Skills 4 eosc

Learning Path and Training Materials on "Open Science and Research Data Management in Solid Earth Sciences"

Training Facilitator Guide

Lead Partner:	European Plate Observing System
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Deliverable Abstract
The purpose of this document is to include all the necessary information regarding the preparation and planning of the training in Open Science and Research Data Management in Solid Earth Sciences. This document is part of the *D5.3: Learning Path and Training Materials on "Open Science Research Data Management in Solid Earth Sciences"* package.

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TERMINOLOGY

https://eosc-portal.eu/glossary

Terminology/Acronym	Definition
EOSC	European Open Science Cloud
EPOS	European Plate Observing System
FAIR	Findable, Accessible, Interoperable, Reusable
RI	Research Infrastructure
RDM	Research Data Management
SES	Solid Earth Science
TCS	Thematic Core Service
ToT	Train-of-Trainers

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1 Executive Summary

1.1 Introduction – Context

The purpose of this document is to include all the necessary information regarding the preparation and planning of trainings on Open Science and Research Data Management in Solid Earth Sciences, addressing either end users (i.e. researchers, PHD students, teachers…) or prospective trainers.

2 Structure of the Course

2.1 Learning Objectives

By the end of this course, students will be able to:

1. Understand basic OS/FAIR/RDM concepts
2. Recognise OS/FAIR principles and practices in the Solid Earth Sciences, and within the EPOS infrastructure in particular
3. Use the EPOS Data Portal to discover and reuse FAIR data and scientific products

2.2 Modules

The course is composed of 2 mandatory modules:

- **Module 1 - An Introduction to Open Science, FAIR Principles and RDM in Solid Earth Sciences - Open Science, FAIR and EPOS**

An overview of basic Open Science and FAIR RDM concepts with examples from the field of SES, and an introduction to how Open and FAIR principles are implemented in practice within the EPOS RI, with some references to its global counterparts. This module is offered as a slideset complete with presenter's notes, and a list of additional resources you can use for additional discussion, assignments, or just as a reading list for participants.

- **Module 2 - EPOS Data Portal Training: Introduction to the EPOS infrastructure and EPOS Data Portal walkthrough (Including Hands-On Session)**

Brief presentation of the EPOS infrastructure and demonstration of how the EPOS data portal can be used to discover, visualise, and reuse SES data and scientific products.

This module is divided in two parts, a short presentation and demo and the actual hands-on interactive session introduces the hands-on session. Provided materials are a slideset with presenter's notes and a kit of use cases that can be used in the demonstration and hands-on session.

- **Hands-On Session**

In this session, participants are invited to access the EPOS Data portal, presented with one or more scientific use cases and asked to use the portal to complete some tasks related to the use case. They can self-assess their performance through a form, and provide feedback on the difficulties they find. A facilitator is available the whole time to answer questions and provide tips, and they provide a walkthrough the exercises at the end of the session.

Two more optional modules are offered that can be used depending on the prevalent audience:

- **Module 0 - Data, Databases and Data Sharing in Solid Earth Sciences: An Introduction - From Basic Definitions to the European Regulation (Optional)**
- **Module 3: Focus on Interoperability: The EPOS Approach (Optional)**

Trainers are supposed to have successfully completed at least the basic modules and to be proficient in the use of the EPOS Data portal.

Experienced trainers can easily create new use cases for demonstrations and hands-on sessions, but we recommend using the proposed ones for your first training facilitation.

2.3 Available Resources

The picture shows the available materials for this course.

All the materials are designed as FAIR-by-Design Open Educational Resources according to the Skills4EOSC FAIR-by-Design methodology (https://zenodo.org/records/11548062), so they can be adapted and reused.
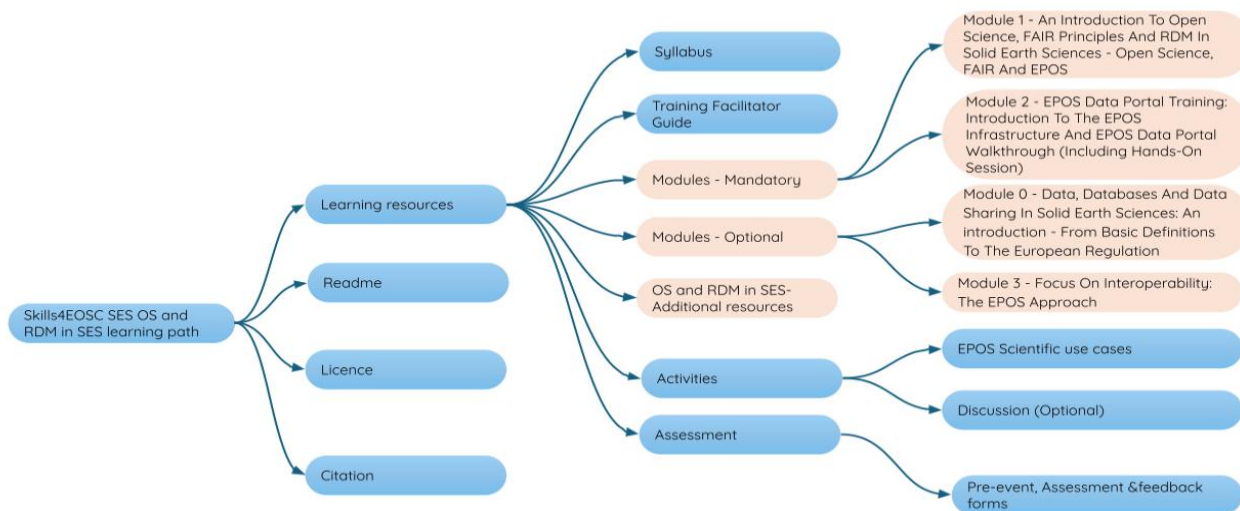
Figure.1 Representation of the training materials and path

3 Modules And Activities

3.1 Module 1 - An Introduction to Open Science, FAIR Principles and RDM in Solid Earth Sciences - Open Science, FAIR and EPOS

An overview of basic Open Science and FAIR RDM concepts with examples from the field of SES, and an introduction to how Open and FAIR principles are implemented in practice within the EPOS RI, with some references to its global counterparts.

Main Content: PPTx Slideset with presenter's notes.

Supporting material: OS and RDM in SES- Additional resources

Title	An Introduction to Open Science, FAIR Principles and RDM in Solid Earth Sciences - Open Science, FAIR and EPOS
Abstract / Description	This is the first of two mandatory modules in the Skills4EOSC Open Science and RDM in Solid Earth Sciences Learning path. It offers an overview of basic Open Science and FAIR RDM concepts with examples from the field of SES, and an introduction to how Open and FAIR principles are implemented in practice within the EPOS RI, with some references to its global counterparts. There are no prerequisites to attend the module but a basic knowledge of the domain of Solid Earth Science will make the learner's experience more fulfilling.
Author(s)	EPOS
Primary Language	English
Keyword(s)	Solid Earth Science, FAIR, EPOS, interoperability, RDM
*Version Date	v1.0 09/2024
URL to Resource	https://zenodo.org/records/13682347
Resource URL Type	DOI
License	CC by international 4.0

Access Cost	NO
Target Group (Audience)	Researchers, PHD students in Solid Earth Science, Data Stewards
Learning Resource Type	Presentation (MS PPTX)
Learning Outcome	● Understanding of basic OS/FAIR/RDM concepts ● Recognising of OS/FAIR principles and practices in the SES context and in the EPOS infrastructure in particular
Expertise (Skill) Level	Beginners, Intermediate

3.2 Module 2 - EPOS Data Portal Training: Introduction to the EPOS Infrastructure and EPOS Data Portal Walkthrough (Including Hands-On Session)

Brief presentation of the EPOS infrastructure and demonstration of how the EPOS data portal can be used to discover, visualise, and reuse SES data and scientific products. This module introduces the hands-on session.

Main Content: PPTx Slideset with presenter's notes.

Supporting material: recorded video: https://www.youtube.com/watch?v=-dD2sMn-X5M

Hands-On Session

In this session, participants are invited to access the EPOS Data portal, presented with one or more scientific use cases and asked to use the portal to complete some tasks related to the use case. They can self-assess their performance through a form, and provide feedback on the difficulties they find. A facilitator is available the whole time to answer questions and provide tips, and they provide a walkthrough the exercises at the end of the session.

Main Content: Document with EPOS Data Portal Scientific use cases

Supporting material: recorded video of hands-on exercise https://youtu.be/YeqW1Qp1L6g?featurehttp=shared (walkthrough starts at min 42) Assess and feedback form material.

Title	EPOS Data Portal Training: Introduction to the EPOS Infrastructure and EPOS Data Portal Walkthrough (Including Hands-On Session)
Abstract / Description	This is the second of two mandatory modules in the Skills4EOSC Open Science and RDM in Solid Earth Sciences Learning path. It offers an introduction of the EPOS infrastructure and a demonstration of how the EPOS data portal can be used to discover, visualise, and reuse SES data and scientific products. This module introduces a hands-on session where trainees can experiment with the portal.
Author(s)	EPOS
Primary Language	English
Keyword(s)	Solid Earth Science, FAIR, EPOS, interoperability, RDM
*Version Date	v1.0 09/2024
URL to Resource	https://zenodo.org/records/13682396 https://zenodo.org/records/13683830
Resource URL Type	DOI
License	CC by international 4.0
Access Cost	NO
Target Group (Audience)	Researchers, PHD students in Solid Earth Science, Data Stewards
Learning Resource Type	Presentation (MS PPTX) Document With Scientific Use Cases (MS DOCX)
Learning Outcome	● Understanding of basic OS/FAIR/RDM concepts ● Recognising of OS/FAIR principles and practices in the SES context and in the EPOS infrastructure in particular
Expertise (Skill) Level	Beginners, Intermediate

3.3 Module 0 - Data, Databases and Data Sharing in Solid Earth Sciences: An Introduction - From Basic Definitions to the European Regulation (Optional)

A 101 module especially useful for undergraduates, PHD students, secondary school teachers etc providing general definitions of data, datasets, databases as well as basic orientation regarding RDM in the context of Solid Earth Science

Main Content: PPTx Slideset with presenter's notes.

Title	Data, Databases and Data Sharing in Solid Earth Sciences: An Introduction - From Basic Definitions to the European Regulation (Optional)
Abstract / Description	This module is propaedeutic to the two mandatory modules in the Skills4EOSC Open Science and RDM in Solid Earth Sciences Learning path. It offers very basic definitions and concepts related to data and data manipulation in the context of SES. It is recommended for beginners in the field of Data Science.
Author(s)	EPOS
Primary Language	English
Keyword(s)	Solid Earth Science, FAIR, EPOS, interoperability, RDM
*Version Date	v1.0 09/2024
URL to Resource	https://zenodo.org/records/13646664
Resource URL Type	DOI
License	CC by international 4.0
Access Cost	NO
Target Group (Audience)	Undergraduate and PHD students in Solid Earth Science, Secondary school teachers, generic audiences
Learning Resource Type	Presentation (MS PPTX)

Learning Outcome	● Understanding of basic OS/FAIR/RDM concepts ● Recognising of OS/FAIR principles and practices in the SES context and in the EPOS infrastructure in particular
Expertise (Skill) Level	Beginners

3.4 Module 3 - Focus on Interoperability: The EPOS Approach (Optional)

A more technical discussion of interoperability in the context of SES Research Infrastructures and EPOS in particular, suitable for learners who have more time and interest in getting more information about how the RI works, IT people, Data Providers and Research Infrastructure professionals.

Main Content: PPTx Slideset with presenter's notes.

Supporting video material and additional resources: https://www.geo-inquire.eu/dissemination/training-activities/epos-metadata-training

Title	Focus On Interoperability: The EPOS Approach (Optional)
Abstract / Description	This module is offered as an optional addition to the two mandatory modules in the Skills4EOSC Open Science and RDM in Solid Earth Sciences Learning path. It offers more detailed knowledge on the approach to interoperability adopted in EPOS (and followed by other infrastructures in this field) for audiences with an interest in IT and data science.
Author(s)	EPOS
Primary Language	English
Keyword(s)	Solid Earth Science, FAIR, EPOS, interoperability, RDM
*Version Date	v1.0 09/2024
URL to Resource	https://zenodo.org/records/13682759
Resource URL Type	DOI
License	CC by international 4.0

Access Cost	NO
Target Group (Audience)	IT Professionals, Data Stewards and other Data Professionals, RI staff
Learning Resource Type	Presentation (MS PPTX)
Learning Outcome	● Understanding of basic OS/FAIR/RDM concepts ● Recognising of OS/FAIR principles and practices in the SES context and in the EPOS infrastructure in particular
Expertise (Skill) Level	Intermediate, Advanced

Additional Activities

Depending on the time available for the course, facilitators can decide to add interactive discussions and flipped classroom moments to increase the activities of the learners' group. This could be especially beneficial in case you the trainees are prospective trainers themselves (ToT). In the training plan we offer some input for discussion.

4 The Training Facilitator Checklist: What to Do…

4.1 Before the Training

- Setting your target audience. As discussed above, this training is mainly designed for researchers and/or ECR/PHD students in Earth Sciences in mind. However, for best results or because of your specific objectives, you may want to narrow a bit the scope of your audience and focus on more specific segments (e.g.1st year PHD students, or seismologists). This choice will inform how you will customize the training agenda and materials (see below).

- You are of course free to adapt the materials for a wider/slightly different audience (for instance, Civil Engineers or Data Scientists from other Environmental disciplines), but we strongly recommend avoiding putting together audiences that are too different in terms of previous knowledge of the domain because their training needs are going to differ and you might be unable to meet them all (e.g. the background knowledge and scientific interests of a student, a researcher and a civil servant could be very different).

- Another important choice you have to make is the size of the audience. We suggest allowing no more than 20-25 participants for live, in-person training if you want to foster on-site interactions (e.g. trainees working individually or in groups on a use case of their interest), but if you don't plan to include this kind of interaction you could allow more. You have more flexibility for online training. For both online and onsite training, however, you will need to divide participants into groups (>50) for optimal results in the hands-on training (see below for a discussion).

- Take time to get to know your audience, and better understand their previous knowledge of Open Science and RDM, the level of expertise in handling geoscience data, their scientific interest etc. Ideally you will do this already in the enrolment form and will take care of using the information to fine-tune the lectures and exercises.

- You should set up some form of registration to collect the participants' contacts and preferences and this can be used also to ask some background questions,

that can be used for the above. Please bear in mind that you will need to comply with the GDPR when collecting and handling the participants' data. This includes adhering to the minimisation principle (i.e. not asking information that is not directly or indirectly connected to delivering the training and making their training experience as valuable as possible – e.g. you will need to ask their email to provide information about the training, access links etc; you don't need to ask their physical address as its provision is not connected with the training; you could ask if they have already attended Open Science trainings or used the EPOS Data portal as this will allow to better tune the training).

- Decide about the format (online, in person, blended) and the timing of the course (full immersion Vs organised in different lessons, with the possibility to assign homework to attendees between one lesson and the other. See also the Additional Resources for Trainers and Trainees https://zenodo.org/records/13646488 for this). The materials were tested for both online and in-person interactions, however depending on your choices you may want to tweak the agenda and materials to adapt them to your schedule and setting.

- A module on general knowledge about geological data is included in the materials. You might decide to include it in your course depending on your audience's entry level (for instance it could be useful if you're training undergraduates or PHD students but may not be needed for more experienced researchers who have experience in handling data).

- The training materials include different use cases that can be used depending on your audience's prevalent scientific interests; in particular, you may want to tailor the tasks and questions for the hands-on session(s) on the EPOS Data Portal. Detailed instructions on the hands on are provided in the examples and use cases folder.

4.2 During the Training

- The training materials (slides, hands-on, additional resources) are designed so that you can in principle use them as they are. However, when interacting with the trainees in real time be open to questions and feedback and use the information to

adapt what you say and show to their need and level.

- Allow space for questions. If possible, allow for different ways to submit a question (e.g. by raising one's hand and speaking up, but also using a chat or some interactive presentation tool e.g. menti.com or slido): not all people feel comfortable when it comes to standing up and speaking but introverted (or younger and less self-confident) people may have questions and comments too, so is important to create an environment where they empowered to express themselves. Prepare a couple of questions that you can use as an icebreaker for Q&As in case no question arises from the audience: in many cases this will encourage others to ask.

- Assess the knowledge achieved by the trainees through the final quiz.

Optional Activities

- You can use the Additional Resources for Trainers and Trainees https://zenodo.org/records/13646488 to give learners assignments or suggest materials for them to further explore some of the discussed topics independently between lessons.
- If you have time in your setting, and you would like to stimulate the discussion and interaction among participants, you can decide to add an interactive discussion activity. In the following table we provide a few general questions that you can use to stimulate discussion, but you might want to tailor the discussion to the specific audience. For instance, in the case you only have people from one subdomain, e.g. cartography or volcanology, there might be specific challenges or opportunities connected to open data availability/FAIRness in that domain; the same applies If you're organising a training for a specific country/region, or if you're focussing on a specific segment of audience (for example university students/teachers might be more interested than other audiences in discussing how OS/RDM/FAIR can be taught in the academic session).

General questions for interactive discussion
Which are the advantages of OS in the field of SES?

Which are the challenges/disadvantages?
Which kind of difficulties have you/your audience encountered when trying to access/make data available?
What kind of help can be provided to overcome them?
In your/your audience's opinion, is it easy to find data for your SES research?
Is it easy to access them?
Is it easy to read/manipulate them?
Is it easy to reuse them?
What kind of support would you/your audience need in terms of training, infrastructures and available services?

- This exercise can be especially useful if you are addressing prospective trainers (ToT) as it will help them to reflect on the topics they will discuss when they'll organise a training in turn. A variation of the discussion activity especially suitable for ToT events is leaving to the participants the task to select "hot" topics for discussion, for example using the "unconference" methodology[1] or flipped classroom[2] techniques.

- The interactive discussion session can be organised in physical, blended or online settings. Depending on the setting, some techniques/tools can be used to help the facilitator, from **interactive presentation tools**, such as menti.com, kahoot or sli.do, to **group chats and fora**, to **OST settings** (resources here: https://openspaceworld.org/wp2/what-is/).
- Whatever tool you choose, it is important to remember that successful interactive sessions need animation and facilitation. You can do this activity yourself or give

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[1] https://en.wikipedia.org/wiki/Unconference
[2] https://en.wikipedia.org/wiki/Flipped_classroom

(part of) the responsibility to the more active/volunteers among the participants.

- If you are organising a longer course or a summer school, you can also consider assigning **individual or group projects** to participants. In this case the project should stem from the participants' background and research interests, therefore this exercise cannot be pre-determined, and should be discussed during the course/school with the training organisers. However, we recommend that if you chose to develop such an activity you:
    - Make available one or more tutors who are experts of the specific domain and are used to work with the EPOS Data portal, who can provide guidance during the project.
    - If possible, schedule a moment for learners to briefly present themselves and their research beforehand (this can be done through a form, poster, lightning talk etc);
    - Encourage learners to come with one or more scientific questions that they would like to use in the exercise.

4.3 After the Training

- Use the post-event feedback form. Take your time to analyse the replies afterwards in order to improve your next training. Share the feedback with others using the same materials, if relevant.

- For optimal engagement, it is highly recommended to keep in touch with trainees after they have taken the course. Research demonstrates that creating and animating a forum or a group where trainees can exchange information and experiences and ask questions that could arise in a second moment can improve training outcomes and increase the likelihood that they will keep using what they have learned, including the EPOS Data Portal. However, if you decide to include post-event activities you have to take into account that you will need to allocate time and effort to the task: if no(t enough) time is devoted to community animation, the forum or group will most likely remain passive, spontaneous interactions won't take off and this could be perceived negatively by participants, as something promised but not delivered. You should be prepared to keep the group space (being it a forum, a chat, a group on social media or on a LMS, ect) open for a period between some

weeks and some months. In this period the tutors will animate the discussion, answer questions and propose insights and additional resources on studied topics.

5 Training Formats and Their Setting

5.1 Physical Training Setting

If you are organising a physical or blended event, you will need the following:

- A room suitable to the selected audience size, ideally with a classroom layout.

- A PC connected to a projector.

- A stable internet connection. If you have reasons to believe that you might experience network connectivity issues, we strongly recommend preparing a recording of the demonstration part. This will help you in case network connectivity issues arise.

- A suitable place for trainees and trainers to take breaks. Depending on the locations and on organisational choices and constraints this may be a cafeteria, or a catering room/area in case you as an organiser are offering refreshments/lunches etc. Breaks are important for several reasons: they allow the trainees and trainers to relax and better keep their attention in the next part of the training, they allow trainees to ask questions or provide comments in a more relaxed situation, they facilitate the peer interactions and exchange among learners, potentially improving learning outcomes. Breaks can be also useful to absorb any delays in case one session took longer than anticipated without affecting the end of the event – which could be important when people are planning to travel back the same day (however this only works if your breaks are not too short). It is therefore important that you allow enough time for breaks and offer a comfortable location for them.

- Although this is not mandatory, you are encouraged to provide name tags to participants and trainers, as it will facilitate the interactions. Ideally, they should include at least name and organisation.
- If this training is organised as a part of a project (e.g. Skills4EOSC) you are required to keep track of attendees. To this end, we recommend having signing sheets or keep otherwise track of the presences. This is a best practice even if you don't have an obligation to report about the training as it will help to keep

track of the participants' contacts and may be needed in case you're awarding badges, participation, and/or proficiency certificates etc.

5.2 Online Training Setting

In case you are organising a live online training, you will need to:

- Set up a virtual room choosing a stable and easy-to-use videoconferencing or virtual classroom tool. provide in advance the access link to all participants and trainers. We strongly advise against using public links for the training as this could result in zoom crashing or other unwanted disruptions. It is better to set up a registration for your participants beforehand and send the access code to them directly (this can also be automated but will still offer a modicum of protection from occasional trolls). Advance registration is also useful to correctly dimension your virtual room and, possibly, to take decisions about how to organise hands-on sessions: if you plan a virtual course with more than 50 participants, you may want to split participants in groups to carry out the hands-on and give different groups different tasks (or having them performing the tasks in a different order): this is because while the data portal is robust enough, it never occurs in real life that dozen of users access the same service to perform the same task at the exact same time, and this may result in the system slowing down, thus making the user experience less effective.

  An example of how you could organise hands on with 100+ participants could be:

  - split them into three groups and use three tasks based on different services
  - group 1 will perform tasks A, then B, then C
  - group 2 will perform task B, then C, then A
  - group 3 will perform task A, then B, then C
  - At the end, all will have performed the same tasks so they can still compare notes and ask questions that are relevant for the other groups too, but you won't slow down the services.

5.3 Blended Learning Option

You can also decide to offer a blended training, mixing live online and/or onsite training with self-paced activities and assignments. In this case you'll likely need to consider the instructions offered above for both the online and physical settings; additionally, you can assign extra self-paced hands-on basing on the use cases or other activities such as reading and quizzes. In a blended scenario you can also consider setting up a group chat or similar for trainees to exchange experiences and materials and an asynchronous way to contact the trainers for questions and support. As discussed above, this option also works with the other settings, but the blended scenario is the one that can benefit the most of this arrangement.

6   Discussion – Next steps

Additional modules on specific services/groups of services are being developed. The idea is that these can be added or not depending on the specific subdomain the trainees belong. Some of the EPOS thematic communities (TCS) also provide materials on the usage of data in their specific subdomain (e.g. Induced Seismicity). In some cases, these materials are also compliant with the FAIR-by-design methodology, while in others (especially in case of pre-existing materials) an ongoing effort to improve their reusability is being carried out. The community can participate to this effort by sharing learning resources and making them FAIR-by-design and by providing feedback on the existing materials, in a perspective of continuous improvement.

A much longer version (30 hours) of the training with more space to OS basics, Research Data Management and to scientific use cases is being developed for specifically addressing PHD students (lessons plans expected for second half of 2024) and will be tested in at least one of the EPOS partner countries. This version of the training is intended to become part of university curricula, so it is very different in scope. It assumes that participants, while possessing specific expertise in the Solid Earth Science domain, do not necessarily have prior knowledge of open science and research data management concepts, making it necessary to include several modules on this topic.

7 Links to Additional Documentation

- Learning Path and Training Materials on "Open Science and Research Data Management in Solid Earth Sciences" - Additional Resources for Trainers And Trainees: https://zenodo.org/records/13646488

- Web page: https://www.epos-eu.org/communication/news/epos-data-portal-online-training

- LinkedIn: https://www.linkedin.com/events/eposdataportalonlinetraining7154055256941682688/

- Intro and demo: https://www.youtube.com/watch?v=-dD2sMn-X5M

- Hands-on exercise instructions and feedback: https://forms.gle/1yB2KVz2kNW1mFweA https://youtu.be/YeqW1Qp1L6g

- Recording of the whole webinar (longer version; 1h15min; including the walk-through and exercises), which were made available to registered participants only: https://youtu.be/YeqW1Qp1L6g

- Metadata training videos:
  - https://www.geo-inquire.eu/fileadmin/videos/20231019_Training_EPOS_Metadata/20231019_EPOS_Metadata_training_within_Geo-INQUIRE_part1_Daniele_Bailo.mp4
  - https://www.geo-inquire.eu/fileadmin/videos/20231019_Training_EPOS_Metadata/20231019_EPOS_Metadata_training-within_geo-INQUIRE_part2_Rossana_Paciello.mp4

8   Updates, versions, contacts

As for most domains, the knowledge and practices in the field of Open Science and Research Data Management for Solid Earth Science evolve with time. We are committed to periodically update this learning path and resource package (DOI: 10.5281/zenodo.13684718) and the individual materials that are part of it, offer new one and improve the training path based on the feedback received by trainers and trainees.

Always make sure you are using the latest version of the materials. New versions will be added to the appropriate Zenodo records and made available to everyone interested. In case of doubts about the version, the terms for reusing the materials, and the materials themselves, or if you notice errors, outdated information etc, please contact us at communication@epos-eric.eu