GreenHeritage

The impact of Climate Change on the Intangible Cultural Heritage

Deliverable D3.2

GreenHeritage Virtual Learning Environment (VLE)

Version: V 2.0

Project details:	
No:	**101087596**
Name:	**GreenHeritage**
Title:	The impact of Climate Change on the Intangible Cultural Heritage
Start date:	December 1st, 2022
Duration:	36 months

Co-funded by the European Union

Co-funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Education and Culture Executive Agency (EACEA). Neither the European Union nor EACEA can be held responsible for them.

Dissemination Level		
PU	Public	●
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

Document details:	
Project	GreenHeritage
Title	GreenHeritage_D3.2- Virtual Learning Environment (VLE)
Version	2.0
Work package	WP 3
Author(s)	Petros Chondros, Olga Karamichailidou (ReadLab)
Keywords	Software specifications, VLE
Document ID	Deleverable GreenHeritage_D3.2-v2.0
Synopsis	Report for work package 3; D3.2: GreenHeritage Virtual Learning Environment (VLE)
Release Date	27, July, 2023

Revision history			
Version	Date	Changes	Changes by
0.1	July, 12, 2023	Draft version	Petros Chondros, Olga Karamichailidou,
0.2	July, 21, 2023	Draft version	Kostas Kotis (UAEGEAN), Patrizia Griffoni (CNR), Olga Karamichailidou (ReadLab), Ourania Xylouri (ALLI)
0.3	July 26, 2023	Draft version	Petros Chondros
1.0	July, 27, 2023	Final version	Giuseppina Padeletti, Patrizia Grifoni
2.0	December, 20, 2023	Revised version upon PO request	G. Padeletti

Table of contents

EXECUTIVE SUMMARY

This report defines the technical and contextual specifications for the GreenHeritage Virtual Learning Environment (VLE or Platform from now on).

Contextual requirements concern the key features of the GreenHeritage e-learning platform, including building blocks of the GreenHeritage e-learning platform architecture, course structure, assessment and certification, collaborative mechanisms, users' communication, accessibility, roles, and enrolment.

Technical requirements concern the software specifications of the VLE, including IT architecture, software components, installation prerequisites, software prerequisites, course content format and specifications.

1. Introduction

1.1. Document organization

The present document is organized in the following sections:

Section 2: Introduction to the VLE

Section 3: Contextual requirements of the GreenHeritage e-learning online platform

Section 4: Technical Specifications – System description

Section 5: Conclusion

1.2. Reference Documents

Document name	Reference number
GreenHeritage – Annex 1: Description of Work	Grant Agreement nr. 101087596

1.3. Acronyms and Abbreviations

Acronym	Description
AAC	Advanced Audio Coding
API	Application Programming Interface
CMS	Content Management System
CSS	Cascading Style Sheets
edX	edX is an American massive open online course (MOOC) provider created by Harvard and MIT
EU	European Union
FAQ	Frequently Asked Questions
GUI	Graphical User Interface
HTML	Hyper Text Markup Language
ICT	Information and Communication Technologies
IDA	independently deployed applications
IT	Information Technologies
LMS	Learning Management System
LTI	Learning Tools Interoperability
MCQ	Multiple-Choice Question
MOOC	Massive Open Online Courses)
NGO	Non-Governmental Organization
OCR	Optical Character Recognition
OER	Open Educational Resources
OLX	Open Learning XML
ORA	Open Response Assessment
PDF	Portable Document Format
PhD	Philosophiae Doctor
PO	Project Officer
REST	REpresentational State Transfer

SRT	Secure Reliable Transport
TA	Teaching Assistants
URL	Uniform Resource Locator
VBR	Variable Bit Rate
VLE	Virtual Learning Environment
XML	eXtensible Markup Language

2. Introduction to the VLE

The objective of this document is to present the contextual and technical requirements for the design and development of the GreenHeritage e-learning platform. The GreenHeritage e-learning platform follows the latest technology in Online Training to allow for collaborative interaction between its users through both learning and assessment activities. The GreenHeritage e-learning Platform will be linked to the project website https://greenheritage-project.eu/, and accessible at the subdomain: elearning.greenheritage-project.eu.

2.1. GreenHeritage objectives

The GreenHeritage project aims at developing a holistic, innovative, and inclusive approach toward direct and indirect of climate change impact on intangible cultural heritage, a topic which has received little attention or no attention at all. Its goal is to bring to the forefront the neglected and often overseen issue of climate change implications on immaterial cultural heritage. The project seeks innovative tools and methodologies able to promote adaptive and systemic approaches to better manage climate change.

The GreenHeritage specific objectives are:

- Analysing the state of play at national and European levels regarding intangible cultural heritage and current climate change threats
- Exploring the key role that immaterial cultural heritage could have in sustainable and climate-resilient development and mapping existing adaptation practices across EU.
- Developing a methodology, policy recommendations and a handbook for the management, preservation, and protection of immaterial cultural heritage in the face of climate change implications.
- Adding the preservation and protection of intangible cultural heritage at the heart of the public debate as well as the national & EU policy making
- Empowering awareness and active citizenship regarding environmental issues, sustainability, and the importance of preserving tangible cultural heritage along with intangible cultural heritage.
- Developing a culture of sustainability and innovation among researchers, practitioners and empowering them by providing a set of cutting-edge training resources building on skills intelligence, available in digital and open media.
- Supporting the development and approach of micro-learning and digital based education by promoting effective use of digital learning practices and capabilities.

2.2. Scope of the VLE

The GreenHeritage VLE will contain:

- External links to the project's website and social media accounts.
- The GreenHeritage course organized in the form of an online learning course (MOOC).
- A description page about the course including information about the learning objectives of the course, important dates, information related to the instructors, etc (see Annex 2 – Course information page).
- Legal documentation addressing Privacy Policy. Terms of Service and Code of Honor rules.
- A custom theme in line with the GreenHeritage branding and visual identity.
- The GreenHeritage course in all partner's languages.

The GreenHeritage VLE will offer its users learning resources freely and openly for use, reuse, adaptation and sharing. Constraints imposed will be related to the commercial reuse of the material as well as giving appropriate credit and license when reusing the material. Thus, the resources will be released under the Creative Commons licenses. The exact configuration (NonCommercial, ShareAlike, etc) will be defined by the GreenHeritage consortium. All resources will be made available in downloadable and editable formats so that the user can store them locally and access them when offline (such as text documents, presentations, pdfs, and videos). The quality of these open educational resources will be assured based on OER commons recommendations, as well as the EU Open Education 2030 vision on lifelong learning.

2.3. Target groups

The direct users of the GreenHeritage VLE are:

- PhD candidates
- Researchers
- Ethnographers
- Sociologists
- Scientists
- Anthropologists
- Archaeologists
- Historians
- Policymakers
- Students at least 18 years old
- Environmental actors (NGOs)
- Economic actors
- Journalists and professionals form media
- Other practitioners

3. Contextual requirements of the GreenHeritage e-learning platform

The GreenHeritage e-learning platform will be tailored to the training needs of the GreenHeritage target groups. It will take advantage of the **Open edX platform** [1]capabilities. Since Open edX is an open-source LMS, it is adaptable to meet any specifications necessary. The core features of the GreenHeritage e-learning platform are presented below.

3.1. Branding

The GreenHeritage platform is in line with the project's visual identity. This means that the front-end system is configured and developed according to the project's color scheme with the aim to provide a consistent look & feel. The mockups below present the branded version of the GreenHeritage training platform.

[1] https://openedx.org/

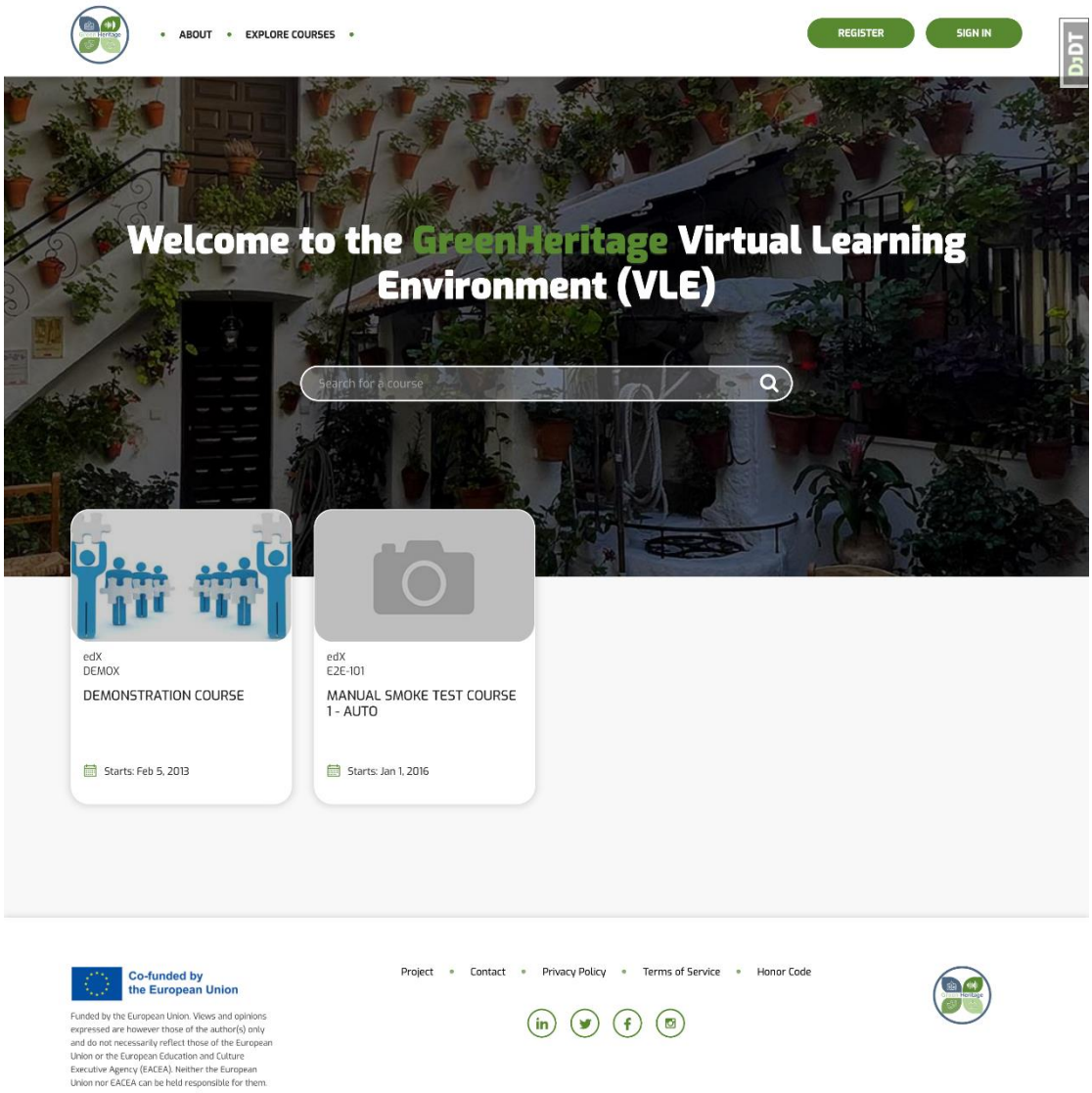

Figure 1 Landing Page of the Platform populated with dummy data.

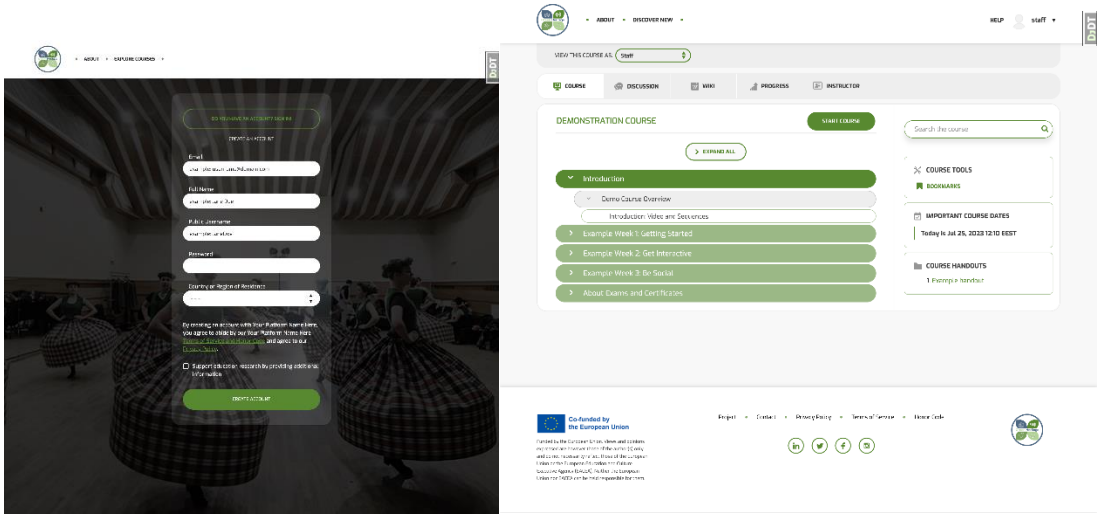

Figure 2 Registration Page and course navigational flow following a modular structure.

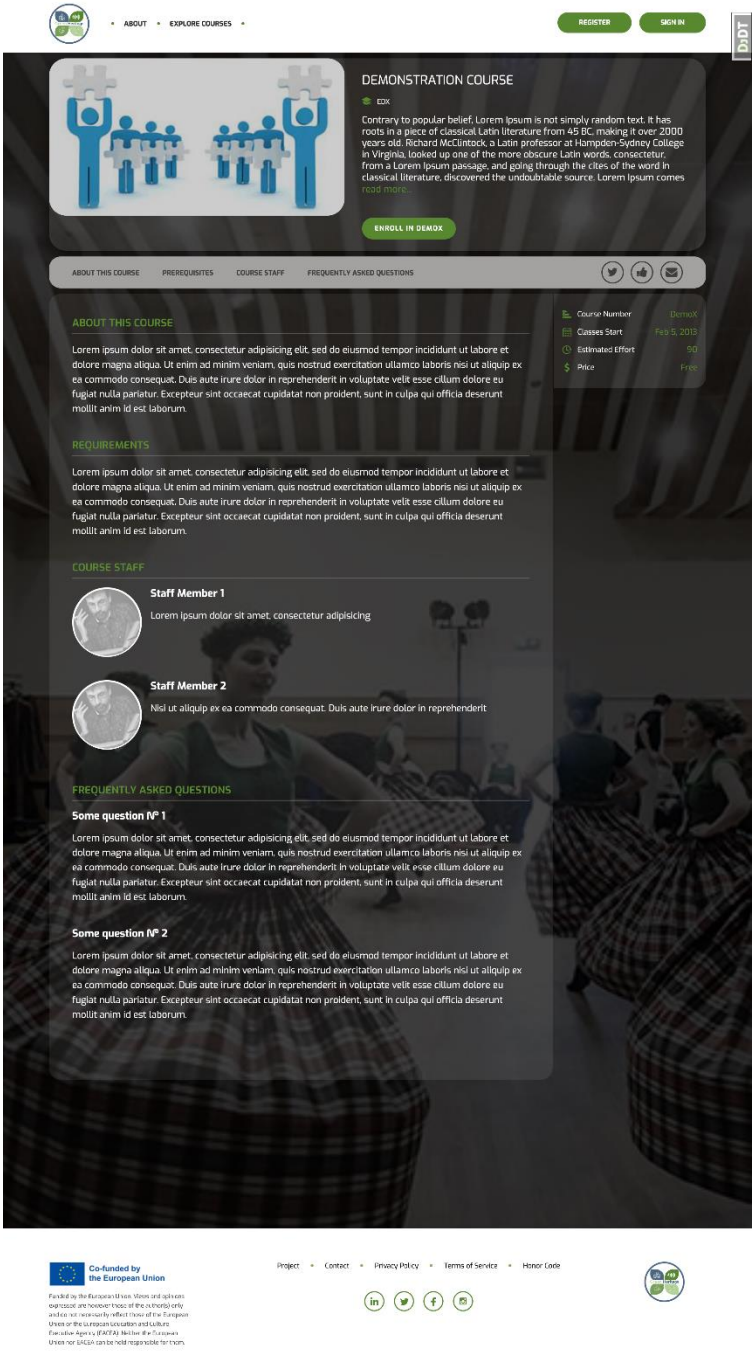

Figure 3 Layout of the Course description page. It provides publicly available course-related information

3.2. Modularity

The design of the GreenHeritage course supports a state-of-the-art educational approach that focuses on the needs of the learners. Four modules will be developed, making the transfer of learning more efficient and more engaging for the learners. The modules are related to:

1. Intangible cultural heritage: an Introduction.
2. Intangible cultural heritage from Climate Change/Crisis:

a. The GreenHeritage cases study n1
b. The GreenHeritage cases study n2
c. The GreenHeritage cases study n3
d. etc……..
e. The GreenHeritage cases study nN

3. Intangible cultural heritage protection and preservation.
4. ICT tools for intangible cultural heritage protection and preservation.

The main difference between an online course and a campus class is that instead of hour-long lectures, online classes are built up of many bite-sized components, such as, short videos or text, self-reflective activities, etc. These components are modular or standalone since modularity has many benefits. Learners can quickly find compactly organized reference information about a specific topic without having to scroll through many texts or scrub through an hour-long video to find the one piece of information they were looking for.

Learning modules are organized so that static learning material alternate with interactive elements. This will facilitate editing, reorganizing, replacing, or improving the modular course content or exercises because it minimizes the impact on adjacent material.

In this context, the content structure includes the following building blocks:

- The course outline is the container for all the course content. The outline contains one or more sections.
- Course **section** (Modules/Weeks) are at the top level of the course and typically represent a time period (1 week or 2 weeks). A section contains one or more subsections.
    - Course **subsections** (Lessons) are parts of a section, and usually represent a topic or other organizing principle. Subsections are sometimes called “lessons” or “learning sequence"”. A subsection contains one or more units.
    - Course **units** are lessons in a subsection that students view as single pages. A unit contains one or more components.
    - Course **components** are objects within units that contain the actual course content: Videos, reading material, problems/quizzes, and discussion forums.

The following picture summarizes the content display flow. When published, the content is available online. Graded assignments and problems are located in the subsection level.

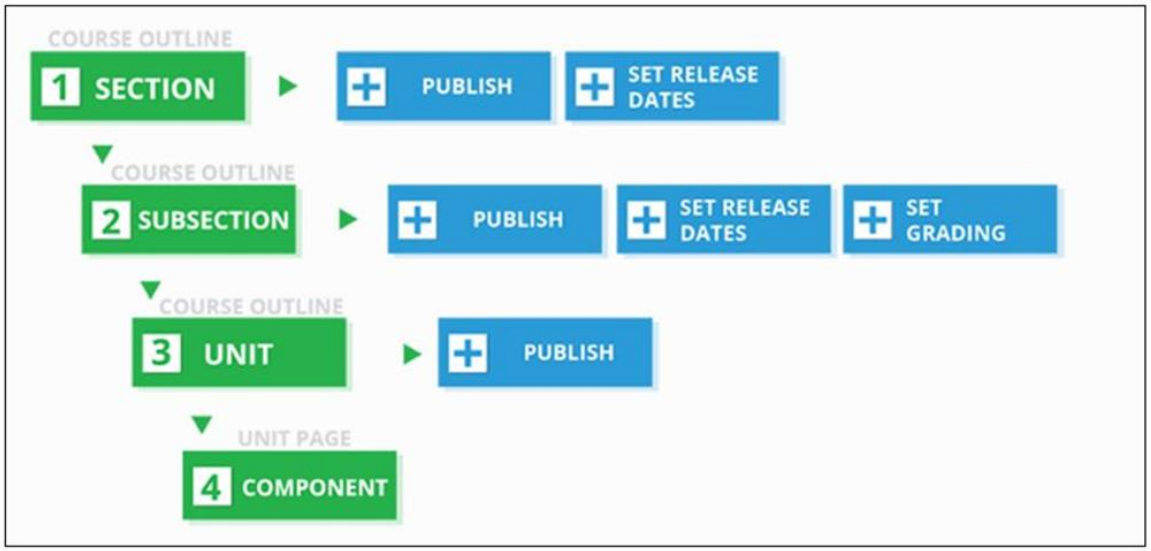

Figure 4 Course Outline Approach

The template for the GREENHERITAGE building blocks is presented in **Annex 1**

3.3. Accessible Content

The GreenHeritage e-learning platform will make the GreenHeritage course available to people from diverse backgrounds with different skills and abilities. In this context, accessibility refers to how information and activities are available to all learners equally regardless of physical or other disabilities.

The following best practices are considered to make the content accessible:

- Facilitate the learners who use screen readers using descriptive titles in the course content.
- The content will be structured with HTML elements or textbooks that should follow the accessibility guidelines presented in the following section.
- When using images, charts or diagrams, the color will not be used as a distinguishing element in the image, chart, or diagram.
- GreenHeritage will use high-resolution images that always include descriptive, alternative text.
- All GreenHeritage courses will use videos with interactive, accessible transcripts.
- Any external content or content that requires plug-ins, will be accessible.

Textbooks and PDF Accessibility guidelines

Portable Document Format (PDF) is a standard format for course materials, including textbooks. However, converting materials to PDF documents can create accessibility barriers, particularly for learners with visual impairments. Accessibility issues are very common in PDF files scanned from printed sources or exported from a non-PDF

document format. Scanned documents are simply images of text. To make scanned documents accessible, Optical Character Recognition (OCR) should be performed on these documents and proofread the resulting text for accuracy before embedding it within the PDF file.

Also, semantic structure and other metadata (headings, links, alternative content for images, and so on) should be added to the embedded text. When exporting documents to PDF from other formats, it is essential to ensure that the source document contains all the required semantic structure and metadata before exporting. The following Best Practices for Authoring Accessible PDF Documents will be followed:

- Explicitly define the language of the document so that screen readers know what language they should use to parse the document.
- Explicitly set the document title. When a file is exported to PDF format, the document title usually defaults to the file name, not a human readable title.
- Verify that all images have alternative content defined or are marked as decorative only.
- Verify that the PDF file is “tagged”. Make sure the semantic structure from the source document has been correctly imported to the PDF file.
- Verify that a logical reading order is defined. This is especially important for documents that have atypical page layouts or structure.
- If the document includes tables, verify that table headers for rows and columns are properly defined.

Mobile learners

In general, the percentage of learners who access online courses through smartphones is constantly rising. It is expected that an important percentage of the GreenHeritage registered users will perform part of their learning activities through their personal mobile devices. Having this in mind the following best practices are employed:

- Implementation of a custom theme (branding, colors, fonts, buttons) to support registering, enrolling, and performing learning activities. The theme must be responsive and able to display content in displays with different size.
- Keep display names of sections and labels concise.
- Avoid if possible, learning material in Flash format since mobile platforms do not support it efficiently. (https://www.adobe.com/products/flashplayer/enterprise-end-of-life.html)

- When needed, components in HTML will use relative rather than explicit sizes for objects so that they scale appropriately when viewed on displays of different sizes.
- Employment of mobile ready problem types.

Open access

The GreenHeritage MOOCs will include lectures and assessments that are specially created for the GreenHeritage project. The project's educational resources will be offered freely and openly for educators, learners and self-learners for use, reuse, adaptation and sharing through the GreenHeritage e-learning platform. There will be constraints imposed regarding commercial reuse of the material and giving appropriate credit and license when reusing the material. Thus, the resources will be released under the Creative Commons License. The GreenHeritage consortium will decide the exact configuration (NonCommerical, ShareAlike, etc.). The Creative Commons Licence and the respective logo will be displayed on all individual web pages. All resources will be made available in downloadable and editable formats so that the user can store them locally and access them when offline (such as text documents, presentations, pdfs, and videos). The quality of these open educational resources will be assured based on OER commons recommendations, as well as the EU Open Education 2030 vision on lifelong learning. All the static material (images, pdfs, podcasts) will be hosted in the VLE's database through the authoring tool and will be publicly available in in the Front-End (LMS). Image pre-processing is needed to secure a consistent learning experience (resolution, rendering, low size for fast page loading.

Additional, pre-existing resources can be included, such as published textbooks or articles. These educational materials can be incorporated into the GreenHeritage MOOC, provided that copyright laws and regulations are respected.

Finally, the consortium will examine the possibility of GreenHeritage fees for the online courses after the project lifetime, which will turn the GreenHeritage VLE courses into a commercially viable product to enhance the project's long-term sustainability. This can be done based on a commercial and IPR agreement between all interested partners, thus safeguarding the coverage of the costs after the project ends, ensuring the long-term sustainability of our project.

3.4. User Navigation

The GreenHeritage VLE will be available through: https://elearning.greenheritage-project.eu

Since the VLE is based on the open source Open edX software (see section **Errore. L'origine riferimento non è stata trovata.**), the community has already provided online documentation targeting different user profiles (DevOps, Developers, Learner's Guide). They are publicly available in https://openedx.org/community/documentation/.

Course information page

To get the word out about the GreenHeritage MOOC an About page will be initially created. The About page will be the website where the platform users will come to register and will serve as an advertisement of the GreenHeritage course. The course page can include texts and short videos (no longer than 3-5 minutes) describing the course content, introducing the course staff, and stating the learning objectives of the GreenHeritage course in a general and succinct way. More information is provided in **Annex 2**.

Registration

The GreenHeritage e-learning platform supports the registration function. Each user needs to create an account and verify it through a confirmation email on the email address used. Upon verification the user can log in /sign in the GreenHeritage e-learning platform. The GreenHeritage e-learning platform will link to the online user manual of the platform facilitating the user in managing his/her account and acquire information regarding the foreseen learning activities.

Learning Sequence

GreenHeritage training content includes a variety of material, from GreenHeritage syllabus and schedule to GreenHeritage course handouts. Most of the GreenHeritage training content consists of courseware and the teaching and assessment material developed throughout the project. The courseware may include videos, slides, readings, exercises, quizzes/tests, and case studies. This content will be placed in the Course tab of the GreenHeritage e-learning platform.

The courseware will be organized in sections. When a learner selects a section, he/she will be able to drill down further into subsections. When a learner selects a subsection, he/she will see a learning sequence, a sequential list of course units across the top of the screen in the Course ribbon.

Learners will engage with content as they move through the units in the learning sequence.

The learning sequence will be designed to engage the learner by creating a modular experience to navigate through. Learning sequences promote active engagement as students are navigating between learning concepts and solving simple exercises to check their understanding.

A typical learning sequence has a video lecture with reading material followed by a quick exercise, then another video lecture with reading material, and another exercise, and so on

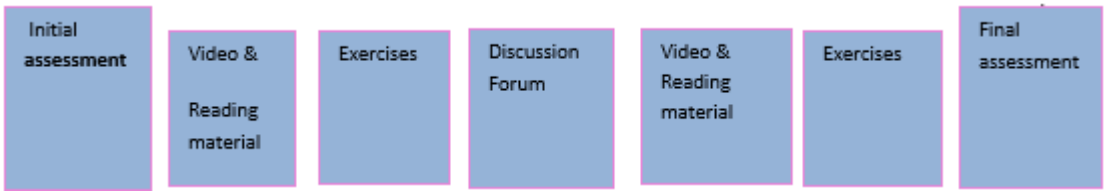

Figure 5 GreenHeritage MOOC learning sequence

This active-learning method enables learners to apply what they've learned from the videos and the reading material before moving on to new material. The videos and

reading material included in the learning sequence will cover the important ideas, relevant questions, issues, and problems that are at the heart of the GreenHeritage training material. In order to make the learning sequence engaging the video content will be split into small, bite-sized elements and inter-weaving meaningful exercises, or other interactive experiences, to follow them.

A discussion topic may be inserted after each module (video, reading material and exercise) so that learners/trainees can discuss open issues or reflect on the specific learning component. This “local” discussion topic, embedded in the learning sequence, will also appear in the course discussion forum.

The GreenHeritage e-learning platform will offer a variety of exercises from basic multiple-choice questions to drag and drop exercises that are especially geared towards an online audience. All these problems can be automatically graded and will have customizable features. For example, learners will be allowed to have multiple attempts before they submit their responses or will be shown the answer, or a hint, after several attempts.

Discussion Forums

Through course discussions, learners will share their opinions and ideas, engage in conversations with other learners, ask questions of the course staff and comment on the various components of the course. It will include a diversity of perspectives, interests, and background knowledge and will allow learners to benefit from this diversity.

During the lifetime of the project, discussion components may be added directly into a unit, allowing learners to respond to the content introduced in the unit. Learners will be able to view and access all of the course discussions in the "Discussion" tab in the navigation bar.

Discussions will be moderated by the GreenHeritage consortium. Each partner will appoint one person as discussion moderator, who will be responsible for the active upkeep, for example keeping an eye on discussions in order to alert the trainers of particularly interesting conversations.

When using course discussions, learners will be able to:

- create new discussion posts, reply to existing posts, comment on existing responses, and upvote posts and responses;
- filter and sort posts by various criteria, including posts with the most votes or with the greatest level of activity;
- search on discussion forums by keyword;
- receive an email message each day that summarizes discussion activity for the posts they are following.

Discussion moderators can perform the same tasks as learners, but in addition they can:

- edit, delete or close posts;

- pin posts so they appear at the top of the discussion;
- add more discussion moderators to the course team.

Types of problems/assessments

The GreenHeritage e-learning platform can provide many different types of questions, exercises and feedback options that can be used when designing the exercises for the GreenHeritage courses:

- Multiple choice/Checkbox/Dropdown questions: They have a limited number of possible answers and can allow learners to quickly check their understanding in the middle of a learning sequence.
- Problem types that prevent random guessing are a powerful tool combined with automatic grading. Text input (fill-in-the-blank) and numerical input (enter a number) problems can allow an unlimited number of tries without guaranteeing a correct answer.
- Open Response Assessment (ORA) problems allow instructors to assign questions that may not have definite answers or may be too lengthy for instructors to grade at scale. ORA's can be designed in three ways: as a Peer Assessment, Self-Assessment, or for Staff Assessment. Learners submit a response to the driving question, and then that learner and the learner's peers compare the response to a rubric that you create. Learners can submit text responses, or you can allow them to upload an image to accompany the text.
- Peer Instruction provides students with in-class opportunities to discuss questions and arrive at a deeper understanding of concepts. The peer instruction tool emulates this classroom experience for the learners in an online course.

Some or all of these exercises will be auto-graded on the GreenHeritage e-learning platform, so as to allow learners to receive instant feedback. Also, they will allow learners multiple attempts, including hints, and writing detailed solutions to increase the effectiveness of feedback. Studies have shown that this kind of rapid feedback has significant and positive effects on learner performance when compared to assessments without instant feedback.

Passing a Course and verified certificates

Each course may have its own passing score. Learners can see where those cut-offs are by looking at the vertical description in the Progress tab. Learners will receive a certificate once they have achieved the passing score. They will be able to download the GreenHeritage professional certificate from the Progress page, or their dashboard on GreenHeritage e-learning platform. Every verified certificate will come with a unique URL, which learners/trainees can include on their resume or LinkedIn profile to confirm that they passed the course. There will be also a possibility to validate the

certificate either through the Academic Partner's portal or through the Europass portal (microcredential) (https://epale.ec.europa.eu/en/tags/microcredentials). EPALE is Europe's biggest multilingual, open membership community of adult learning professionals.

3.5. Instructor Functionalities

Instructor Dashboard

The Instructor Dashboard of the GreenHeritage e-learning platform will be included in a special staff-trainers only tab in the navigation bar. Learners will not see the Instructor Dashboard listed in their course navigation. This tab has two main purposes: to show instructors information about student grades and enrolment, and to help them manage the course team. To put it simply, anything administrative that an instructor would do for a normal in-classroom course, can be performed on the Instructor Dashboard.

- Using the Instructor Dashboard, instructors, and other course staff can perform many different administrative tasks including the following:
- Access learner grades and records.
- Correct grades and perform other grading tasks. For example, download a spreadsheet (.csv) file that contains a breakdown of all the grades for GreenHeritage enrolled learners.
- Access learner enrolment data.
- Enrol and disenroll learners, or close course enrolment.
- Email every enrolled learner in the GreenHeritage course.
- Assign specific roles to course team members including discussion administrators and beta testers.

Analytics

The GreenHeritage e-learning platform will provide information about courses available to course team members who have the Course Staff or Instructor role. The GreenHeritage e-learning platform will provide these course team members with data about learner backgrounds and activities throughout the course. The GreenHeritage e-learning platform will provide intelligent, learner-centric analytics to help instructors understand how learners engage with course material.

The Analytics Dashboard will track learner enrolment and student engagement.

Enrolment. The Enrolment tab will include the total number of learners enrolled in the course, the number of new learners who enrolled in the previous week, a demographic breakdown of learner age, gender and education level, and a geographic breakdown of the learners enrolled in the GreenHeritage course.

Engagement. The Engagement tab will report the total number of active learners in the past week, as well as the number of learners who viewed videos and attempted to answer problems in the GreenHeritage course.

CMS – Course authoring tool

The CMS is the course authoring tool. The developing of the structure and the content is taken place through this online tool. The CMS is accessed by the Staff members. Apart from the content creation, the CMS provides functionalities regarding important dates, configure certificates and defining the grading policy. Any of the out of the box problems, such as multiple-choice problems, can be graded or ungraded. The GreenHeritage course team will have complete control of what type of graded exercises the GreenHeritage courses will have, how much exercises count towards the final grade, and when they are due. The instructor dashboard will provide a source for tracking learners' progress.

Concerning grading policy, the GreenHeritage e-learning platform will give instructors considerable control over the exact nature of the grading policy. Instructors will be able to adjust grade ranges, change the names of grades, and decide on the number of possible grades. It is important to note though that any learner earning a grade over the "F", or "Fail," threshold will qualify for a certificate. This will be true regardless of how many grade levels will be add in the grade range. Thus, when establishing the GreenHeritage grading policy it is important to consider where to set the bar for receiving a certificate. It will be defined before the release of the first course.

Roles

Staff (Instructor) / Trainer.

Team members with the Staff role can complete the following tasks:

- View the course before the Course Start Date.
- Enrol and disenroll students.
- Access student grades.
- Reset student attempts to answer a question correctly.
- Send email messages to course participants.

Administrator.

Team members with the Admin role have access to all of the same options for running the course as team members with the Staff role. They can also complete the following tasks:

- Add and remove Staff.
- Add and remove other Admins.
- Add and remove Beta Testers.
- Add and remove Discussion Admins, Discussion Moderators, and community Teaching Assistants (TAs-see below)

Discussion moderator.

While course discussions can contribute tremendously to the student experience, there are numerous reasons why it is important that the GreenHeritage course team

maintain a constant presence in the discussions throughout the duration of the course.

- First, moderators should enforce the Discussion Guidelines and edit or remove offensive or inappropriate content, ensuring that the discussions provide a positive and respectful environment for learner interaction.
- Secondly, moderators answer questions posed by students regarding course content or structure and reply to suggestions or complaints about the course. No issues should go completely unaddressed—even a simple acknowledgement that an issue can only be fixed the next time the course is offered is better than no reply. Learners want to be heard and to understand why things are done the way they are; they always appreciate when the course staff is responsive to their needs and suggestions.
- Third, moderators can help foster vibrant and active discussions by replying to interesting posts, thanking, or congratulating particularly active or insightful discussion participants, posing thought-provoking questions, and pinning or highlighting insightful discussion threads.
- Lastly, moderators can identify learners who are especially active in the discussions and invite them to become community Teaching Assistants (TA). As community TAs, these learners are very helpful to their peers and find the experience very rewarding.

In brief, GreenHeritage course team will spend a significant amount of time in the course discussions, as this is a great place to communicate with learners and ensure they have an excellent experience.

Beta Tester.

Beta testers have early access to the course. Beta testers are not members of the course team: they do not have information about “how it is supposed to work”. They use their own computers and Internet connections to view videos, follow links, and complete problems. They interact with the course as learners to find and make mistakes.

However, beta testers are not the same as other learners in the course, either. They have privileged access to the course and have more time to review and complete the course materials than the enrolled learners do. Course discussions are not open before the course start date, so beta testers cannot participate in community conversations. As a result of these differences, beta testers do not receive certificates when they complete a course.

The GreenHeritage course team can provide valuable feedback about the GreenHeritage courses. However, they are typically stakeholders in the success of the courses and have a significant amount of knowledge about it. As a result, they can be too close to the course to interact with it in the same way as learners will.

If a team member will be a beta tester, it should be noted that the privileges of the Staff or Admin role override those of a beta tester. The team member must use a different, second email address to create an additional edX account and enrol in the course, and the course team must assign only the beta tester role to that edX account. The course team member experiences the course as a learner only when she signs in to edX using the beta tester account.

4. Technical Specifications – System description

4.1 Platform Architecture

The centerpiece of the GreenHeritage e-learning platform is the Open edX platform (https://github.com/edx/edx-platform), which contains the learning management and the course authoring applications (LMS and Studio, respectively). This service is supported by a collection of other autonomous web services called independently deployed applications (IDAs).

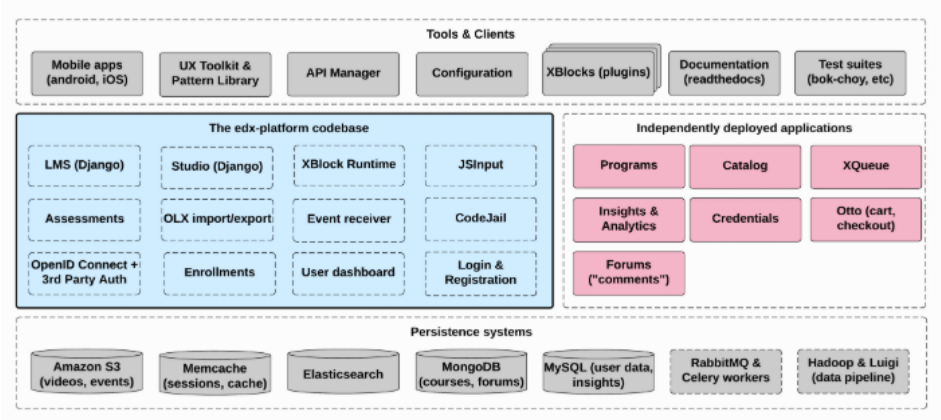

Figure 6 GreenHeritage e-learning platform architecture

Almost all of the server-side code in the Open edX project is in Python, with Django as the web application framework. A number of other repositories are also included, that can be used off the platform to integrate machine learning and analytics.

The Django server-side code in the LMS and elsewhere uses Mako[2] for front-end template generation. The browser-side code is written primarily in JavaScript with some CoffeeScript as well (edX is working to replace that code with JavaScript). Parts of the client-side code use the Backbone.js framework, and edX is moving more of the code base to use that framework. The GreenHeritage e-learning platform uses Sass and the Bourbon framework for CSS code.

Course discussions are managed by an IDA called comments (also called forums). Comments is one of the few non-Python components, written in Ruby using the Sinatra framework. The LMS uses an API provided by the comments service to integrate discussions into the learners' course experience.

The comments service includes a notifier process that sends learners notifications about updates in topics of interest.

Events describing learner behaviour are captured by the GreenHeritage analytics pipeline into an SQL database. In addition, the system uses data related to course structure from a schemeless database (MongoDB) and storage tables from the Django Python Web Framework. The data for users is gathered during the registration on the

[2] https://www.makotemplates.org/

platform and course enrolment and from interaction with the platform (video streams, problems submission, discussion posts, etc). The results are made available via a REST API to the front-end through a user-friendly GUI allowing instructors and administrators to know what their learners are doing and how their courses are being used.

Expandability

GreenHeritage Open edX courses are composed of units called XBlocks. Anyone can write new XBlocks, allowing educators and technologists to extend the set of components for their courses.

In addition to XBlocks, there are a few ways to extend course behavior:

- The LMS is an LTI tool consumer. Course authors can embed LTI tools to integrate other learning tools into an Open edX course.
- Problems can use embedded Python code to either present the problem or assess the learner's response. Instructor-learner's python code is executed in a secure environment called CodeJail.
- JavaScript components can be integrated using JS Input.
- Courses can be exported and imported using OLX (open learning XML), an XML- based format for courses.

Given the expandable nature of the architecture, the partnership will explore the possibility to integrate 3rd party tools for **localisation**. If needed, the platform will integrate Transifex (transifex.com) which is an open-source translation platform and hosts translations of the User Interface (Strings). ReadLab will investigate the current coverage of available translations in the partners' languages and together with the Partnership will make a common decision if the integration is needed.

4.2 Installing the GreenHeritage e-learning platform

Open edX is a large complex system driven by the edX community. It is important to select the appropriate version and installation method. Regarding the version, there are two options:

- Select a Master version, which is the latest version of the edX code.
- Select a Release version, which is a marked and tested for wide use version. These versions are named alphabetically for trees: Gingko, Hawthorn, Ironwood, Juniper, etc. The updated catalogue of the available open edX releases can be found at https://edx.readthedocs.io/projects/edx-installing-configuring-and-running/en/latest/platform_releases/.

The available installation methods are:

- **Devstack**: useful if you want to modify the Open edX code. For Hawthorn and above, Devstack is based on **Docker**.

- **Native**: Automated installation on an Ubuntu machine of your own. Details are on the Native Open edX platform Ubuntu 16.04 64 bit Installation page[3].
- **Manual**: you are on your own, using our scripts as a guide. Read the Native instructions to find the scripts to study.
- **Bitnami**: installable pre-packaged images for popular cloud platforms. Details are at the Bitnami Open edX page[4].

It is foreseen that the GreenHeritage e-learning platform will be installed through a docker-based distribution (devstack) in order to facilitate deployment, customization, upgrading and scaling. The Release to be used will be based on a widely used and tested version. In addition, an analytics engine is going to be deployed in order to develop Analytics features in the GreenHeritage e-learning platform. The Analytics engine provides tools and services to modify the Open Analytics Pipeline and Data API and is the base for developing custom visualization pages and performance metrics describing user performance and engagement.

4.3 Content as XBlock

The XBlock specification is a component architecture designed to make it easier to create new online educational experiences. XBlock was developed by edX, which has a focus in education, but the technology can be used in web applications that need to use multiple independent components and display those components on a single web page.

GreenHeritage e-learning platform will be a XBlock compatible application. This means, that an XBlock developer does not need to download and run the entire edx-platform developer stack or to know anything about the technologies that edX uses to provide the XBlock runtime. Instead, XBlock developers writing with edX in mind can work from the xblock-sdk and deploy their work on any platform that is compatible with XBlocks.

In educational applications, XBlocks can be used to represent individual problems, web-formatted text and videos, interactive simulations and labs, or collaborative learning experiences. Furthermore, XBlocks are composable, allowing an XBlock developer to control the display of other XBlocks to compose lessons, sections, and entire courses.

The content of the GreenHeritage courses will be based on HTML and video independent components. Special focus must be given to Video components in terms of:

[3] https://openedx.atlassian.net/wiki/spaces/OpenOPS/pages/146440579/Native+Open+edX+platform+Ubuntu+16.04+64+bit+Installation

[4] https://bitnami.com/stack/edx

- Duration: Videos should be kept as short as possible. Learners are more likely to finish watching a video if it is no more than 3-10 minutes long.
- Subtitling: Media-based course materials help to convey concepts and can bring course information to life. All videos in GreenHeritage courses are required to include timed text captions in SubRip (SRT) format. The edX media player displays caption files in an interactive sidebar that benefits a variety of learners, including learners who are hard of hearing or whose native language differs from the primary language of the media. This built-in universal design mechanism enhances course's accessibility.
- Support course's formats. The GreenHeritage MOOC will support videos in .mp4, .mpeg, webm, and .ogg format. However, to help make sure all standard browsers can play the videos, GreenHeritage course team will use the .mp4 format.
- Posting the Video online. The Open edX platform does not come with a built-in streaming server. Thus, all video content will be streamed through an **external streaming server** and be integrated in the GreenHeritage e-learning platform. The platform can be configured to display a built-in video player directly accessing the content through YouTube. In case YouTube is not available in all locations, another external streaming server may be employed with Amazon S3 infrastructure being the primary candidate.
- Recommended Compression specifications. The recommended specifications for the videos, which will be hosted to the GreenHeritage MOOC are the following:

Output	Publish to YouTube	Publish downloadable file to AWS S3
Codec	H.264 .mp4	H.264 .mp4
Resolution & Frame Rate (see note)	1920x1080, progressive, 29.97 fps	1280x720, progressive, 29.97 fps
Aspect	1.0	1.0
Bit Rate	VBR, 2 pass	VBR, 2 pass
Target VBR	5 mbps	1 mbps
Max VBR	7.5 mbps	1.5 mbps
Audio	AAC 44.1 / 192 kbps	AAC 44.1 / 192 kbps

Figure 7 Recommended specifications of the GREENHERITAGE video content

Section 5: Conclusion

GreenHeritage e-learning platform will create an accessible Massive Open Online Course (MOOC) which integrates the GreenHeritage training units, based on the Open edX platform. It will allow the collaborative interaction between their users through interactive learning content, assessment activities and discussion forums. The online platform content will be monitored and kept up-to-date continuously, encouraging learners' cocreation and content development.

To ensure user acceptance, the GreenHeritage e-learning platform will be presented to the project's External Group of Advisors and Focus Groups for feedback. The feedback received will be used for the review and final delivery of the GreenHeritage e-learning platform.

Annex 1 – GREENHERITAGE VLE story board example

COURSE NAME (consisting of one or more modules)

Module Title – 1. XXX

Lesson	Unit name *	Comp Type	Title/Source description	Notes
[Lesson 1 Title]	Introduction	Video	[Title] 3 minutes short video addressing Video title …	
		Text	[Title] Full text or link to external doc	
	Lecture 1	Text	[Title] ->> Link to the file	

		Video	[Title] -> Link to the file	
	Lecture 1 part II	Text	[Title] -> Link to the file	
	Knowledge check	Text	Information regarding the assessment types	
		Prob	Number of MCQ, retry limit, feedback information	
	Discussion	Forum		
[Lesson 2 Title]	….			

**You can treat unit as an independent webpage containing up to three learning components*

Module Title – 2. YYY

Lesson	Unit name*	Comp Type	Title/Source description	Notes
[Title]	Introduction	Video	[Title] 3 minutes short video addressing Video title …	
		Text	[Title] Full text or link to external doc	
	Lecture 1	Text	[Title] ->\ Link to the file	
		Video	[Title] ->\ Link to the file	
	Lecture 1 part II	Text	[Title] ->\ Link to the file	
	Knowledge check	text	Information regarding the assessment types	

		Prob	Number of MCQ, retry limit, feedback information	
	Discussion	Forum		
[Lesson 2 Title]				

**You can treat unit as an independent webpage containing up to three learning components*

Annex 2 – Course information page

This section provides the general description of the course and lists all relevant information to the course. This information is publicly available to any user without having to register or enrol in the Art is Us platform.

- General information about the course.
    - Estimated effort, language, course type (self-paced or instructor-led)
    - Social media links
    - Prerequisites
    - Learning objectives
- A Syllabus. A syllabus is an outline and summary of topics to be covered in a course. As with an on-campus course, syllabus may include:
    - Topics covered by the course.
    - Names of instructors and teaching assistants for the course.
    - A grading rubric.
    - Textbook information.
    - Assignments that the learners can expect.
    - Deadlines and important dates.
    - quizzes/tests and topic coverage for tests.
    - Any additional information, such as information about course discussion sessions.
- Staff biographies.
    - Staff biographies for the course About page may include the following information.
    - Name
    - Title
    - Email address
    - Biography (1-2 paragraphs)
    - Image. Note: The instructor's image must meet the instructor's requirements.
        - Resolution of 110 x 110 pixels
        - Under 256 KB in size
        - .gif, .jpg, or .png file type
    - Additionally, biographies can optionally include Facebook, Twitter, blog URLs, and List of major works
- Frequently Asked Questions (FAQ).
    - Weblink to Open edX Learner's Guide FAQ that will help learners' transition to online learners' The guide answers common questions about topics like getting started in an online course, earning

certificates, participating in course discussions, and completing some of the exercises you may see in your course.

- Contact details of the technical support team