

As open as possible, as restricted as necessary

What public data standards and open data mean for policymakers and innovation procurers?









Objectives

What should public bodies be aware of when it comes to data standardisation and open data?

How are data standards indispensable to assess the quality of a procured/envisaged data solution?

✓ Introduction to open data sharing and data management principles be included (GEO, FAIR, CARE, TRUST).

Outline

Raise awareness about Open Data and Standards

Best Practices



Some milestones on Open Data

- 1963 WMO approved the concept of a WWW program to exchange data between Met services
- 1998 Baveno Manifesto: Global Monitoring of Environment and Security (GMES)



- 1998 The Aarhus convention Access to environmental information, Public participation in environmental decision making, justice
- 1999 The International Charter Space and Major Disasters
- 2005 GEO open data sharing principles
- 2008 Landsat free and open data policy
- 2012 GMES, operational since 2011, is renamed Copernicus
- 2013 WMO decides to transition to the WMO Information System -WIS opened to everyone.
- 2015 Enhanced GEO Data Sharing Principles & GEO data management principles

Online video recording: GEO Dialogue recording: "Data sharing principles and the value of Open data"

https://gkhub.earthobservations.org/records/4dy10-49891



The European Strategy for data at a glance



The **European Strategy for data** (2020) aims to make the EU a leader in a data-driven society.



The **Data Governance Act** (2020) facilitates data sharing across sectors and Member States.



The **Data Act** (2022) clarifies who can create value from data.



Ten European common data spaces,

ranging from industry to mobility, from European Green Deal to energy and health.



GEO DATA SHARING PRINCIPLES

Data, metadata and products will be shared as **Open Data by default**, by making them available as part of the GEOSS Data Collection of Open Resources for Everyone (Data-CORE) **without charge or restrictions on re-use**, subject to the conditions of registration and attribution when the data are re-used;

2

Where international instruments, national policies or legislation preclude the sharing of data as Open Data, data should be made available with **minimal restrictions on use** and at **no more than the cost of reproduction and distribution**



All shared data, products and metadata will be made available with **minimum time delay**

The GEO Data Management Principles





GEO Dialogue Series 2023 - Discover with us the strategies for a collaborative world

APRIL2023

Discoverability

DMP-1. Data and all associated metadata will be discoverable through catalogues and search engines, and data access and use conditions, including licenses, will be clearly indicated.

Accessibility

DMP-2. Data will be accessible via online services, including, at minimum, direct download but preferably user-customizable services for visualization and computation.

Usability

DMP-3. Data will be structured using encodings that are widely accepted in the target user community and aligned with organizational needs and observing methods, with preference given to non-proprietary international standards.

DMP-4. Data will be comprehensively documented, including all elements necessary to access, use, understand, and process, preferably via formal structured metadata based on international or community-approved standards. To the extent possible, data will also be described in peer-reviewed publications referenced in the metadata record. DMP-5. Data will include provenance metadata indicating the origin and processing history of raw observations and derived products, to ensure full traceability of the product chain.

DMP-6. Data will be quality-controlled and the results of quality control shall be indicated in metadata; data made available in advance of quality control will be flagged in metadata as unchecked.



GED

Data management principles

Preservation

DMP-7. Data will be protected from loss and preserved for future use; preservation planning will be for the long term and include guidelines for loss prevention, retention schedules, and disposal or transfer procedures.

DMP-8. Data and associated metadata held in data management systems will be periodically verified to ensure integrity, authenticity and readability.

Curation

DMP-9. Data will be managed to perform corrections and updates in accordance with reviews, and to enable reprocessing as appropriate; where applicable this shall follow established and agreed procedures. DMP-10. Data will be assigned appropriate persistent, resolvable identifiers to enable documents to cite the data on which they are based and to enable data providers to receive acknowledgement of use of their data.

GEO FAIR CARE TRUST Principles

FAIR Principles

- F1: (Meta) data are assigned globally unique and persistent identifiers
- F2: Data are described with rich metadata
- F3: Metadata clearly and explicitly include the identifier of the data they describe
- F4: (Meta)data are registered or indexed in a searchable resource
- A1: (Meta)data are retrievable by their identifier using a standardised communication protocol
- A1.1: The protocol is open, free and universally implementable
- A1.2: The protocol allows for an authentication and authorisation procedure where necessary
- A2: Metadata should be accessible even when the data is no longer available
- I1: (Meta)data use a formal, accessible, shared, and broadly applicable language for knowledge representation
- I2: (Meta)data use vocabularies that follow the FAIR principles
- I3: (Meta)data include qualified references to other (meta)data
- R1: (Meta)data are richly described with a plurality of accurate and relevant attributes
- R1.1: (Meta)data are released with a clear and accessible data usage license
- R1.2: (Meta)data are associated with detailed provenance
- R1.3: (Meta)data meet domain-relevant community standards





GEO FAIR CARE TRUST Principles

Collective (Benefit) - Data ecosystems shall be designed and function in ways that enable Indigenous Peoples to derive benefit and equitable outcomes from Indigneous Data, such as inclusive development, innovation, and citizen engagement.



Authority to Control - Indigenous Peoples' rights, interests, and authority in Indigneous Data must be recognized and empowered, enabling Indigenous Peoples and governing bodies to determine how Indigenous Peoples are represented and identified within data, in accordance with cultural governance protocols. This also includes Indigenous lands, territories, resources, knowledges and geographical indicators.

Responsibility - Indigenous Data must be connected to relationships built on respect, reciprocity, trust, and mutual understanding, as defined by the Indigenous Peoples to whom those data relate. Information must be shared about how data are used to support Indigenous Peoples'selfdetermination and collective benefit through openly available, meaningful evidence. This includes enhancing data literacy and supporting the development of an Indigneous digital infrastructure, able to generate data grounded in the languages, worldviews, and lived experiences of Indigenous Peoples.

Ethics - Indigenous Peoples' rights and wellbeing should be the primary concern at all stages of the data life cycle and across the data ecosystem. Representation and justice, as well as consideration of potential future use (or harm) should be incorporated. This includes

GEO DSMP FAIR CARE Principles

Transparency	To be transparent about specific repository services and data holdings that are verifiable by publicly accessible evidence.
R esponsibility	To be responsible for ensuring the authenticity and integrity of data holdings and for the reliability and persistence of its service.
User Focus	To ensure that the data management norms and expectations of target user communities are met.
S ustainability	To sustain services and preserve data holdings for the long-term.
Technology	To provide infrastructure and capabilities to support secure, persistent, and reliable services.



https://www.rd-alliance.org/trustprinciples-rda-community-effort

2019-2020

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Where international instruments, national policies or legislation preclude the sharing of data as Open Data, data should be made available with **minimal restrictions on use** and at **no more than the cost of reproduction and distribution**



All shared data, products and metadata will be made available with **minimum time delay**

Licences

As open as possible, as restricted as needed

A license provides clarity and certainty on possible downstream usage of Earth Observation services, which enables innovation for research, and business and supports its sustainability.

A license depends on the business model, but it also depends on the licenses attached to the input data. Crediting the data used is requested for instance by Copernicus and can be critical for some data providers.

GEO Data Licensing Guidance

In February 2023, the Law and Policy Subgroup of the GEO Data Working Group recommended the use of the following data licenses, consistent with the GEO Data Sharing Principles:

- Creative Commons Zero 1.0 Universal Public Domain Dedication (CC0) (https://creativecommons.org/publicdomain/zero/1.0/)
- Open Data Commons Public Domain Dedication and License (PDDL) v1. (https://opendatacommons.org/licenses/pddl/1-0/)
- Creative Commons Attribution 4.0 International (CC BY 4.0) (https://creativecommons.org/licenses/by/4.0/)

Standard licences enable M2M Processing, restrictions are still not fully standardized



Licences: More on Creative Commons

CC0: This license does not preserve copyright and waives all rights. However, it comes with no warranties.

BY: This building block allows the use of the data and to create derivative works as long as the original author is credited. Even commercial use of the data or the derived product is allowed.SA: This building block ensures that the data or derived product gets distributed under the same license as the original data.

NC: This building block prohibits commercial use of both the original data and any derived products.

ND: This building block prohibits the creation of a derived product.





And Data Licences are different than Software licences

What are open standards?

Open standards are technical standards developed through a **collaborative**, **consensus-driven** process and are **publicly available** for anyone to use and implement.

These standards are essential to make the data Findable, Accessible, Interoperable, and Reusable ensuring that different systems can interoperate together seamlessly.

What is interoperability?



Interoperability allows to open your information system:

- In Input
- In Output





Value of Open Standards

- foster innovation, **healthy and fair competition**, and efficiency preventing monopolies
- Enable switching between different products and services, which lowers the risk of dependency, helps to reduce the costs of switching, increasing consumer choice.
- encourages companies to stay competitive, rather than relying on vendor lock-ins
- help to promote social values such as accessibility, transparency, and inclusivity ensuring diversity and inclusion
- play a critical role in promoting innovation, competition, accessibility, cost savings, social values, and risks resilience specially as technology advances
- Challenges for developing standards include implementing a **consensus-driven agile development process** involving a wide diversity of stakeholders, **adapting** to change, and **maintaining stability** for broad adoption while evolving with new data sources, new technologies and needs

Reference standardization bodies for Geographic and environment information





ORGANIZATION

WORLD

- **ISO/TC 211** about Geographic information/Geomatics: https://www.iso.org/committee/54904/x/catalogue/
- The Open Geospatial Consortium OGC : https://www.ogc.org/standards/
- WMO for Weather and Hydro METEOROLOGICAL https://community.wmo.int/en/standards-andrequirements-climate-observations



Internationa IHO Hydrograph Organization

• **IHO** : https://www.iso.org/committee/54904/x/catalogue

In Europe **INSPIRF**

OGC and ISO cooperate on many topics of common interest.

https://www.iso.org/organization/9825.html

WMO has endorsed the following OGC standards: CSW, WMS, WCS, WFS, SOS an several parts of WaterML

Ocean Data Standards are defined by **Technical** Joint WMO-IOC а Commission on Oceanography and Marine Meteorology (JCOMM)

Compliance testing

- Compliance tools enable to check the good quality of the implementations
- The OGC Compliance Program is a certification process that ensures organizations' solutions are compliant with OGC Standards. It is a universal credential that allows agencies, industry, and academia to better integrate their solutions. See: https://cite.opengeospatial.org/teamengine/
- The INSPIRE Reference Validator is to help data providers, solution providers and national coordinators to check whether data sets, network services and metadata meet the requirements defined in the INSPIRE Technical Guidelines. The Validator provides detailed test reports to help implementers understand how well their data, services, metadata or software solutions are doing (or where improvements may be needed). See: https://inspire.ec.europa.eu/validator/home/index.html

Online webinar recording "Standards compliance Tools, benefits and return on experience": https://www.youtube.com/watch?app=desktop&v=BZX0O-pLxXE

Data Management Plan (DMP)

Definition:



- A formal document outlining how data should be handled during and after the project is completed.
- Consider the many aspects of data management, metadata generation, data preservation before the project begins.
- Lead to **data being well-managed** in the **present** and prepared for **preservation** in the **future**.

Context:

• **Required** by national and international **funding agencies** (eg. European Commission)

Support:

- Online tools: OpenAIRE, DMPonline, OPIDoR...
- OPIDoR: <u>https://opidor.fr/</u> Models, tools and online services in support of machine-actionable DMP
- GEO-FAIR DMP Self Assessment Tool: <u>https://gkhub.earthobservations.org/records/0ksgt-7v316</u>

DMP Self Assessment Tool in a nutshell

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- Designed for GEO and FAIR Principles
- 10 GEO DMPs and 5 FAIR Principles
- Excel package (Macro)
- Free, open, simple and easy to navigate
- Allow templating (Look & feel)
- Based on self-assessment (Pilot or project)
- Provide recommendation and guidance
- Notion of compliance and trajectory
- Tested and validated on 37 e-shape pilots (X2)
- Free download on the GEO Knowledge Hub



Note: this summary fills from the content entered in previous sections. To edit, please do so in the corresponding section.

GEO Data Management Principle	Start: Level of compliance (select)	Finish: Level of compliance (select)	Details included (mandatory)	Exceptions	Reasons for exceptions	< TO START
AP-1: METADATA FOR DISCOVERY ta and all associated metadata will be icoverable, through catalogues and search gines, and data access and use conditions, iluding licenses, will be clearly indicated.	1 - Applicable but not started	3 - Fully compliant	ISO 19139 Metadata record has been generated on a GKD compliant catalogue (SKV/Open Search) brokkered by the GEO DAB (Discovery and Access Broker). The Webservice- Energy catalogue supporting the GEO-VENER Initiative has been used: The metadata record is available here: http://geocatalog.webservice- anergy.org/geocatalog.webservice-	Access to metadata is fully compliant with GEO recommendations but no direct access to the input data will be made available. Access to interoperable process (OGC WPS) is available haved on registration	Exception due to commercial restrictions	BACK TO EDIT DMP - 1>
AP-2: ONLINE ACCESS ta will be accessible via online services, luding, at a minimum, direct download but ferably user-customizable services for cess, visualization and analysis.	2 - Partly implemented / ongoing	3 - Fully compliant	This distibution is mean'to browled an urban energy system modelling of distribution grist out plan, monitor and nowcast (i.e. and short term forecast) the spatiotemporal variability of the electric consumption on one hand and of the production of fleet of PV roofboy systems on the other hand.	Restrictions might apply according to the type of licence that will be applied to the final product.	Exception due to commercial restrictions	BACK TO EDIT DMP - 2>
AP-3: DATA ENCODING ta should be structured using encodings that e widely accepted in the target user mmunity and aligned with organizational eds and observing methods, with preference ren to non-proprietary international indards.	2 - Partly implemented / ongoing	3 - Fully compliant	The output format is NetCDF (timeSeries feature type using CF Convention metadata encoding).	Restrictions might apply according to the type of licence that will be applied to the final product.	Exception due to commercial restrictions	BACK TO EDIT DMP - 3>
AP-4: DATA DOCUMENTATION ta will be comprehensively documented, duding all elements necessary to access, use, derstand, and process, preferably via formal uctured metadata based on international or mmunity-approved standards. To the extent	1 - Applicable but not started	2 - Partly implemented / ongoing	The encoding of the output data is NetCDF (timeSeries feature type using C Convertion metadata encoding). ISO 19139 Metadata record describing and providign accus to the pilot process and ressources is available in a CSW catalog: http://geocatalog.webservice- energy.org/geonetwork/sv/frejCatalog.searchi/metadat a/9/13542-256-2439-6516-23616/0711	Restrictions might apply according to the type of licence that will be applied to the final product.	Exception due to commercial restrictions	BACK TO EDIT DMP - 4>
GEO -DMP 2 GEO -DMP 3 GEO -DMP 4 GEO	D -DMP 5 GEO -DN	IP 6 GEO -DMP 7	GEO -DMP 8 GEO -DMP 9 GEO -DMP 10 FAIR - 1 FAIR	- 2 FAIR - 3 FAIR - 4 FAIR - 5	Your DMP +	

GEO DMP - FAIR Principles Cross-Analysis





DSP-1: Open by Default FAIR does not DSP-2: Available with minimal restrictions, at no explicitly address more than the cost of reproduction and distribution the DSPs DSP-3: Available with minimum time delay. DMP-1: Metadata for Discovery Findable DMP-2: Online Access DMP-3: Data Encoding Accessible DMP-4: Data Documentation DMP-5: Data Traceability Interoperable DMP-6: Data Quality-Control DMP-7: Data Preservation DMP-8: Data and Metadata Verification Reusable DMP-9: Data Review and Reprocessing DMP-10: Persistent and Resolvable Identifiers

Based on: GEOSS Data Sharing Principles Implementation Guidelines 2016-2025, GEOSS Data Management Principles: A Brief Overview, and [The FAIR Data Principles.

Based on: GEOSS Data Sharing Principles Implementation Guidelines 2016-2025, GEOSS Data Management Principles: A Brief Overview, and The FAIR Data Principles.

DMP Self Assessment Tool - Addresses GEO/FAIR overlap



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1		DMP - 1 DMP - 2	GEO D	ata Management Prin	come - 7 [DMP - 8] DMP - 9 [DMP - 10] PAIR - 1 ciples	FAIR Principles			
2	On some aspects, the GEO and FAIR assessment frameworks overlap. Your response to the GEO DMP - 3 is reminded here.	The output form	at is NetCDF (tim	eSeries feature ty	rpe using CF Convention metadata encoc	ing).			
3	Foreseen efforts towards	GEO - DMP - 1	GEO - DMP - 6	Color code:					
4	interoperability, for each GEO DMP.	GEO - DMP - 2	GEO - DMP - 7	NONE - N/A or u	inknown				
5	You reconnect from the GEO section	GEO - DMP - 3	GEO - DMP - 8	RED - Not signifi	cant effort to ensure interoperability				
5	are reminded here.	GEO - DMP - 4	GEO - DMP - 9	ORANGE - Interc	operable but with restrictions	ations			
8	Level of compliance 0: Not applicable to my Pilot 1: Applicable but not started 2: Partly implemented 3: Fully compliant	Current status	Start: Level of compliance (select)	Finish: Level of compliance (select)	Please provide details (Mandatory)				
	Assess the interoperability of your data. Specify what data and metadata vocabilaries, standards or methodologies you will follow to facilitate interoperability.	2 - Partly implemented / ongoing	2 - Partly implemented / ongoing	3 - Fully compliant	This GIS-tool is meant to provide and short term forecast) the spati fleet of PV rootpo systems on thi It is available val a Jupyerk Noteko -JupyerHub Notebook Web Clien -Solar PV Vield Service (WPS) This -Solar PV Vield Service (WPS) This -SithVib Master. https://gli.soph SIO 19139 Metadata record desor catalog: http://geocatalog.webse b51e-c356faf0741f This catalogue is weekly harvest	an urban energy system n totemporal variability of t e other hand. sook that access a remote (tt: https://notebook.oie-i p://s32.0ie- &version=1.0.0&request- ia.mines-paristech.fr/e-si ibing and providing acces wrice-energy.org/geout d by the GEO DAB (Discov https://bit.ly/34MSYdc	nodelling of distribution gri ne electric consumption on DGC WPS. Code are availab ab.net DescribeProcess&identific app(-shape-S3P2-notebor s to the pilot process and r ork/srv/fre/catalog.searchi ary and Access Broker) and	ds to plan, monitor a one hand and of the le in a GIT repository: res3p2 kk/ esources is available /metadata/d973542 consequently the inf	ind nowcast (i.e production of in a CSW d-2626-4294- ormation are

DMP Self Assessment Tool - Compliance & Trajectory



		Trajectory			
		Start	Finish		
	Level of compliance				
	0 : Not applicable to my Pilot				
	1: Applicable but not started				
	2: Partly implemented				
	3: Fully compliant				
	Level of interoperability				
e S C C C	0 : Not applicable or unknown				
llar	1: Not significant effort to ensure interoperability				
	2: Interoperable but with restrictions				
5	3: Fully interoperable in line with GEO recommendations				
	List of possible exceptions (Free text)				
	Nature of the exception				
	Exception due to security risks				
	Exception dur to commercial restrictions				
	Exception due to research embargo				

DMP Self Assessment Tool - Final doc/pdf document



Note: this summary fills from the content entered in previous sections. To edit, please do so in the corresponding section.

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4	GEO Data Management Principle	Start: Level of compliance (select)	Finish: Level of compliance (select)	Details included (mandatory)	Exceptions	Reasons for exceptions	< TO START
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6	DMP-2: ONLINE ACCESS Data will be accessible via online services, including, at a minimum, direct download but preferably user-customizable services for access, visualization and analysis.	2 - Partly implemented / ongoing	3 - Fully compliant	This GIS-tool is meant to provide an urban energy system modelling of distribution grids to plan, monitor and nowcast (i.e. and short term forecast) the spatiotemporal variability of the electric consumption on one hand and of the production of fleet of PV rooftop systems on the other hand.	Restrictions might apply according to the type of licence that will be applied to the final product.	Exception due to commercial restrictions	BACK TO EDIT DMP - 2>
7	DMP-3: DATA ENCODING Data should be structured using encodings that are widely accepted in the target user community and aligned with organizational needs and observing methods, with preference given to non-proprietary international standards.	2 - Partly implemented / ongoing	3 - Fully compliant	The output format is NetCDF (timeSeries feature type using CF Convention metadata encoding).	Restrictions might apply according to the type of licence that will be applied to the final product.	Exception due to commercial restrictions	BACK TO EDIT DMP - 3>
	DMP-4: DATA DOCUMENTATION Data will be comprehensively documented, including all elements necessary to access, use, understand, and process, preferably via formal structured metadata based on international or community-approved standards. To the extent possible, data will also be described in peer-	1 - Applicable but not started	2 - Partly implemented / ongoing	The encoding of the output data is NetCDF (timeSeries feature type using CF Convention metadata encoding). ISO 19139 Metadata record describing and providign accss to the pilot process and ressources is available in a CSW catalog: http://geocatalog.webservice- energy.org/geonetwork/srv/fre/catalog.search#/metadat a/d9f3542d-2626-4294-b61e-c356faf0741f This catalogue is weekly harvested by the GEO DAB	Restrictions might apply according to the type of licence that will be applied to the final product.	Exception due to commercial restrictions	BACK TO EDIT DMP - 4>

DMP Self Assessment Tool - A closer look...





DSP-1: Open by Default DSP-2: Available with minimal restrictions, at no more than the cost of reproduction and distribution DSP-3: Available with minimum time delay.

FAIR does not explicitly address the DSPs

DMP-1: Metadata for Discovery DMP-2: Online Access DMP-3: Data Encoding DMP-4: Data Documentation DMP-5: Data Traceability DMP-6: Data Quality-Control DMP-7: Data Preservation DMP-8: Data and Metadata Verification DMP-9: Data Review and Reprocessing DMP-10: Persistent and Resolvable Identifiers

Based on: GEOSS Data Sharing Principles Implementation Guidelines 2016-2025, GEOSS Data Management Principles: A Brief Overview, and [The FAIR Data Principles.

DMP Self Assessment Tool - A closer look...

Recommendations and guidances from GEO DMP-3 and FAIR-3						
GEO DMP-3	FAIR-3					
Data should be structured using encodings that are widely accepted in the target user community and aligned with organizational needs and observing methods, with preference given to non-proprietary international standards .	Humans should be able to exchange and interpret each other's data, but this also applies to computers, meaning that data that should be readable for machines without the need for specialised or ad hoc algorithms, translators, or mappings. Interoperability means that each computer system at least has knowledge of the other system's data exchange formats .					
 Adopt standardized encodings to meet user expectations: Validate that encodings work with community-adopted tools Facilitate schematic and syntactic interoperability: Enable use with mature services, such as OGC WMS, OpeNDAP, and NetCDF 	 For this to happen and to ensure automatic findability and interoperability of datasets, it is critical to use: 1. commonly used controlled vocabularies, ontologies, thesauri (UUID and DOI) 2. a good data model (a well-defined framework to describe and structure (meta)data). 					

Data Management Plan Self Assessment Tool - Take away...

- The tool is a powerful and flexible formal framework to **assess data and services compliance** towards **GEO** and **FAIR** Principles
- Automatic generation of a Data Management Plan document
- In practice it is **not easy to answer** to all DMP questions (-> **Trajectory**)

- **2024** planned activity in GEO:
 - Implement GEO Data Management Principles into OPIDoR for reliable, scalable, interoperable and machine actionable DMPs

GEO Timeline - Data management & Dialogues



From open data sharing and data management principles to open knowledge statement and knowledge management principles

From "Kunnskapsgrunnlag GEO" by Bente Lilja Bye for The Norwegian Environmental Agency, 2022

From Data sharing to Open Knowledge

In 2021 GEO has endorsed the open knowledge statement <u>https://shorturl.at/jMOS5</u>.

In the following year, GEO has implemented the Open Knowledge Hub that makes accessible Open Knwoledge packages https://gkhub.earthobservations.org/

Geo Advocates now not only Data Sharing but also Open knowledge

https://gkhub.earthobser vations.org/



From Data sharing to Open Knowledge

Op e n Science	Open Access	Citizen and Participatory Science	Open Data
Open Reproducible Research	Open Software	Open In fra structure	Open Hardware
Open Education	Op e n Eva lu a tio n	Diversity of knowledge	SEPTEMBER 2023

Final Take Aways

Open data policies reveals the value of data

Licences enable to make the data as open as possible, as restricted as needed

Open Standards are needed to make the data open according to GEO, FAIR, CARE, TRUST and get many other benefits

Data Sharing, Open knowledge and Standards should be required/recommended/considered as needed in calls and tenders

Tools enable policy makers and innovation procurers assess GEO Data Management, FAIR Principles and standards compliance