



Assessment Information

[CoreTrustSeal Requirements 2020–2024](#)

Repository: ISRIC - World Soil Information - WDC -Soils
Website: <https://www.isric.org/>
Certification period: Nov. 9, 2023 - 08 November 2026
Requirements version: CoreTrustSeal Requirements 2020-2022

This repository is owned by: **ISRIC - World Soil Information**

CORE TRUSTWORTHY DATA REPOSITORIES REQUIREMENTS

Background Information

Repository Type

Please provide context for your repository. You can select one or multiple options.

Response:

- Archive
- Domain or subject-based repository
- Institutional repository
- Library
- Museum
- Publication repository

Reviews

Reviewer 1:

Comments:

Reviewer 2:

Comments:

Description of Repository

Provide a short overview of the repository.

Response:

ISRIC — World Soil Information, legally registered as the International Soil Reference and Information Centre (ISRIC), is an independent foundation by Dutch law. We have a mission to serve the international community as custodian of global soil information.

ISRIC, founded in 1966, has been a World Data Centre since 1989. We are a service provider to the international science communities, policy communities and the private sector dealing with issues including food production, land and water management, climate change, environmental quality, social justice, land use planning, and biodiversity. We do this by providing quality-assessed soil data and interpreted soil information. We maintain a deep understanding of soil standards, soil assessment, soil analysis, soil data handling and soil mapping.

ISRIC is a science-based organisation, meaning that the approaches and methods we use to build our products are based on sound science. We participate in scientific research in the field of soil measurement, soil data standardisation/harmonisation, soil mapping, pedometrics and soil/information standards, aiming to generate knowledge which we use to innovate our methods. In conjunction with this, we are developing a community of practice for soil information providers.

Our centre handles/accepts all kinds of soil-related data: physical collections (e.g., reference soil samples and soil monoliths), soil maps and reports, digital soil profile data (i.e., morphological observations and physical/chemical measurements for specified depth layers or horizons), as well as GIS-based datasets provided the provenance and license are well documented in the accompanying metadata. These data are then registered, quality-assessed and processed according to domain specific workflows (see section R12 for additional information) for ultimate access/distribution to our user community following FAIR principles.

The primary webpage for ISRIC can be found at <https://www.isric.org>. A diagram of the context and landscape of the data centre may be found at <https://www.isric.org/about/vision-mission>. Our activities are organised according to four workstreams. The first workstream (WS1), 'global soil information and standards', develops harmonised and quality assessed soil information products targeted to the needs of various global users. WS2 facilitates a Community of Practice (CoP) of soil information providers to assist partners at regional and national levels to develop and maintain their soil information systems, products and services using agreed upon standards. WS3, develops soil and related information services for ISRIC's stakeholders to support improved soil management. The fourth workstream (WS4) aims to offer an inspiring place to learn about soils and their diversity, accompanied with inspiring learning experiences (both on-location and on-line). Synergies and interdependencies between the workstreams, and corresponding stakeholders (or user communities) and results and impact are visualised here (<https://www.isric.org/sites/default/files/Linkages%20between%20ISRIC%20WS's.png>).

For these workstreams to operate smoothly there are three crucial 'supporting' activities: a) scientific research in support of methodology development, b) management and maintenance of the ISRIC World Soil Reference Collection and Library, and c) development of our spatial data infrastructure (SDI).

ISRIC - World Soil Information - WDC -Soils

Many of the above activities and processes are designed to underpin and consolidate our role as World Data Centre for Soils (WDC-Soils). A special page (<https://www.isric.org/about/world-data-centre-soils-wdc-soils>) is devoted to the WDC-Soils itself, with brief sections describing our a) accreditation and certification, b) role as trusted steward of soil information, c) collections and information services, d) data policies and service level agreements, and progression as WDC-Soils.

Reviews

Reviewer 1:

Comments:

Reviewer 2:

Comments:

Designated Community

Provide a clear definition of the Designated Community

Response:

The designated community for ISRIC WDC-Soils consists of a wide range of users of primary as well as derived soil data. Users are scientific researchers, decision makers, international science communities, policy communities and the private sector dealing with issues including food production, land and water management, climate change, environmental quality, social justice, land use planning, and biodiversity.

The breadth of activities undertaken to support this diverse community is illustrated in the workflow for ISRIC's community of practice for soil information providers (https://www.isric.org/sites/default/files/SIW_linear_text_for_WSrview.jpg). Much of this work is undertaken in collaboration with our partners (<https://www.isric.org/utilise/collaboration>).

Reviews

Reviewer 1:

Comments:

Reviewer 2:

Comments:

Level of Curation

Select all relevant types of curation.

- Content distributed as deposited
- Basic curation – e.g., brief checking, addition of basic metadata or documentation
- Enhanced curation – e.g., conversion to new formats, enhancement of documentation
- Data-level curation – as above, but with additional editing of deposited data for accuracy

Response:

- C. Enhanced curation – e.g. conversion to new formats; enhancement of documentation
- D. Data-level curation – as in C above; but with additional editing of deposited data for accuracy

Reviews

Reviewer 1:

Comments:

Reviewer 2:

Comments:

Level of Curation - explanation

ISRIC - World Soil Information - WDC -Soils

Please add the description for your Level(s) of Curation.

Response:

The goal of ISRIC WDC-Soils is the long-term and professional archiving, preservation and dissemination of its data holdings. All deposited, digital point datasets are preserved in their original format in the ISRIC repository. All subsequent handling, including plausibility checks, conversion to preferred formats and quality control is done in our central PostgreSQL database (WoSIS) using well documented workflows (see section R12). The Digital Preservation Policy describes our policy with respect to the long-term preservation of digital soil resources (sensu datasets; <http://dx.doi.org/10.17027/isric-wdc-202102>).

Reviews

Reviewer 1:

Comments:

Reviewer 2:

Comments:

Insource/Outsource Partners

If applicable, please list them.

Response:

ISRIC is a relatively small organisation (23 FTE). We have five service level agreements (SLA) aimed at facilitating operations, such as financial accounting, human resources management, IT infrastructure (and security), housing and legal advice:

- SLA with Wageningen University and Research formalising operational support (18 December 2020).
- SLA with Wageningen UR concerning the housing of ISRIC (i.e., office space and museum) on the Wageningen campus (18 May 2018, revised version).
- SLA with Wageningen University Library for maintaining and serving the on-line 'ISRIC World Soil Reference and Map Collection' (1 September 2019, ref: ISR1946095.pdf).
- SLA with Wageningen UR FB-IT (Information Systems) concerning our IT workspaces and the handling of the overall ICT infrastructure, including security-related aspects and making of regular backups (FB-IT, ver. 1.2 July 2021).
- SLA with ELONISAS (<https://www.elonisas.nl/>) concerning Drupal support and ISRIC website maintenance (revised Sept. 2022).

For transparency, the above SLA's are listed on a specific webpage [<https://www.isric.org/overview-service-level-agreements>]. However, the documents/contracts themselves are not publicly available; for additional information you may contact us at info@isric.org.

Reviews

Reviewer 1:

Comments:

Reviewer 2:

Comments:

Significant Changes

Summary of Significant Changes Since Last Application if applicable.

Response:

ISRIC WDC-Soils is continuously improving its processes and workflows. This is reflected in the '2021-2023 ISRIC Strategy' which includes a 'realignment' to enable ISRIC to better serve its user community [<https://www.isric.org/sites/default/files/ISRIC%20Strategy%202021-2023%20FINAL.pdf>].

Significant improvements since the last application include:

- Changes in staff composition/number to be in a better position to address rapidly evolving soil-related information needs [<https://www.isric.org/about/people>] (see Section R5).
- Improved ICT infrastructure and services (SDI) as well as access to the Anunna HPC (High Performance Cluster) of Wageningen University (see Section R2).
- Updated and stream-lined policies that underpin our diverse functions and services as World Data Centre. These include a) ISRIC Data and Software

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Policy, b) ISRIC Collection Management Policy (for our physical WDC-collections), c) ISRIC Digital Data Preservation Policy, as well as d) a dedicated web page relating to 'Privacy and Personal Data'. The policies themselves can be accessed online [<https://www.isric.org/about/world-data-centre-soils-wdc-soils#Data%20policies%20and%20Service%20Level%20Agreements>].

Further, we have implemented a Data Management Protocol [<https://www.isric.org/documents/document-type/isric-data-management-protocol>] that describes the procedures and processes of ISRIC with respect to the management and long-term preservation of data produced/handled by the center.

Reviews

Reviewer 1:

Comments:

Reviewer 2:

Comments:

Other Relevant Information

You may provide other relevant information that is not covered by the requirements.

Response:

Providing information on the soils of the world is an enormous task and a continuing challenge for a compact organisation such as ISRIC. Consequently, to properly fulfil our mission, we collaborate with a wide range of partners [<http://www.isric.org/utilise/collaboration>], pro-actively contribute to a range of scientific and technical working groups [<https://www.isric.org/memberships-scientific-committees-and-editorial-boards>], and support a community of practice (CoP) for soil information providers [<https://www.isric.org/utilise/community-practice>]. Co-development and use of international standards for handling soil data/information is an important part of our work [<https://www.isric.org/about/standards>]. We also have an active educative programme through the World Soil Museum [<https://wsm.isric.org/>], support a guest researcher programme [<https://www.isric.org/about/isric-guest-researcher-programme>], and welcome PhD and MSc students to do part of their thesis research or an internship with us in Wageningen [<https://www.isric.org/utilise/capacity-building/theses>].

We presented our 2020-2022 WDC-related work as well as activities envisaged for the coming three during the on-line '2022 WDS Members' Forum' (<https://vimeo.com/731732717>), held as part of the WDS-supported international symposium 'Data to Improve our World' (SciDataCon 2022), and are currently working towards realising these objectives within the framework of ISRIC's strategy for 2021-2023.

Reviews

Reviewer 1:

Comments:

Reviewer 2:

Comments:

Organizational Infrastructure

R1 Mission/Scope

The repository has an explicit mission to provide access to and preserve data in its domain.

Compliance level:

The guideline has been fully implemented in the repository - 4

Response:

ISRIC was founded following a proposal of the International Society of Soil Science (ISSS, now IUSS) to establish an international soil museum to provide physical examples of main soil types of the world delineated during the FAO-UNESCO 'Soil Map of the World' project. This proposal was adopted by the UNESCO General Council in 1964. In 1966, the Ministry of Education, Culture and Sciences of the Netherlands provided working funds for the establishment of the International Soil Museum (ISM).

Since that time, the scope of our 'soil mission' has gradually broadened [see: ISRIC vision and mission]. Nowadays, we are a service provider to the international science communities, policy communities and the private sector dealing with issues including food production, land and water management,

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climate change, environmental quality, social justice, land use planning, and biodiversity. We do this by providing quality-assessed soil data and interpreted soil information, and ensuring the long-term preservation and archiving thereof. We maintain a deep understanding of soil assessment, soil analysis and soil data handling. This is reflected in our present name 'ISRIC – World Soil Information'.

Links:

- [ISRIC vision and mission](#)

Reviews

Reviewer 1:

Compliance level:

The guideline has been fully implemented in the repository - 4

Comments:

Reviewer 2:

Compliance level:

The guideline has been fully implemented in the repository - 4

Comments:

R2 Licenses

The repository maintains all applicable licenses covering data access and use and monitors compliance.

Compliance level:

The guideline has been fully implemented in the repository - 4

Response:

Licensing information, terms of use and any required citations/acknowledgements are included in the metadata record describing each dataset/service [see: ISRIC soil data hub].

License conditions for point datasets are enforced in WoSIS, a PGAdmin/PostgreSQL system. Point (soil profile) datasets with a CC BY, CC BY-NC Creative Commons or less limiting license are quality-assessed and standardised according to the regular WoSIS workflow [see: FAQ WoSIS] prior to their distribution (with the original license). Alternatively, some point datasets have licenses specifying that, upon their standardisation in WoSIS, they can only be used to make derivative predictions and visualisations using the SoilGrids workflow [see: FAQ SoilGrids]; an overview of the licenses is provided through a dashboard [see: WoSIS dashboard]. The derivative products, or GIS layers, are made available with an open data license in accordance with the ISRIC Data Policy [see: ISRIC data policy].

We monitor data usage, citation and compliance to the conditions of the ISRIC Data and Software Policy in so far as possible. When non-adherence is observed, or reported to us, we kindly request the concerned parties to resolve the situation. We also have a 'Notice-and-Take-Down' clause; however, we currently have no means of identifying non-compliance unless it is brought to our attention by others.

Links:

- [FAQ WoSIS](#)
- [WoSIS dashboard](#)
- [FAQ SoilGrids](#)
- [ISRIC data policy](#)
- [ISRIC soil data hub](#)

Reviews

Reviewer 1:

Compliance level:

The guideline has been fully implemented in the repository - 4

ISRIC - World Soil Information - WDC -Soils

Comments:

Reviewer 2:

Compliance level:

The guideline has been fully implemented in the repository - 4

Comments:

R3 Continuity of access

The repository has a continuity plan to ensure ongoing access to and preservation of its holdings.

Compliance level:

The repository is in the implementation phase - 3

Response:

Long-term preservation/maintenance/serving of ISRIC's digital (and physical) collections is at the core of ISRIC's mission, as indicated in the foundations three-yearly strategic plans and digital preservation policy [see: ISRIC mission and ISRIC Digital Preservation Policy].

As mentioned in Section R1, ISRIC have received core funding from the Netherlands Government since 1966. Nonetheless, a 100% assurance of perpetual core funding, hence continuity of access, cannot be provided. If for any unforeseen reason ISRIC would be unable to sustain their long-term commitment to WDS (since 1989) concerning the ongoing access to and management/preservation of their digital holdings, the ISRIC Board and Director will implement a formal mechanism (i.e., 'the continuity plan') to secure the long-term preservation and accessibility of these holdings.

As a follow up to a recent meeting (12 September 2023), the ISRIC Board will pursue formal discussions with Wageningen University & Research (WUR) concerning this 'continuity plan'. The aim is to mutually agree that "in case of cessation of ISRIC's core funding", WUR would ensure that ISRIC's digital holdings are transferred to Wageningen University or to a regular WDS member that deals with environmental sciences (e.g., PANGEA), subject to a written request by the ISRIC Board."

Once mutually agreed upon, the definitive mechanism for ensuring the 'continuity of the ISRIC foundation's collections' (i.e., WDC-Soils holdings) will be formalised in the service level agreement with Wageningen University, which is currently being revised [See: Service Level Agreements]

Links:

- [ISRIC service level agreements](#)
- [ISRIC mission](#)
- [ISRIC Digital Preservation Policy](#)

Reviews

Reviewer 1:

Compliance level:

The repository is in the implementation phase - 3

Comments:

..

Reviewer 2:

Compliance level:

The repository is in the implementation phase - 3

Comments:

Concur. Revisions address my questions in the original review.

R4 Confidentiality/Ethics

ISRIC - World Soil Information - WDC -Soils

The repository ensures, to the extent possible, that data are created, curated, accessed, and used in compliance with disciplinary and ethical norms.

Compliance level:

The guideline has been fully implemented in the repository - 4

Response:

ISRIC WDC-Soils are dealing with physical geosciences. Personal information, such as the name(s) of our data providers and their hosts organizations –as required for citation or acknowledgement in line with common scientific practice or registration to a training course– are in accordance with the General Data Protection Regulation (GDPR). The justification and purpose for handling personal data are made explicit on our website under the tab 'Privacy and Personal Data' [see: Privacy and personal data] and related 'cookie' statement' [see: Cookie statement]. In case of possible 'non-compliance' with these conditions, concerned parties may contact our Data Protection Officer.

ISRIC staff are required to comply with the guidelines on governance of good research and service provisioning as outlined in the Wageningen UR Integrity Policy [see: Wageningen UR Integrity Policy]. This policy is in accordance with the terms of Netherlands Code of Conduct for Research Integrity [see: Netherlands Code of Conduct for Research Integrity].

Links:

- [Netherlands Code of Conduct for Research Integrity](#)
- [Wageningen UR Integrity Policy](#)
- [Cookie statement](#)
- [Privacy and personal data](#)

Reviews

Reviewer 1:

Compliance level:

The guideline has been fully implemented in the repository - 4

Comments:

Reviewer 2:

Compliance level:

The guideline has been fully implemented in the repository - 4

Comments:

R5 Organizational infrastructure

The repository has adequate funding and sufficient numbers of qualified staff managed through a clear system of governance to effectively carry out the mission.

Compliance level:

The guideline has been fully implemented in the repository - 4

Response:

ISRIC, the host institute of WDC-Soils, receives core funding (since 1966) from the Netherlands Government to carry out its mission of reference centre on soils of the world and 'trustworthy' provider of quality-assessed soil information; additional funding is acquired to carry out or participate in international projects [see: ISRIC projects].

ISRIC's operations are guided by the Managing Board [see: ISRIC Management Board] which in turn can seek advice from the International Scientific Advisory Council [see: ISAC]. Specific areas for recommendations include international institutional strategy, science policy and funding strategy with 3, 5- and 10-year goals, and support for fundraising opportunities.

Our diverse work (see section R0 under Designated Community) is carried out by a team of about 25 persons (~ 23 FTE) whose expertise can be used in the course of delivering its functions and services relating to the WDC-Soils. Expertise covered, include data experts, soil scientists, pedometricians, soil mapping experts, programmers as well as SDI specialists [see; ISRIC staff].

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Individual performance and scope for personal development are discussed annually with the Director as part of annual 'Results and Personal Development' rounds. There are also regular team building activities aimed at addressing the increasingly complex nature of the large, international projects that we lead or collaborate in as partners.

Our staff regularly attend a range of international scientific as well as professional meetings/trainings to present or to gain new insights (e.g., EGU, FOSS4G, Global Soil Partnership, IUSS, Pedometrics, WCCS) and regularly publish their findings in peer-reviewed journals [see: ISRIC staff publications]. Further, our staff actively interact with a range of scientific committees and editorial boards [see: Memberships of scientific committees].

Links:

- [Memberships of scientific committees](#)
- [ISRIC staff publications](#)
- [ISRIC staff](#)
- [ISAC](#)
- [ISRIC Management Board](#)
- [ISRIC projects](#)

Reviews

Reviewer 1:

Compliance level:

The guideline has been fully implemented in the repository - 4

Comments:

Reviewer 2:

Compliance level:

The guideline has been fully implemented in the repository - 4

Comments:

R6 Expert guidance

The repository adopts mechanism(s) to secure ongoing expert guidance and feedback (either in-house, or external, including scientific guidance, if relevant).

Compliance level:

The guideline has been fully implemented in the repository - 4

Response:

Data types, data volumes and data rates and the technologies to handle/analyse them are evolving rapidly. We maintain and develop our scientific and technical expertise through active participation in various international fora and working groups, and by regularly contributing to international meetings and training sessions [See: Examples of contributions to international meeting and training sessions]. Importantly, we can draw on a wide range of international experts from partner organisations with whom we interact regularly, for example the Global Soil Partnership hosted by FAO, and build new knowledge in synergy during international projects [see: ISRIC projects]. As indicated (Section R5), ISRIC can also draw on the expert advice from the International Scientific Advisory Board (ISAC).

Since 2021, we can better interact with our designated community for feedback through our evolving 'Community of practice for soil information providers' [see: Community of practice]. Many of these activities are directly related to supporting and improving our functioning as World Data Centre for Soils and ultimately serving a growing range of quality-assessed soil data.

Links:

- [ISRIC projects](#)
- [International collaboration](#)
- [Examples of contributions to international meetings and training sessions](#)
- [Community of practice](#)

ISRIC - World Soil Information - WDC -Soils

Reviews

Reviewer 1:

Compliance level:

The guideline has been fully implemented in the repository - 4

Comments:

Reviewer 2:

Compliance level:

The guideline has been fully implemented in the repository - 4

Comments:

Digital Object Management

R7 Data integrity and authenticity

The repository guarantees the integrity and authenticity of the data.

Compliance level:

The guideline has been fully implemented in the repository - 4

Response:

ISRIC WDC-Soils has policies in place that set out the requirements and terms and conditions for depositing data with our centre. Maintaining data integrity and authenticity, along the full data life cycle, is considered the responsibility of everyone within ISRIC; guiding principles for this, and other in-house procedures, are described in an internal handbook (for internal use only). Adherence to the overall procedure is overseen by our Coordination team.

We maintain and operate a GeoNetwork 3.0 metadata catalogue and manage point data in a relational server database (PostgreSQL). Referential integrity checks and versioning are inbuilt in the process; lineage is checked and documented to the extent possible (note: data providers are not necessarily the creator(s) of the data they submit themselves, so complete information is seldom provided). The original point datasets are kept 'as is' in a separate 'store' to the processed digital data for safe keeping in order to permit future cross-checks (or checks with the data providers themselves) should the need arise.

Consistent procedures and de facto standards are used to screen (QA/QC) and standardise respectively harmonise the wide range of soil-related data that have been shared with us for consideration in our world-covering databases and web services [for an overview see: Overview of procedures and standards]. Ultimately, these processes are aimed at facilitating global data interoperability and citability in compliance with FAIR principles: the data should be 'findable, accessible, interoperable, and reusable.'

Our IT specialists are investigating how fixity checks and check sum procedures for the datasets we manage should be consolidated; this is part of our continuous efforts to improve our services.

Links:

- [Overview of procedures and standards](#)

Reviews

Reviewer 1:

Compliance level:

The guideline has been fully implemented in the repository - 4

Comments:

Reviewer 2:

ISRIC - World Soil Information - WDC -Soils

Compliance level:

The guideline has been fully implemented in the repository - 4

Comments:

R8 Appraisal

The repository accepts data and metadata based on defined criteria to ensure relevance and understandability for data users.

Compliance level:

The guideline has been fully implemented in the repository - 4

Response:

Our collection development policy for (digital) soil data is mainly focused on filling existing soil geographic, taxonomic and thematic (e.g., soil carbon stocks) gaps to gradually arrive at a representative global coverage for use in digital soil mapping and other applications. To a large extent, the success of this activity is determined by the willingness and ability of potential soil data providers to share (some) of the data they hold with the WDC-Soils for the greater benefit of the international community. The overall procedures, criteria and standards used from ingestion to dissemination are described on a dedicated webpage [see: Approach for generating open soil data].

Profile data submitted for consideration in the ISRIC repository must be compiled according to some basic principles, i.e., following the Observations and Measurements (O&M) conceptual approach, as described in the WoSIS Procedures Manual [see: WoSIS procedures manual, p. 47]. All submissions of datasets must be accompanied by sufficiently detailed metadata, including applicable license (e.g., CC or ODbL) and lineage. Suggested templates for organising and submitting (analogue) soil profile data can be downloaded from GIT [see: WoSIS data entry templates].

Existing digital datasets may be shared (i.e., submitted) by email either as an attachment or, for larger datasets, by providing URL/FTP access. In all cases, we recommend data providers contact us before submitting their data; this to discuss technical details, license considerations, and possible data/metadata quality issues.

We are in the process of improving our ETL (Extraction, Transformation and Load) procedures whereby data providers can easily submit, respectively validate, their own data on-line using tailor made dashboards, for possible consideration in WoSIS. The new ETL procedures should be operational at the time of the next certification round.

Preferred formats for submitting datasets, to ensure long-term useability, accessibility and preservation are discussed in Section R9. As indicated, for our own products (e.g., WoSIS point data and SoilGrids layers) we use OGC-compliant formats.

Submitted (digital) data that do not fall within the mission of ISRIC will not be considered in our workflows and the data providers will be informed accordingly. When possible, we may suggest alternative repositories for such (e.g., PANGAEA).

Links:

- [WoSIS procedures manual](#)
- [Approach for generating open soil data](#)
- [WoSIS data entry templates](#)

Reviews

Reviewer 1:

Compliance level:

The guideline has been fully implemented in the repository - 4

Comments:

Reviewer 2:

Compliance level:

The guideline has been fully implemented in the repository - 4

Comments:

R9 Documented storage procedures

ISRIC - World Soil Information - WDC -Soils

The repository applies documented processes and procedures in managing archival storage of the data.

Compliance level:

The guideline has been fully implemented in the repository - 4

Response:

ISRIC's overall approach for acquiring, checking, processing, serving (digital) and archiving soil data is summarised here [see: Approach for generating open soil data]. Following the writing of the ISRIC Digital Preservation Policy [see: ISRIC digital preservation policy], the internal team procedures have been reviewed and updated where necessary. In general terms, this approach may be considered OAIS (Open Archival Information System) compliant. However, as a relatively small data centre we find it difficult to conform fully to the OAIS reference model, with its emphasis on administrative processes. ISRIC's Digital Preservation Policy includes a self-assessment according to the community-based Digital Preservation Coalition Rapid Assessment Model (DPC RAM), aimed at setting goals for further development and to monitor progress.

To be transparent towards our user community, main criteria and procedures for accepting, ingesting, archiving (safeguarding), and subsequently processing and serving various categories of data (e.g., point, vector, grid) through our SDI (spatial data infrastructure) are regularly published in peer-reviewed journals. Recent examples include articles describing the workflow for acquiring, ingesting, standardising and serving soil profile (point) data [see: Batjes et al. 2020], procedures for generation of global soil property map at 250m resolution [see: Poggio et al. 2021], and a description of the corresponding computational structure [see: de Sousa et al. 2020].

Our storage/preservation procedures are described in a separate policy [see: ISRIC digital preservation policy]. As indicated (see R3), metadata for our digital holdings are managed/accessible through a GeoNetwork catalogue instance [see: ISRIC soil data hub]. The data themselves are stored on servers of Wageningen University through our SLA with the FB-IT department (please see R2). The physical infrastructure (hardware, storage, etc.) is located at two dedicated 'data centers' on the Wageningen campus as well as a backup 'data center' off campus (see also R15). Access to these 'data centers' is restricted to WUR ICT staff only.

In short, the SLA covers the setup, security and management of the server(s). ISRIC institutional public data served on data portals (e.g., data.isric.org and soilgrids.org) is differentiated into vector and raster data; different locations and systems are used for each of these. Vector data (point data, for example WOSIS - World Soil Information System) are managed in a PostgreSQL 12 database hosted on a dedicated WUR database cluster as described in the corresponding SLA. Alternatively, due to the volume of raster data served by ISRIC, and required user/application raster access, a 2 tier approach is used for raster data storage:

- User application and application data access (tier 1): these data are containerised and run on a dedicated Kubernetes container platform with appropriate security measures against cyber attacks (see also R16). Raster data at application level are stored on permanent Kubernetes volumes on a Kubernetes platform at WUR campus data center. Tier 1 data is considered ephemeral, and it can be removed and created at any time on the pod lifecycle, from dedicated and backed up data (Tier 2).

- Massive file storage (tier 2): single data replication at one WUR data centre. Accidentally deleted or overwritten files, or previous versions of the files, can be restored by (dedicated) ISRIC staff within a one year period.

Overall, in the event of an incident, 'data loss' occurs for a maximum of one hour (Monday to Friday), with system recovery usually taking place within 4 hours within office hours. System recovery at the second / transaction level depends on the software used, the transaction mechanism of the application and the nature of the disruption (see R16).

Links:

- [Approach for generating open soil data](#)
- [Poggio et al. 2021](#)
- [Batjes et al 2020](#)
- [De Sousa et al. 2020](#)
- [ISRIC soil data hub](#)
- [ISRIC Digital Preservation Policy](#)

Reviews

Reviewer 1:

Compliance level:

The guideline has been fully implemented in the repository - 4

Comments:

Reviewer 2:

Compliance level:

ISRIC - World Soil Information - WDC -Soils

The guideline has been fully implemented in the repository - 4

Comments:

Revision is responsive to board revision request.

R10 Preservation plan

The repository assumes responsibility for long-term preservation and manages this function in a planned and documented way.

Compliance level:

The guideline has been fully implemented in the repository - 4

Response:

Funding for ISRIC's long-term preservation function is provided through core funding by the Netherlands Government (see Section R1). We aim to serve all our digital holdings in an open source and open access format (to ensure continuity of access) next to preserving the original materials in their source format (see Section R3).

Permissions to store, copy, and transform digital items are regulated in the licenses, or letters of agreement, between the respective data providers and ISRIC WDC-Soils. Overall terms for this are described in the ISRIC Digital Data Preservation Policy [see: ISRIC digital data preservation policy]; the actual licenses for point datasets are registered in, and enforced through, our central PostgreSQL database (see section R2).

All digital data will be retained indefinitely (see Section R1), irrespective of when it was submitted (to the repository) or last accessed (e.g., via the ISRIC Soil Data Hub and other web-services). The Digital Data Preservation Policy addresses a.o. the long-term sustainability and preservation planning. Alternatively, the ISRIC Data Management Protocol [see: ISRIC Data Management Protocol] describes the actual procedures and processes at ISRIC with respect to the management and long-term preservation of data received and produced by the center. The associated workflows [see: ISRIC_data_and_mapping_workflows] are discussed and evaluated regularly during staff meetings where progress is monitored and recommendations for further improvements are made.

The actual implementation of recommendations concerning evolving preservation requirements as well as infrastructural innovation (see Section R15) is ensured through bi-weekly meetings of ISRIC's coordination team, which regularly involve consultation with the collection management team (i.e., implementation of Section 7 in Digital Preservation Policy) and SDI team (see Section R15. and R16).

ISRIC's data steward participates in the quarterly meetings of the Wageningen University Data Steward group to discuss and keep abreast of recent developments. Similarly, our SDI team has regular meetings with the IT-department of Wageningen University to discuss and implement recent technological and infrastructural changes. We also participate in a number of EU-funded projects and international expert groups with the aim of sharing, developing and expanding our knowledge and expertise in the field of digital data handling, preservation, processing and serving. The benefits derived from our involvement in this type of activities include new innovative tools and methodologies that can be implemented at ISRIC WDC-Soils to improve the effectiveness of their data management processes in a planned and documented way, with the objective to better serve our diverse user community.

Links:

- [Soil information workflow](#)
- [ISRIC Data Management Protocol](#)
- [ISRIC Digital Preservation Policy](#)

Reviews

Reviewer 1:

Compliance level:

The guideline has been fully implemented in the repository - 4

Comments:

Reviewer 2:

Compliance level:

The guideline has been fully implemented in the repository - 4

ISRIC - World Soil Information - WDC -Soils

Comments:

R11 Data quality

The repository has appropriate expertise to address technical data and metadata quality and ensures that sufficient information is available for end users to make quality- related evaluations.

Compliance level:

The guideline has been fully implemented in the repository - 4

Response:

Soil data are collected all over the world using different standards for sampling, analysing soil samples, and processing the data. Information on the actual quality of the source data, however, is seldom provided with the metadata, so this must generally be inferred by centre staff.

Data centre staff with backgrounds in soil science and environmental science, will use their experience to judge whether the content of a data file is sensible. For this, ISRIC carries out a number of 'trustworthiness' or 'plausibility' checks upon receipt of data. These include checking if data files are: 'in one of the preferred formats' thus open and readable in an appropriate, preferably open-source application; the content of the file(s) is as described in the metadata; data types are appropriate and consistent; units of measurement are properly documented and consistent, min/max values for defined properties (e.g., soil pH, organic carbon content) are not exceeded; null/missing values are recorded appropriately and consistently. Further, the data should contain no information of a personal nature, except as needed for acknowledging the data providers themselves in-line with common scientific practice (see section R4).

The initial assessment provides a measure to data centre personnel concerning the possible confidence they may have in data submitted to our institute, and whether these should be processed further following our regular workflow for data ingestion and mapping.

All WoSIS and SoilGrids-derived output is subjected to a technical and content screening by our 'product quality control' team (see R12 for schema of workflow). Further, prior to any major releases, we seek also feedback from the international community to evaluate new products against their 'local' expert knowledge (see e.g., 'SoilGrids - request for feedback' and Rossiter et al. 2022).

Research is ongoing as to how best quantify the uncertainty of globally acquired soil analytical data [see: van Leeuwen et al. 2022] in databases such as WoSIS. Typically, measures for uncertainty in our point- as well as map-based data are documented in peer-reviewed papers [see: Batjes et al. 2020 and Poggio et al. 2021]. Based on this information, the user-community can make informed decisions about 'fitness-for-intended use' of the respective data sets. Additional information in this respect is provided on dataset specific FAQ pages [see: FAQ Wosis and FAQ SoilGrids].

If there is a question about SoilGrids that is not answered in the FAQ, these can be posted to GIS.StackExchange, under the tag soilgrids. ISRIC staff are subscribed to this tag and will be automatically notified of any new question arising. GIS.StackExchange makes it easier for other SoilGrids users to find quality answers to their questions.

ISRIC further provides feedback mechanisms for data users to comment/interact on data quality, availability, systems and other issues by emailing (soilgrids@isric.org) respectively using dedicated Git services or Google Groups (e.g., <https://groups.google.com/g/isric-world-soil-information>). Regular interaction with our user community is aimed at continuously improving the quality of our data, products and services.

Links:

- [FAQ WoSIS](#)
- [FAQ SoilGrids](#)
- [Poggio et al. 2021](#)
- [Batjes et al 2020](#)
- [van Leeuwen et al. 2022](#)
- [Rossiter et al. 2022](#)
- [SoilGrids - request for feedback](#)

Reviews

Reviewer 1:

Compliance level:

The guideline has been fully implemented in the repository - 4

Comments:

Reviewer 2:

Compliance level:

ISRIC - World Soil Information - WDC -Soils

The guideline has been fully implemented in the repository - 4

Comments:

R12 Workflows

Archiving takes place according to defined workflows from ingest to dissemination.

Compliance level:

The guideline has been fully implemented in the repository - 4

Response:

ISRIC has policies and procedures in place to cover the lifecycle of the data from stage of collection, laboratory, archiving, data organisation, modelling and mapping, applying soil information and data and information serving to the international community according to FAIR principles, as well as longer-term preservation. In general terms, this approach may be considered OAIS-compliant (see section R9). The soil information workflow has been schematised in a graphic designed for our community of practice for soil information providers [see: Soil information workflow].

More specifically, all ingestion of data to, and provision of data from, ISRIC WDC-Soils is undertaken according to defined, quality controlled workflows and processes. This includes discussion with potential data providers as regards the formats and types of data they should submit, how they may define how their data should be handled / processed /distributed, the quality checks involved, as well as selection criteria for inclusion (e.g., check on uniqueness of profiles, as similar profiles may have been described in different database using different identifiers; completeness of metadata), decision handling within the workflow subject to the defined license specified by each data provider, and actual data processing and subsequent serving to the international community.

The specific workflow for archiving, quality-assessing, processing and serving point (soil profile) data is documented in Earth System Science Data [see: Batjes et al. 2020] with additional technical details provided in the WoSIS FQA page [see: FAQ WOSIS]. Similarly, the workflow for generating soil property maps for the world (i.e., SoilGrids), using big data solutions and machine learning algorithms, are described in greater detail in dedicated peer-reviewed paper [see: Poggio et al. 2021]; see also the FAQ page [see: FAQ SoilGrids].

The workflow for describing metadata is according to that defined by our GeoNetwork metadata catalogue instance (ISO 19 155), and includes validation according to schema (DataCite), semantics checks, as well as compliance check against INSPIRE (<https://inspire.ec.europa.eu/>), with possibility for DOI minting through DataCite upon passing all validation checks.

The full workflow for acquiring, ingesting, processing and serving digital soil data, as described above, is visualised here [see: Data and mapping workflows]; it serves to ensure consistency and transparency throughout the data life cycle.

Links:

- [FAQ WoSIS](#)
- [FAQ SoilGrids](#)
- [Poggio et al. 2021](#)
- [Batjes et al 2020](#)
- [Data and mapping workflows](#)
- [Soil information workflow](#)

Reviews

Reviewer 1:

Compliance level:

The guideline has been fully implemented in the repository - 4

Comments:

Reviewer 2:

Compliance level:

The guideline has been fully implemented in the repository - 4

Comments:

R13 Data discovery and identification

ISRIC - World Soil Information - WDC -Soils

The repository enables users to discover the data and refer to them in a persistent way through proper citation.

Compliance level:

The guideline has been fully implemented in the repository - 4

Response:

As indicated, ISRIC WDC-Soils provides direct access to a range of datasets through its GeoNetwork catalogue instance [see: ISRIC soil data hub]. Discovery metadata complying with TC/ISO 19115/19139 standards, allow users to make an initial, high-level assessment of whether the data resource described is suitable for their requirements. The discovery metadata ensure datasets are described in sufficient detail to be found using search parameters that include geographical coordinates or location, free text against abstract, keywords, formats as well as 'locators' (i.e., URL, UUID or DOI) to the datasets themselves.

Further, we have developed a portal through which users can visualize and down-load specific, geographically bounded, subsets of our point and grid datasets [see: SoilGrids/WoSIS portal]. Additional options for accessing the various datasets/products are described on project-specific FAQ pages to facilitate our user community (see: FAQ WoSIS and FAQ SoilGrids).

Metadata for digital datasets hosted at ISRIC are harvested and queryable through the WDS data portal, GEOSS portal and generically through the NASA-GMCD portal. From October 2020, our SoilGrids250m data can also be found and accessed on Google Earth Engine (see: SoilGrids on GGE).

The suggested form of acknowledgement and recommended data citation for datasets is provided in our Data and Software Policy. It should include contributing investigators/authors; year of publication; paper/product title; publisher; publisher's location; where available on-line, the DOI respectively URL with access date. Appropriate in-text wording may be: Name et al. (2013) through ISRIC - WDC Soils'.

Links:

- [FAQ WoSIS](#)
- [FAQ SoilGrids](#)
- [SoilGrids on GGE](#)
- [SoilGrids/WoSIS portal](#)
- [ISRIC soil data hub](#)

Reviews

Reviewer 1:

Compliance level:

The guideline has been fully implemented in the repository - 4

Comments:

Reviewer 2:

Compliance level:

The guideline has been fully implemented in the repository - 4

Comments:

R14 Data reuse

The repository enables reuse of the data over time, ensuring that appropriate metadata are available to support the understanding and use of the data.

Compliance level:

The guideline has been fully implemented in the repository - 4

Response:

Metadata in our GeoNetwork 3.0 instance are provided according to ISO 19 115 standards, defining metadata sections, entities and elements. These can be easily harvested by a diverse user community (see R13).

ISRIC - World Soil Information - WDC -Soils

We use open source software for all our web applications and provide digital data in OGC-conform formats to ensure effectiveness of 're-use' aimed at FAIR data sharing. Older proprietary formats, such MS Access databases, are converted to open source alternatives upon specific user demand.

In case of major updates to a given dataset or visualisation, a new 'snapshot' or version will be generated with its own DOI and detailed information on changes and data lineage (and typically a peer-reviewed paper for citation).

To facilitate re-use we also maintain FAQ pages for key datasets (see: FAQ WoSIS and FAQ SoilGrids), providing answers or links to pages that provide more detail about specific releases. For other datasets, the metadata may refer to webpages with additional information about successive versions of a given dataset [see: Explore WISE-databases].

Our models are supported by appropriate metadata that provide pointers to the versioned code repository, input or output data, and papers or further guidance notes to facilitate (re-)use. In some instances, product-specific manuals are available to access the data. For example, scripts to access the last 'snapshot' of WoSIS are provided as R Markdown source documents [see: WoSIS markdown], along with their compiled HTML and PDF outputs, and R scripts extracted from the R Markdown source.

Code used to generate SoilGrids 2.0 is available under GPL3 license 3 license [see: SoilGrids code]. SoilGrids predictions themselves are available to the public under the Creative Commons CC-BY 4.0 license, allowing their widespread use.

As indicated, to facilitate data re-use, our SDI-group is currently developing a 'list of preferred formats' for digital data, building on the now partly outdated list of DANS [see: DANS preferred file formats] complemented with community-preferred open-source formats. The new list, with special attention for formats commonly used in the soil's domain, should be available at the time of the next re-certification.

Links:

- [FAQ WoSIS](#)
- [FAQ SoilGrids](#)
- [DANS preferred file formats](#)
- [SoilGrids code](#)
- [WoSIS markdown](#)
- [Explore WISE-databases](#)

Reviews

Reviewer 1:

Compliance level:

The guideline has been fully implemented in the repository - 4

Comments:

Reviewer 2:

Compliance level:

The guideline has been fully implemented in the repository - 4

Comments:

Technology

R15 Technical infrastructure

The repository functions on well-supported operating systems and other core infrastructural software and is using hardware and software technologies appropriate to the services it provides to its Designated Community.

Compliance level:

The guideline has been fully implemented in the repository - 4

Response:

Our web services are aimed at maximising service availability, data interoperability and continuity. We strive to apply the principles of open source code, open data, and Fairness-Accuracy-Confidentiality-Transparency (FACT) for research and Findable-Accessible-Interoperable-Reusable (FAIR) principles for data.

ISRIC - World Soil Information - WDC -Soils

Our spatial data infrastructure (SDI) is based on Free and Open Source Software such as Linux, PHP, LaTeX, R and contributed R packages, RStudio, GDAL, GRASS, SAGA GIS, QGIS, PostgreSQL, Geoserver, PostGIS, Python and similar. Use of OGC standards such as Web Feature Service (WFS) and Web Map (WMS) as well as WebDAV (Web-based Distributed Authoring and Versioning; <http://www.webdav.org/>), a set of extensions to the HTTP protocol which allows users to collaboratively edit and manage files on remote web servers, makes our products largely independent of commercial software packages, as well as widely findable and accessible from a wide range of platforms.

In recognition of our special expertise in the field of SDI development and data handling, ISRIC was selected to be the first host (2017-2021) of the Soil Data Facility (SDF) for the Global Soil Partnership (GSP-FAO). Within this collaborative framework, we developed the conceptual design for the technical infrastructure of the federated Global Soil Information System (GLOSIS), with different participation levels foreseen depending on the present level of national SIS (soil information system) development [see: de Sousa et al. 2021b]. Upon its completion in the next decade, GLOSIS will provide the soil component for a globally searchable infrastructure that is both interoperable and distributed can be formed.

Rigorous procedures are in place to ensure the technical infrastructure remains fit for purpose over time (i.e., considers evolving international technology standards), and is able to effectively respond to disasters or other organization continuity issues (see R16). These 'technical' aspects are taken care of through an SLA with FB-IT Wageningen University in close consultation with ISRIC's SDI-team (see R2 and R16). Importantly, the above SLA also provides access to Wageningen University's Anunna HPC (High Performance Computer) which we need for our global SoilGrids mapping.

Links:

- [de Sousa et al. 2021b](#)

Reviews

Reviewer 1:

Compliance level:

The guideline has been fully implemented in the repository - 4

Comments:

Reviewer 2:

Compliance level:

The guideline has been fully implemented in the repository - 4

Comments:

R16 Security

The technical infrastructure of the repository provides for protection of the facility and its data, products, services, and users.

Compliance level:

The guideline has been fully implemented in the repository - 4

Response:

We have a service level agreement with FB-IT of Wageningen UR that ensures the security of our web services, IT infrastructure, and covers regular backups of our holdings on multiple, distributed servers (see SLA's (R2) and R3). As such, the repository has a comprehensive suite of procedures in place to ensure rapid recovery and return to normal operations (within 24-48 hours) in the event of a system failure/disaster or other technical failure. In such cases, only the latest changes to the corresponding systems will have to be re-implemented. These procedures and standards are in line with international developments in the field and continuously evolving.

Depending on their roles within ISRIC, specific staff have varying, password enforced, access rights to defined components of our SDI, ranging from full access (for administrators) to restricted (i.e., read only).

Since COVID, external access of authorised staff to data holdings is always via secured VPN connection with multi-factor authentication using digital tokens.

Regular virus control, firewall protection and other security measures are enforced through our SLA with Wageningen University to protect us against any malicious activity (classified information).

Personal data linked to the data holdings (i.e., mainly lineage for citation purposes), and on-line user communities, are handled in accord with EU GDPR regulations. In compliance with these regulations, users may always request that we remove, or update, their personal registration details at any time. For this, they may contact our Data Protection Officer (DPO, see section R4).

ISRIC - World Soil Information - WDC -Soils

Links:

Reviews

Reviewer 1:

Compliance level:

The guideline has been fully implemented in the repository - 4

Comments:

I suggest ensuring that any elevated privilege access, particularly administrative access, requires more than a password. This is a comment for the repository to consider, and is not grounds for requesting further revision. -- Revision is responsive to suggestion.

Reviewer 2:

Compliance level:

The guideline has been fully implemented in the repository - 4

Comments:

Applicant Feedback

R17 Applicant Feedback

We welcome feedback on the CoreTrustSeal Requirements and the Certification procedure.

Compliance level:

The guideline has been fully implemented in the repository - 4

Response:

Thanks for your constructive comments. These have been addressed as follows:

Revision 1:

- [Rx] Policies and procedures relating to physical samples have been removed from the various sections.
- [R1] Thanks. 'Long term preservation and archiving of (our physical and) digital resources' has been made explicit in our mission statement [see: ISRIC vision and mission], as well as on our WDC-related webpage [see: WDC Soils webpage].
- [R3] This section is now limited to digital data holdings (see also Rx1).
- [R9] Additional information has been provided concerning storage (and recovery) procedures for digital (point resp. vector data) and where the data are stored based on our SLA with Wageningen UR FB-IT.
- Whenever possible links have been moved to the 'Evidence' box; they are now referred to in the text as '[see: document name].'

Revision 2:

- [Significant changes]: Main changes since the preceding review have been added for clarification.
- [R10]: Processes related to the 'preservation and infrastructure requirements', as outlined in Section 7 of the Digital Data Preservation Policy, have been clarified. References to the ISRIC Data Management Protocol and ISRIC's 'data handling/processing' workflow were added.

Revision 3:

- [R3]: The formal mechanism for ensuring the "continuity" of ISRIC's digital collections will become part of ISRIC's service level agreement with Wageningen University.
- [R10]: Processes ensuring the implementation of Section 7 of ISRIC's Digital Data Preservation Policy were clarified.

Links:

- [WDC Soils webpage](#)
- [ISRIC vision and mission](#)

Reviews

Reviewer 1:

ISRIC - World Soil Information - WDC -Soils

Compliance level:

The guideline has been fully implemented in the repository - 4

Comments:

Reviewer 2:

Compliance level:

The guideline has been fully implemented in the repository - 4

Comments: