

ESA Φ-WEEK 2021

11 - 15 October 2021 | Virtual Event

New Space

The Earthserver Datacube Federation: A Single Pool of Pixels

Organization/Company: Rasdaman GmbH

📅 Thursday 14 October, 17:30-19:00

LANDSUPPORT: Towards a Free Integrated Land Decision Support System

Fabio Terribile

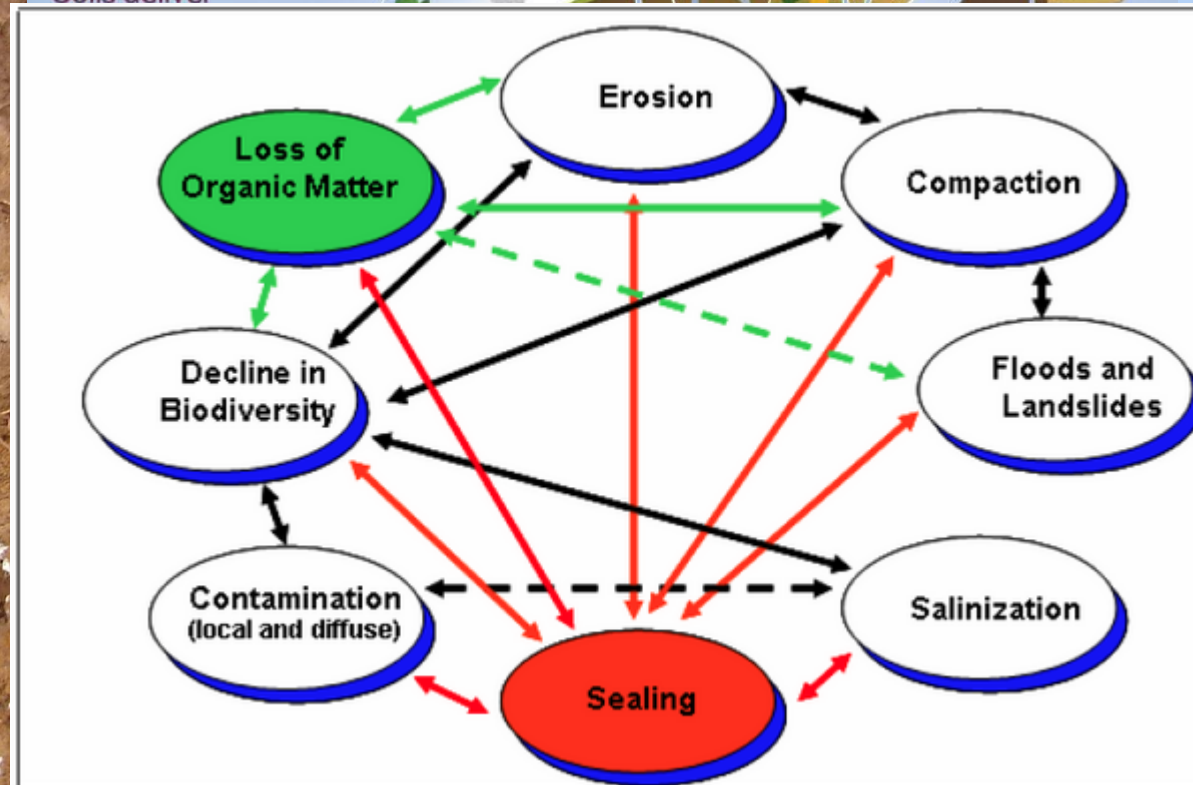
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... few words about myself ?



Soil functions

Soils deliver

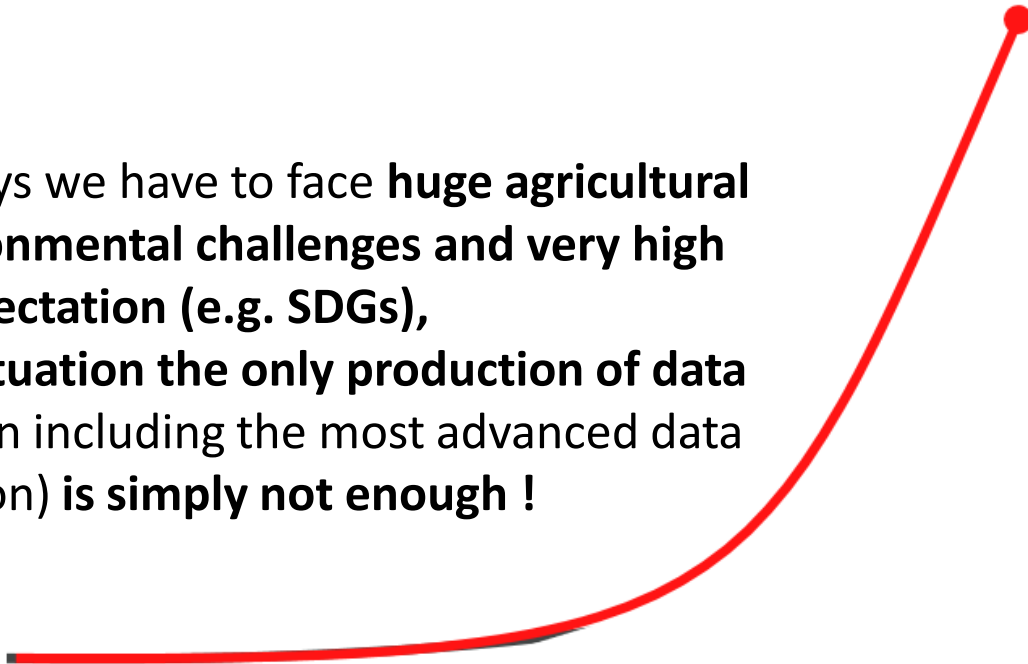


Producing data is extremely important !

... nowadays we have to face **huge agricultural and environmental challenges** and **very high policy expectation (e.g. SDGs)**,
...in this situation the **only production of data** (even when including the most advanced data visualization) **is simply not enough !**

Produce
Data

(satellites, data, maps, artificial intelligence, precision agriculture, omics, bioinspired molecules ...)



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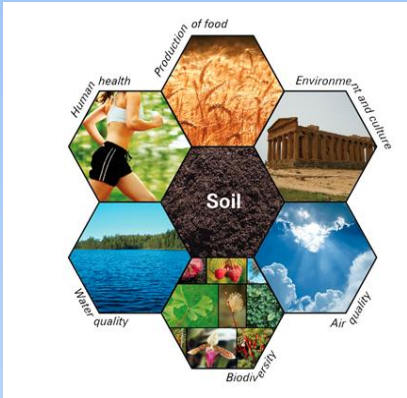
Use
Data (at institutions)

But why things are complex ?

Some important EU regulations concerning the management of agricultural/forestry and environmental issues.		
EU regulation/directive	Required answer	
	Time	Space
Rif. ACP System of conditionality Reg. (EC) 1782/03 1783/05	Dynamic	Varying in the landscape
Directive 91/676/EC Nitrates Directive 60/00 EC Water Framework	Dynamic	Varying in the landscape
COM 2006/231. Soil Thematic Strategy and NAP for Italy	Static/ Dynamic	Varying in the landscape
Directive 80/68/EC Groundwater against pollution	Dynamic	Varying in the landscape
Directive 86/276/EC Sewage sludge	Static/ Dynamic	Varying in the landscape
Directive 75/268/EC; Reg. (EC) 1257/99; art.19 reg.(EC) 1698/05 art. 50.3(a) Disadvantaged areas	Static	Varying in the landscape
Reg.(EC) 510/06 Reg.(EC) 1898/06 Designations of origin	Static	Varying in the landscape
Reg. (EC) 1698/05 Reg. (EC) 1974/06 Rural development in forestland	Dynamic	Varying in the landscape

In addition it is required to

- Have answers across different scales (action is often local !)
- Accounting for the multifunctional role of soil and landscape
- Data quantity/quality varying in space and time...



..then if life is complex, we require engines to address such complexity...



and NOT to oversimplify complexity !

...e.g. the only use of visualization tools - such as standard web-GIS - are simply not enough to address landscape management and planning complexity !



PROJECT TEAM COMMUNICATION COLLABORATIONS 

www.landsupport.eu

LANDSUPPORT

Development of **Integrated Web-Based Land Decision Support System** aiming towards the *Implementation of Policies* for Agriculture and Environment



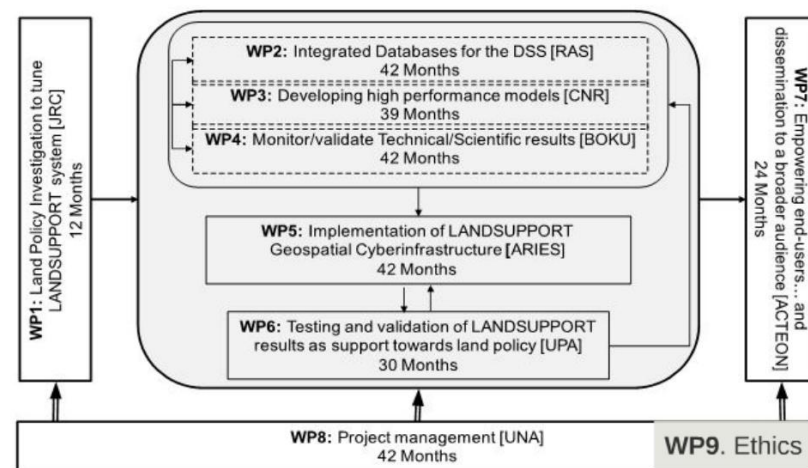
ACCESS TO THE
S-DSS PLATFORM





- 19 partners
- >10 countries
- 3.5 years
- €7 million budget
- >60 people
- 1200 person months
- >€300k travel!

May 2018 - April 2022



† Arrows with standard thickness represent DATA transfer - bold thickness KNOWLEDGE transfer - double line MATERIAL transfer

The objective of LANDSUPPORT is the construction of a web-based smart geoSpatial Decision Support System (S-DSS), which shall provide a powerful set of tools devoted to

- (i) support sustainable agriculture/forestry,
- (ii) support sustainable spatial planning
- (iii) contribute to implementation, impact and delivery of about 20 European land policies and SDG 15.3 “achieving a land degradation-neutral world”.

LANDSUPPORT will be applied at **four geographic scales:**

- ✓ EU;
- ✓ 3 Nations (Italy, Hungary, Austria);
- ✓ 2 European Regions in IT and HU;
- ✓ 4 pilot sites in AU, IT, HU, Tunisia;

List of participants		
#	Participant Legal Name	Country
1	UNIVERSITA DEGLI STUDI DI NAPOLI FEDERICO II.	Italy
2	ARIESPACE SRL	Italy
3	BARCELONA SUPERCOMPUTING CENTER- CENTRO NACIONAL DE SUPERCOMPUTACION	Spain
4	UNIVERSITAET FUER BODENKULTUR WIEN	Austria
5	CONSIGLIO NAZIONALE DELLE RICERCHE	Italy
6	Crops for the Future Research Centre	Malaysia
7	INTERNATIONAL CENTRE FOR AGRICULTURAL RESEARCH IN THE DRY AREAS	Lebanon
8	Institute of Advanced Studies	Hungary
9	Istituto Superiore per la Protezione e la Ricerca Ambientale	Italy
10	PASDAMAN GMBH	Germany
11	JRC - JOINT RESEARCH CENTRE- EUROPEAN COMMISSION	Belgium
12	REGIONE CAMPANIA	Italy
13	PANNON EGYETEM	Hungary
14	UNIVERSITA DEGLI STUDI DI MILANO	Italy
15	ZALA MEGYEI ONKORMANYZATA	Hungary
16	OMAST	Belgium
17	ACTEON SARL	France
18	UMWELTBUNDESAMT GESELLSCHAFT MIT BESCHRANKTER HAFTUNG (UBA GMBH)	Austria
19	GOZDARSKI INSTITUT SLOVENIJE	Slovenia

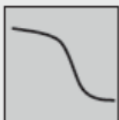
DATABASE

Vector Data



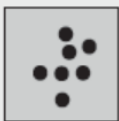
Polygon

(e.g. Administrative unit)



Line

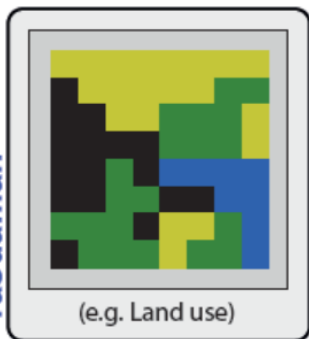
(e.g. Paths)



Point

(e.g. sites of cultural interest)

Raster Data



rasdaman

(e.g. Land use)

Application Server

Modelling

Static
off line - on the fly

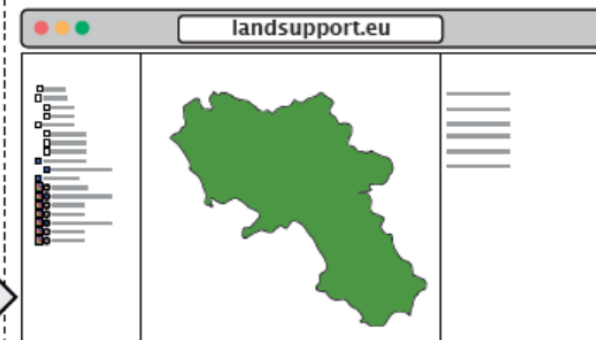
Dynamic
On the Fly

Functions

Labels
Statistical analysis
Maps
Statistical reporting
Output (pdf, html)

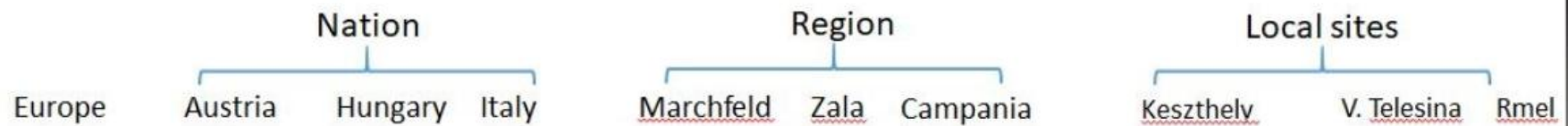
Services

GUI



Postgres Postgis

- **Deterministic central engines**, integrating crop growth and water balance ;
- **Stronger modular structure**, with basic routines easy to change (e.g. evapotranspiration, water balance) or easy to integrate with new routines and all clearly connected;
- Possibility to **switch the different modules on/off**, in accordance with the required application (e.g. soil erosion, soil water quality, salinization risk);
- Facilities for extensive **validation** (on the ground or through remote sensing);
- **Large use of datacube** facilities (*rasdaman*) and modelling using **HPC** approaches (GPU, COMPS);
- Ease in creating / **managing different scenarios** (what if modelling);
- **Assimilation** of new remote-sensing data;
- **Open Source** Web GIS;
- **Web-based Geospatial Decision Support Systems** abilities.



Public Authorities



Agriculture & Forestry



Environmental protection



Land take & Spatial planning



Biodiversity & Ecotourism



Each tool: specific territories/ specific policies/ specific user

Some examples from LANDSUPPORT

Some conclusions

We showed that if we think bigger... connecting datacubes-modelling-GUI in (**dynamic**) geoSpatial Decision Support Systems (S-DSS) we can indeed support sustainable land management.

S-DSS must be:

- i. based on the concept of soil/landscape **multifunctionality**;
- ii. potentially **adapted** to the need of **each end-user (action at the local scale)**;
- iii. enabling **“what if” modelling**.
- iv. Then we do not to provide “solutions” but **“options”**.
- v. **Local communities awareness** on soil/landscape conservation/sustainable management;
- vi. enabling to incorporate **bottom-up contributions to governance**;
- vii. **user friendly** (complexity is embedded);

But all this has a high cost

we (scientists, technical assistants, landscape planners and managers, stakeholders, farmers) must abandon some of our certainties (our approaches) and reschedule part of our work !



...otherwise we never meet !

Needless to add; the challenge is very difficult but powerful... if you are interested, you could contribute to this adventure !