



EU-CIRCLE

A pan-European framework
for strengthening Critical
Infrastructure resilience to
climate change

D8.8 Training Material

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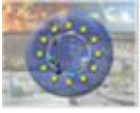
This deliverable provides a description of the EU-CIRCLE training course. This course is addressed to professionals, academics, researchers and others (authorities, institutions etc.) involved or interested in critical infrastructures, climate change and resilience. It is delivered online through an e-learning platform where the learners can attend self-paced.

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Executive Summary

This document provides an overview of the educational framework which was developed and used as a basis for the implementation of the EU-CIRCLE training material. The course objectives, modules and pedagogical framework which will allow EU-CIRCLE target groups to develop the necessary competences and skills related to climate change impacts on critical infrastructures and the EU-CIRCLE risk, resilience and adaptation methodologies are described.

The document further provides a description of the EU-CIRCLE e-training platform, as well as characteristic examples of the training material which is available to the users. Users of the e-platform can experience the full software functionality by gaining access through the process explained in Section 3.2.



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1 Introduction

The scope of this document is to provide a description of the EU-CIRCLE online training course with respect to its instructional design and its development within an e-learning platform. The training material itself can be accessed via the EU-CIRCLE e-training platform.

1.1 EU-CIRCLE Training

One of the principal goals of EU-CIRCLE is the development of methodologies, tools and data that will allow CI operators and the relevant national authorities to enhance the resilience of their infrastructure to climate change, as well as provide scientific input into the research and academic fields of climate change, resilience and adaptation.

The provision of practical training material in the methodologies and tools of EU-CIRCLE, is one of the means used by the consortium to achieve its stated goal. Through development of appropriate training material, the key points related to the EU-CIRCLE assessment methodologies (risk and resilience) and tools can be distilled and presented in an easy to understand manner. The training material provides a first introduction to the results of EU-CIRCLE, and allows interested parties to gain a more in-depth knowledge of the parts that are of particular interest through the project's deliverables and other reference material.

The provision of dedicated training to stakeholders has been identified as a key way of exploiting the results of EU-CIRCLE, as training can be used both as a stand-alone activity or as a gateway to more specialised consultancy services. The training material, however, has been developed in such a manner as to allow self-paced learning if stakeholders prefer, through the development of an e-training platform. The e-training platform is customisable and can be updated with more material.

The details of the rationale behind the training, its objectives, the pedagogical background and the use of the e-training platform are described in Sections 2 and 3 respectively.



2 EU-CIRCLE Training Framework

The following units provide a description of the educational approach adapted in the framework of the EU-CIRCLE course, entitled “**EU-CIRCLE training on Enhancing Resilience of Critical Infrastructure to Climate Change**”. The course is available online through an e-learning platform and it can be accessed by any learner after creating an account (see details in Section 3 EU-CIRCLE Online Course Development).

2.1 EU-CIRCLE Course Objectives

The EU-CIRCLE online course aims to introduce learners to climate change science and other relative concepts such as critical infrastructure, data capturing and processing, risk assessment, resilience and finally, adapting critical infrastructure to climate change. After completing the course, learners are expected to:

- identify and understand the concepts described;
- explain different climate phenomena;
- describe different climate change scenarios and their implications;
- understand the potential impacts of climate change on critical infrastructure;
- understand how to capture, process and visualize climate data;
- recognize the EU-CIRCLE climate hazards metadata and standards;
- understand damage functions;
- estimate risks to critical infrastructure from climate change using the EU-CIRCLE risk assessment methodology;
- improve the resilience of critical infrastructure to climate change using the EU-CIRCLE resilience methodology and the Resilience Assessment Tool;
- adapt critical infrastructure using the EU-CIRCLE adaptation framework;
- realise the seriousness of the climate impacts.

2.2 EU-CIRCLE Course Target Groups

The EU-CIRCLE online course target groups include, but are not restricted to, the following:

- CI operators
- City managers
- National Authorities (CI Regulatory Authorities, Environment Authorities, Met Offices)
- Researchers and Academics
- Consultants

Generally, any individuals and/or institutions involved or interested in critical infrastructures, climate change and resilience, can take the EU-CIRCLE course.



2.3 EU-CIRCLE Pedagogical Background

The EU-CIRCLE online course is self-paced. Self-paced learning environments enable learners to study online from their own location, in their own time and at their own pace [3]. This kind of learning is inherently asynchronous and provides more autonomy [4], [5]. The main characteristics supporting self-paced learning within EU-CIRCLE online course are:

- Asynchronous modules with educational resources on topics related to critical infrastructures, climate change and resilience;
- Multiple types of educational resources, including both online and offline options, so that the learners are not restricted;
- Specific case studies and resources with additional information, so that the learners can acquire deeper knowledge on the topics studied;
- Discussion forum, so that the learners can discuss issues of their interest and create a community.

Moreover, during the design of the EU-CIRCLE online course, the main principles of adult education were taken into consideration, since the target group includes mainly adults. There is a general acknowledgement of the fact that in educational programs targeted to adults [1], [2]:

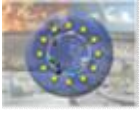
- i) their own competencies and potential for growth and development should be emphasized;
- ii) they should undertake the responsibility for their own learning as they do so in everyday life situations;
- iii) the actual real-life situations are the source and the focus of learning;
- iv) learning usually takes place in their workplace settings or in social communities - and aims to develop knowledge and skills that are usable and applicable there;
- v) learning in informal ways in a meaningful setting (such as an e-learning platform) is much more effective than learning in traditional classroom settings.

2.4 EU-CIRCLE Structure

The following table describes the modules included in the EU-CIRCLE online course, in order to enhance learners’ navigation and better understanding of the educational content. The modules’ content is based on the EU-CIRCLE project WPs and main deliverables. The educational resources’ types included in these modules are texts, images, embedded content (e.g. iframes), presentations, additional links and readings (more in 3.4 EU-CIRCLE Educational Activities).

Table 1: EU-CIRCLE Training Modules

EU-CIRCLE COURSE MODULES		
MODULE	UNITS	EU-CIRCLE DELIVERABLES
Module 1: Introduction to Climate Change Science	1. Introduction to Climate Change Science 2. Anthropogenic Drivers of Climate Change 3. Observed Trends and Impacts of Climate Change 4. Projected Trends and Impacts of Climate Change 5. Sources of Scientific Data	D1.2
Module 2: Climatic Data	1. Overview of existing climate information and metadata	D2.1, D2.2, D2.3



Capture and Processing	<ol style="list-style-type: none"> 2. Access Policy on Climate Databases 3. Tools for Processing Climate Hazards Information 	
Module 3: Projected Impacts of climate change on Critical Infrastructure	<p>Impacts on CIs:</p> <ol style="list-style-type: none"> 1. Impacts on Energy Sector 2. Impacts on Water Sector 3. Impacts on ICT Sector 4. Impacts on Public Sector 5. Impacts on Transport Sector 6. Impacts on Chemical sector 	D1.2
Module 4: Damage functions	<ol style="list-style-type: none"> 1. Terminology 2. Introduction to damages and damage functions 3. Development and features of damage functions 4. Overview: damage functions for transport, electricity and (waste -) water 	D3.2
Module 5: Holistic CI Climate Hazard Risk Assessment Framework	<ol style="list-style-type: none"> 1. Risk management approach 2. Risk quantification 3. Modelling risk 4. Impacts/consequences 5. Uncertainty estimation 	D3.4, D3.5
Module 6: Resilience of Critical Infrastructures to Climate Change	<ol style="list-style-type: none"> 1. Critical Infrastructure Resilience 2. Resilience Capacities and parameters 3. EU-CIRCLE Resilience Methodology 4. Resilience Indicators and Metrics 5. Resilience Indexes 6. Resilience Assessment Tool 	D4.3, RAT TOOL
Module 7: Adapting Critical Infrastructures to Climate Change	<ol style="list-style-type: none"> 1. Concepts - What is climate change adaptation? 2. Methodologies - How to adapt under uncertainty? 3. EU-Circle Approach - A dedicated framework for Critical Infrastructures (CI) adaptation 	D4.6



3 EU-CIRCLE Online Course Development

The EU-CIRCLE online course was decided to be developed in Moodle (version 3.5.1). Moodle is a free, online Learning Management System (LMS) enabling the creation of websites with dynamic courses that extend learning, anytime, anywhere (more at <https://moodle.org/>). Some of its main features between others are the following:

- provides a modern and easy to use interface for both back-end and front-end users;
- allows users to register with different roles (e.g. students/ learners, teachers/ instructors, administrators);
- allows users to have personalised dashboards;
- supports numerous collaborative tools and activities;
- supports a wide variety of learning resources;
- is flexible and scalable, characteristics which promote self-paced learning;
- allows learners to organize themselves with tools such as calendars, private files management areas, notifications, etc.;
- offers progress tracking functions.

Moreover, there are many administrative features that were taken into consideration for the selection of the Moodle LMS to design and develop the EU-CIRCLE online course, such as:

- secure authentication and control of the registered users – a critical characteristic, especially when referring to EU Horizon Projects with specific requirements;
- customizable layout and general website design – allowing the administrators to configure the learning environment based on the EU-CIRCLE project identity;
- multilingual support for the LMS's interface – useful for EU projects since there are users from different countries, preferring their mother language for their navigation;
- easy backup and course restore features – appropriate for an EU project to ensure maintenance and continuity;
- plugins easy to manage – allowing the administrators to use the necessary plugins through a user-friendly interface;
- regular security updates – a critical characteristic for the maintenance of the EU-CIRCLE e-learning platform.

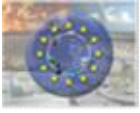
The following units describe the main characteristics implemented in the EU-CIRCLE e-learning platform, including the functional elements and the educational activities in the context of the course developed.

3.1 Demo account

The EU-CIRCLE e-learning platform is available online through <https://eu-circle.coders-lab.eu/>. A demo account has been created for demonstration purposes:

username: test_student

password: Test_student2018



3.2 Registration and Access

Within the homepage a guest-user can see a block including the link to the project’s main website (Figure 1-a). The general description of the EU-CIRCLE course is available (Figure 1-b), but the course’s content is accessible only by logged-in users (Figure 1-c).



FIGURE 1: GUEST USERS' HOMEPAGE

In order to attend the “**EU-CIRCLE training on Enhancing Resilience of Critical Infrastructure to Climate Change**”, users need to register themselves. Access is not allowed to guest users. Users that register themselves automatically receive the role of a “student”. Figure 2 shows the registration form for new learners while Figure 3 shows the “Log-in” page, where existing learners can enter with their credentials (username and password).

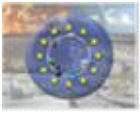


FIGURE 2: REGISTRATION FORM

FIGURE 3: LOG-IN FORM

After successfully logging-in to the EU-CIRCLE e-learning platform, learners gain access to the homepage as “students”. In order to enter the course, learners need to self-enrol themselves (Figure 4). Moreover, registered users are authenticated to have access in their private files, the e-learning platform’s calendar (including future events, trainings etc.) and their personal dashboard. More details about these elements are presented in 3.3.5 Authenticated Areas.

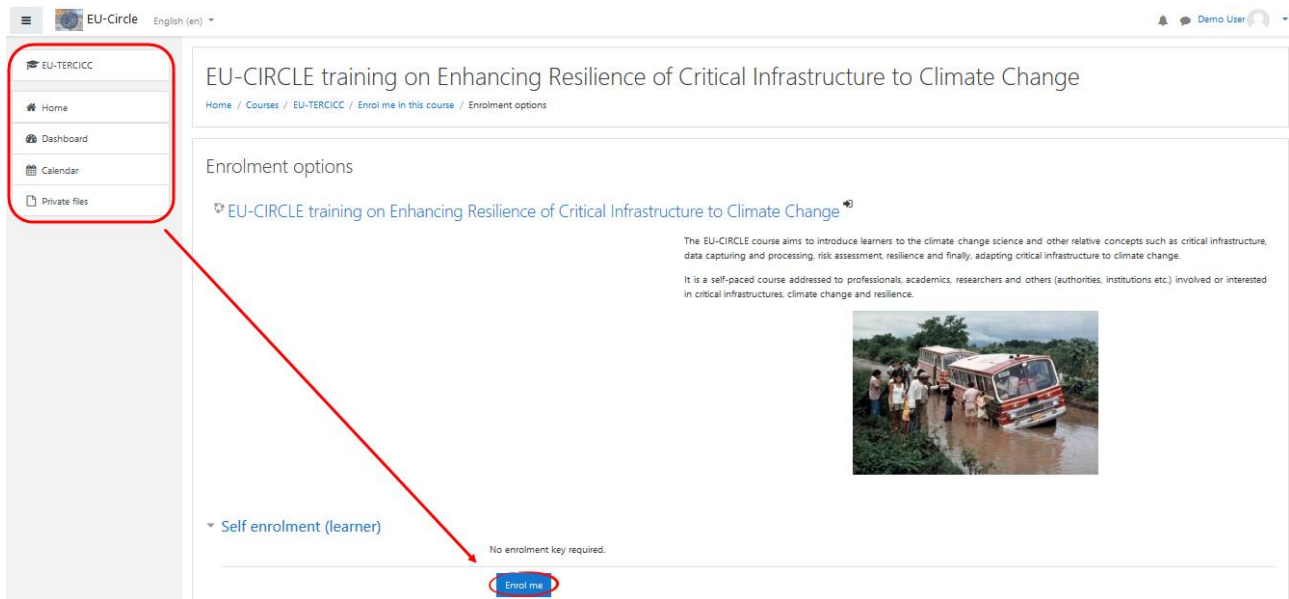
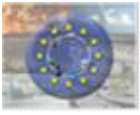


FIGURE 4: LOGGED-IN USERS’ INTERFACE AND SELF-ENROLMENT

3.3 EU-CIRCLE Functional elements

EU-CIRCLE online course includes many elements enhancing the functionality of the course and providing a friendly user interface for the learners (navigation options, help etc.). These are described in detail in the following sub-units.

3.3.1 Multilingual Support

The EU-CIRCLE e-learning platform supports all project partners’ languages, including German (DE), English (EN), French (FR), Croatian (HR), Italian (IT), Norwegian (NO) and Greek (EL) (Figure 5). These languages are available for all the platform’s and course’s functionalities. However, the educational content is available in English.

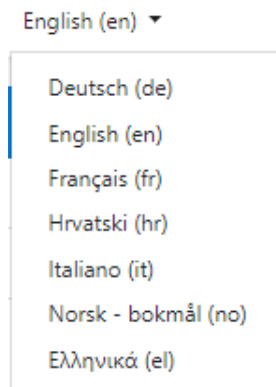


FIGURE 5: EU-CIRCLE E-LEARNING PLATFORM’S AVAILABLE LANGUAGES

3.3.2 Users’ profile options

As registered users, learners of the EU-CIRCLE online course can manage their profiles through the relative menu options. More specifically, as illustrated in Figure 6, learners can: (a) edit their profiles, (b) view their grades (total progress), (c) view their messages, (d) change their preferences concerning their account, and



finally, (e) log out of the e-learning platform. Moreover, they can receive notifications related with the EU-CIRCLE course (Figure 6-a).

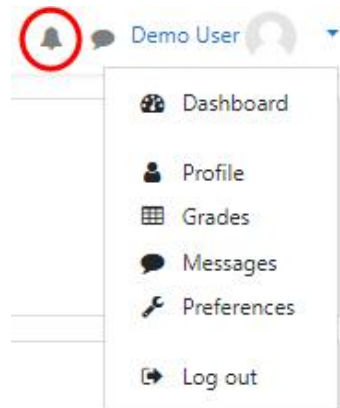


FIGURE 6: LOGGED-IN USERS' PROFILE MENU

3.3.3 Navigation Panel

The navigation panel within the EU-CIRCLE e-learning platform, consists of an element that can be visible or hidden by clicking on the panel button (Figure 7-c). This provides the learner the flexibility to study the educational content in a wider window, depending on the device used.

In the homepage, the navigation panel includes the authenticated areas (more in 3.3.5 Authenticated Areas) where the learner can have access (dashboard, calendar, private files and enrolled courses) (Figure 7-a). Within a course, above the authenticated areas, the learners can see the general course structure and navigate between the available modules (Figure 7-b).

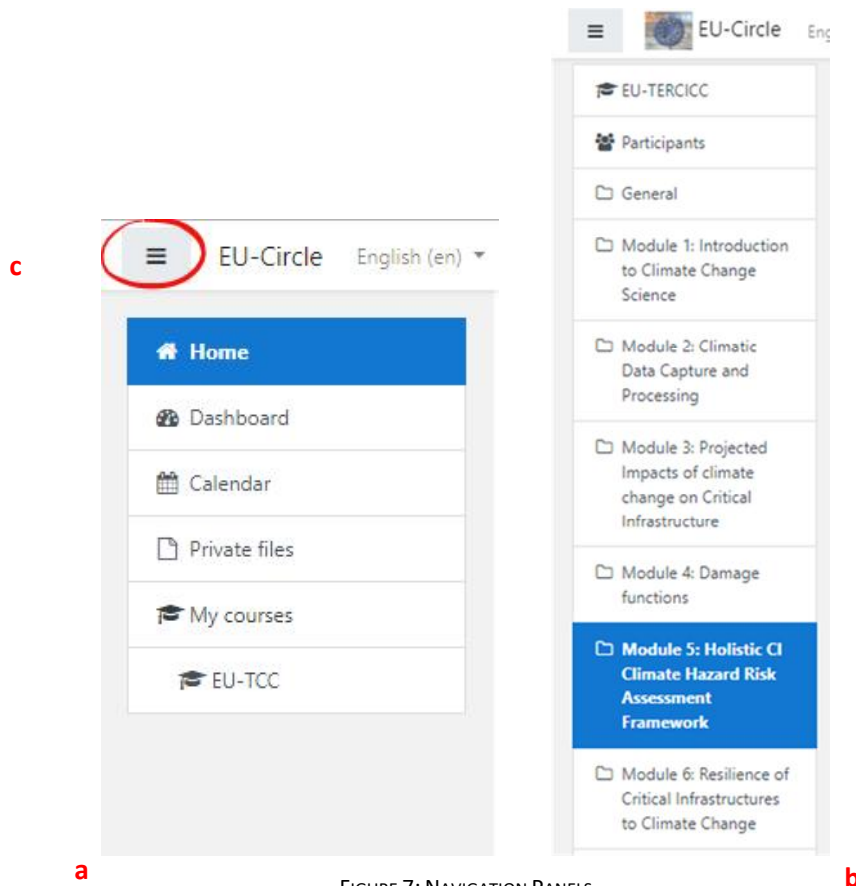


FIGURE 7: NAVIGATION PANELS

3.3.4 Help button

At some points of the EU-CIRCLE online course, there is a question mark button for help (Figure 8) which provides guidance to the learners when necessary.

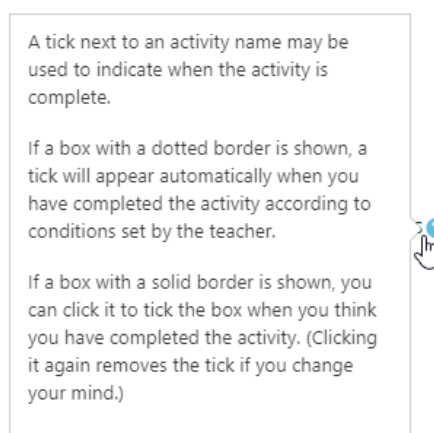
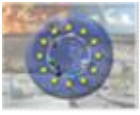


FIGURE 8: HELP BUTTON

3.3.5 Authenticated Areas

As already mentioned, registered users in the EU-CIRCLE e-learning platform can have access in authenticated areas, named: (a) dashboard, (b) calendar, (c) private files and (d) enrolled courses.



The dashboard is a personal page that can be customised by each learner, including blocks and plugins with details about their progress, upcoming events and/or deadlines, online users etc. (Figure 9). The calendar displays the EU-CIRCLE e-learning platform’s, course’s and individual learner’s events (Figure 10). Finally, the private files consist an area for uploading and managing a set of files that could be useful in the context of the EU-CIRCLE e-learning platform by the learner (e.g. individual notes, files for further reading, drafts of assignments) (Figure 11).

The authenticated area of the EU-CIRCLE online course is described in detail in 3.4 EU-CIRCLE Educational Activities.

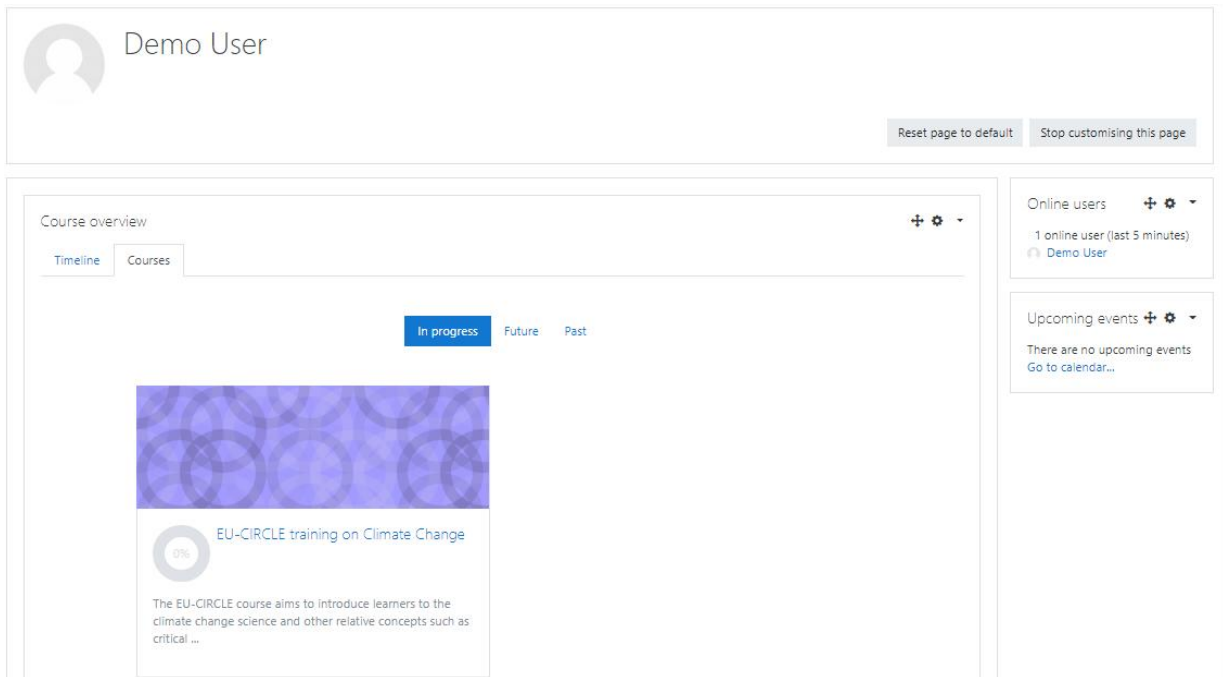


FIGURE 9: DASHBOARD

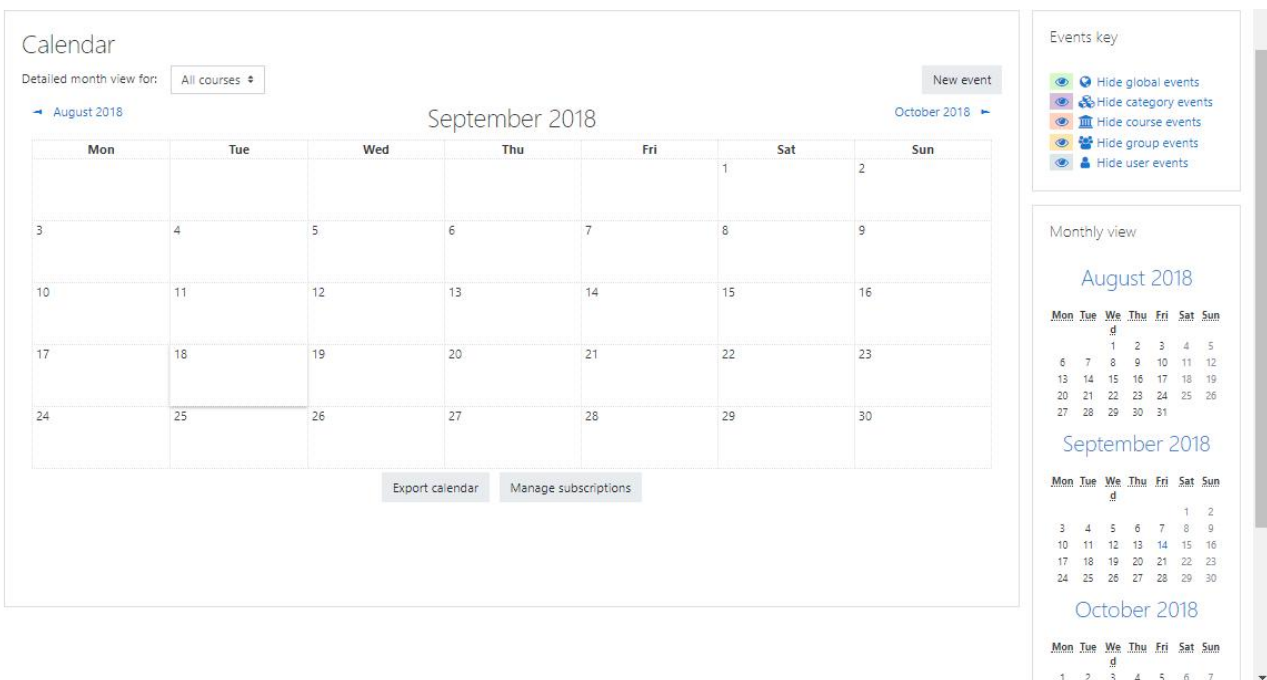


FIGURE 10: CALENDAR

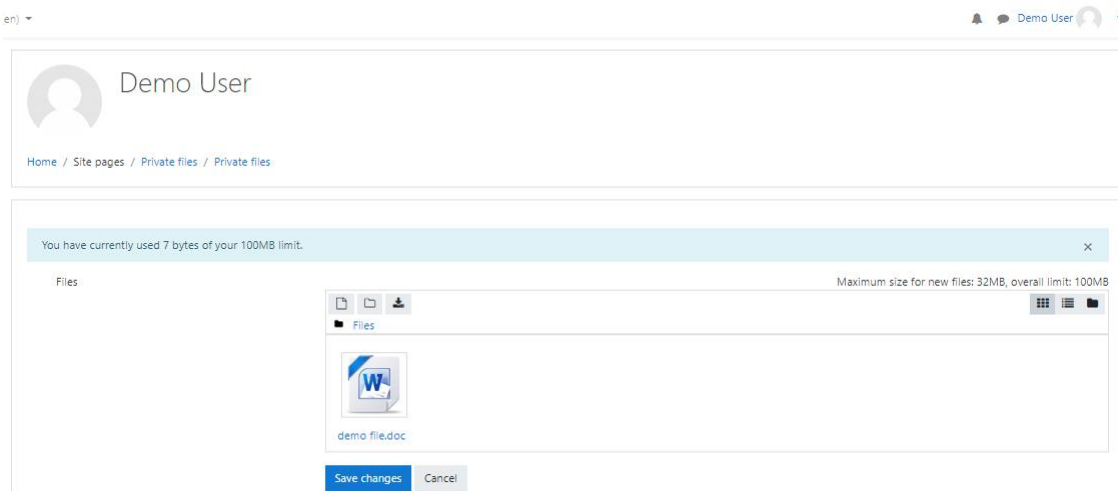
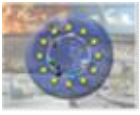



FIGURE 11: PRIVATE FILES

3.4 EU-CIRCLE Educational Activities

EU-CIRCLE online course includes many educational activities in the six (6) modules as described in 2.4 EU-CIRCLE Structure. The learners can keep control of their progress by marking an activity and/or educational content as completed (Figure 12). The EU-CIRCLE educational activities are described in detail in the following sub-units.

5 Sources of Scientific Data

- Atmospheric Research and Environment (ARE)
- Global Framework for Climate Services



Recommended Readings

- Cambridge University (2013). *Climate Change: Action, Trends and Implications for Business*

Symon, C. (2013). Climate change: actions, trends and implications for business. The IPCC fifth assessment report, Working Group 1.

FIGURE 12: MARKING ACTIVITIES AS COMPLETED

3.4.1 Discussion Forums

The discussion forum is an interactive activity (Figure 13), where the learners of EU-CIRCLE online course can attend asynchronous communication, discussing topics of their interest in the fields of critical infrastructures, climate change and resilience.



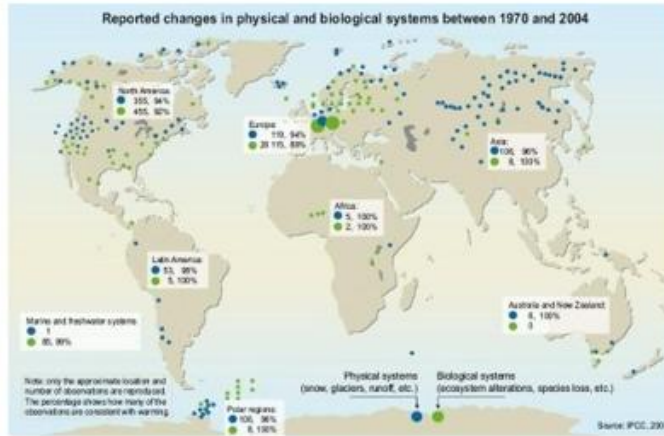
FIGURE 13: DISCUSSION FORUM



3.4.2 Texts and Images

Texts and images constitute part of the educational activities, mainly to inform learners about the objectives of each module and provide illustrative information on the studied concepts (Figure 14).

Module 1: Introduction to Climate Change Science



By the end of this module participants will be able to:



1. Explain the basic concepts of climate change science
2. Identify the anthropogenic drivers of climate change
3. Explain observed and projected trends in the climate
4. Describe different climate change scenarios and their implications

FIGURE 14: TEXT AND FIGURES

3.4.3 Presentations

In the context of the EU-CIRCLE online course the presentations are provided both as embedded content from an external source (iframes) (Figure 15) and as presentation files (.ppt, .pptx), so that the learners can download them to their own devices and study offline (Figure 16).

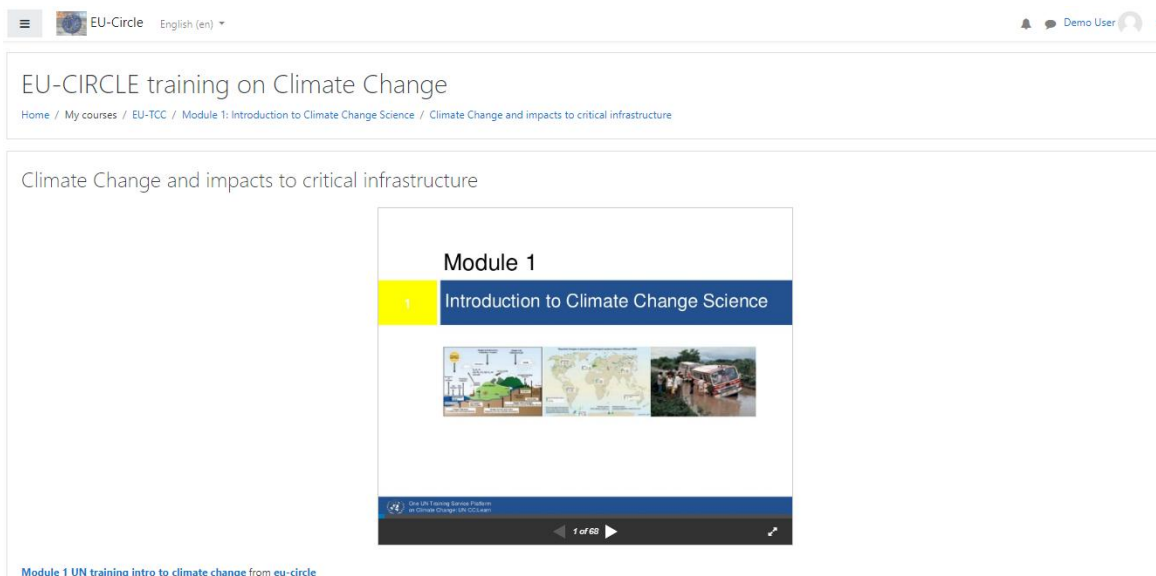
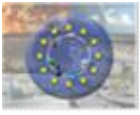


FIGURE 15: EMBEDDED ONLINE EDUCATIONAL CONTENT



Module 1: Climate Change and impacts to critical infrastructure
7.1MB

Download the .ppt file, save it on your computer and view the presentation offline, including all notes and additional material.

FIGURE 16: PRESENTATION FILES AVAILABLE FOR DOWNLOAD

3.4.4 External Links

External links in the context of each subject within the modules of the EU-CIRCLE online course (Figure 17) are of additional educational value. Learners can visit the suggested links (targeting websites, videos, blogs, reports, repositories, databases etc.) navigate for further information, find more related subjects of their interests etc.

Green house gases

Globally Harmonized System of Classification and Labelling of Chemicals (GHS)

"An EU Strategy on Adaptation to Climate Change", COM (2013) 216

FIGURE 17: EXTERNAL LINKS

3.4.5 Recommended Readings

The recommended readings of each module (Figure 18) consist of a collection of additional documents to read, including research publications (journal articles, conference papers, project reports etc.), user guides/ manuals and policy reports, allowing learners to gain deeper knowledge on the topics of their interest.

Recommended Readings

Climate Change 2014 Synthesis Report

IPCC (2014) Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, 151 pp.

Meteorological data for RES-E integration studies - State of the art review

Iratxe Gonzalez Aparicio, Andreas ZUCKER; Meteorological data for RES-E integration studies - State of the art review; EUR 27587; 10.2790/349276

CADDIES: a new framework for rapid development of parallel cellular automata algorithms for flood simulation

Guidolin, M., Duncan, A., Ghimire, B., Gibson, M., Keedwell, E., Chen, A. S., ... & Savic, D. (2012). CADDIES: a new framework for rapid development of parallel cellular automata algorithms for flood simulation.

FIGURE 18: RECOMMENDED READINGS



4 Bibliography

- [1] M. Knowles. The adult learner: a neglected species, 1973.
- [2] J. Mezirow. A critical theory of adult learning and education. *Adult education*. 32(1):3-24, September 1981.
- [3] J.L. Moore, C. Dickson-Deane and K. Galyen. e-Learning, online learning, and distance learning environments: Are they the same?. *The Internet and Higher Education*, 14(2):129-35, March 2011.
- [4] J. Rhode. Interaction equivalency in self-paced online learning environments: An exploration of learner preferences. *The international review of research in open and distributed learning*. 10(1), February 2009.
- [5] J.M. Spector, M.D. Merrill, J. Elen, M.J. Bishop, editors. *Handbook of research on educational communications and technology*. New York, NY: Springer, 2014.