Soil Services for Science and Society: GloSIS

Fenny van Egmond

Content

- Current world soil data and ISRIC
- Why soil information at global level?
- Global Soil Partnership
- Demand for GloSIS
- How is GloSIS designed?
- Implementation
- Open issues and possibilities

GLOSIS
Global Soil Information System

ISRIC
World Soil Information

GLOBAL SOIL PARTNERSHIP

ISRIC – World Soil Information

- Independent foundation since1966, upon recommendation of UNESCO, FAO and IUSS
- Accredited as the World Data Centre for Soils (WDC – Soils) by the International Council for Science
- Participating Organisation of the Intergovernmental Group on Earth Observations (GEO)
- Global Soil Partnership, hosting the Soil Data Facility (pillar 4)

ISRIC
World Soil Information

USER COMMUNITY

Soil Information Brokering

Soil Museum & Capacity building

Setting Standards & References

Co-creation & Boosting impact

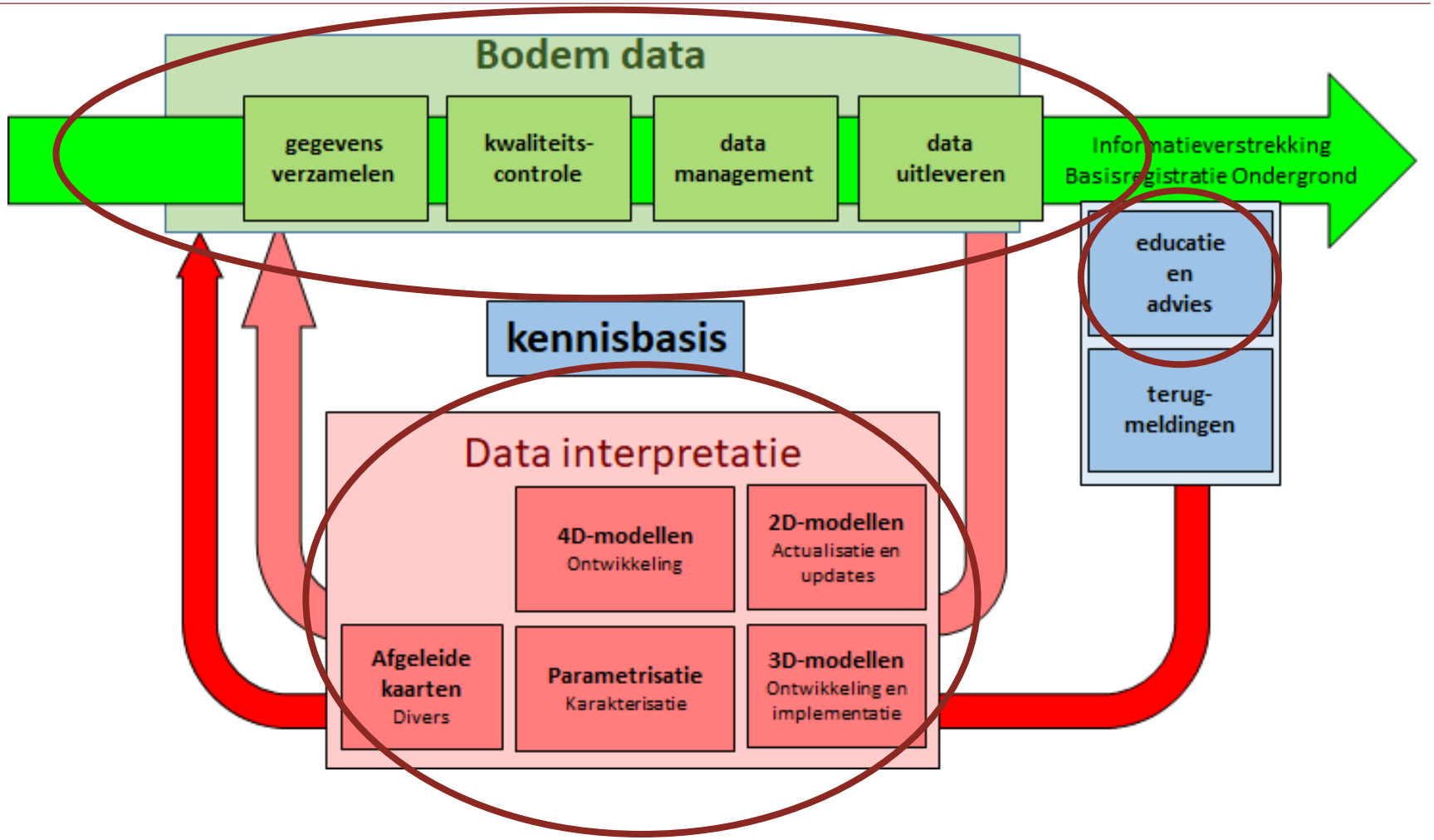
ISRIC
World Soil Information

World Reference Collection

Scientific Excellence

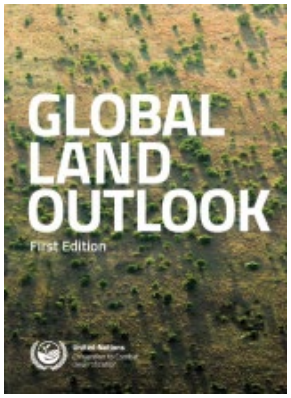
Soil Data

Global Soil Services



Why Global Soil Services?

Vision: A world where **reliable** and relevant soil information is **freely-available** and **properly used** to address global environmental and social challenges.



ipcc
INTERGOVERNMENTAL PANEL ON climate change

WMO UNEP

United Nations
Climate Change

RECARE

Food and Agriculture Organization
of the United Nations

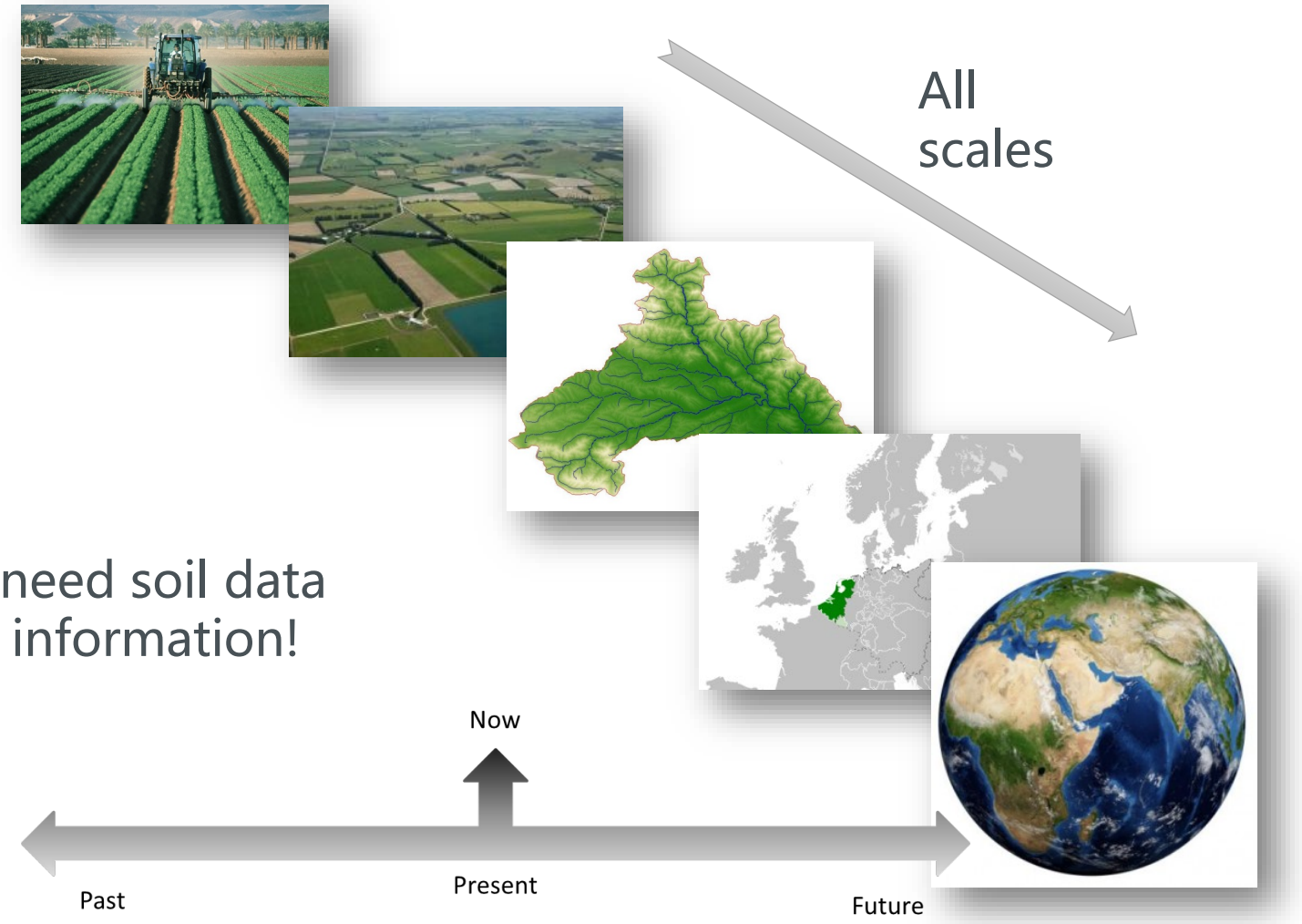
SUSTAINABLE DEVELOPMENT GOALS
17 GOALS TO TRANSFORM OUR WORLD

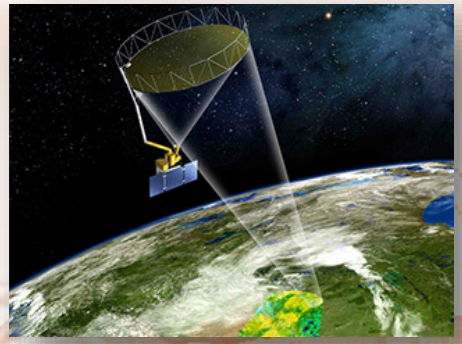
Achieving Land Degradation Neutrality

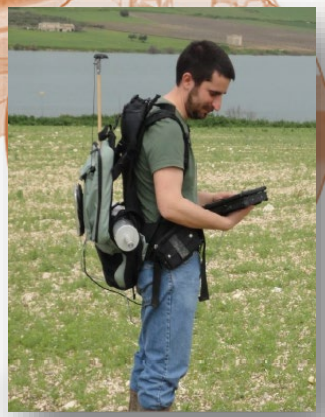
United Nations
Convention to Combat
Desertification

ISRIC
World Soil Information

Why Global Soil Services?





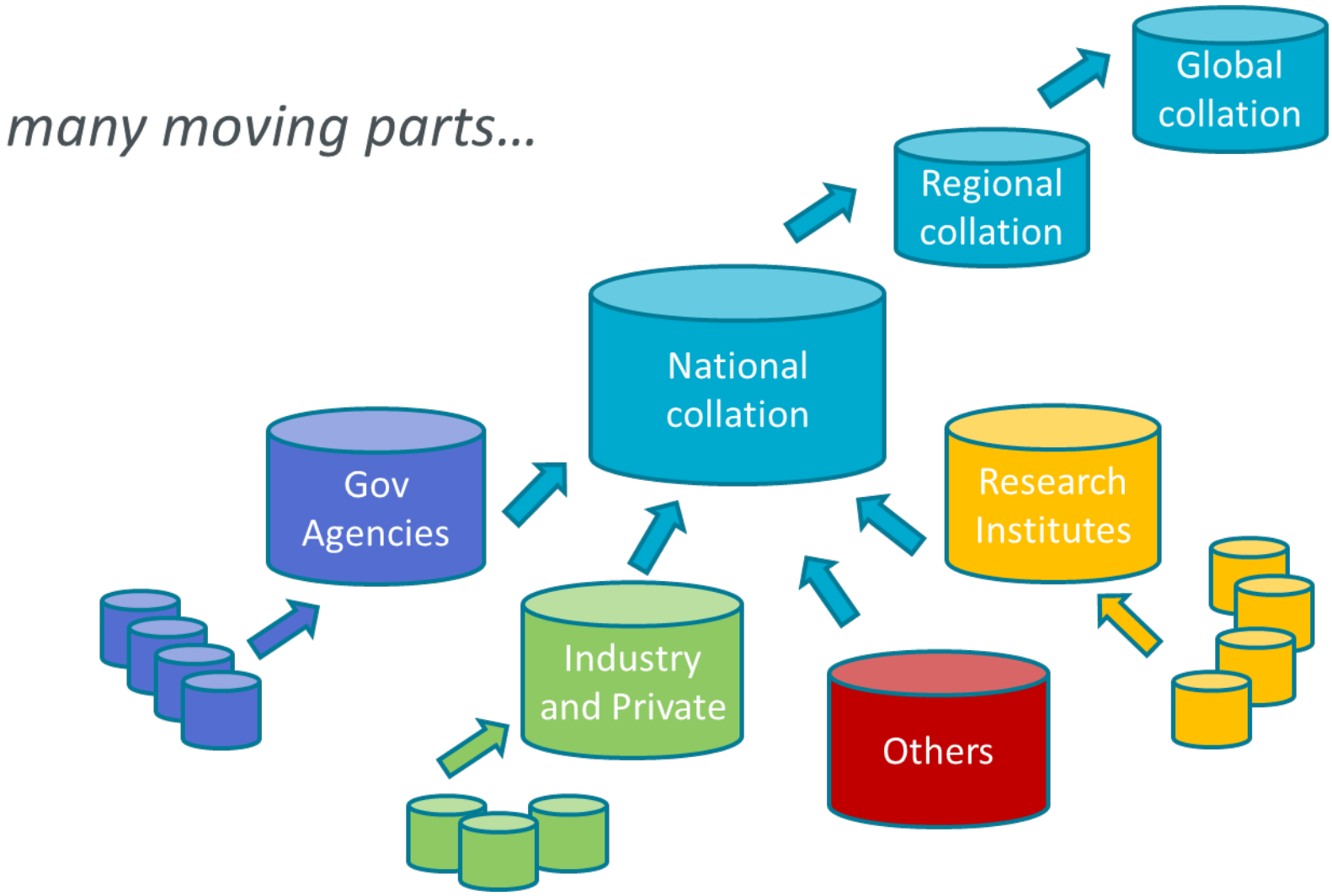


satellite
vehicle

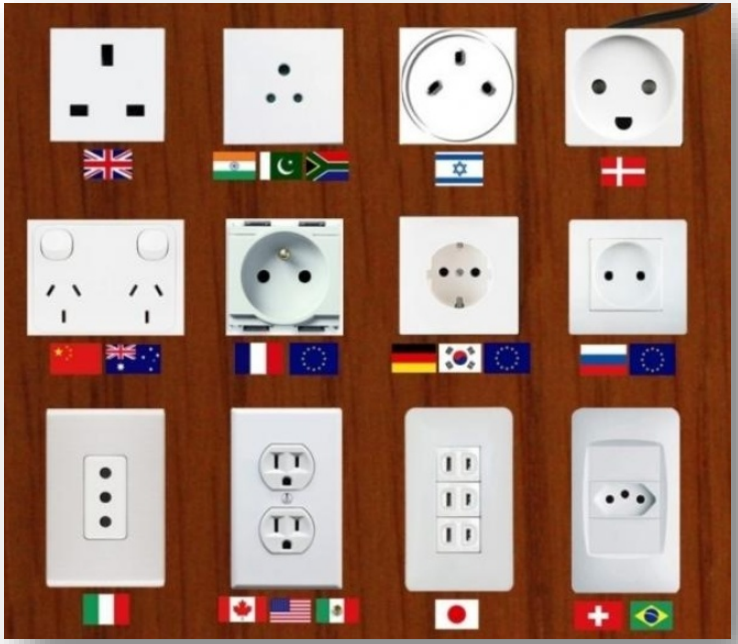
9 Atmospheric profile
10 Eddy covariance system
11 Groundwater observation well
12 Stream gauge
13 Automatic sample collector
14 Optical sensors
15 Position sensor
16 TDR probes
17 Tensiometer
18 LAI sensor
19 Gas exchange measuring device

ISRIC
World Soil Information

Sources and flows of soil data

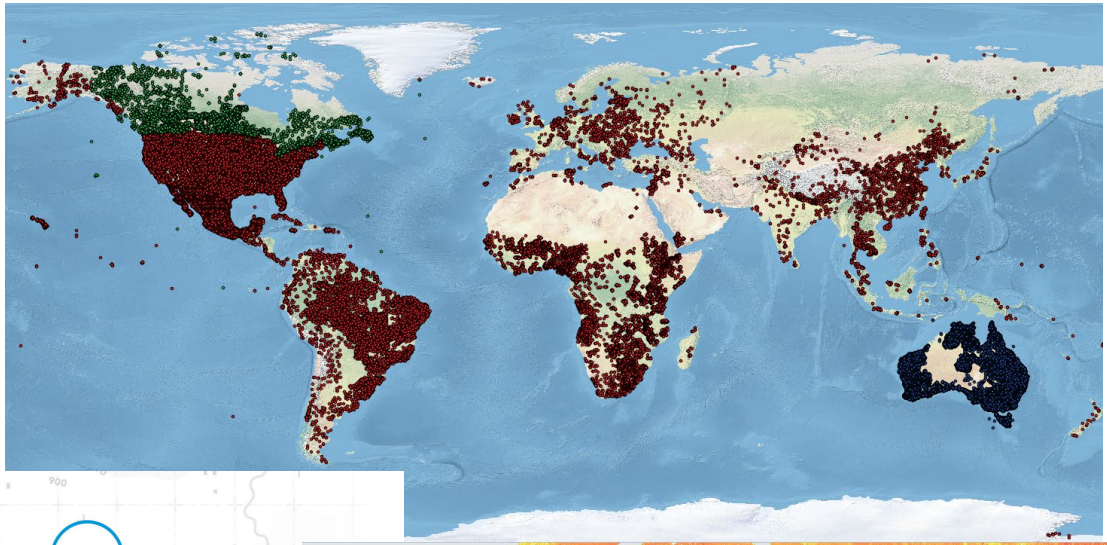


Problem space

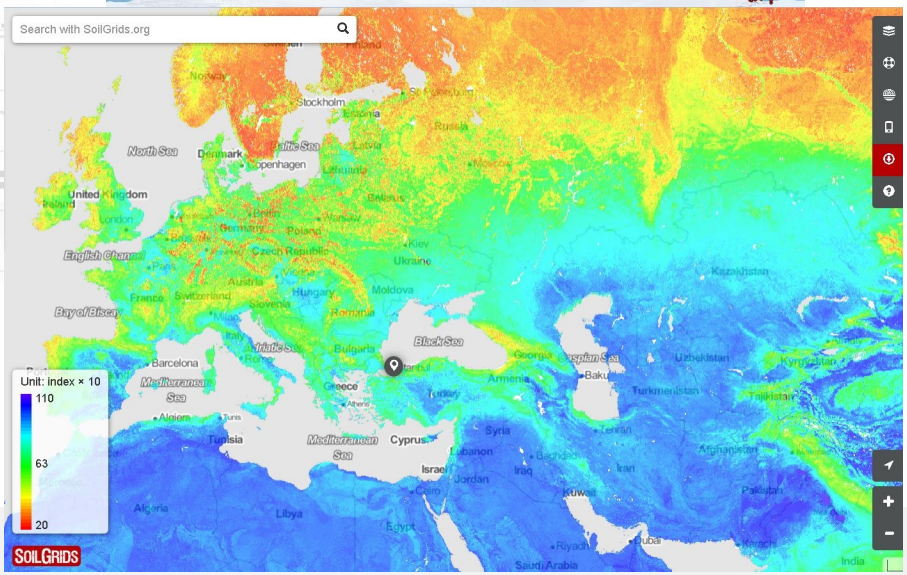


Standardisation and harmonisation in collection, storage and exchange needed

Isn’t ISRIC or GSM doing this already?



- Soil Profile database
- >150.000 profiles
- Ongoing process
- Properties:
  - Bulk density
  - Calcium carbonate
  - Carbon (Total / Organic)
  - Coarse fragments
  - pH
  - Water retention
  - Texture (Sand, Silt, Clay)
  - Cation exchange capacity
  - Electrical conductivity
  - Phosphorus
  - Total nitrogen
  - Classification: FAO, WRB, S. Taxonomy

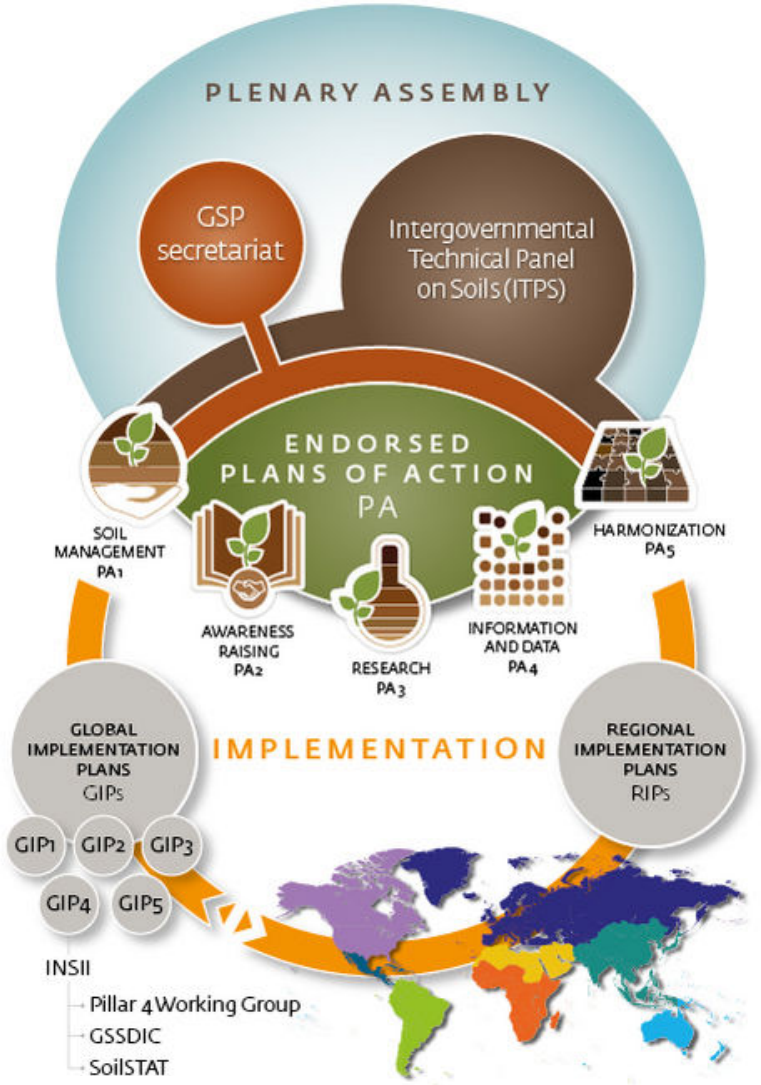


ISRIC
World Soil Information

Yes, but

- Data ownership
- Standardisation, harmonisation lot of work
- Local institutes know better which data is available online or offline
- Empower soil/environmental institutes:
  - Local soil information system
  - Capacity building
  - Use soil data for planning and monitoring at national scale
- Build an internet of data
- One entry point for searches
- Bottom up organisational structure

The Global Soil Partnership



- **Voluntary partnership;** open to governments, regional organizations, institutions and other stakeholders at various levels
- Goal: **enhance sustainable soil management** by building awareness, capacity and exchange of knowledge
- Pillar 4: Enhance the quantity and quality of **soil data and information**.
- Guided by the International Network of Soil Information Institutions (**INSII**).
- **Soil Data Facility** (ISRIC)

P4 Implementation Plan

"Towards a Global Soil Information System" (February 2016)

- Based on the recommendations of the "Plan of Action for Pillar Four":
  - Establishment of an **enduring** and **authoritative global system** to monitor and forecast the condition of the Earth's soil resources.
  - Use soil data primarily from **national** and **within-country** systems through a federated design.
  - Integrated into **GEOSS**.
  - Implementation should include a **training programme**.

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GLOBAL SOIL PARTNERSHIP

P4 Implementation Plan

GloSIS:

- **Soil profile** databases (Tier 1, Tier 2)
- Global **polygon** coverage, as replacement of FAO/UNESCO SMotW, 1:5M
- Global **Grids**:
  - Harmonized World Soil Database, version 2
  - Fine-resolution grid of soil properties, version 0 (collation of grids, 1km)
  - Fine resolution grid of soil properties, version 1 (harmonized, <1km)

Guidelines and capacity development for implementation

SoilSTAT:

- System for **monitoring**, forecasting and status **reporting** of the soil resource.
- Addition to the FAOSTAT family of reporting systems.
- Current status: concept note on the content and design.

GloSIS Guiding Principles

- Infrastructure bringing together soil information collected by (national) institutions in a **de-centralized** way.
- GloSIS is to be a **federation** of soil information systems.
- Source institutions **retain** their data and **control access**.
- Data sharing according to **data policy** of data providers.
- Implementation that is lightweight, cheap to deploy, “simple”.
- Based on open source software.
- Should **empower** countries (and other data providers) to develop their national soil information system as a centre for national soil information.

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GloSIS Implementation

Implementation period: 2017 – 2020.

Coordinated by **GSP Secretariat (FAO)** and **GSP Soil Data Facility (ISRIC – World Soil Information)**, with contributions from Pillar 4 Working Group, Pillar 5, soil information experts.

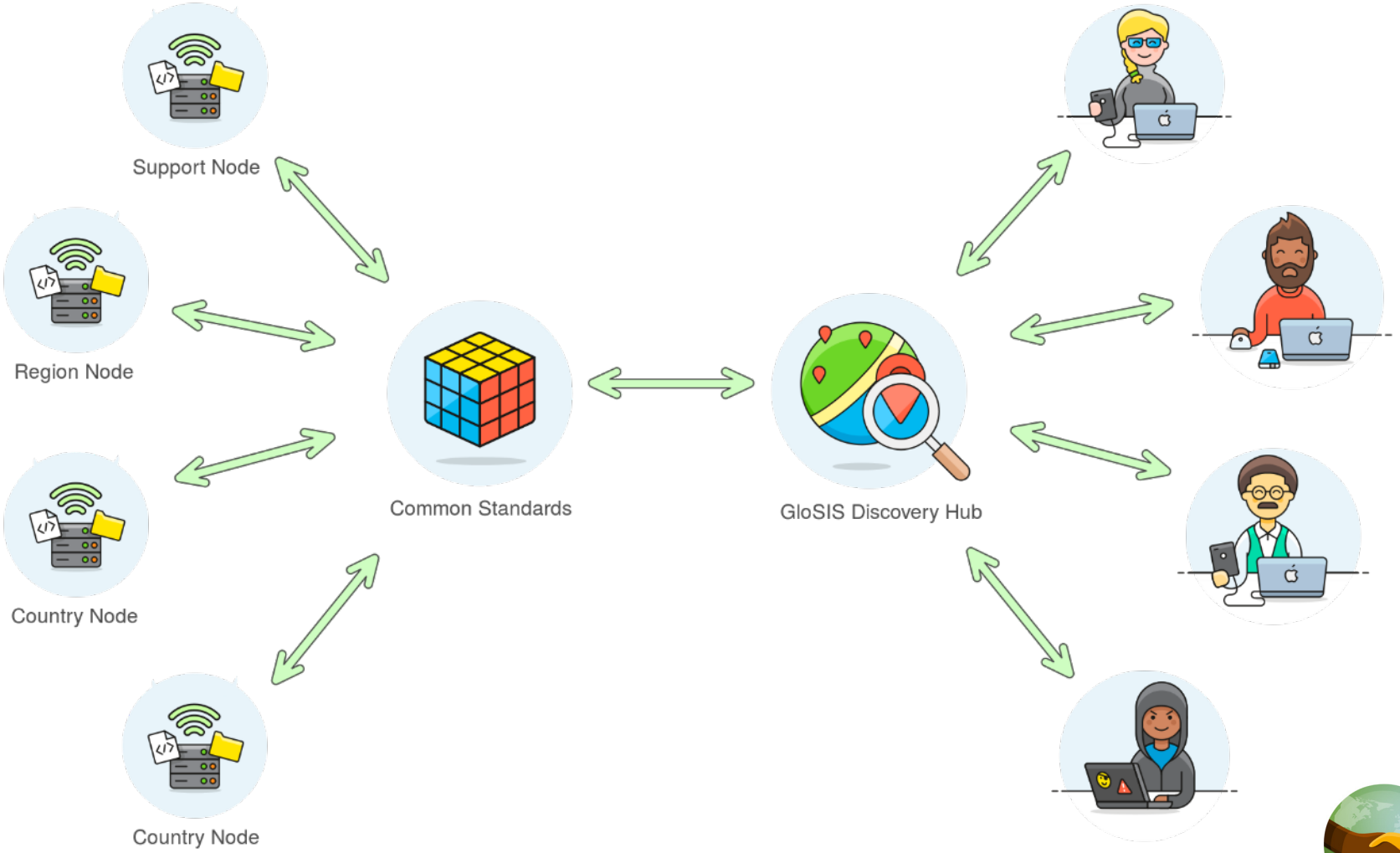
General timeline GloSIS:

- 2017: SDF appointed, general work plan presented during INSII 3 for implementing GloSIS.
- 2018: development technical specifications of GloSIS and its data products
- 2019: implementation and testing
- 2020: population and capacity building

ISRIC World Soil Information

GLOBAL SOIL PARTNERSHIP

A federation of Soil Information Systems



ISRIC World Soil Information

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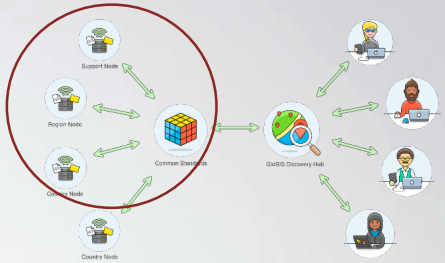
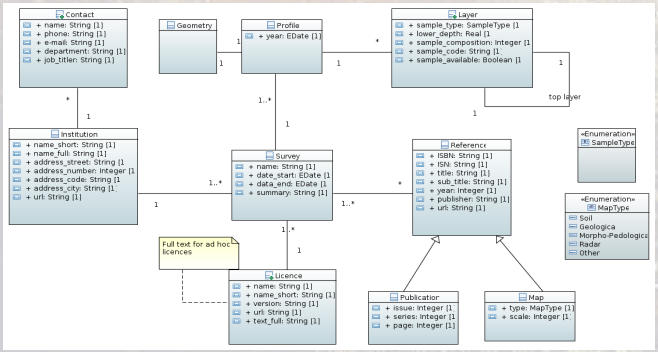
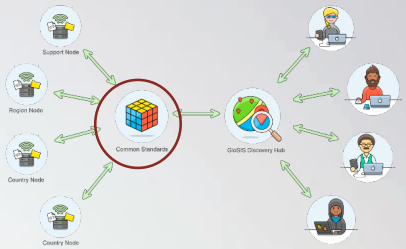
Domain model



- Defines how data stored in GloSIS will be **structured**.
- **Common understanding** of what soil profile data are; defines what is a soil profile, horizon and how these concepts **relate** to each other.
- Defines **structure** of the **data sharing** vehicle.
- Temporary solution while waiting for an endorsed soil data exchange standard.



Data exchange



- Each node must publish its soil data while adhering to the structure defined by the domain model (respecting all relationships).
- **Existing standards** for data publication and exchange will be adopted: OGC **Web Feature Service** (WFS) standard + **Application Schema** to structure the attribute data associated to the spatial features.
- Implementation allows adoption of **future standards** (Pillar 5); adoption would be facilitated if the new standard can be integrated with WFS.
- Data exchange governed by **GSP Data Policy**; respects the data policy set by the data provider.

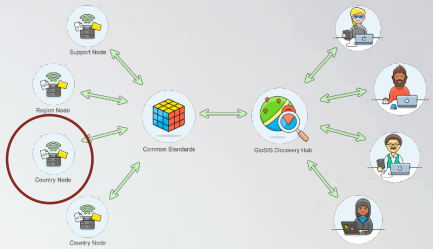
Participation levels: adhesion to GloSIS

GLOSIS
Global Soil Information System

promoting sustainable soil management for all

GLOBAL SOIL PARTNERSHIP

GloSIS node

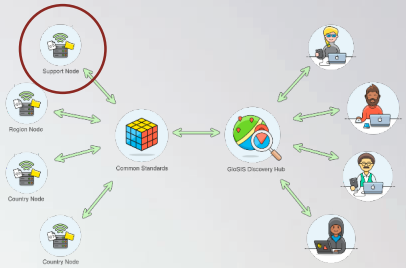


- Two different implementations of a country or institutional GloSIS node are foreseen:
  - Existing implementation: an **existing SIS** able to publish data **complying** with the GloSIS data exchange. Requires implementation of the GloSIS Application Schema in its services. (no hosting of a parallel system).
  - **Standard** reference implementation: **off-the-shelf deployable bundle** of techs that performs the functions of a node. Cheap and fast vehicle to setup a SIS that can function as a GloSIS node. Includes tools for **load**, **management** and **publication** of data

Deployment of the GloSIS standard reference node

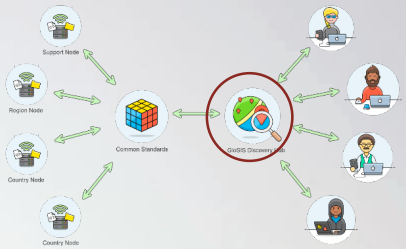
- Principle: setting up an institutional SIS should be made as easy as possible, limiting infrastructure admin work.
- Implementation should be a **ready-to-run block**, i.e. one package that bundles all software.
- Making use of **container technologies** (e.g. Docker).
- Container is a lightweight **virtual system** into which different tools may be installed and connected, producing a **single bundle**.

Support node



- Instance of the standard or reference implementation deployed and managed by the GSP.
- Harbour data from institutions not able to set up their own node.
- Protocol will be established that will prescribe how institutions can submit their data to the GSP to be loaded in the support node.
- Data providers will be responsible for data standardization.
- Can be used a temporary solution.

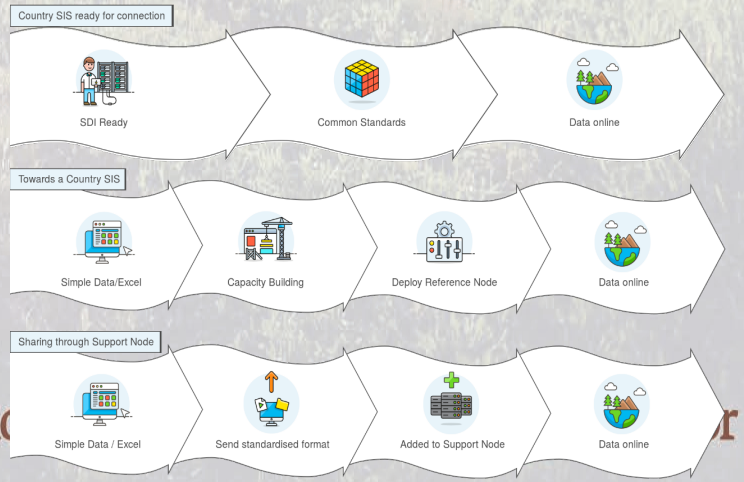
Discovery hub



- Web-based gateway to the GloSIS federation.
- Two functions:
  - Registrar of all the nodes compliant with the application.
  - Search engine for soil data.
- Registrar: **catalogue** of GloSIS nodes, able to verify the **correct application** of the data schema, guarantee **correct identification** of each soil profile and its origin (e.g. through UUIDs or DOIs).
- Search the federation by spatial location, meta-data, data fields.
- Software solutions: GeoPortal, GeoNode, geoOrchestra, iGUESS.

Implementation programme: ‘CountrySIS’

- GloSIS, being a **federated** system, relies on the **participation** of data providers.
- Many countries (and other data holders) do not have a SIS yet.
- The GSP Pillar 4 ‘CountrySIS’ programme will provide **tools** and **support** to set up soil information systems.
- Main aim: **support data holders** to set up their **own** (institutional or national) SIS.
- **Link** institutional or national SIS **as a node to GloSIS** if the data holder wishes to do so.



Challenges

- Ambitious task to develop and implement a global soil information system through a federated approach in 3 years time (2018-2020).

- Lack of funding; cost estimate P4 implementation 8-9M USD (+3.5M P5).
- Voluntary contributions.
- Engagement of countries, data holders, individuals.
- Data sharing: restricted data access.

Why joining GloSIS?

GLOSIS
Global Soil Information System

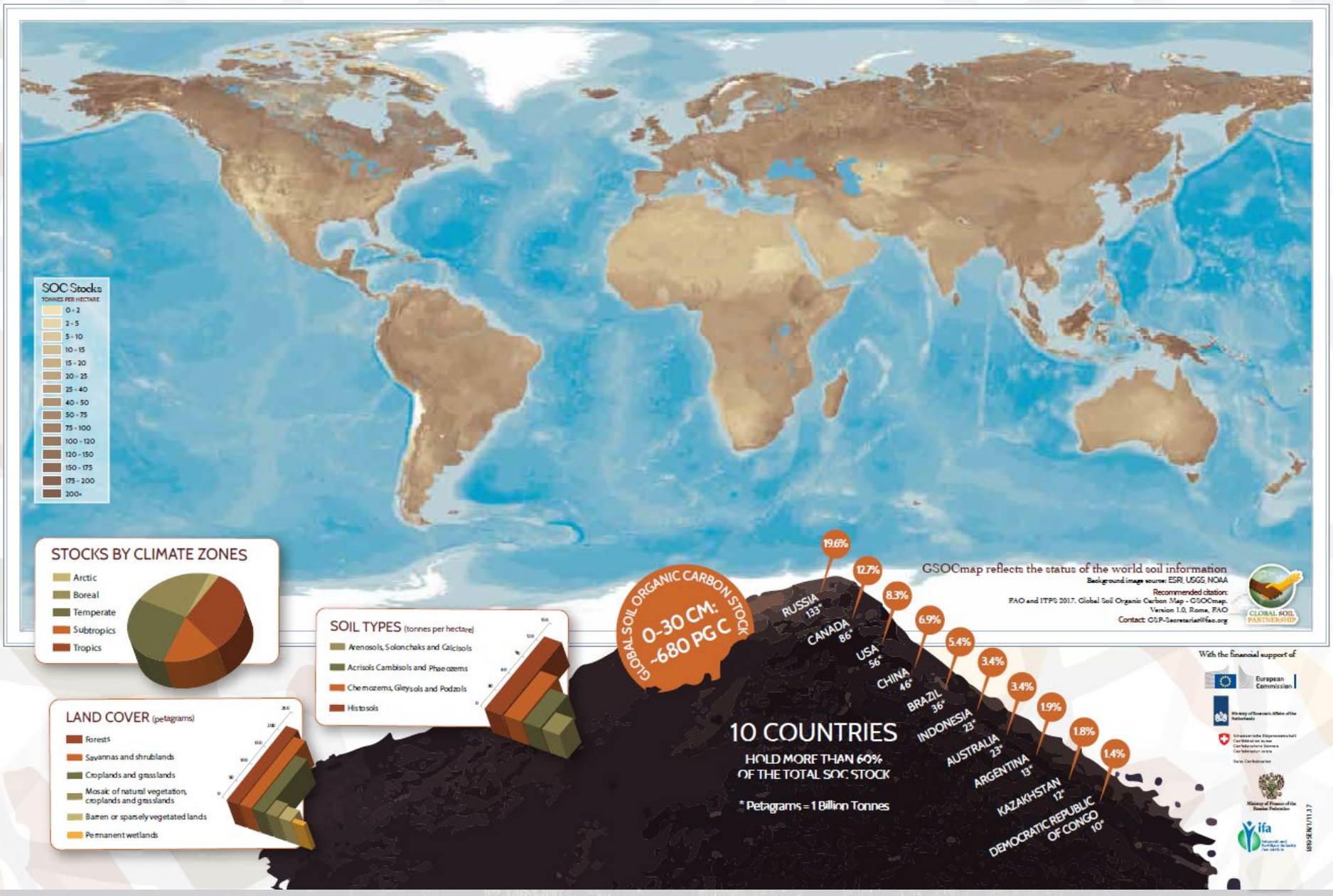
- Improve **visibility** of a national SIS; enhance **usability** of (national) soil data.
- Contribute to more **consistent** and **accurate** global soil data products to be used in SDG-related global assessments (informing national policy development).
- Make national soil data **compatible** and **exchangeable** with other soil data sources:
  - to support (inter)national scientific research;
  - to address trans-boundary issues.
- Supports private sector in your country to assess international soil resources, for instance for developing sustainable food chains.

Some more features

GLOSIS
Global Soil Information System

- Nodes within GloSIS can function as **standalone SIS** (web service or not)
- Nodes within GloSIS can be **linked to GloSIS**
- Single or complex **searches** can be performed
- **Applications** can link to GloSIS data, such as SoilSTAT
- Soil profile data from GloSIS can be used for bottom up and top down **global gridded soil products**.
- Global gridded products can be an **incentive** to build GloSIS
- The first gridded GloSIS product is the **GSOC map**
- **More maps are foreseen**, linked to the yearly GSP conferences (carbon, erosion, pollution, salinity)
- **Harmonisation** in GLOSOLAN
- Possible **extension** with other (types of) data?

GLOBAL SOIL ORGANIC CARBON MAP *(GSOCmap)*



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More information:

www.isric.org

http://www.fao.org/global-soil-partnership/en/