



Global Soil Partnership Plenary Assembly



Fifth session

Rome, 20-22 June 2017

Progress under the GSP Pillars including the development/execution of implementation plans: for information and decision

Executive Summary

- The Terms of Reference (ToRs) contemplate that GSP work should revolve around five “Pillars of Action”. The Rules of Procedure (RoP) specify that corresponding Plans of Action (PoAs) and more specific Global and Regional Implementation Plans shall be developed following an inclusive and participatory process and in accordance with agreed guidelines (cf. Annex 1 of the RoP). This guidance was closely adhered to in developing the five PoAs that were endorsed by the GSP Plenary Assembly at its second and third sessions of 2014 and 2015. Since then, the Secretariat gave utmost attention to facilitating the development of Global Implementation Plans (GIPs) and Regional Implementation Plans (RIPs).
- Accordingly, the Secretariat sought to mobilize efforts of all concerned partners for the development of both RIPs (cf. also Item 4 of the agenda) and GIPs for the five GSP Pillars. To date, GIPs for Pillars 2, 4 and 5 are available. The GIPs for Pillars 2 and 5 were recently finalized and are hereby submitted for information of the Plenary Assembly, while the process for Pillars 1 and 3 is still at a more initial stage.
- Due to its relevance to the key area of soil information, the GIP for Pillar 4 is addressed in more detail under section 3.4 below. Important decisions should be made by this PA session in order to move fully into the execution phase and establish the Global Soil Information System (GLOSI) according to the official Arrangement, building on good momentum to that end. The execution of the Pillar 4 GIP requires the establishment of various components, including the International Network of Soil Information Institutions (INSII), a GSP Soil Data Facility (SDF), and a GSP Soil Data Policy (SDP), which shall be considered by this Plenary Assembly.
- In addition, the preparation of the Global Soil Organic Carbon Map (GSOCMap), which is the first product of GLOSI, is in full swing, though the Assembly should also make some important decisions about it.

- The establishment of the International Network of Soil Information Institutions and that of the International Network of Black Soils (INBS) are very positive developments to support action under Pillar 4 and Pillar 1 respectively.
- A major short- to long-term priority for all partners clearly remains the fully-fledged execution of both the GIP and RIPs, especially *via* the Regional Soil Partnerships. The availability of sufficient financial (and in-kind) resources of both domestic and external nature is critical in order to meet the expectations embodied by these plans.

Suggested action by the GSP Plenary Assembly

The Plenary Assembly may wish to:

- acknowledge the extensive work done so far in developing global and regional implementation plans and call on all partners to join forces in the execution of these plans, including those partners prepared to invest in this process;
- note with appreciation the development of the Pillars 2 and 5 GIPs and request the Secretariat to move into the execution phase, together with all interested partners;
- endorse the establishment of the International Network of Black Soils and invite members to play an active role in its work;
- endorse the Arrangement for establishing the Global Soil Information System and call on all concerned partners to become active members of the INSII by sharing expertise, data, information and other inputs;
- call for candidates for the position of INSII Chair, select and appoint the Chair for a two-year term;
- endorse the GSP Soil Data Policy to guide soil data sharing of the Global Soil Information System and urge its immediate application;
- review the only candidature for the GSP Soil Data Facility and, if deemed appropriate, appoint it for a mandate until 31/12/2020;
- welcome the efforts made to date by the ITPS, the GSP Secretariat and those interested members in the preparation of the Global Soil Organic Carbon Map (GSOCMap).
- request the Secretariat to continue to assist with developing capacities at national level on soil organic carbon mapping, monitoring and reporting;
- invite the ITPS and the Secretariat to finalize the GSOCMap, taking into account the contributions made by countries. In the case of countries that were unable to respond to this joint initiative, the PA is invited to make a decision to either leave those countries blank in the global product, or covering them with the best available and reliable information;
- invite resource partners to contribute financially to, or second experts to, the Secretariat for the execution of the GIPs and RIPs.

3.1 Pillar 1: Finalization of the implementation plan

1. The Global Implementation Plan for Pillar 1 is still under development, taking into account the activities listed under the Regional Implementation Plans in order to ensure that regional priorities are well captured at a global level. The GIP is expected to focus more particularly on the implementation of the Voluntary Guidelines for Sustainable Soil Management (VGSSM).
2. The implementation of the Revised World Soil Charter is also of critical importance for a successful Pillar 1 GIP. An assessment of how member countries are performing against the principles of the Revised World Soil Charter will be made by the Secretariat following a case study done in [Australia](#).

3.1.1 Implementation of the Voluntary Guidelines for Sustainable Soil Management

3. The VGSSM were endorsed by the 155th session of the FAO Council in December 2016 and their implementation at all levels will take a central place under Pillar 1. The VGSSM focus mostly on agriculture and elaborate the principles outlined in the revised World Soil Charter, taking into account the evidence provided in the Status of the World's Soil Resources report. Attention was given to disseminating the VGSSM that were published in the UN languages in as wide a manner as possible. A global dialogue is to be organized to discuss with stakeholders (mainly in countries) how they could be implemented at national level. Resources are being identified to support this dialogue. Meanwhile, a concept note is under preparation for submission to different potential resource partners that could support their implementation.

3.1.2 Establishment of the International Network of Black Soils

4. The International Network of Black Soils (INBS) was launched on 21 March 2017 during the Global Symposium on Soil Organic Carbon, held at FAO headquarters, as a platform for countries with black soils to discuss common technical issues related to the conservation and sustainable management of these soils. The concept note for the establishment of this network is available in Annex I for consideration of this plenary session. Similarly, a chairperson for this network should be appointed so that its first meeting could be organized.

3.2 Pillar 2: Presentation of the implementation plan

5. The GIP for Pillar 2 was endorsed by the Pillar 2 working group (composed of representatives from the different RSPs and the ITPS) in November 2016. The plan can be accessed [here](#) and copies will be made available during the plenary session.
6. The plan defines the road map for five years (2017-2021) to achieve sustainable soil management by focusing on six interlinked components: investment, policy, education, extension, societal awareness, and technical and scientific cooperation. Ultimately, the Pillar 2 GIP is to contribute to the success of all the other GSP Pillars, because it aims to involve stakeholders in promoting, investing in and practicing sustainable soil management.
7. The activities in the GIP for Pillar 2 are relevant to the implementation of the three Rio Conventions and the achievement of the Sustainable Development Goals. In this context, the Plan identifies ways to promote soil-related actions in the policy domain, and to exchange knowledge and information on soils. It also presents a strategy for investment, including the compilation of databases, the creation/identification of public-private partnerships, and the identification and involvement of international funds and donors in soil related activities. Education and awareness raising activities are listed to commit stakeholders to protecting soils from degradation and restoring degraded soils. To this end, the plan focuses on reviewing academic curricula, increasing the number of learning opportunities, scholarships and awards on soil, developing societal awareness material, making better use of communication media and new technologies for raising awareness, and organizing public relation events that involve groups engaged in soil. Special attention is also given to the quality and quantity of extension services at the regional and local levels, which should aim to involve rural and indigenous communities, produce and distribute extension material, and establish targeted training programmes and international programmes and

exchanges. The use of appropriate media and tools is necessary to facilitate the exchange of knowledge, experiences and technologies.

8. The GIP for Pillar 2 is expected to undergo a revision process based on monitoring of progress, assessment of results, and reformulation.

3.3 Pillar 3: Finalization of the implementation plan

9. The Global Implementation Plan for Pillar 3 focuses on identifying research priorities to address the ten major soil threats identified in the Status of the World's Soil Resources Report and fostering collaboration between existing research initiatives to address these priorities. While the GIP is being developed, current efforts are made to bring the global research community and decision makers together. One of the key activities in the GIP will be to hold scientific symposiums to address the ten soil threats, starting with the Global Symposium on Soil Organic Carbon which was held at FAO headquarters on 21-23 March 2017. Given the huge amount of soil research activities happening in the different regions and countries, the GIP for Pillar 3 should aim for synthesis of these activities to ensure that well-targeted research is promoted and used.

3.4 Pillar 4: Execution of the implementation plan

10. The [Pillar 4 GIP](#) was finally presented in February 2016 and the Secretariat has sought to assist with its execution, given the importance of enhancing the amount and quality of soil data/information for decision making. Since then, progress was made on establishing different elements of the Global Soil Information System (GLOSIS). However there is an evident need to raise some issues that require the attention of members in order to expedite the process.

3.4.1 Establishment of the Global Soil Information System:

a) Arrangement to establish the Global Soil information System including the International Network of Soil Information Institutions

11. As indicated in the Pillar 4 GIP, a Global Soil Information System (GLOSIS) will be its main product. Various components should be in place for making this system a reality. An International Network of Global Soil Information Institutions (INSII) needs to be established as the main decision making platform, while understanding that the GSP Plenary Assembly is the ultimate policy and decision making body. The Secretariat took the initiative to organize a workshop of national soil information institutions on 8-10 December 2015 to pave the way for constituting INSII. A second workshop was organized on 24-25 November 2016 in order to discuss various issues related to the execution of the implementation plan. Some participants requested the Secretariat to formalize INSII so that national soil information institutions could officially represent their countries in this network with the necessary national endorsement.
12. After carefully addressing this request, together with the FAO Legal office, it was suggested to develop an Arrangement for the establishment of GLOSIS (including INSII) to be submitted to the 5th GSP Plenary Assembly for consideration and endorsement. This arrangement will provide the legal basis for a fully functioning GLOSIS and is presented in Annex II in the form of a resolution to be agreed by partners.

b) Selection of the INSII Chair

13. During the second INSII workshop, there was some attempt to nominate the INSII chair as per the INSII terms of reference (Annex III).
14. However, the selection and appointment of the chair did not materialize due to various issues, including a potential conflict of interest of the only candidate. Therefore, it was decided to postpone the appointment of the chair until the 5th GSP Plenary Assembly where the floor would be opened for members to offer candidates for this important position. It is expected that the chair of the PA will indeed call for volunteers for this position, following which a selection may be made *via* vote. The terms of reference for this important role are presented in Annex IV.

c) Selection of the GSP Soil Data Facility

15. The Pillar 4 GIP foresees the selection of a GSP Soil Data Facility which is mandated to host, develop, and maintain important elements of the Spatial Data Infrastructure needed for a distributed Global Soil Information System. The terms of reference for this Facility are provided in Annex V.
16. As agreed during the second INSII workshop, the Secretariat launched an [open call](#) for the GSP Soil Data Facility and invited candidates to submit their applications by 20 May 2017. The Secretariat received only one application, i.e. from the ISRIC World Soil Information, which is in line with the submission criteria and is hereby submitted for the consideration of the Plenary Assembly. The call, including the selection criteria and the submitted application from ISRIC, can also be found in Annex V.

d) Review and approval of the GSP Data Policy

17. The establishment of the Global Soil Information System will be based on a distributed model in which countries will contribute with soil data/information according to agreed technical specifications. The Pillar 4 GIP foresees the development and endorsement of a GSP Soil Data Policy that will regulate the sharing of data between members and the Global Soil Information System. In Annex VI the draft GSP Soil Data Policy is presented for review and endorsement by the Plenary Assembly. This draft was prepared by the Pillar 4 Working Group.

3.4.2 Preparation of the Global Soil Organic Carbon Map (GSOCMap)

18. The preparation of the Global Soil Organic Carbon map (GSOCMap) was mandated by the 4th GSP Plenary Assembly to the ITPS and GSP Secretariat. This request was endorsed by the 25th session of the Committee on Agriculture (COAG) held on 26-30 September 2016 (document [here](#)) and the 155th FAO Council held on 5-9 December (document [here](#)). Initially, the preparation of this map came as a request from the SPI-UNCCD to the ITPS as a contribution to the SDG process, particularly the SDG indicator 15.3.1. This initiative gained particular support during the Global Soil Organic Carbon Symposium, as one of the symposium recommendations was to develop guidelines for the mapping, measuring, monitoring and reporting of soil organic carbon for national application. In doing so, a baseline or starting point would be required and it was suggested that the GSOCMap could play this role.
19. The preparation of the map was conceived as a first experiment as a way of establishing the Pillar 4 Global Soil Information System. Therefore, the process follows the distributed system approach in which members produce their own soil organic carbon map according to [guidelines/technical specifications](#) that were jointly prepared during the second INSII workshop. Additionally, a cookbook on Soil Organic Carbon Mapping was developed to support the mapping process in member countries.
20. During the second INSII workshop, various countries requested support in terms of capacity development/training on the use of digital soil mapping tools for preparing their national soil organic carbon maps. The Secretariat, thanks to the extra-budgetary contributions from some resource partners, took the initiative to organize training activities for the different regional soil partnerships. The “on-the-job” training modality was chosen in which country participants bring their own datasets and receive applied training on how to bring together soil legacy data, harmonize the data, generate covariate data and combine these elements to predict soil organic carbon within the country using various digital soil mapping methods. The training included the calculation of uncertainty of predictions. Ultimately, it is expected that the final country SOC maps will be shared with the ITPS and GSP Secretariat for the final compilation of the GSOCMap.
21. The detailed training sessions to support the preparation of national SOC maps are presented below:

Capacity development on digital soil mapping and soil organic carbon mapping. Training on digital soil mapping and soil information management	Completed (31 October – 4 November 2016, Almaty, Kazakhstan)
Training on digital soil mapping for NENA	Completed (10-14 October 2016, Rabat, Morocco)
Training on SOC mapping for Asia	Completed (24-29 April 2017 Bangkok, Thailand)
Training on SOC mapping for Africa	Planned (3-7 July 2017 Nairobi, Kenya)
Training on SOC mapping for Central America and the Caribbean	Planned (26-30 June 2017 Aguas Calientes, Mexico)
Training on SOC mapping for Eurasia	Planned (24-29 July 2017 Tashkent, Uzbekistan)
Training on digital SOC mapping (organized by the GSP together with ISRIC for 16 countries: Bolivia, Costa Rica, Cuba, Democratic Republic of Congo, Egypt, Iraq, Kazakhstan, Mongolia, Mozambique, Nigeria, Paraguay, Ukraine, Uzbekistan, Tanzania, Tunisia and Zambia).	Ongoing (6-23 June 2017, Wageningen, The Netherlands)

22. To date, the Secretariat has received confirmation from more than 100 countries regarding their preparation of national SOC maps, following the request sent to the focal points and as per the guidelines/technical specifications agreed in INSII.
23. However, a number of countries responded that they do not have the capacities or lack the data for preparing this map. Very few countries responded negatively to the request, while few did not respond at all, considering that their priorities are currently different.
24. An important decision is required on what to do with those countries that are not in a position to develop their national SOC map: shall the GSOCMap leave those countries in a “blank” form, or shall the Secretariat/ITPS seek to find available information to cover these countries with sufficiently reliable data on a par with the other countries?
25. The GSOCMap will be reviewed by the ITPS during its 7th working session on 23-27 October 2017 to be organized jointly with the third INSII workshop.
26. The final GSOCMap will be launched during the 5th of December World Soil Day celebration at FAO headquarters. After that, the map will be continuously updated with information received from countries.

3.5 Pillar 5: Presentation of the implementation plan

3.5.1 Draft Implementation Plan

27. A [Pillar 5 GIP](#) has been elaborated (to be distributed separately due to its length) by the Pillar 5 working group (composed of representatives of the regional soil partnerships, one member of the ITPS, and representatives from the following institutions: International Standardization Organization, International Union of Soil Sciences, Asian Soil Laboratory Network) and was finalized in May 2017.
28. Following the recommendations of the pertinent Plan of Action, the Pillar 5 GIP covers the harmonization areas of soil classification, soil description, soil analysis, soil information

modelling and soil indicators. The global plan is consistent with implementation activities and steps included in the RIPs.

29. The Pillar 5 GIP is submitted to the Plenary Assembly for information, with the understanding that it is a living document that will require continuous updating and monitoring.

Annex 1: Concept note of the International Network of Black Soils

1. Definition of black soils

“Black soil” is a term used in some national soil classifications that may cover very different types of soil. For example in India the soil group of Black soils was used for soils on the Deccan plateau that are nowadays classified as Vertisols¹. In China, Black soils correspond with soils originally very rich in organic matter (6 – 8%) and are subject to a significant loss of soil carbon due to soil erosion². In the Canadian soil classification, Black soils are a great group of the Chernozemic Order (note that the meaning of the word *Chernozem* is “Black Earth” in Russian)³ and are associated with sub-humid climates and tall-grass native vegetation and have a relatively thick black A horizon. In Bangladesh, Black Terai soils are of alluvial origin classified in the Soil Taxonomy as Humic Dystrudepts⁴. In the United States, Black soils correspond with Mollisols in the United States Soil Taxonomy, while in the WRB system Black soils would correspondent with three different but related reference soil groups: Chernozems, Kastanozems and Phaeozems. Table 1⁵ summarizes the essential characteristics of black soils in three different soil classification systems¹.

Table 1. Specific characteristics of Black soils as defined by three soil taxonomic systems, compared with the characteristics of Black soils defined in the International Network of Black soils. In bold: commune characteristics with the other taxonomies.

Classification	Canadian	US	FAO-WRB			International Network of Black soils
	Chernozem	Mollisol	Chernozem	Kastanozem	Phaeozem	
Carbon content	1-17%	>0.6%	>0.6%	>0.6%		>2% Organic matter content: 2-20%
Base saturation	>80%	>50%	>50%	>50%	>50%	>50%
Minimum thickness of mollic colours	10 cm	18 cm	20 cm	20 cm	20 cm	25 cm

Given the different perceptions of Black soil, this group of soils is **defined under the International Network of Black soils as soils containing:**

- A thick layer of humus (minimum thickness of 25 cm);
- A soil organic carbon (SOC) content greater than 2% and a minimum soil organic matter (SOM) content of 2%, up to 20% (histic epipedons are excluded);
- High base saturation (greater than 50% : umbric epipedons are excluded)
- Well drained : poorly-drained soils and Aquolls are excluded, and;

¹ The Chernozem criteria in the Table reflect the WRB classification of 2006.

Based on this definition, black soils cover about 916 million hectares worldwide (7% of the world's ice-free land surface). In the mollic horizon there is a predominance of Ca and clay minerals with medium and high exchange capacity⁶⁻⁸. They are most prevalent in the mid-latitudes of⁸:

- North America where they are the most common soils, radiating across Mexico (50 million ha), the central plains of the United States (200 million ha) and southern Canada (more than 40 million ha).
- Eurasia where it extends over around 450 million ha across south-eastern Europe and central Asia.
- South America where it extends across the Pampas of South America, covering most of central-eastern Argentina (89 million ha), and almost all of Uruguay (13 million ha).
- Minor areas in the tropics and subtropics (the Parana-La Plata basin of South America).

2. Introduction

Mollisols have a high SOM content. According to Buringh (1984)⁹, the average organic carbon content of a Mollisol is around 130t/ha in croplands and 160 t/ha in grasslands. However, figures on organic carbon and organic matter are highly variable according to land-use and land-cover. For example, self-restoration of arable lands in Russia resulted in vegetation succession development towards virgin steppe vegetation and development of soil characteristics towards that of natural Chernozems¹⁰. Organic carbon (OC) content in these soils increased from 3.9% to 5.5% in the upper 10 cm of topsoil. In Ukrainian Mollisols¹¹, SOM content increases from 5.2% in Wet Forest-Steppe to 5.7% in Forest-Steppe and 6.2% in Steppe, but decreases to 3.4% in South Steppe. In Turkey¹² the SOM content varies from 0.73% to 2.35%.

According to the World Reference Base (WRB) classification system, Chernozems are made up of very dark topsoil and secondary carbonates. Their mollic horizons are rich in organic matter (10–16%), are highly saturated with bases and react neutrally in terms of soil pH¹³. As stated in the Status of World's Resources report¹⁴, Chernozems are known for their unique structure, chemical properties and inherent fertility. These soils are distinguished by a very deep (more than 1 m) humus-enriched layer, perfectly expressed granular structure, almost optimal bulk density, and a good and satisfactory stock of nutrients. However, these favourable soil properties are only present in soils under virgin ecosystems. They cover an estimated 230 million ha worldwide as a continuous belt in steppe and forest-steppe landscapes in Russia and Ukraine, in the Great Plains of the US, in northern Kazakhstan, and locally in some countries of Central Europe. Wheat, barley and maize are the principal crops grown, alongside other food crops and vegetables. Part of the Chernozem area is also used for livestock rearing¹⁵.

Kastanozems have a similar profile to that of Chernozems, but the humus-rich surface horizon is thinner than and not as dark as that of the Chernozems, and they show more prominent accumulation of secondary carbonates. Kastanozems are potentially rich soils but suffer from periodic lack of soil moisture. Small grains and irrigated food and vegetable crops are the principal crops grown, while Kastanozems are also used for extensive grazing. The total extent of these soils is estimated to be about 465 million ha. Major areas are in the Eurasian short-grass steppe belt (southern Ukraine, the south of the Russian Federation¹⁶, Kazakhstan and Mongolia), in the Great Plains of the United States of America, Canada and Mexico, and in the pampas and Chaco regions of northern Argentina, Paraguay and southeastern Bolivia¹⁵.

Finally, although Phaeozems are similar to Chernozems and Kastanozems, they are leached more intensively. Consequently, they have dark, humus-rich surface horizons that, in comparison with Chernozems and Kastanozems, are less rich in bases. Phaeozems are either free of secondary carbonates or have them only at greater depths. They all have a high base saturation in the upper meter of the soil. They cover an estimated 190 million ha worldwide. Some 70 million ha are found in the humid and sub-humid Central Lowlands and easternmost parts of the Great Plains of the United States of America. Another 50 million ha are in the subtropical pampas of Argentina and Uruguay. The third largest area of Phaeozems (18 million ha) is in north-eastern China, followed by discontinuous areas in the centre of the Russian Federation. Smaller, mostly discontinuous areas are found in Central Europe, notably the Danube area of Hungary and adjacent countries and in montane areas in the tropics. Phaeozems accommodate soils of relatively wet grassland and forest regions in moderately continental climates. In the United States of America and Argentina, Phaeozems are mostly in use for the production of soybean and wheat. Irrigated Phaeozems on the high plains of Texas produce good yields of cotton. Phaeozems in the temperate belt are sown with wheat, barley and vegetables alongside other crops. Vast areas of Phaeozems are used for cattle rearing and fattening on improved pastures¹⁵.

Black soils constitute the food basket for many countries and for the world in general and are often recognized as inherently productive and fertile soils. They are extensively and intensively farmed, and increasingly dedicated to cereal production, pasture, range and forage systems. Thus, black soils are of particular global importance because of their relevance to food security and climate change. Given favorable climatic conditions, these soils allow a very high crop productivity. Their significant soil organic carbon (SOC) content makes them sensitive as potential sinks and sources of greenhouse gases.

However, the Status of the World's Soil Resources report¹⁴ underlined that these soils remain very sensitive to anthropogenic intervention. They are prone to severe degradation such as erosion, SOC loss, dehumification (loss of stable aggregates and organic matter), salinization or sodification, and can suffer from anthropogenic soil acidity.

Considering the great importance of these soils, it becomes crucial to promote their conservation and sustainable use and unlock their potential in the longer term to support food security while protecting the environment and mitigating climate change.

Taking note of the importance of these soils and connecting it to the aim of the Voluntary Guidelines for Sustainable Soil Management, it was suggested to establish an International Network of Black Soils under the Global Soil Partnership framework in order to promote the conservation and ensure the long term productivity of black soils through sustainable soil management.

3. Objectives

The establishment of this network has the following objectives:

- To provide a platform for countries with black soils to discuss common issues related to the conservation and sustainable management of these soils;
- To develop a report on the global status, current production and challenges in black soils;
- To foster collaboration among these countries towards promoting the sustainable use and management of black soils and identify relevant research gaps;

- To serve as a platform for knowledge sharing and technical cooperation on black soil management.

4. How will it work?

The network will be established under the framework of the Global Soil Partnership (GSP). Countries with black soils through their national soil institutions (i.e. Austria, Argentina, Brazil, Bolivia, Bulgaria, Canada, China, Hungary, India, Mexico, Mongolia, Paraguay, Romania, Russian Federation, Ukraine, Uruguay, USA, etc.) will be invited to join this network under clear Terms of Reference (to be developed by the GSP Secretariat and endorsed by participating countries during its first working session) and under the guidance of a Network Chair (to be appointed following the ToRs). The Intergovernmental Technical Panel on Soils (ITPS) of the GSP will provide the scientific advice needed.

The GSP Secretariat will facilitate the implementation of agreed activities of this network by allocating staff members upon contribution of resource partners.

The launch of the International Network of Black Soils will take place during the Global Symposium on Soil Organic Carbon (21-23 March 2017) at FAO headquarters in Rome, Italy.

5. Financial implications

The functioning of the network will rely on voluntary contributions from member countries. The establishment of this network will require:

- A full time staff member to be seconded to the GSP Secretariat and based at FAO headquarters in Rome.
- Non-staff resources will be needed for implementing activities that will be agreed by member countries.

Annex II: Arrangement for the establishment of the Global Soil Information System (GLOSIS) including the International Network of Soil Information Institutions (INSII)

The Global Soil Partnership Partners,

Recognizing the importance of sustainable soil management which is central to the mandate of the Global Soil Partnership (GSP), and

Confirming the need to have efficient and reliable soil data and information available for sound decision making,

Agree to:

- a) work jointly on the establishment of the Global Soil Information System and its associated products under the framework of Pillars 4 and 5 of the GSP and related agreed Plans of Action, based on agreed technical specifications and standards which would embody a GSP Data Policy;
- b) nominate national soil technical institutions in FAO member countries to join the International Network of Soil Information Institutions (INSII);
- c) contribute with expertise, data/information sharing, and other forms of technical support to the establishment of the Global Soil Information System and its associated products;
- d) cooperate through various modalities, including:
 - exchange of expertise on issues related to Pillars 4 and 5 of the Global Soil Partnership;
 - soil data sharing;
 - development and harmonization of representative soil data sets;
 - exchange of these data through standards-based procedures;
 - joint organization of/participation in training courses and workshops;
 - exchange of relevant publications and methodologies.

In particular, GSP Partners will undertake the following tasks of mutual interest:

- to carry out an assessment of existing soil data, including a gap analysis in the light of the Pillar 4 data requirements;
- to develop methods to fill data gaps as needed, and to develop data extracts suitable for Pillar 4 products;
- to exchange data for building the following Pillar 4 global data products: Tier 1 and Tier 2 soil profile data bases, global soil polygon map, version 0 and version 1 soil grids, and SoilSTAT; preferably, data should not be physically exported but shared using web-based technology (for product definitions, see [Pillar 4 Plan of Action](#));
- to use standards-based web data formats (WMS, WFS, WCS); this would require that the locally stored soil data, or extracts of those, are pre-processed (harmonized), and transformed using a protocol for the web-based exchange of digital soil data (SoilML, Pillar 5);
- to apply the highest level of harmonization possible and necessary, in order to allow for the integration of these data sets into the global product scheme;
- to provide documentation about the national or local data sets via meta data and additional information needed to assess the source, methodology and accuracy of the data shared.

Further agree on the following provisions:

1. Intellectual Property Rights. Title rights, including intellectual property rights and copyrights of the data shall remain with the originating parties which grant to FAO a non-exclusive royalty-free perpetual license to use such data for non-commercial purposes and with a view to implementing FAO's mandate. Use of such data shall include storage, display and publication through the Global Soil Information System.

FAO, when using the data, will acknowledge that the latter contains proprietary and confidential information protected by copyright.

This arrangement does not imply any ownership rights of the data.

2. Confidentiality. Data items or information that are considered confidential should be identified as such and should not be communicated to any other person or entity without prior written permission. FAO shall not disclose or use information or documents communicated to it or brought to its attention in the framework of this arrangement for any purposes other than those set out in this arrangement. This provision shall survive the expiration or termination of this arrangement.

FAO may share, on a confidential basis, data with the Global Soil Spatial Data Infrastructure Centre (GSSDIC), which shall not further disseminate any data.

3. Financial implications. Each Party will meet its own costs and expenses, as may be incurred in the implementation of this arrangement.

4. Entry into force, modification and termination. This arrangement shall become operational upon approval by the 5th GSP Plenary Assembly in accordance with Rule V of the GSP Rules of Procedure. The GSP Plenary Assembly may amend or terminate this arrangement in accordance with the same rule. In the event of termination, the GSP Partners will agree on measures for the orderly conclusion of ongoing activities.

Annex III: Terms of Reference of the International Network of National Soil Information Institutions (INSII)

These institutions have already, or will develop, the technical ability to develop and share selected national soil information and data. The discussion of methodologies and product specifications, as well as a shared data infrastructure throughout the globe, will be coordinated in a participatory approach through the International Network of Soil Information Institutions (INSII). While ensuring consistency with national data sets and data policies, each institution acts through the respective regional partnership and is also embedded in the global soil information system. Therefore, INSII is the implementing organization of Pillar 4. The process is facilitated by the GSP secretariat. By agreeing to the PoA, and by its participation in the drafting of this implementation plan, all GSP partners have in principle already agreed to the establishment of INSII.

The INSII will:

- convene an annual meeting to monitor progress on Pillar 4 implementation; the relationship to the regional soil partnerships shall be regularly addressed and developed
- appoint a Chair for a period of 2 years, extendable via INSII decision to a second term; the chair will moderate the annual workshop and the Pillar 4 Working Group
- contribute to the execution of the Pillar 4 implementation plan by serving as its strategic decision making body, within the constraints of the Pillar 4 Plan of Action approved by the GSP Plenary Assembly;
- report on progress and outstanding issues at each GSP Plenary Assembly
- oversee the P4WG and the GSP Soil Data Facility; - delegate the P4WG tasks, as needed, to support the efficient implementation of Pillar 4;
- provide access to soil geographic information in order to populate the products of the Global Soil Information System under specified conditions (Pillar 4 code of ethics and IP policy);
- support the process by providing overall guidance and advising on matters related to funding and implementation of actions;
- endorse a code of ethics for privacy, data sharing, and use and submit this to the GSP Plenary for approval.

Annex IV: Terms of Reference for the Chair of the International Network of National Soil Information Institutions (INSII)

The Chairperson INSII will:

- i) ensure that the Pillar 4 Implementation Plan is executed and the Global Soil information System is established;
- ii) chair the Pillar 4 Working Group, thus ensure work objectives and deliverables² are met in time; delays must be communicated to the GSP secretariat and ITPS Chair;
- iii) maintain active communication with the GSP Secretariat in relation to the execution of the P4 global implementation plan;
- iv) report (jointly with the GSP Secretariat and ITPS Chair) to the Plenary Assembly about the Pillar 4 implementation progress;
- v) participate in the Pillar 5 Working Group ensuring integration and complementary between pillars 4 and 5;
- vi) advocate for the mobilization of resources to execute the Pillar 4 GIP.

² Main task of P4WG is to monitor compliance with the Pillar 4 implementation plan by all members and to ensure that products meet specifications.

Annex V: Call for the GSP Soil Data Facility and submission of a proposal by ISRIC

Open call: Global Soil Partnership Soil Data Facility

1. Introduction

In accordance with the Pillar 4 Implementation Plan of the Global Soil Partnership (GSP)³, which was welcomed by the 4th GSP Plenary Assembly, and in line with the GSP Rules of Procedure, the GSP Secretariat is herewith launching a call for proposals to host the GSP Soil Data Facility (SDF)⁴.

The GSP Soil Data Facility is to provide technical and infrastructure support to the Global Soil Information System (GLOSIS), to be established as per the Pillar 4 Implementation Plan. The major tasks of the SDF are outlined in Annex 1. Functioning of the Global Soil Information System will be overseen by INSII, which delegates operational management to the Pillar 4 Working Group (P4WG). The GSP Soil Data Facility will be a member of both INSII and P4WG.

The Facility is not a formal data owner: data are either released by the owners themselves, or the GSP Secretariat is explicitly asked by GSP partners/data owners to physically host and disseminate national soil data on their behalf. INSII through the GSP secretariat and the P4WG will assign tasks to the GSP Soil Data Facility to undertake as required. In this case, INSII members through the GSP secretariat will share the relevant data with the GSP Soil Data Facility. However, ownership remains with the data owner, unless specified otherwise.

2. Who can apply to become the GSP Soil Data Facility?

- Any member or consortia of members of the GSP, in particular members of the INSII network, can apply to take up the role of GSP Soil Data Facility.
- The GSP Soil Data Facility can be a single institution or a consortium of institutions.
- In this light, offers in response to this call must specify the information, as listed under Section 4: Selection Criteria.

3. Tasks of the GSP Soil Data Facility

According to Annex 3 of the Pillar 4 Implementation Plan (Terms of Reference of GSP Soil Data Facility), the GSP Soil Data Facility will:

- host, develop and maintain important elements of the spatial data infrastructure (SDI) for a distributed system⁵;
- provide as needed, infrastructure components for INSII members who choose not to develop and host their own web services;
- actively participate in the P4WG;
- support various technical and product-related elements of the Global Soil Information System (see also Annex 1);
- support the design and implementation of the distributed Global Soil Information System and cooperate with FAO to support the delivery of SoilSTAT;
- provide data services that support the aims and objectives of the Global Earth Observation System of the Systems (GEOSS).

³ <http://www.fao.org/3/a-bl102e.pdf>

⁴ In the Pillar 4 Implementation Plan, the GSP Soil Data Facility was originally referred to as the 'Global Soil Spatial Data Infrastructure Centre (GSSDIC)' but INSII preferred the shorter name for ease of use.

⁵ It may be noted that following the Pillar 4 Implementation Plan, FAO is currently developing a corporate SDI, which will also be aimed at supporting the requirements for the Global Soil Information System. The finalisation of the overall SDI for the Pillar 4 Global Soil Information System will be discussed and agreed with the P4WG and INSII, clarifying respective involvement as well as ownership, accountability and responsibility for the infrastructure and services to be provided.⁶ A general GSP data sharing policy is currently being prepared.

The Annex presents a summary of the technical tasks outlined in the Pillar 4 Implementation Plan.

4. Selection criteria

The selection of the institution, or consortium of institutions, to serve as the GSP Soil Data Facility, will be based on applications by GSP members who express interest in this open call in written form, and can demonstrate the following institutional capacities or features:

- Technical capability in hosting elements of a spatial data infrastructure (examples: discovery and download services, transformation services, soil thesaurus/vocabulary services);
- Adequate permanent technical support staff;
- Experience with managing soil geographic databases;
- Experience with interoperable systems;
- Extensive experience in international collaboration, including dealing with intellectual property issues concerning soils data;
- Approval and support from the pertinent national government, as specified in its statutes or terms of reference, or explicitly by letter;
- Adequate amount of self-funding, complementing GSP contributions (which are subject to availability of resources);
- Synergy with GSP and own SDI activities;
- Experience in soil-related education and training.

The Soil Data Facility will operate within the framework of the Pillar 4 Intellectual Property Rights/data policy requirements⁶. While this policy is currently under consideration, there is already an initial agreement that national data sets (or those of other than national institutions) remain in ownership thereof.

The screening of applications and assessment of compliance with the selection criteria will be conducted by the GSP Secretariat and P4WG. The Secretariat will submit to the 5th GSP Plenary Assembly (20-22 June 2017) a list of applicants that complied with the criteria. The selection of the GSP Soil Data Facility will rest with this session of the Plenary Assembly.

5. Financing

The GSP Soil Data Facility will be relying on its own funding for basic operations. Additional resources via the Healthy Soils Facility will be sought to support the execution of the Pillar 4 Implementation Plan.

6. Timeline

- Launch of the Call: 10 April 2017
- Application deadline: 10 May 2017
- Selection deadline: 20-22 June 2017
- The initial operational phase of the GSP Soil Data Facility will conform with the schedule outlined in the Pillar 4 Implementation Plan. Currently, the plan covers the period 2017 to 2020. Therefore, the appointment of the GSP Soil Data Facility will be until 31/12/2020, with a possibility of extension to be determined by the GSP Plenary Assembly.

Interested partners should send their applications to the GSP-Secretariat@fao.org by 10 May 2017.

⁶ A general GSP data sharing policy is currently being prepared.

Annex: GSP Soil Data Facility technical tasks according to the Pillar 4 Implementation Plan

1. Participation in meetings: INSII, P4WG, grid specification meetings;
2. Provide support for the development of data product specifications by the P4WG;
3. Provide support for the development of the global polygon map;
4. Tier 1 and Tier 2 profile database: design and implementation, technical support, maintenance;
5. Development, installation and maintenance of a soil profile data up- and download tool;
6. Development of a web viewer for v0 and v1 gridded maps as part of the GSP data portal;
7. Harmonization of v0 grids 1 km;
8. Documentation of v0 gridded maps;
9. v1 grid server and network maintenance;
10. Provide support for the technical SDI of GSP: development of data services (WMS, WFS, WCS), catalogue services, support to metadata development, vocabulary services;
11. Provide support for the formulation of a capacity development program by P4WG;
12. Development of training materials and conduct of training courses.

In order to allow for orderly planning of SDF activities along the tasks defined in Pillar 4, and depending on the final design of the Global Soil Information System, a work plan will be developed at the beginning of each year.



Expression of Interest

Soil Data Facility for Global Soil Partnership

About ISRIC - World Soil Information

ISRIC – World Soil Information (hereafter 'ISRIC') is a service provider, providing quality-assured soil data and interpreted soil information to the international science communities, policy communities and the private sector dealing with issues such as food production, land and water management, climate change, environmental quality, land use planning, and biodiversity. We maintain a deep understanding of soil assessment, soil analysis and soil data handling. ISRIC is a science-based organisation, meaning that the approaches and methods we use to build our products are based on sound science, published in peer reviewed scientific journals.

ISRIC is active in the following areas: (i) the development of standards for soil mapping, soil classification, soil measurements (both physical and chemical) and interoperability of soil data; (ii) compilation and harmonization of soil data; (iii) using soil data for the production of predictive soil maps (grids) at regional, national and global level; (iv) capacity building in the field of soil data, soil mapping and classification, and (v) production of derived information products in cooperation with (potential) users.

Under the World Data System (WDS), which is an Interdisciplinary Body of the International Council for Science (ICSU), we are the World Data Centre for soils. In this capacity we are a recognized focal point for soil-related collections and information services. As regular member of ICSU-WDS, ISRIC is a Participating Organization of the Intergovernmental Group on Earth Observations (GEO).

ISRIC is an independent foundation under Dutch law. We are based on the campus of Wageningen University and Research, with which we have a service level agreement for operational support. Our funding comes from various sources, including a long term basic funding by the Dutch government, various (applied) research programs (EU, US), private sector and charity.

Reflection on the call

As a member of the GSP and the INSII we have been involved in the process leading to this call and we understand the context of it. The tasks to be executed by the GSP Soil Data Facility are clear and necessary to achieve the goals defined in the Pillar 4 Implementation Plan.

We fully agree with the principle that a *distributed* information system, in which contributing partners can handle and serve their own soil information in line with their own principles, is the basis of the Global Soil Information System. A consistent INSII-wide capacity building programme at country level is required to provide the possibility for all partners to join the distributed system. However, it is likely that not all countries will be in the position to develop a national information system and serve them as part of a distributed system. Therefore combining the bottom up approach with global efforts to fill the gaps is necessary, at least in the medium term.



We endorse the principles of the IP policy drafted by the Pillar 4 Working Group. ISRIC endorses the governance structure of the P4, meaning that we will work according to the activity plans designed by the P4 Working Group, as long as these activities are in line with the ToR of the Soil Data Facility.

Our approach

Focus on coordination and streamlining of communication. If we are granted to host the GSP Soil Data Facility, we would make one lead expert (Dr. Bas Kempen) available as a contact person for the Pillar 4 Working Group. This person will be responsible for the day to day work and manage the input by other ISRIC colleagues where necessary.

High level direct support. Because of the high profile and importance of the GSP, this activity needs institutional backup. Therefore the director of ISRIC (Rik van den Bosch) will be following the process closely and participate in INSII meetings and in the General Assembly meetings.

Cooperation. There are various internationally renowned institutions and universities with in-depth knowledge and expertise in the field of soil data and soil mapping. We firmly believe the Pillar 4 Working Group and the Soil Data Facility should tap into this rich body of knowledge in order to continue to innovate and apply the best methods and tools available. We have approached various of these institutions, and various have given support to ISRIC's application (see support letters) and expressed their willingness to participate in a later stage. ISRIC is willing to take the lead in involving these partners.

Structured and accountable: We will draft annual work plans for the work to be done by ISRIC, with clear deliverables and timelines. After approval by the Pillar 4 Working group these annual plans will be guiding for ISRIC's activities to support Pillar 4. Every year the results will be evaluated by the Pillar 4 Working Group and a new plan for the next year will be drafted. As we do with all our project related activities, we will record all time investments in our integral time writing system and if desired these records can be shared with the GSP P4 Working Group.

Our offer

We offer to carry out the tasks as specified in section 3 of the open call and in the annex. Our contribution is maximised to 2 FTE per year for a period of 3 years. These 2 FTE will be divided over various specialists (soil information specialist, database expert, IT expert, expert digital soil mapping, etc.), depending on the requirements specified by the annual plans. As this is a voluntary in-kind contribution by ISRIC to the GSP, ISRIC will not be paid for this input, as long as there is no funding available for the activities in Pillar 4.

The following conditions apply to this offer:

- ISRIC is investing time in order to boost the activities in Pillar 4 and to generate first products. However, without external funding it is unlikely that the INSII will gain enough momentum for implementation of all activities of the plan. Therefore our main condition is that the Pillar 4 Working Group installs a permanent task force that has the duty to make all reasonable efforts



necessary to acquire external funding for all Pillar 4 activities. As soon as funding is available ISRIC will be compensated for its input against cost price.

- ISRIC is prepared to share its training materials or develop new materials, but only in the context of comprehensive and coherent training program across INSII, in which ISRIC is involved as a trainer of trainers.
- All training material developed by ISRIC as part of this agreement will remain the intellectual property of ISRIC. However, all such training material will be open for use by all consortium partners.
- ISRIC will execute its activities as long as the INSII and the Pillar 4 Working Group demonstrably perform according to decisions taken by the INSII and the GSP Plenary, guaranteeing long term impact of ISRICs input.
- ISRIC remains free to develop and deliver any other data and services to any other party, in accord with ISRIC's own Data and Software Policy, using its own data sources and staff.

ISRICs relevant expertise

ISRICs daily work is the development of web-based soil information systems and capacity building and training in this field. We have developed the following relevant expertise.

- We have a broad experience in *cooperation with national level partners* in organising soil data, quality assessment and control, for instance in the AFSIS project¹.
- We have developed a *comprehensive soil profile database* (WoSIS²) (similar to the database proposed in the GSP Pillar 4 Implementation Plan, along with the required operational standardisation procedures. We currently serve standardised data for over 100,000 profiles to the international community.
- We are the initiator and co-developer of the *Soil and Terrain database program (SOTER)* and led the consortium that developed eSOTER³. SOTER is one of the mapping methods proposed to be used in Pillar 4.
- We have developed internationally recognized *expertise and experience in digital soil mapping, geostatistics and machine learning algorithms*, all fields of expertise required to assist partners in building national gridded soil maps.
- We are contributor to the *Harmonised World Soil Database* and has recently developed an update of this product. A more elaborate update of the HWSD is one of the products foreseen in the implementation plan for Pillar 4⁴.

¹ <http://www.isric.org/projects/africa-soil-profiles-database-afsp>

² <http://www.isric.org/projects/data-wosis-project>

³ <http://www.isric.org/projects/soil-and-terrain-soter-database-programme>

⁴ FAO-GSP 2014. *Plan of action for Pillar Four of the Global Soil Partnership : Building an enduring and authoritative global system to monitor and forecast the condition of the*



- Acknowledging that not all countries will be in the position to develop national grids, combining the bottom up approach with global efforts to fill the gaps is necessary, at least in the medium term. We are *uniquely positioned to provide gap filling*, due to our rich global datasets.
- We have operational expertise in *standardisation and harmonisation* of point datasets, and extensive experience with *metadata*⁵ (we will be INSPIRE-compliant by the end of this year), and we are building up our expertise in *soil sensing*.
- We have an *advanced and operational IT infrastructure*, supported by in-house IT specialists, needed to use and serve large sets of global data layers. This infrastructure can be extended to host the products produced by INSII / Pillar 4 of the GSP.
- We have experience and capacity to deal with the development of *Web Mapping Services, Web Feature Services, Web Coverage Services, REST and API interfaces*. These are all interfaces required to share, exchange and serve spatial datasets globally.
- We are member of the consortium that has developed a prototype of SoilML⁶, a markup language for soil data, which is intended to evolve into an *international standard (OGC and /or ISO) for soil data and information exchange*. This is done in cooperation with GODAN, GSP Pillar 5, Open Geospatial Consortium, IUSS Working Group on Soil Information Standards and ISO. Such a standard is critical to the envisaged data exchange process within Pillar 4.
- We host a *large set of satellite imagery-derived products, terrain attributes and climate properties* that can be freely used as covariates to develop (national) digital soil maps.
- We have experience in developing *web services and websites* (see for instance www.soilerids.org) for the distribution of the INSII products, as well as experience with the *development of mobile phone apps* (such as SoilInfoApp) that distribute and collect soil information.
- We have long-term experience in cooperation projects focussing on *capacity building*, extensive experience in the development of training material and providing training on location for a diverse set of partners. In addition ISRIC organises a yearly Spring School (isric.org/utilise/capacity-building) dealing with digital soil mapping and soil classification.
- We have developed our own data policy⁷ for soil information exchange, along with the strict internal procedures to ensure adherence to these policies. This experience can be helpful in the development and implementation of the Pillar 4 data policy and the accompanying procedures.

Earth's soil resources FAO Global Soil Partnership, Rome, 33 p.

http://www.fao.org/fileadmin/user_upload/GSP/docs/plenary_assembly_II/pillar4.pdf

⁵ <http://www.isric.org/explore/metadataservice>

⁶ Ritchie A 2016. *OGC Soil Data Interoperability Experiment*, Open Geospatial Consortium, 74 p. https://portal.opengis.org/files/?artifact_id=69896

⁷ <http://www.isric.org/about/data-policy>



Finally

ISRIC looks forward to being a pro-active partner in this important global effort to set up a global soil information system for the benefit of scientists, policymakers and practitioners who deal with important and pressing issues such as food security, sustainable land management, climate change mitigation and adaptation, and water management. We will work in a collaborative manner with INSII and the Pillar 4 Working Group, and support the INSII members where ever possible to build up their own soil information system that feeds into the global soil information system.

Annex VI: GSP Soil Data Policy

1. General provisions

1.1 Purpose

This Data Policy has been developed by the Global Soil Partnership secretariat in order to promote soil data sharing for data products identified through Pillar 4, and considering harmonization and interoperability requirements according to Pillar 5. Following the Pillar 4 Implementation plan⁷, “the emphasis is on interoperable systems and web-based delivery of information services”. Besides these data exchange principles, the Pillar 4 implementation plan contains details about the data to be exchanged.

This GSP data policy aims to ensure that:

- a. every existing ownership right to shared soil data are respected;
- b. the specific level of access and the conditions for data sharing are clearly specified;
- c. the ownership of each dataset and web service is properly acknowledged and well-referenced;
- d. the data owners are protected from any liability arising from the use of their original and/or derived data.

1.2 Applicability

This Global Soil Partnership Data Policy is applicable to:

- a. all members of the GSP and FAO that share soil data through the Global Soil Information System and SoilSTAT
- b. users, developers, and contributors to the Soil Information System, SoilSTAT, and Soil Spatial Data Infrastructure.
- c. creators of Derived Data developed in any form using the Original Data shared through the Global Soil Information System and SoilSTAT
- d. any authorized user, institution, or Nation that has access to the Global Soil Information System and SoilSTAT, regardless of the conditions on which such access is given.

1.3 Definitions

- a. Soil spatial data infrastructure (soil SDI): technical basis for sharing spatial soil data via view, download and discovery services: it can include a physical infrastructure, transformations services and invoking services if needed and available.
- b. Global Soil Information System: all shared national soil data products, developed using common GSP protocols (“specifications”, see Pillar 4 Implementation plan), and distributed via web services, facilitated by national and a global soil spatial data infrastructure.
- c. SoilSTAT: Component of the Global Soil Information System, which involves indicators, assessed according to agreed updating intervals.
- d. SDI host institutions: The SDI for the Global Soil Information System will consist of a network of national SDIs, or components of such, and global-level SDI components (viewer, download service etc.); the latter may be provided and supported by several institutions. For SoilSTAT, FAO will build a basic SDI using free and open source software (portal with view service,

⁷ <http://www.fao.org/documents/card/en/c/6ae46a44-281c-4381-b399-4ff47c4c4585/> “This implementation plan will provide the guidance to build the global soil information system. It will be based on soil data sets provided by national and other institutional soil information institutions (...). Data will be provided according to own national and institutional terms, (...)”

discovery and download services). An important provider of additional SDI components may also be the GSP Soil Data Facility (SDF).

- e. Original data: any final national data product according to Pillar 4 specifications, including but not limited to: soil maps, soil profiles comprehending measurements, soil grids with soil properties and indicators. Original data may not involve raw data, and may not consist of all data available in a national soil data base; rather, it refers to the soil data according to Pillar 4 product specifications, selected, provided and shared by the data owner.
- f. Derived data: original data transformed by an institution other than the owner of the original data, for example, in the case of adjustments necessary to adapt original data according to global-level product specifications (e.g. global polygon map), or evaluation of indicators if not done so at national level. For example, such transformations are likely to be done by the SDI host.
- g. Original data owner: original data remain in the ownership of the data provider (usually an INSII member, or any other provider of soil data according to Pillar 4 product specifications).
- h. Derived data owner: Depending on the extent and intensity of the processing and evaluation of original data, either co-ownership or new ownership of the derived data product shall be considered. During Pillar 4 implementation, institutions (such as the SDF) could become mandated through individual INSII members to conduct country-level evaluations, or by the Pillar 4 Working Group for global level evaluations, thus to process original data, following Pillar 4 product specifications. In any case, the evaluating institution must specify the origin of the input data (data sources), and correctly cite it including reference to national data policies).
- i. Web services: for original or derived data shared through web services, data will be provided and exchanged according to international standards (e.g. ISO 19115/19119/19139 & OGC WMS, WFS, WCS) and divulged on a continuous basis – preferably by the partners themselves, through either own web interfaces, or the web interface of the central soil SDI.
- j. Intellectual Property: the rights including, but not limited to, patents, copyrights, related rights, trademarks, design rights, database rights, software rights, and know-how rights, that are either registered or unregistered and may prevail anywhere in the world.

1.4 Repository for information exchange between FAO and member countries

According to its constitution⁸, FAO “*shall collect, analyse, interpret and disseminate information relating to nutrition, food and agriculture*” (Art I.1). “*Through FAO, its Member Nations and Associate Members will report to one another on the measures taken and the progress achieved in the fields of action*⁹ (...).”

To meet this obligation, FAO has built FAOSTAT as a global repository for statistics on agriculture. The responsible national partners are mostly the agricultural ministries, contacted through the permanent representations to FAO. Depending on the type of indicator collected, these national contact points involve or request information from other relevant national institutions (e.g. national statistical offices). For SoilSTAT, these institutions may be the National Soil Information Institutions (INSII), mandated by the respective GSP national focal point (which is either the agricultural ministry or an institution mandated by it).

⁸ www.fao.org/3/a-mp046e.pdf

⁹ among others, this list of actions includes “the conservation of natural resources and the adoption of improved methods of agricultural production”

Through the above-mentioned intergovernmental network between FAO and its members, a general framework for data exchange between FAO and its members thus already exists. This may then also apply for the new SoilSTAT system.

1.5 Data exchanged through the Global Soil Information System and SoilSTAT

Each INSII institution has the task to develop and share the following national data according to the Pillar 4 Plan of Action and Implementation plan, following specifications still to be developed and agreed by INSII and the Pillar 4 Working Group:

- a. national soil polygons (soil types)
- b. soil profiles (Tier 1 and Tier 2)
- c. soil properties as soil grids (1 km and 100 m), e.g. soil carbon
- d. soil indicators and soil monitoring (SoilSTAT)

1.6 National data policies

Ideally, soil data is shared by data owners through web services following national and already existing data policies (primary data flow, see Ch. 2). For original data sets collected by FAO or any other institution serving elements of the Spatial Data Infrastructure (centralized component: see also sections 1.7 and 2), and for data derived by it, national data owners may require an additional bilateral data sharing agreement to ensure the full data protection according to national rules.

As much as possible, soil Information and data shall be open and accessible to all potential users. If the sharing of data as Open Data¹⁰ is not possible due to national data policies, it is recommended that data is made available with minimal additional restrictions on use. In any event, national data policies shall always overrule the general recommendations and frame conditions presented here.

1.7 Data sharing principles

It is recommended that data owners comply with the following open data principles:

- a. Accessibility: the data shall be divulged through the Internet (web services).
- b. Availability: means the presentation of the data in a convenient, platform-independent and standards-conformant format (e.g. web feature service – WFS).
- c. License: the formal concession of the usage and access rights over the data shared.
- d. Cost: data shall be shared free of cost, or at no more than a reasonable reproduction cost, preferably by downloading over the Internet.
- e. Re-use and Redistribution: data must be provided and licensed under terms that permit its re-use and redistribution, including intermixing with other datasets.
- f. Global benefit: any user must be able to access, use and redistribute data of the Global Soil Information System. However, inherited restrictions by national data policies shall be accepted.
- g. Metadata: data describing the products of the Global Soil Information System will by default be open for access.

Exceptions from free and open data access might be imposed depending on national data policies, which overrule the GSP data policy in accordance with the above clause 1.6.

¹⁰ Open data is data that can be freely used, re-used and redistributed by anyone - subject only, at most, to the requirement to attribute and share alike (<http://opendatahandbook.org/guide/en/what-is-open-data/>)

1.8 Conformance

Any sharing of data under this policy must conform to all applicable regulations; additionally, this data policy also harmonizes with the below mentioned relevant, generic data sharing principles:

- a. World Data System (WDS) data sharing principles: it supports the open sharing of quality-assured data, data services, products and information. Despite the open accessibility, data can be labelled 'sensitive' or 'restricted' depending on the data provider.
- b. GEOSS Data Sharing Principles Post-2015: The Group on Earth Observation (GEO) promotes fundamental principles for data sharing, expanding the trend towards open data worldwide¹¹.

As for any information presented through the FAO website, the FAO Terms and Condition¹² are valid. These specify the re-use of information presented through the FAO web site. It also specifies the use and storage of contact data (privacy policy). FAO pursues an open access data policy.

1.9 Implication of soil data resolution

Disclosure of spatially explicit soil data has the potential to intersect with the interests of a third party such as a landowner. This holds especially true for soil profile data which may contain spatial coordinates at high resolution; data sharing under this policy will attempt to make reasonable efforts in order to prevent risks that the data use might have over third party individuals.

For most published web data services, the data owner has already clarified the details of further data use and sharing, through metadata, IPR statements and/or through licensing. In some cases, data owners are required by their own stakeholders to maintain anonymity of local data, for example, by reducing the accuracy of the spatial coordinates of soil profile locations. These access restrictions are the responsibility of the data owner and will be fully respected by the SDI host and data users.

2. Data flows under the GSP Global Soil Information and SoilSTAT

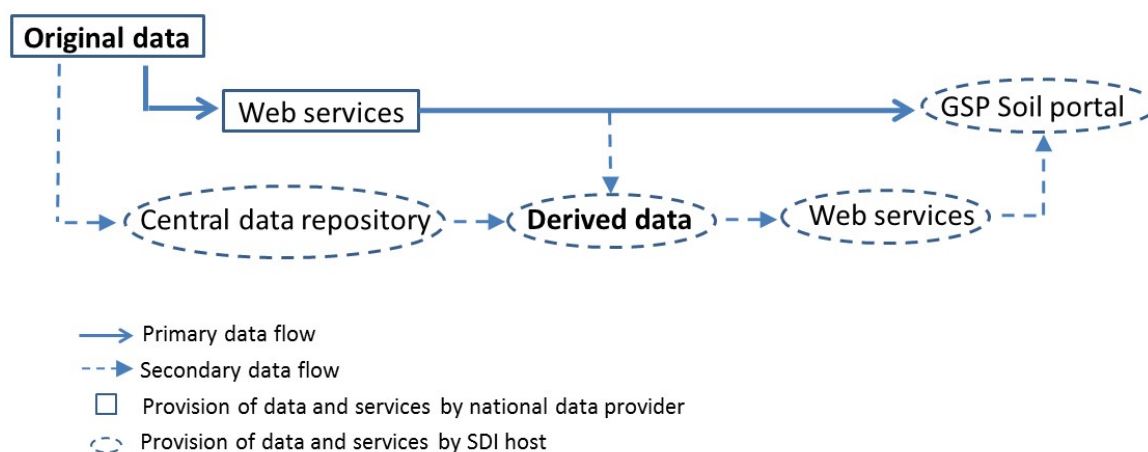
Ultimately, soil data are exchanged via web services. This includes original as well as derived data, following the Pillar 4 product specifications, and the Pillar 5 specifications for web based data.

Soil data will be accessible to users via a GSP soil portal as the front end of the soil SDI. Users are able to open the web portal and request an area of interest. Further links to the data owner will be made available by the SDI host if more information is required.

¹¹ <http://www.earthobservations.org/dswg.php>; see also White Paper "Mechanisms to Share Data as Part of GEOSS Data-CORE" as approved by the GEO Plenary in November 2014

¹² <http://www.fao.org/contact-us/terms/en/>

The following figure presents the schematic data flow under GSP Pillar 4:



Ideally, web data services are provided by the national data owners through their own infrastructures (primary data flow). However, for various reasons, the SDI host may download or receive original data, in order to process them further according to the Pillar 4 Implementation Plan (secondary data flow). In this case, the original ownership has to be properly reflected and cited (see also Ch. 3).

Only if national capacities do not allow for the development of own web services, data may be shared directly with SDI host into a central repository. A bilateral data sharing agreement may be developed in this case, fully considering national data exchange rules.

All data sets will be accompanied by metadata (see also Pillar 5). The metadata shall include information on how to access the data or at least identify the person to be contacted to access the datasets. Detailed metadata specifications will be developed by the Pillar 4 Working Group.

3. Ownership, data rights and citation

In the case of original data, the rightful data owner keeps full ownership of it. All IPR¹³ and copyrights¹⁴ pertaining to the data owner remain intact and are respected by the SDI host. All data providers must communicate to the SDI host their IPR and data use policies. Thus, the ownership of all data made available through the GSP soil portal can be clearly specified. This is an important prerequisite to permit this data to be accessible through the soil SDI.

In the case of derived data, the deriving institution becomes the owner (see Ch. 1.3, Derived data owner). However, all original data must be accredited and correctly cited. According to the Pillar 4 Implementation Plan, each global-level derived GSP data product will be quality-assured by the P4WG. This includes agreement about the correct citation.

The data owner shall ensure that the data shared can be used and interpreted by the authorized users in general; this includes providing the proper citations, as well as providing information over the ownership of such data for acknowledgement purposes.

Users shall acknowledge the source of data provided through the Global Soil Information System.

¹³ Intellectual property rights (IPR) clarify the ownership of data and how others may use it. These rights guarantee that all legal, ethical, and professional obligations that data users may have to the provider of the data are met. See also <http://data.research.cornell.edu/content/intellectual-property>

¹⁴ Copyright is a legal right created by the law of a country that grants the creator of an original work exclusive rights for its use and distribution (<https://en.wikipedia.org/wiki/Copyright>). It governs the use of databases and data content. Generally, it includes the right to reproduce, distribute, display, and make adaptations.

4. Data licensing

All providers of original data ('data owners') are responsible to define and clarify the IPR and licensing if decided so¹⁵. Any user of this data, such as the SDI host, has to respect the national data policies and/or licensing involved with the retrieval of the respective web services.

In the case of data provided to the central repository, a bilateral agreement/license may be required (between the national data owner and SDI host), depending on and in conformity with national rules.

In the case of derived data, a Creative Commons¹⁶ licensing will be implemented. The license selection will consider the CC pre-license recommendations. This is also recommended for data owners to be applied to original data. Detailed recommendations about product licensing will be provided by the P4WG.

An example of the above mentioned is that the most commonly used license for the exchange of data through web services is CC-BY (<https://creativecommons.org/licenses/>): This license allows users to share (copy and distribute) and adapt (remix, transform, and build upon) data, even commercially, as long as they credit the original source.

5. Liability

The SDI host must not be placed in a position of responsibility for the original data provided to the SDI, and which are portrayed and disseminated through the GSP soil portal. For original data, the soil SDI only acts as a hub to allow users to find data which are released by national data owners.

Any data and content presented through the spatial data infrastructure (SDI) of the Global Soil Information System can be retrieved and reproduced by any user based on the access restrictions/licensing which accompanies each data set. Users must consider that the accuracy and applicability for a particular purpose is in their own responsibility.

Data owners and users shall hold the GSP and the SDI host harmless from any claim of Intellectual Property Rights infringement over data they shared or actions they incurred in while using the Global Soil Information System and SoilSTAT. If such an infringement claim occurs, the data owner or user shall give prompt notice of it to the GSP and the SDI host.

¹⁵ The specific national IPR statement/data policy accompanies the original and derived data provided as web services. The access constraints of each data provider is contained by the respective OGC service GetCapabilities response. It can contain licensing or charging details. For example, if charges are involved, the data is not portrayed in the GSP soil portal until the charging transaction has been conducted.

¹⁶ Creative Commons (CC) is a global non-profit organization that enables sharing and re-use of creativity and knowledge through the provision of free legal tools (<https://creativecommons.org/>). CC licenses are copyright licenses, and depend on the existence of copyright, e.g. to data. CC licenses are legal tools that data rights holders such as data owners can use to offer certain usage rights to users, while reserving other rights. If data owners intend to reserve all of their rights under copyright law, the use of CC licenses is not recommended.

6. Code of conduct

This code outlines the proper practices and responsibilities for all parties sharing soil data according to this data policy.

6.1 Documentation

The data are documented according to metadata standards (ISO EN 19115 and ISO 19139). These standards contain the metadata profiles for geographic data sets to support interoperability between different metadata and/or GIS platforms. It will be good practice to extend the ISO metadata profile by sharing additional information relevant to harmonize the shared soil data (see GSP Pillar 5 Implementation plan, currently under development).

6.2 Best knowledge

The data shared shall contain the relevant soil information representative for the area portrayed. This can be one or several point locations as well as polygons or raster maps. The shared data sets contain the best available information for a given area and topic, however, subject to potential restrictions based on the institutions' or countries' data policy.

6.3 Reliable information

The data shared are quality controlled which means that the data have passed a technical routine to ensure data integrity, correctness, and completeness; errors and omissions are identified and, if possible, addressed¹⁷.

¹⁷ See also IPCC (2006) for quality control and quality assurance.