org/2001/XMLSchema'],
        ARRAY['gmd', 'http://www.isotc211.org/2005/gmd'],
        ARRAY['sac', 'http://www.opengis.net/sampling/1.0'],
        ARRAY['xs', 'http://www.w3.org/2001/XMLSchema-instance']
    ];--list of the namespace uris for valid SoterML

$^$
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e-SOTER Schema
e-SOTER Schema

AttributeReference

AttributeEntry
+ name: ID
+ sourceElement: CharacterString [0..*]
+ description: CharacterString [0..1]

Attribute
+ name: IDREF

Value
+ literalValue: CGI_TermValue
+ numericValue: CGI_NumericValue
+ valueID: IDREF

AnalyticalMethod
+ introductionYear: CharacterString
+ introductionMonth: CharacterString
+ serialNumber: CharacterString
+ description: CharacterString

LaboratoryAnalysis
+ analyticalMethod 0..* 0..*

Laboratory
+ laboratory 1

Only one sub-element out of three can be implemented
Next steps – complex objects model
Drawing national data together: UKSO Case Study

Drawing together soils data from all principle UK soils organisations
http://www.ukso.org

Award-winning web tools by BGS
Select layers from multiple institutions ... for example (i) James Hutton Institute soils of Scotland (WRB) and (ii) NSRI ‘LandIS’ soils of England and Wales (WRB)
Drawing national data together: UKSO Case Study
Learning Points Summary

- ‘Fast track’ (e.g. within a year), get a rapid prototype up front
- Update e-SOTER technical approaches to SOTER 2013 manual
- SoTerML (use of parser to convert shp/access) a useful foundation
  - Needs further elaboration to ensure INSPIRE / ISO compliance
- Cookbook developed describes a test-bed technical implementation
  - Portal implementation and architecture
  - Database schema and implementation
  - SoTerML (parser and loader)
- Data represented
  - Spatial polygon geometry and profile points (not raster yet)
  - Attributes for profiles and all components
  - Algorithms
  - Metadata

http://www.esoter.net/    http://portal.esoter.net/