

# SERVIR West Africa 2024 Training Program on Data Stewardship and the CoreTrustSeal Requirements: Session 8, R06 Requirement

Robert R. Downs, PhD

Center for International Earth Science Information Network (CIESIN)  
Columbia Climate School, Columbia University

Coordinated by AFRIGIST

October 9, 2024, 13:00 – 14:30 GMT (9:00 - 10:30 a.m. EDT)



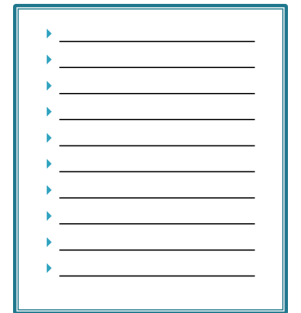
## Brief Review of Previous Webinars

- Data Stewardship Concepts, Principles, and Certification Instruments
  - CoreTrustSeal, ISO 16363, Nestor DIN 31644
- Preservation, Designated Community, Sustainability
- CoreTrustSeal Certification requirements
- Organizational aspects of Data Stewardship
- CoreTrustSeal Requirements 2020-2022: R01-R16
- Setting the stage for Planning to Meet the CoreTrustSeal Requirements
- Motivation and R0 Requirement
- R01, R02, R03, R04, R05 Requirements (Sessions 3-7)



# **SERVIR West Africa 2024 Training Program on Data Stewardship and CoreTrustSeal Requirements**

- Key topic:
  - R06 Requirement
- Instructional format
  - Lecture, questions, and discussion
- Session will be recorded
  - Recording will be posted on the SERVIR West Africa website



## Outline for Current Session

- Progress Planning and Participant Introductions (5 minutes)
- Scheduling Training Sessions and CoreTrustSeal Application Preparation (5 minutes)
- Review of Homework: Draft Self-Assessment Responses in Template (20 minutes)
- CoreTrustSeal Requirement 06 and Examples of Responses (30 minutes)
- Homework: Draft Self-Assessment Response (10 Minutes)
- Introduction to CoreTrustSeal Requirement 07 (10 Minutes)
- Preparing for Next Session (10)



## Progress Planning and Introductions

- CoreTrustSeal application template created for each repository
  - CERSGIS, ICRISAT FMNR, AFRIGIST, AGRHYMET, CSE
- Each repository uses template to progressively revise their self-assessment
- Please put additional repository names and your email address in Zoom chat
- Brief introductions by those who have not previously introduced themselves



## Scheduling Training Sessions and CoreTrustSeal Application Preparation

- Plan to schedule sessions twice monthly enabling time for progress
  - Repositories complete template sections between sessions ✓
  - Each session includes review and introduction to subsequent section ✓
- Next session planned for Wednesday, October 30, 2024, 13:00-14:30 GMT
  - Topics: R07 Requirement and Introduction to R08 Requirement

# Review of Homework: Self-Assessment in CoreTrustSeal Application Template

- R0 Background Information and Context
  - Re3data identifier
  - Repository Type
  - Overview – Brief Description of Repository
  - Brief Description of the Designated Community
  - Level of Curation Performed
  - Cooperation and Outsourcing to third parties, partners, and host organizations
  - Applicants renewing – Summary of Significant Changes Since Last Application
- R01 Mission & Scope
  - The repository has an explicit mission to provide access to and preserve digital objects.
- R02 Rights Management
  - The repository maintains all applicable rights and monitors compliance.
- R03 Continuity of Service
  - The Repository has a plan to ensure ongoing access to and preservation of its data and metadata.
- R04 Legal & Ethical
  - The repository ensures to the extent possible that data and metadata are created, curated, preserved, accessed and used in compliance with legal and ethical norms.



# Questions about previous homework to compose draft responses in template

- Identifying resources that address a challenging requirement
  - Can we start listing and describing current resources that address the requirement?
- Needed resources
  - What resources are needed to comply with a challenging requirement?
- Good progress on CoreTrustSeal application templates for R0:
  - We previously featured examples: CERSGIS, AGRHYMET, and ICRISAT FMNR
- More progress is needed to feature more examples
  - Suggestions have been offered in the templates
- Let's all continue making progress on the CoreTrustSeal application templates





Review repository self-assessment in template:

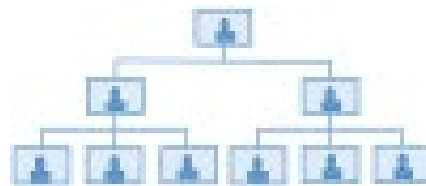
Draft response to

**CoreTrustSeal Requirement R05: Governance & Resources**

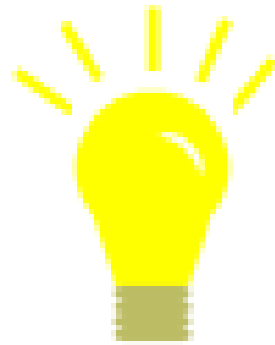
The repository has adequate funding and sufficient numbers of staff managed through a clear system of governance to effectively carry out the mission.

## Review of Homework in Template: R05 Governance & Resources

- Describe the type, source, and duration (renewal schedule) of funding
- Describe repository's host institution and relationship to repository
- Describe governance body for repository
- Describe the decision-making structure for the services provided
- Describe the number of repository staff members and their roles



# CoreTrustSeal Requirement R06 Expertise & Guidance



# CoreTrustSeal Requirement R06 Expertise & Guidance



R06. The repository adopts mechanisms to secure ongoing expertise, guidance and feedback-either in-house, or external.

## Compliance Level

### Guidance

A repository must identify the skills necessary to deliver the services it offers, and source and maintain those skills either as internal resources or through external engagement. An effective repository strives to accommodate evolutions in data types, data volumes, and data rates, as well as to adopt the most effective new technologies in order to remain valuable to its Designated Community.

# CoreTrustSeal Requirement R06 Expertise & Guidance



The response statement and evidence should include references to the following items:

- That guidance and expertise reflects the scientific scope of the repository, if relevant.
- The repository aligns internal recruitment and external engagement with the services it offers.
- The repository ensures that its staff have access to ongoing training and professional development.
- The range and depth of expertise of both the organisation and its staff, including any relevant affiliations (e.g. national or international bodies), is appropriate to the mission.
- In-house advisers, or external advisory committees that include technical, curation, data science, data security, and disciplinary experts.
- How the repository communicates with experts for advice.

## CoreTrustSeal Requirement R06 Expertise & Guidance (Continued)



Responses and evidence should demonstrate that the repository has sufficient internal expertise and is linked to a wide network for advice and guidance. Evidence must account for the repository day-to-day activities and the monitoring of potential new challenges on the horizon (community and technology watch).

## R06 Expertise & Guidance Example: SAEON CoreTrustSeal Application (Excerpt 1 of 2)

- ✓ SAEON personnel are involved in the following data and Information and Communication Technology (ICT) related initiatives and professional bodies, and these serve as reference groups for a variety of subjects: ICT advisory committees for the NRF and the Department of Forestry, Fisheries and the Environment (DFFE), International Longterm Ecological Research (ILTER) Information Management Committee, South African Geomatics Council (SAGC) Geo-Information Society of South Africa (GISSA). SAEON is also a direct and voting member of DataCite<sup>1</sup>.
- ✓ SAEON staff take part in a number of Research Data Alliance<sup>2</sup> interest groups. Our team members regularly attend webinars and participate in conferences both locally and internationally. These engagements serve as a valuable source of expert input, and are routinely used to test our ideas and progress.
- ✓ SAEON encourages uLwazi team members to publish occasionally, although this is not a major focus of the node. The NRF provides publication incentives to encourage this practice, and uLwazi publishes, on average, 2 peer-reviewed papers or book chapters annually, allowing discourse and SAEON Open Data Platform exchange with experts<sup>3</sup>.

## R06 Expertise & Guidance Example: SAEON CoreTrustSeal Application (Excerpt 2 of 2)

SAEON's structure as both a repository and an observation network means that the uLwazi team has access to scientists and researchers from various scientific fields across SAEON's six nodes, which enables feedback throughout the workflow from representatives of our Designated Community. The SAEON Data Management Committee serves as the advisory board for the SAEON Open Data Platform and is a cross-nodal panel that acts as a discussion forum for any queries or issues, and facilitates decision-making surrounding data management at SAEON. There is a quarterly Technician's Forum Meeting that a member of the curation team attends. SAEON also holds monthly seminars for people across the nodes to share their work as well as an annual Science Meeting where people from all the nodes can come together and discuss their work and form working groups that then continue on and report back the following year.

Data providers and users are also encouraged to send any feedback they have through the various portals and websites, and data users can comment on datasets when downloading from the SAEON Data Portal.





## R06 Expertise & Guidance Example: ICPSR CoreTrustSeal Application (Excerpt 1 of 2)

Compliance level: Implemented: the requirement has been fully implemented by the repository - 1

ICPSR continuously seeks and receives guidance and feedback from its staff and Designated Community.

ICPSR possesses in-house expertise in various areas, such as digital archiving, data preservation, usability testing, ADA Section 508 compliance, DOI registration, web traffic analytics, search engine optimization, secure data storage and dissemination, restricted-use data agreements, and researcher credentialing. Staff are hired based on project needs and expertise, and are encouraged to participate in ongoing professional development. Curation staff, for instance, receive ongoing training related to data security and disclosure risk. [1] A Privacy and Security Officer leads the development and implementation of a comprehensive program in privacy and IT security, including liaising with the University of Michigan's Office of General Counsel, Information Assurance Office, and Institutional Review Board. [2] Senior staff are experts in various disciplines related to digital archiving, such as human subjects protection, disclosure risk, digital preservation, and effective research data practices. [3] ICPSR Council members are also experts in their fields, Inter-university Consortium for Political and Social Research (ICPSR) representing key areas of social and behavioral science research. [4] The Council's work is supplemented by advisory committees of leading scholars who help ICPSR address needs in special fields, which include census data, American politics, comparative politics, gerontology, and economics in addition to data processing priorities, Summer Program curriculum development, and technology planning. [5]

Source: Inter-university Consortium for Political and Social Research (ICPSR) - CoreTrustSeal Requirements 2023-2025", <https://doi.org/10.34894/WCWZU0>, DataverseNL, V1

## R06 Expertise & Guidance Example: ICPSR CoreTrustSeal Application (Excerpt 2 of 2)

ICPSR regularly communicates with its Designated Community to provide updates and gather feedback. Each member organization selects an Official Representative (OR), who directly interacts with their institution's data users in libraries and social science departments. [6] ICPSR actively engages with the over 800 consortial ORs via biennial meetings held at the University of Michigan, [7] formal surveys regarding user needs and ICPSR services, and informal communications as needed. Additionally, ICPSR has regular contact with sponsoring agencies, who fund research and help prioritize archiving and dissemination. [8] ICPSR staff furthermore participate in major professional conferences each year to interact with the community, including students and researchers. Outreach efforts include webinars [9], social media [10] [11] [12] [13], the monthly ICPSR Bulletin newsletter, [14] and user experience interviews [15].

As a center in the University of Michigan's Institute for Social Research, ICPSR undergoes periodic, mandated self-assessments and organizational reviews to ensure efficient functioning. These efforts include five-year situational reviews that evaluate both the organization and its director based on various criteria such as financial stability, contributions to social science research, mission responsiveness, the scope and relevance of holdings, educational strength, overall efficiency, and organizational capacity. Stakeholder interviews are conducted as part of these situational reviews. [16]

## R06 Expertise & Guidance Example: DANS CoreTrustSeal Application (Excerpt 1 of 2)

Compliance level: Implemented: the requirement has been fully implemented by the repository - 1

The Scientific Advisory Council (Wetenschappelijke Advies Raad) of DANS [33] meets several times a year and offers solicited and unsolicited advice to DANS. The Council consists of prominent disciplinary experts in the fields of DANS, including sociology and survey data, as well as experts with an IT background.

DANS makes regular use of external advisors for legal, privacy and security advice. DANS also has an ongoing fellowship program and invites seminars and joint research from its fellows and external collaborators [36].

Since the launch of the Data Station SSH domain specific Data Station Managers with a research background in SSH are leading this Data Station. The internal expertise on SSH research data management is further ensured by different other staff members as well, including members of the Expert Team and a dedicated member of the Data Processing Team processing SSH data.

Note: SSH refers to Social Science and Humanities.

## R06 Expertise & Guidance Example: DANS CoreTrustSeal Application (Excerpt 2 of 2)

Expert guidance is also secured via active participation of DANS and its staff in international organisations like RDA, ISC/WDS, and CTS (Assembly of Reviewers), as well as European research infrastructures such as EOSC, DARIAH, CLARIN and CESSDA (see [47 and 18]).

There is ample opportunity to update the professional knowledge, both in one of the long-term (inter)national projects, as well as in the national and European data infrastructures in which DANS participates. In the organisational budget there is a structural budget line available for staff training and further professionalisation.

The Data Station SSH meets the latest technological standards according to user requirements. Working closely together with the community in this digital workflow improves (inter)national collaboration. To keep up with innovative developments, we are working together with the SSH community in national and international projects. DANS is participating in different infrastructures, projects and other collaborations such as for instance CLARIAH, ODISSEI, CESSDA, DARIAH, EHRI and E-RIHS [18] which also ensures that our developments are in line with the needs of the community and that we keep up to date with new developments and expertise.

## R06 Expertise & Guidance Example: PURR CoreTrustSeal Application (Excerpt 1 of 2)

Compliance level: Implemented: the requirement has been fully implemented by the repository - 1

The PURR staff [13] attend professional conferences, workshops, and webinars both in person and virtually that keep them apprised of the most recent developments in the area of research data, scholarly communication and curation. They also attend various research-related presentations and events, such as GIS Day or lectures of the Purdue faculty, where they solicit data and input regarding needed data-related services.

The Purdue researchers share their needs with the PURR staff through the ticketing system and outreach activities. Feedback and expertise of the respective subject liaisons of the Purdue University Library and School of Information Studies (PULSIS) faculty is occasionally requested as part of the dataset approval workflow when specialised domain-knowledge is needed.[15]

The HUBzero team and infrastructure benefits from their involvement with the NSF funded Science Gateways organization as part of the diverse research data cyberinfrastructure. Members of the PURR team actively participate in the MetaArchive Cooperative committees and governance and through this involvement gain valuable insights into the more recent trends in digital preservation. The work with the MetaArchive committees and participation in the

## R06 Expertise & Guidance Example: PURR CoreTrustSeal Application (Excerpt 2 of 2)

Big Ten Academic Alliance (BTAA) Digital Preservation group are particularly significant for the technology watch activities. In addition, Purdue Libraries has institutional membership in DataCite, ORCID, OCLC, the Center for Research Libraries, and MetaArchive that also provide for communication on recent development that impacts the future success of PURR's work.

PURR has procedures that ensure that the digital objects in the repository remain relevant and continuously understandable by the Designated Community. The Designated Community can provide feedback through support tickets, during data publication review, or through representatives of researchers on the PURR Steering Committee. The PURR Steering Committee is responsible for establishing policies for the preservation of datasets submitted to PURR. It also makes sure that the repository meets the needs of its Designated Community. Along with the Steering Committee, the Research Data Systems Manager is responsible for monitoring the organizational environment.

## R06 Expertise & Guidance Homework: Self-Assessment in Template

- What type of training and expertise guides repository services?
- How do repository services inform recruitment and community engagement?
- Describe the training and professional development of staff members.
- Describe the relevant expertise and affiliations of the organization's staff.
- Describe the internal and external advisors that guide services offered.
- How does the repository communicate with experts for advice?

Preparing for Next Session



## Preparing for Next Session: Activities in Your Repository

- Update template assigned to each repository for self-assessment
- Review requirements for R06 within the context of your repository
- Discuss among managers and staff within your repository
- Draft responses to R06 for your repository within your template
- Review draft responses to other requirements for consistency

Questions?

We have explored the  
Organizational Infrastructure requirements, R01-R06.

Next, we focus on the  
Digital Object Management requirements, R07-R13 .

# CoreTrustSeal Requirements 2023-2025: Organizational Infrastructure

- R01 Mission & Scope
  - The repository has an explicit mission to provide access to and preserve digital objects.
- R02 Rights Management
  - The repository maintains all applicable rights and monitors compliance.
- R03 Continuity of Service
  - The Repository has a plan to ensure ongoing access to and preservation of its data and metadata.
- R04 Legal and Ethical
  - The repository ensures to the extent possible that data and metadata are created, curated, preserved, accessed and used in compliance with legal and ethical norms.
- R05 Governance & Resources
  - The repository has adequate funding and sufficient numbers of staff managed through a clear system of governance to effectively carry out the mission.
- R06 Expertise & Guidance
  - The repository adopts mechanisms to secure ongoing expertise, guidance and feedback-either in-house, or external.



Source: CoreTrustSeal Standards and Certification Board. (2022). CoreTrustSeal Requirements 2023-2025 (V01.00). Zenodo. <https://doi.org/10.5281/zenodo.7051012>

# CoreTrustSeal Requirements 2023-2025: Digital Object Management

- R07 Provenance & Authenticity
  - The repository guarantees the authenticity of the digital objects and provides provenance information.
- R08 Deposit & Appraisal
  - The repository accepts data and metadata based on defined criteria to ensure relevance and understandability for users.
- R09 Preservation Plan
  - The repository assumes responsibility for long-term preservation and manages this function in a planned and documented way.
- R10 Quality of Service
  - The repository addresses technical quality and standards compliance, and ensures that sufficient information is available for end users to make quality-related evaluations.
- R11 Workflows
  - Digital object management takes place according to defined workflows from deposit to access.
- R12 Discovery & Identification
  - The repository enables users to discover the digital objects and refer to them in a persistent way through proper citation.
- R13 Reuse
  - The repository enables reuse of the digital objects over time, ensuring that appropriate information is available to support understanding and use.



# Digital Object Management

Introduction to CoreTrustSeal Requirement, R07 Provenance and Authenticity



## CoreTrustSeal Requirement R07 Provenance and Authenticity

- R07. The repository guarantees the authenticity of the digital objects and provides provenance information.

### Compliance Level

#### Guidance

- The repository should provide evidence to show that it operates a data and metadata management system that maintains provenance information to ensure authenticity from deposit, and through curation and preservation to the point of access.
- Any intentional changes to data and metadata should be documented, including the rationale and originator of the change. Authenticity covers reliability and provenance, including the relationship between the deposited digital objects and those provided at the point of access.

## CoreTrustSeal Requirement R07 Provenance and Authenticity



The response statement and evidence should include references to the following items:

- The repository approach to changing and versioning data and metadata. How the approach and records of changes are communicated to data depositors and users.
- The provenance information and audit trails recorded for data and metadata processing and versioning.
- How the repository compares the essential properties of different versions of the same file.
- Identification checks for depositors.



# Review of the CoreTrustSeal Requirements

# CoreTrustSeal Requirements 2023-2025: Context

## R0 Context

- General information about the repository
- Re3data identifier
- Repository Type. Select all relevant types from:
  - Generalist or Specialist; Specialist describes scope
- Overview – Brief Description of Repository
- Brief Description of the Designated Community
- Level of Curation Performed. Select all relevant types from:
  - Content distributed as deposited Basic curation – e.g., brief checking, addition of basic metadata or documentation. Enhanced curation – e.g., conversion to new formats during ingest, enhancement of documentation or metadata; Data -level curation – as in C above, but with additional editing of deposited data for accuracy
- Cooperation and Outsourcing to third parties, partners, and host organizations.
- Applicants renewing – Summary of Significant Changes Since Last Application



Source: CoreTrustSeal Standards and Certification Board. (2022). CoreTrustSeal Requirements 2023-2025 (V01.00). Zenodo. <https://doi.org/10.5281/zenodo.7051012>

# CoreTrustSeal Requirements 2023-2025: Organizational Infrastructure

- R01 Mission & Scope
  - The repository has an explicit mission to provide access to and preserve digital objects.
- R02 Rights Management
  - The repository maintains all applicable rights and monitors compliance.
- R03 Continuity of Service
  - The Repository has a plan to ensure ongoing access to and preservation of its data and metadata.
- R04 Legal and Ethical
  - The repository ensures to the extent possible that data and metadata are created, curated, preserved, accessed and used in compliance with legal and ethical norms.
- R05 Governance & Resources
  - The repository has adequate funding and sufficient numbers of staff managed through a clear system of governance to effectively carry out the mission.
- R06 Expertise & Guidance
  - The repository adopts mechanisms to secure ongoing expertise, guidance and feedback-either in-house, or external.



Source: CoreTrustSeal Standards and Certification Board. (2022). CoreTrustSeal Requirements 2023-2025 (V01.00). Zenodo. <https://doi.org/10.5281/zenodo.7051012>

# CoreTrustSeal Requirements 2023-2025: Digital Object Management

- R07 Provenance & Authenticity
  - The repository guarantees the authenticity of the digital objects and provides provenance information.
- R08 Deposit & Appraisal
  - The repository accepts data and metadata based on defined criteria to ensure relevance and understandability for users.
- R09 Preservation Plan
  - The repository assumes responsibility for long-term preservation and manages this function in a planned and documented way.
- R10 Quality of Service
  - The repository addresses technical quality and standards compliance, and ensures that sufficient information is available for end users to make quality-related evaluations.
- R11 Workflows
  - Digital object management takes place according to defined workflows from deposit to access.
- R12 Discovery & Identification
  - The repository enables users to discover the digital objects and refer to them in a persistent way through proper citation.
- R13 Reuse
  - The repository enables reuse of the digital objects over time, ensuring that appropriate information is available to support understanding and use.



# CoreTrustSeal Requirements 2023-2025: Information Technology & Security



- R14 Storage & Integrity
  - The repository applies documented processes to ensure data and metadata storage and integrity.
- R15 Technical Infrastructure
  - The repository is managed on well-supported operating systems and other core infrastructural software and hardware appropriate to the services it provides to its Designated Community.
- R16 Security
  - The repository protects the facility and its data, metadata, products, services, and users.

Source: CoreTrustSeal Standards and Certification Board. (2022). CoreTrustSeal Requirements 2023-2025 (V01.00). Zenodo. <https://doi.org/10.5281/zenodo.7051012>

## **Online Guidance and Related Resources for Improving Data Stewardship and Attaining CoreTrustSeal Certification 2023-2025**

- CoreTrustSeal Standards and Certification Board. (2022). CoreTrustSeal Requirements 2023-2025 (V01.00). Zenodo. <https://doi.org/10.5281/zenodo.7051012>
- CoreTrustSeal Standards and Certification Board. (2022). CoreTrustSeal Trustworthy Digital Repositories Requirements 2023-2025 Extended Guidance (V01.00). Zenodo. <https://doi.org/10.5281/zenodo.7051096>
- CoreTrustSeal Standards and Certification Board. (2022). CoreTrustSeal Trustworthy Data Repositories Requirements: Glossary 2023-2025 (V01.00). Zenodo. <https://doi.org/10.5281/zenodo.7051125>
- CoreTrustSeal Standards and Certification Board. (2022). CoreTrustSeal Revision Working Group Change Log and Associated Materials (v01.00). Zenodo. <https://doi.org/10.5281/zenodo.7051237>
- Apply for CoreTrustSeal Certification: <https://www.coretrustseal.org/apply/>
- CoreTrustSeal Requirements (& webinars): <https://www.coretrustseal.org/why-certification/requirements/>
- CoreTrustSeal Administrative Fee (& waiver): <https://www.coretrustseal.org/apply/administrative-fee/>
- CoreTrustSeal: <https://www.coretrustseal.org/>

## **Online Resources for Improving Data Stewardship and Attaining CoreTrustSeal Certification (Continued)**

- Consultative Committee for Space Data Systems. 2012. Reference Model for an Open Archival Information System (OAIS). CCSDS 650.0-M-2. Also published as ISO 14721:2012. <https://public.ccsds.org/Pubs/650x0m2.pdf>
- Consultative Committee for Space Data Systems (CCSDS). 2011. Audit and Certification of Trustworthy Digital Repositories. CCSDS 652.0-M-1. Also published as ISO 16363:2012. <https://public.ccsds.org/pubs/652x0m1.pdf>
- Group on Earth Observations (GEO). 2016. Global Earth Observations System of Systems (GEOSS) Data Management Principles. [http://earthobservations.org/open\\_eo\\_data.php#](http://earthobservations.org/open_eo_data.php#)
- Group on Earth Observations (GEO). 2016. Global Earth Observations System of Systems (GEOSS) Data Sharing Principles. [http://earthobservations.org/open\\_eo\\_data.php#](http://earthobservations.org/open_eo_data.php#)

## **Online Resources for Improving Data Stewardship and Attaining CoreTrustSeal Certification (Continued)**

- Carroll, S.R., et al. 2020. The CARE Principles for Indigenous Data Governance. *Data Science Journal*, 19(1). <https://doi.org/10.5334/dsj-2020-043>
- Lin, D., et al. 2020. The TRUST Principles for digital repositories. *Scientific Data* 7, 144. <https://doi.org/10.1038/s41597-020-0486-7>
- Wilkinson, M, et al. 2016. The FAIR Guiding Principles for scientific data management and stewardship. *Scientific Data* 3, 160018. <https://doi.org/10.1038/sdata.2016.18>



## **Online Resources for Improving Data Stewardship and Attaining CoreTrustSeal Certification (Continued)**

- International Science Council (ISC) CODATA international discussion list
  - [http://lists.codata.org/mailman/listinfo/codata-international\\_lists.codata.org](http://lists.codata.org/mailman/listinfo/codata-international_lists.codata.org)
- Research Data Alliance (RDA) <https://www.rd-alliance.org/>
  - <https://www.rd-alliance.org/groups/rdawds-certification-digital-repositories-ig.html>
- Group on Earth Observations (GEO)
  - <https://earthobservations.org/>
- World Data System (WDS)
  - <https://www.worlddatasystem.org/>

## Online Resources for Improving Data Stewardship and Attaining CoreTrustSeal Certification (Continued)

- Downs, 2021. Improving Opportunities for New Value of Open Data: Assessing and Certifying Research Data Repositories. *Data Science Journal*. <https://doi.org/10.5334/dsj-2021-001>
- Downs RR. 2019. International Standards for Trustworthy Data Repositories. National Institutes of Health (NIH) Trustworthy Data Repositories Workshop. Rockville, MD. <https://doi.org/10.7916/d8-h7xf-ha70>
- Downs RR. 2021. Adopting the TRUST Principles for Digital Repositories with the GEOSS Data Management Principles and the GEOSS Data Sharing Principles. ESIP 2021 Winter Meeting (Virtual). <https://doi.org/10.6084/m9.figshare.13607747.v1>
- Downs RR, Chen RS. 2016. A Portfolio Approach to a Sustainable Business Model for Scientific Data Stewardship. SciDataCon 2016, Denver, CO. <https://doi.org/10.7916/d8-fae5-cz67>
- Downs RR, Chen RS. 2015. Bridging Disciplines: Assessing the Interdisciplinary Impact of Open Data. 41st IASSIST Annual Conference, Minneapolis, MN. <https://doi.org/10.7916/D8J38SDZ>
- Downs RR, Lehnert KA. 2020. Opportunities for Sharing Resources Among Research Data Repositories. Research Data Alliance 16th Plenary (RDA P16). <https://doi.org/10.7916/d8-kv81-sv37>
- Downs RR, Lehnert KA, Zhang L, Donaldson DR, Silva JR. 2020. Selecting Research Data Repository Platforms for Open Science. RDA P16. <https://doi.org/10.7916/d8-051c-y379>

**Thank you!**

`rdowns@ciesin.columbia.edu`