# MS22: Training materials for the ENVRI data centers are produced and available at the training portal

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## Introduction and background

Internationally there is a growing need for the development and cataloguing of training materials. At present, a large number of educational resources are available through various platforms, such as Wikis, GitHub and Moodle. However, such resources are not always easy to find and to integrate into a learning course, amongst others, because the required metadata is not available.

This document is the second milestone of Task 6.1 "Building training material for FAIR implementation" and reports about the actions undertaken for the production and availability of training materials for helping the ENVRI data centers and Research Infrastructures to implement FAIR best practices in their data management.

The metadata of the educational resources will be hosted in an open web catalogue so that the resources can be searched, discovered and accessed.

## The ENVRI training catalogue

The reuse of educational resources is only possible when accurate and descriptive metadata is available (Roy et al 2010). The process of creating metadata can be very tedious and time consuming but is essential for sharing and reuse of educational resources because metadata allow teachers and learners to search or discover the most appropriate and well-suited educational resources possible.

### Metadata identification

Two well-known metadata schemas, namely Dublin Core (ISO 2009) and IEEE Standard for Learning Object Metadata (IEEE 2002) have been investigated.

The Dublin Core Metadata Element Set (DCMES) contains 15 well defined elements for describing the "core" properties of digital and physical objects. However, it does not contain any elements that can be used for describing the pedagogical information of educational resources (Roy et al 2010).

The IEEE Learning Object Model (LOM) consists of 60 optional elements that can be used to describe learning objects. Such elements can be combined in various manners to describe the pedagogical intent of an educational resource. This flexibility is important as the IEEE LOM can be too complex for novice catalogues. Mechanisms for converting between Dublin Core and IEEE LOM exist, but the aggregation and disaggregation of metadata fields can affect the usefulness of the resulting metadata.

After reviewing the two schemas, a customized profile of IEEE LOM has been developed. Such profile consists of only 27 metadata elements, with respect to the 60 elements available within the IEEE LOM standard.

In particular, the following IEEE LOM elements have been considered for the ENVRI training catalogue:

1. **General**: this category groups the general information that describes the learning object as a whole
    - 1.1 **Identifier**: a globally unique label that identifies the learning object
    - 1.2 **Catalog**: The name or designator of the identification or cataloging scheme for this entry. A namespace scheme. E.g., URI, ISBN, ARIADNE, etc.
    - 1.3 **Entry**: the value of the identifier within the identification or cataloging scheme that designates or identifies the learning object. A namespace specific string
    - 1.4. **Title**: name given to the learning object
    - 1.5. **Language**: the primary human language or languages used within the learning object to communicate to the intended user
    - 1.6. **Description**: a textual description of the content of the learning object

- 1.7. **Keywords**: list of keywords separated by ';' describing the topic of the learning object
- 1.8. **Coverage**: the time, culture, geography or region to which this learning object applies. The extent or scope of the content of the learning object. Coverage will typically include spatial location (a place name or geographic coordinates), temporal period (a period label, date, or date range) or jurisdiction (such as a named administrative entity). Example: 16th century France NOTE: Specify "Not available" if needed

2. **Life Cycle**: the category describes the history and current state of the learning object and those entities that have affected the learning object during its evolution
   - 2.1. **Version**: the edition of the learning object. Example: 1.2. Specify "Not available" if needed
   - 2.2. **Status**: the completion status or condition of the learning object. It can be Draft, Final, Revised, Unavailable
   - 2.3. **Contribute**: those Entities (i.e., people, organizations) that have contributed to the state of the learning object during its life cycle (e.g., creation, edits, publication)
   - 2.3.1 **Role**: kind of contribution. It can be author, publisher, unknown, initiator, terminator, validator, editor, graphical, designer, technical implementer, content, provider, technical validator, educational validator, script writer, instructional designer, subject matter expert
   - 2.3.2. **Entity**: the identification of and information about entities (i.e., people, organizations) contributing to the learning object (e.g., FOAF: Friend Of A Friend)
   - 2.4. **Date**: the date of the contribution. Specify "Not available" if needed.
3. **Educational**: this category describes the key educational or pedagogic characteristics of the learning object
   - 3.1. **Interactivity type**: predominant mode of learning supported by the learning project. It can be active, expositive, mixed. "Active" learning (e.g., learning by doing) is supported by content that directly induces productive action by the learner. An active learning object prompts the learner for semantically meaningful input or for some other kind of productive action or decision, not necessarily performed within the learning object's frame-work. Active documents include simulations, questionnaires, and exercises. "Expositive" learning (e.g., passive learning) occurs when the learner's job mainly consists of absorbing the content exposed to him (generally through text, images or sound). An expositive learning object displays information but does not prompt the learner for any semantically meaningful input. Expositive documents include essays, video clips, all kinds of graphical material, and hypertext documents. When a learning object blends the active and expositive interactivity types, then its interactivity type is "mixed."
   - 3.2. **Learning resource type**: specific kind of learning object. It can be exercise, simulation, questionnaire, diagram, FAQ, figure, graph, index, slide, table, narrative text, exam, experiment, problem statement, self-assessment, lecture, video, webinar
   - 3.3. **Interactivity level**: the degree of interactivity characterizing the learning object. Interactivity in this context refers to the degree to which the learner can influence the aspect or behavior of the learning object. It can be very low, low, medium, high, very high
   - 3.4. **Semantic density**: the degree of conciseness of the learning object. The semantic density of a learning object may be estimated in terms of its size, span, or - in the case of self-timed resources such as audio or video - duration. It can be very low, low, medium, high, very high
   - 3.5. **Intended end user role**: principal user(s) for which the learning object was designed, most dominant first. It can be Teacher, Author, Learner, Manager

- 3.6. **Context**: the principal environment within which the learning and use of the learning object is intended to take place. It can be school, higher education, training, other
- 3.7. **Difficulty**: how hard it is to work with or through the learning object for the typical intended target audience. It can be: very easy, easy, medium, difficult, very difficult, knowledge-dependent
- 3.8. **Typical learning time**: approximate or typical time it takes to work with or through the learning object for the typical intended target audience. Example: PT1H30M, which means 1 hour and 30 minutes; PT1M45S, which means 1 minute and 45 seconds. Specify "Knowledge-dependent" if the learning time depends on the familiarity with the context
- 3.9. **Rights**: describes the intellectual property rights and conditions of use for the learning object. Example: Copyright © 2018 xxx. Specify "Not available" if needed
- 3.10. **Cost**: whether use of the learning object requires payment (Yes/No)
- 3.11. **Copyright and other restrictions**: whether copyright or other restrictions apply to the use of the learning object (Yes/No)
- 3.12. **Condition of use**: comments on the conditions of use of the learning object (e.g., Free access)

4. **Technical**: this category describes the technical requirements and characteristics of the learning object
   - 4.1. **Location**: a string that is used to access the learning object. It may be a location (e.g., Universal Resource Locator), or a method that resolves to a location (e.g., Universal Resource Identifier). The first element of this list shall be the preferable location. Specify "Not available" if needed
   - 4.2. **Size**: the size of the digital learning object in bytes not Mbytes, GB, etc. This data element shall refer to the actual size of this learning object. If the learning object is compressed, then this data element shall refer to the uncompressed size. Specify "Not available" if needed.
   - 4.3 **Topic codes**: the code and title of the topic covered according to the list of training topic identified in deliverable 6.1 and represented in Table 1. Topic codes are mainly divided into two subject categories: "general FAIR-related" (from G1 to G7) and "research data management-related" (from R1 to R17).

## Training catalogue design

The ENVRI training catalogue has been designed and developed by following simple but effective requirements, mainly based on the need to find educational material. The requirements of the training catalogue are the following:

1. The application used for the catalogue should:
   a. be preferably open source, since long-term funding is not available,
   b. be accessible on all platforms,
   c. allow the administrator to specify a metadata schema profile,
   d. be self-hosted or cloud based.
2. The user should be able to:
   a. add resource with descriptive metadata into the catalogue
   b. request resource to be deleted (would depend on reason and administrative approval)
   c. update the metadata available in the catalogue for a specific resource
   d. list all resources under a specific theme
   e. search resources based on metadata elements
3. The administrator should be able to:
   a. perform all functionalities allowed by the user
   b. manage registered users and roles (admin, contributor, user)
   c. approve the metadata for a resource once the metadata is added by a user
   d. delete the metadata for a resource if requested by a user

## Training catalogue development

An extensive search of existing applications that can be used for the ENVRI training catalogue has been done. Several applications were identified during the initial search. However, after a deep investigation, only six applications have been selected to be evaluated against the identified requirements:

- Islandora (https://islandora.ca): an open source repository that allows institutions to collaboratively manage and discover digital objects. It is based on Drupal, Fedora and Solr. Its big limitation is given by the fact that when users browse resources, they cannot see the detailed metadata for a specific resource.
- EPrints(https://www.eprints.org): a generic institutional repository building software that is intended to create web-based repositories that can be configured to meet the particular requirements of a project.
- AtoM (https://www.accesstomemory.org/en/): an open source archival description application that allows users to tag files and describe the objects using metadata standards built-in to the repository.
- Zenodo (https://zenodo.org): an open access repository very popular among researchers for achieving and preserving datasets, software, reports and other digital artifacts. An attractive feature is that for each submission is assigned a DOI.
- DSpace (http://dspace.org/introducing): an open source "out of the box" repository that allows institutions to preserve all types of digital content, including text, moving images, mpegs and datasets. The files or objects and metadata are stored in a relational database.
- GeoNetwork(https://geonetwork-opensource.org): it is specific for geospatial data but has been also evaluated since it allows to store metadata in Dublin Core standard. Moreover, it also allows teachers to share datasets linked to an educational resource.

Although all evaluated applications have useful characteristics, two requirements are not fulfilled in any of these, that is:

- the implementation of an IEEE LOM profile;
- the possibility to create a metadata record without the need to upload a file.

The majority of the evaluated applications are "repository implementations", that is a place where things are deposited or stored, and not "catalogue implementations", that is a list of descriptions of things.

The state-of-the-art analysis revealed that implementing the training catalogue from scratch would be easier than adapting existing applications to suit the requirements.

The PHP language and the MySQL Relation Database have been adopted for the catalogue implementation.

## Training catalogue population and presentation

Starting from the list of training resources and materials related to FAIR data principles and Research Data Management listed in Table 2 of deliverable 6.1, the catalogue has been populated with 34 training resources.

The catalogue is available at the following address: https://trainingcatalogue.envri.eu/ and the homepage is presented in Figure 1.

From every page it is always possible to go back to the Home Page by following the "Home" link in the upper-right corner of the page or by clicking on the logo in the upper-left corner of the page.

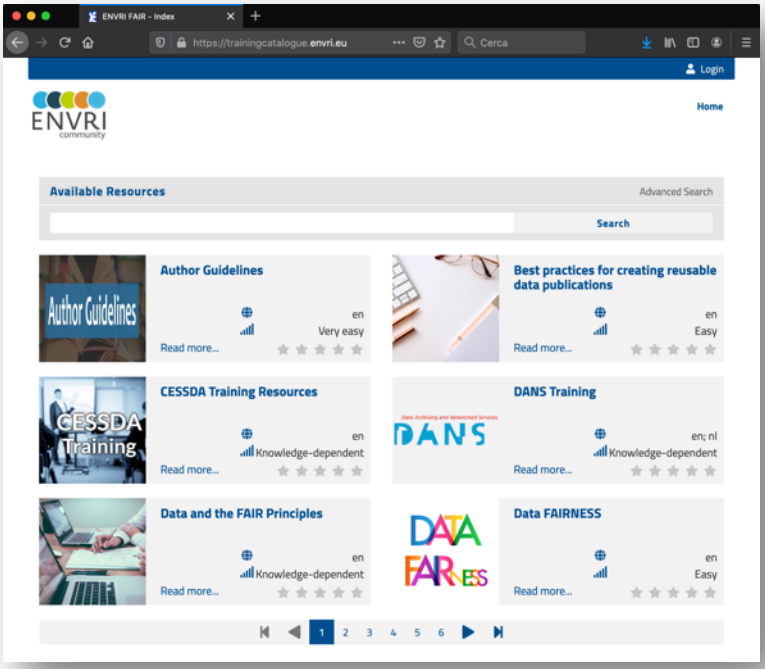


Figure 1. Homepage of the ENVRI training catalogue.

There are four types of target-groups:

- Guest user: lowest permission level, he can only access the public area and view/access the catalogue's resources;
- Registered user: medium permission level, he can only modify his own profile data;
- Contributor: intermediate permission level, he can create new Learning Objects;
- Administrator: highest permission level, he can access the admin area and perform every function (e.g., management of Learning Objects, Users, Metadata, etc.).

Guest users can perform searches by putting the keyword to find in the search input and clicking on the "Search" button. Figure 2 shows the example of a simple search with the keywork "author". The resulting resources will be those containing the word "author" both in title and in description and other metadata.

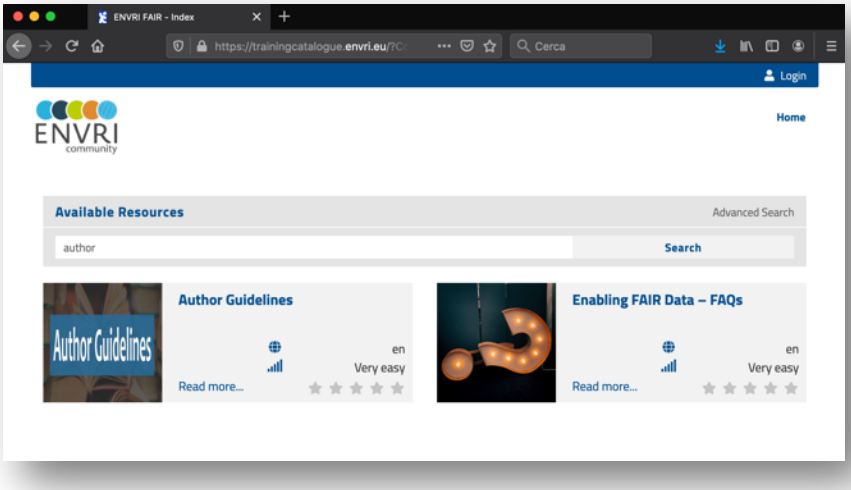


Figure 2. Simple search on the ENVRI training catalogue.

At the same manner, users can perform advanced searches by clicking on "Advanced Search" link in the homepage. The search form will open in order to allow user to perform the search on specific metadata fields. Figure 3 and 4 show the example of an advanced search with two filters: Title = data and Language = nl.

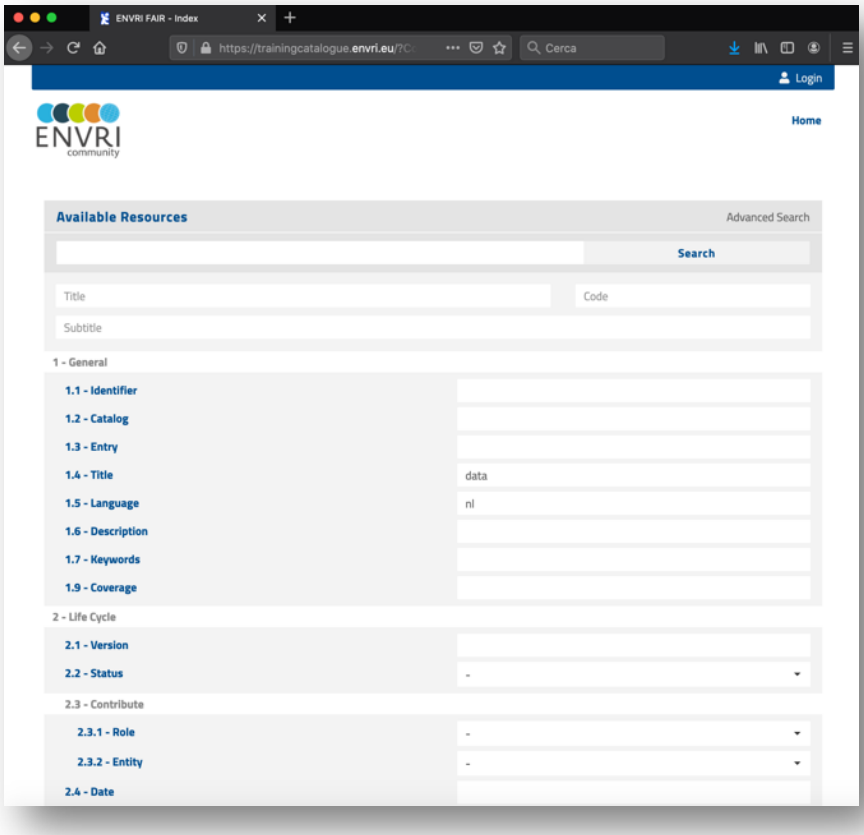


Figure 3. Advanced search on the ENVRI training catalogue.

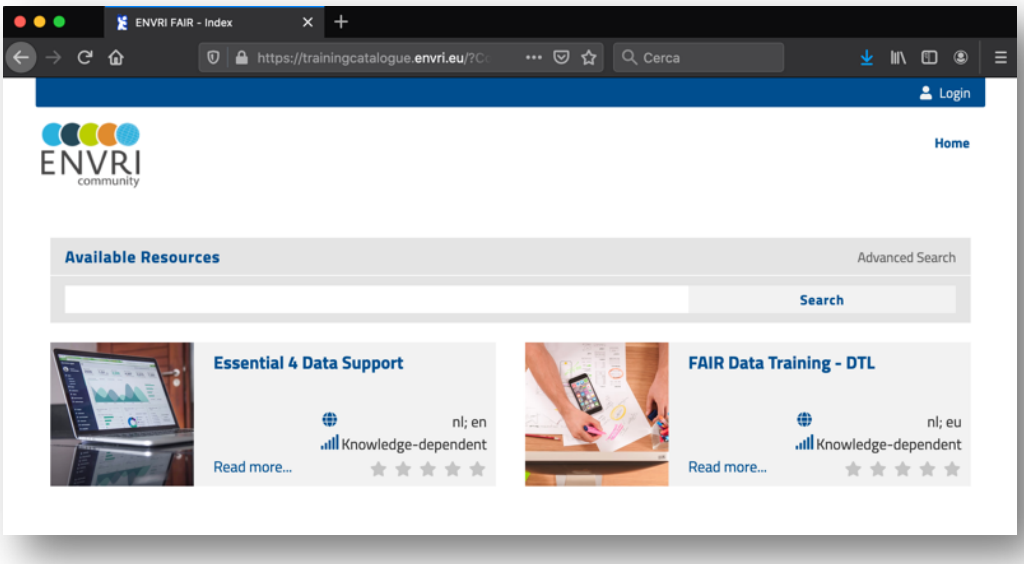


Figure 4. Result of the advanced search on the ENVRI training catalogue.

Guest users can access all training resources by clicking on the title, on the thumbnail or on the "Read more…" link. The page of the specific resource (see Figure 5) will contain all information and metadata on that resource. On the right side of the page, the button "Start" allows to access the resource and hence to start the training.

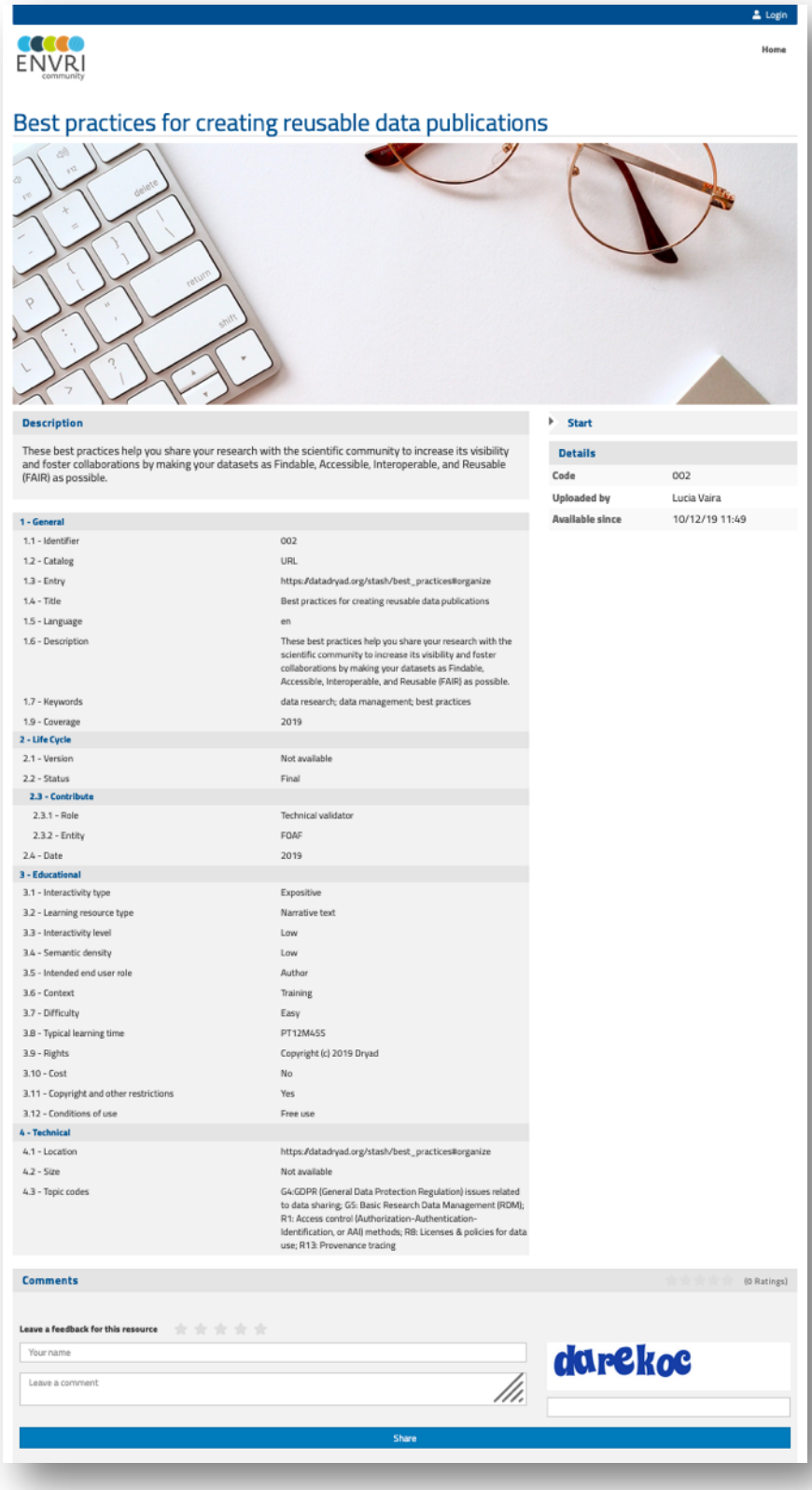


Figure 5. Example of training resource page.

Users can also leave comments and rating on that specific resource. Such feedback will be subject to revision by admin before being published.

Users can register by clicking on the "Login" link in the home page. In Figure 6 are presented the login and the registration forms.

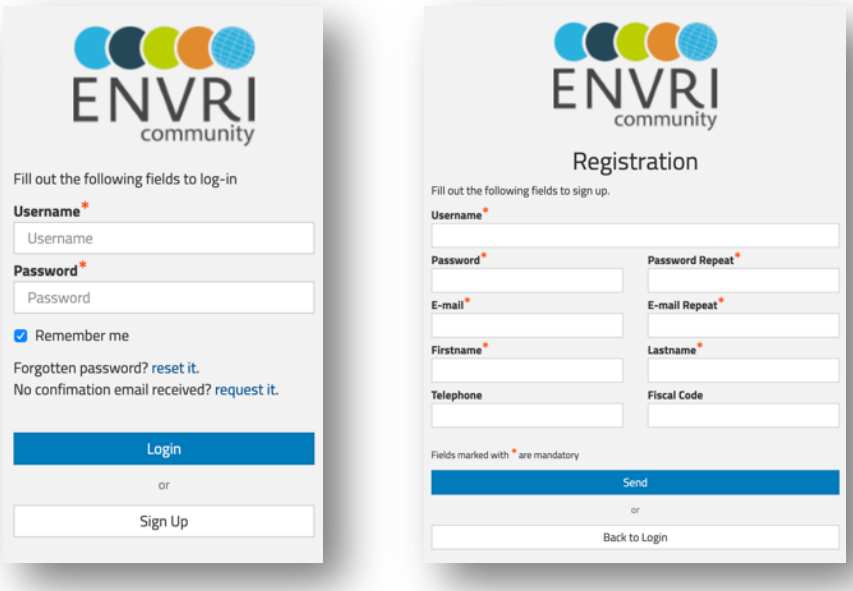


Figure 6. ENVRI training catalogue registration and login forms.

After registered, users will receive a confirmation email to activate the account to the email address specified in the registration form.
Users can hence follow the link specified in the email to acknowledge the success of the confirmation and see the outline of their profile, which will contain username, role (User by default after the registration), and all the other profile details. In this page users can modify the password and edit the profile information.

In order to upload new resources, the administrator has to change the user role from "User" to "Contributor" (Figure 7).

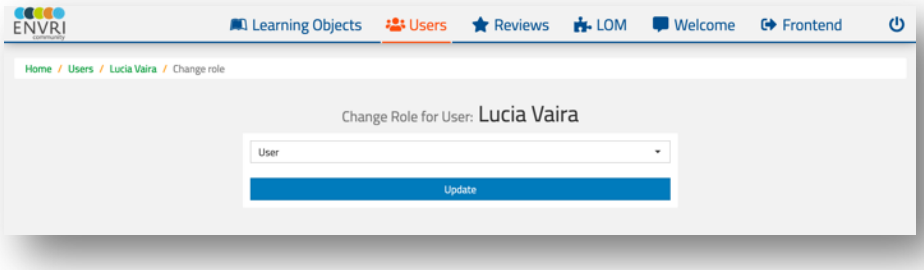


Figure 7. Change role functionality for administrator.

After the change of the role, "Contributors" can create new Learning Objects (upload training resources) by following the metadata schema described before.
In Figure 8 is illustrated the page showed when creating a new Learning Object. "Contributors" have to insert all mandatory data (title, thumbnail and banner) by respecting the constraints (e.g., banners have to be 1500px * 500 px, thumbnails 500px * 500px, the allowed format is PNG or JPG and the file size must be less than 3MB).
External URL is the link of the resource. If the training resource is published in any website and it is for example a ZIP archive, this URL should be left blank.

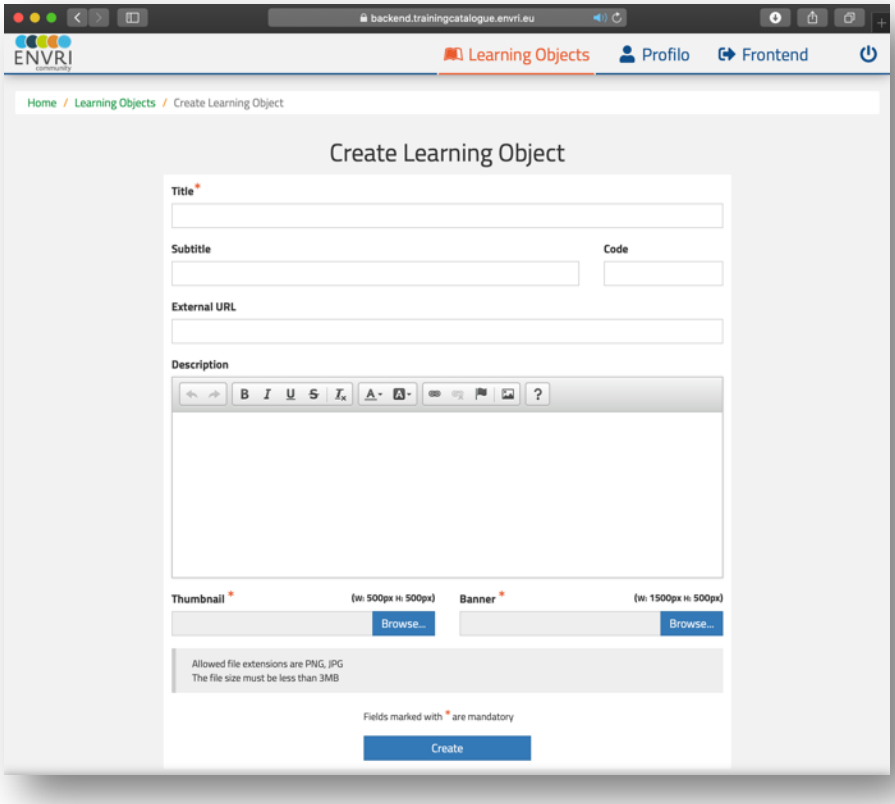


Figure 8. Learning Object creation form.

Once saved such information, the resource will be in "Loading" state (as can be seen on the right side of the title in Figure 9) and that state will remain the same until all metadata will be filled in.
If the external URL has been left blank in the previous step, "Contributors" have to upload the ZIP archive of the resources.

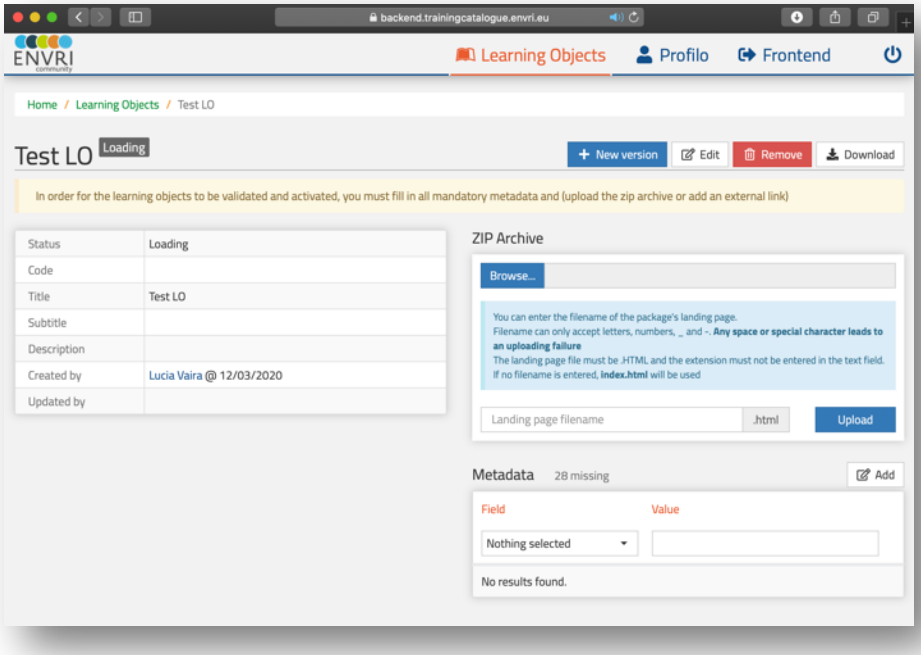


Figure 9. Learning Object overview page.

In order to add all required metadata, "Contributors" have to click on the "Add button" in the Metadata section. Figure 10 shows the page in which metadata have to be inserted. By clicking on the "Example" button, "Contributors" will be able to see a valid and concrete example of how each specific metadata has to be filled in.

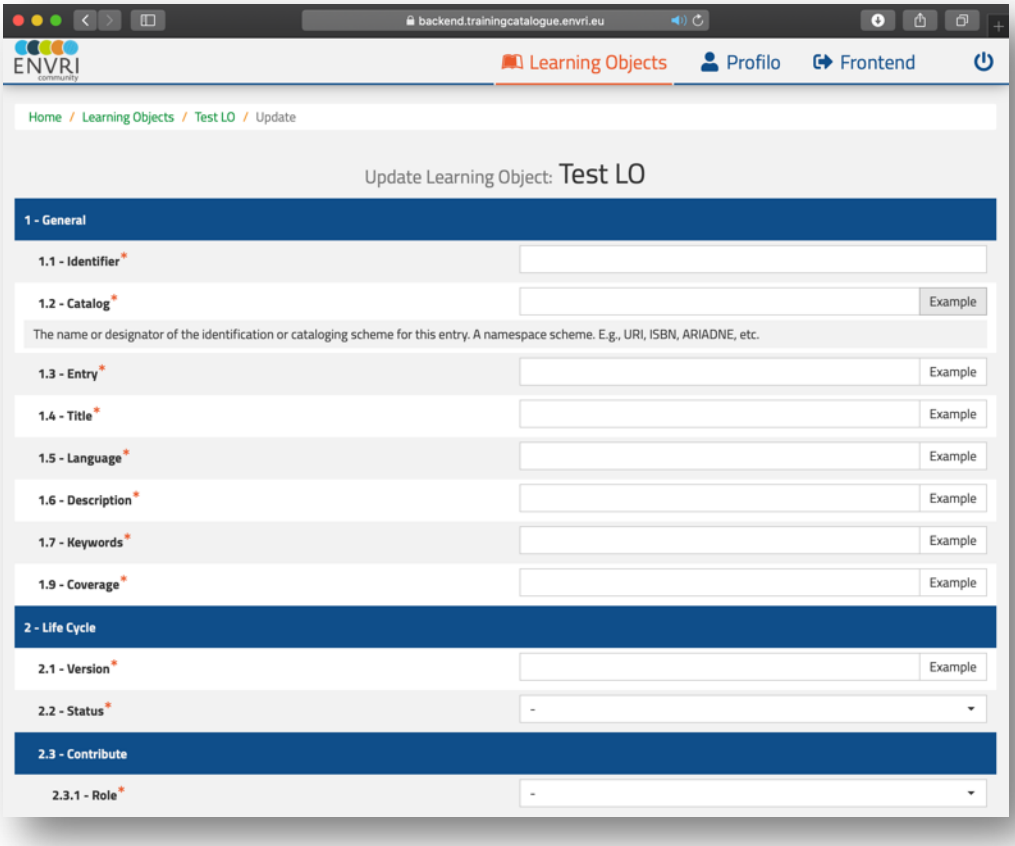


Figure 10. Learning Object metadata form.

Once inserted all metadata, the status of the Learning Object will pass from "Loading" to "Validating".
Administrator will be able to approve and hence activate the Learning Object when all mandatory data and metadata have been specified. Moreover, if the external URL has been left blank, also the ZIP archive needs to be uploaded to activate the Learning Object.

If there will be the need to upload a new version of a specific training resource, "Contributors" can use the "New version" button so that when it will be activated, the previous version will be automatically closed.

## The ENVRI training platform

The training platform will include all ENVRI eTraining and eLearning courses. It is available at the following address: https://training.envri.eu and the homepage is presented in Figure 11.

Figure 11. ENVRI training platform homepage.

In case of training resources belonging to the ENVRI community, users can access the courses from the "Start" button of the ENVRI training catalogue.
They will find the list of the available courses also in the training platform homepage.

Each course has its own rules about the enrolment of users: teachers can decide to adopt the self-enrolment method or the manual enrolment of students.
In both cases users have to login in order to access training resources and this is valid above all in case of assignments or certifications to provide during and after the course.
If teachers decide to provide the training material for free, also guest users can access the resources with no need to log in.