



Next generation toolbox for greener pharmaceuticals design
and manufacturing towards reduced environmental impact

D8.4 – The ENVIROMED training platform

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Executive Summary

This report presents the initial version of the ENVIROMED training platform, developed under Task 8.4 of the ENVIROMED project within Work Package 8 (WP8), which focuses on communication, dissemination, training, and exploitation of results. The training platform, accessible at <https://lms.enviromed.eu> as well as via the main ENVIROMED website <https://www.enviromed.eu>, serves as a digital hub designed to introduce and promote innovative, environmentally friendly pharmaceutical manufacturing processes.

Its primary objectives are to familiarise engineers and scientists with the novel devices and processes developed within the ENVIROMED project, support the early market penetration of these technologies, and raise awareness about their environmental and economic benefits.

Developed using the Moodle Learning Management System (LMS), the platform ensures accessibility, flexibility, and secure user management. It includes a variety of learning modules, multimedia content, quizzes, and assessments tailored to different stakeholders. Input for the platform's content was gathered through targeted workshops and questionnaires involving project partners. The platform features a user-friendly interface with clear navigation.

As a dynamic tool, the platform will be continuously updated with new training content until the end of the project to support ENVIROMED's broader dissemination goals.

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List of Acronyms

Table 1: Acronyms

Term	Definition
AI	Artificial Intelligence
GDPR	General Data Protection Regulation
IR	Infrared
LMA	Liquid Monitoring Analyser
LMS	Learning Management System
MIP	Molecularly Imprinted Polymer
Moodle	Modular Object-Oriented Dynamic Learning Environment
SDS	Sample Delivery Subsystem
SIA	Surface Inspection Analyser
SPE	Solid Phase Extraction
SSL	Secure Sockets Layer
UI	User Interface
WCAG	Web Content Accessibility Guidelines
WSA	Wastewater Spectroscopic Analyser

1 Introduction

This document provides a detailed overview of the ENVIROMED training platform, including its structure, features, and the currently available content. It outlines the technical infrastructure supporting the platform, its user interface design, and the layout of its main components. The document also describes the process followed to develop and organise the training materials, including workshops and partner input, and presents screenshots and explanations of key pages such as the course selection, content areas, and navigation menus. Additionally, it highlights the use of Moodle Learning Management System (LMS) and how its functionalities were customised to meet the project's needs. The platform's current training units, assessment tools, and support features are also described, offering a comprehensive snapshot of its first implementation stage.

This document is structured as follows:

- *Section 1:* Introduction
- *Section 2:* The ENVIROMED training platform
- *Section 3:* Conclusions

2 The ENVIROMED training platform

The ENVIROMED training platform is openly accessible at <https://lms.enviromed.eu/> and on the ENVIROMED website at <https://www.enviromed.eu> and is managed by MITERA.

The training platform was created to meet the requirements of the ENVIROMED project and its consortium. The training platform will serve the wide introduction of new technologies by familiarising engineers and scientists with both the new devices and their manufacturing processes. It will also serve as a medium for spreading awareness of the benefits associated with the use of the new processes.

The key objectives of the ENVIROMED training platform include:

- Familiarisation of engineers and scientists with the novel devices and their manufacturing processes with the aim of enabling the transition of the pharmaceutical industry to “greener” processes.
- Disseminate knowledge about the benefits of the new processes given the highly innovative nature of ENVIROMED technologies.
- Provide targeted and customised content for the different actors in the manufacturing value chain.
- Provide all stakeholders and potential users with a solid overview of the solutions and their benefits.

In order to create the content of the ENVIROMED training platform in line with the above-mentioned objectives, it was first important to define the training needs of the target audience. For this reason, the following actions took place:

1. Guidelines and Questionnaire Distribution

All partners were provided with guidelines and a questionnaire to help:

- Clarify the objectives of the training platform.
- Identify the various profiles of the target audience.
- Define the content required for the training.

2. Workshops

In order to make use of the expertise and material of the expert partners, two workshops were held, on October 16, 2024 and November 6, 2024, in which all partners participated in two groups. These workshops led to the following decisions and outcomes:

- The training material each relevant partner would provide, the target audience, and the media formats to be used (e.g., text, video, or images).
- A time plan, specific actions, and the prioritisation of content delivery.

Table 2: Training material list

Partners	Short description of training content	Main target audience	Expected media
TUW	A short video (5-10 min) explaining the technology behind the liquid analyser (LMA). Provided content will be related to ‘sensor for inline liquid spectroscopy’ and the activities in T4.3/T4.5.	Researchers, industry experts	Video, text
TUW	<ul style="list-style-type: none"> • Hands-on video of setting up a fermentation in lab-scale bioreactor • Actuators and sensors involved in fermentation technology and their proper use • Sample preparation and analytics 	Society, people with interest in (bio)pharmaceutical engineering	Text, video, picture
PLEGMA	Video introducing the solution of Task 3.5 and/or lab results from TUW installation, utilising the energy sensors and the algorithms developed.	Pharmaceutical and industrial facilities in general	Text
CNR	Protocol for: <ul style="list-style-type: none"> • Haemolymph collection from mussels, sea urchin and tunicates; • Vital staining of haemocytes lysosomes; • Staining of fixed haemocytes for checking cell types and nuclear abnormalities. 	Students, Marine Researchers	PPT, text
CLOUD	Material related to the in-silico tools developed for the assessment of the bioaccumulative and ecotoxic potential of chemical compounds.	Environmental scientists, academic researchers, pharmaceutical companies	Text, pictures
ALPES	<ul style="list-style-type: none"> • Demonstration video of the laser source operation • Demonstration of the UI • Demonstration integration potential to analysers Other possibilities: <ul style="list-style-type: none"> • Benefits of using laser sources for mid-IR spectroscopy (comparison to thermal sources) 	Integrators (laser-based equipment manufacturers) Researchers	5 min video Manual with photos

Partners	Short description of training content	Main target audience	Expected media
RECENDT	<ul style="list-style-type: none"> • Demonstration video of the sensor operation • Demonstration of the graphical user interface (spectra, indicator of the detection) • Operational manual for the SIA 	Scientists, academic researchers, pharmaceutical companies	Video, user manual, text, pictures
CYRIC/UULM	Demonstration and guidance of usage of the different subsystems of the Wastewater Analyser (WSA), i.e. a) a multistage filtration, b) a sample delivery subsystem SDS (that is a custom Solid Phase Extraction SPE module) and c) the spectroscopic optical system.	Researchers	User manuals, pictures of the different subsystems
UULM	Principles of molecular imprinting in MIPs for targeted extraction, the operational aspects of solid-phase extraction, and the fundamentals of spectroscopic sensor-based quantification.	Researchers, students	Text

As shown in Table 2, the target audience consists of scientists, researchers, students, experts from the pharmaceutical industry and society, as well as people with an interest in (bio)pharmaceutical technology. The content provided by the partners is in most cases easy to understand for young scientists and students. The use of multimedia (video, text, interactive content) and the nature of the quizzes cater for different learning styles and levels of experience, including those of younger or less experienced engineers and scientists. The training content is reviewed to ensure gender-neutral and inclusive language. The photos and videos used also reflect gender diversity. In future updates, efforts will be made to promote the presence of female scientists and engineers involved in the project and creating the content. Dissemination activities to promote the ENVIROMED training platform will also focus on the target group of female and young engineers and scientists.

The ENVIROMED training platform will continue to operate for at least 3 years after the end of the project. MITERA will be responsible for the efficient operation, maintenance, and accessibility of the platform to enable new users to access the training content.

The technical aspects, organisational layout, and features of the training platform are outlined in the subsequent sections.

2.1 Technical Infrastructure

The training platform is hosted on a high-performance server leased by partner MITERA. It has guaranteed uptime and fast loading speeds to provide users with a seamless browsing experience. To ensure data security and privacy, the platform is protected with SSL encryption to prevent unauthorised access and protect against cyber threats. The latest version of server software is installed, and the server is kept up to date.

The platform is fully compliant with the latest WCAG standards. It is also optimised for desktop and mobile devices, and multiple screen sizes are used to guarantee the legibility of content. Finally, it features user-friendly design and navigation to ensure that all users can easily access and use the platform regardless of their abilities.

The ENVIROMED training platform has been designed using an open-source Learning Management System (LMS) called Moodle. Moodle stands for Modular Object-Oriented Dynamic Learning Environment, which facilitates online learning and course management. It has become a widely used platform in educational institutions, businesses, and other organisations seeking a robust and flexible solution for online learning and training.

Its key features are the following:

- **User-Friendly Interface:** Moodle provides an intuitive and user-friendly interface that makes it easy for both educators and learners to navigate through courses, resources, and activities.
- **Course Management:** Educators can easily create and manage courses, including organising content, assignments, quizzes, and other learning materials. The system supports various file types, multimedia content, and external resources.
- **Assessment and Grading:** The platform offers a range of assessment options, including quizzes, assignments, and surveys. Educators can set up grading scales, provide feedback, and track student progress, enhancing the assessment and evaluation process.
- **Multimedia Integration:** Moodle allows the integration of multimedia elements, such as videos, audio files, and interactive simulations, to enhance the learning experience and cater to different learning styles.
- **Customization and Flexibility:** Moodle is highly customisable, allowing institutions to tailor the platform to their specific requirements. Themes, plugins, and modules can be added or modified to meet the unique needs of educators and learners.
- **Secure and Scalable:** Moodle is designed with security in mind, offering features like secure authentication, data encryption, and role-based access control. It is also scalable, making it suitable for small educational institutions as well as large organisations with extensive user bases.
- **GDPR alignment:** Moodle LMS (and as a result the platform) is aligned with the General Data Protection Regulation (GDPR), which came into effect in May 2018. GDPR is a comprehensive data protection regulation in the European Union (EU) that aims to strengthen the protection of individuals' personal data and privacy.
- **The ENVIROMED training platform incorporates analytics** so the coordinator and partners of the project can view useful statistics about usage, completion rates and quizzes performance.

Based on the analysis and mapping of the functions of the Moodle LMS to the requirements of the project, the design for the adaptation of the functionalities of the LMS was developed.

2.2 Platform Layout

The ENVIROMED training platform is built with simple, friendly and page layouts focusing on providing a solid overview of the solutions and their benefits. Overall, the layout comprises the following sections:

1. Login
2. Course Selection
3. ENVIROMED course layout breakdown
4. Footer

2.2.1 Login

The login page of the ENVIROMED training platform presents a clean and minimalistic design, ensuring user-friendly access (Figure 1). At the center of the page the ENVIROMED logo is displayed, followed by input fields for username and password. Below these fields, users can click "Log in" to access their accounts or use the "Forgotten your username or password?" link if needed. New users are prompted to "Create new account" via a clearly visible button. A notification at the bottom informs users that account creation is required for full access. The interface also includes a language selection option and cookies notice in the bottom-right corner.

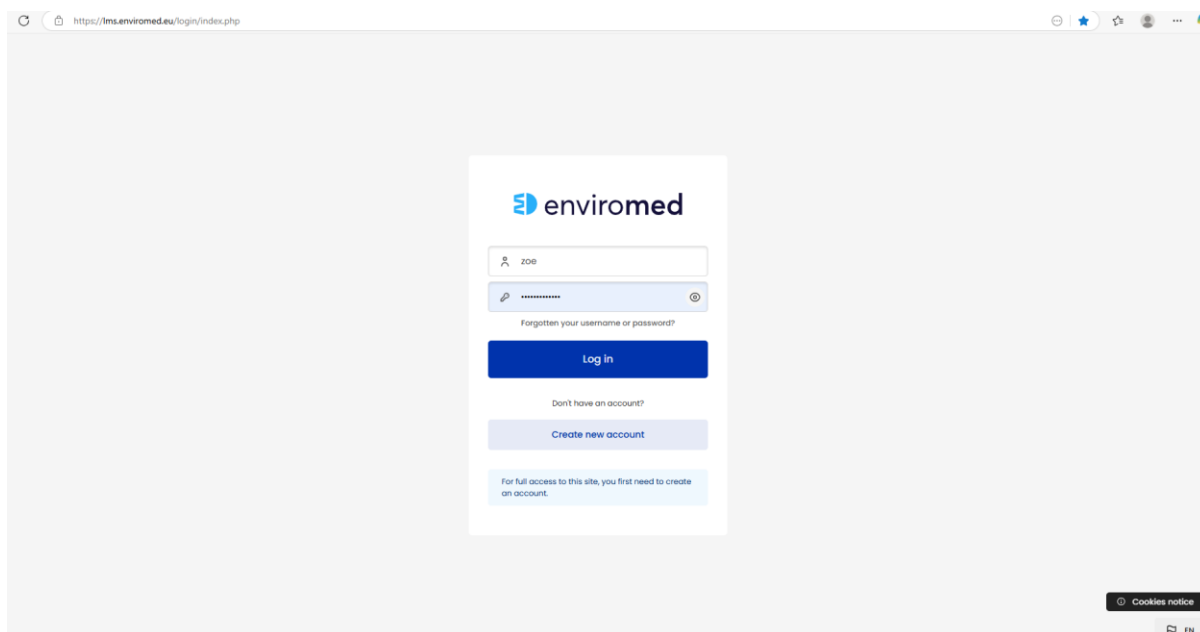


Figure 1: Login page

2.2.2 Course Selection

This screen serves as the gateway to enter the main ENVIROMED course (Figure 2). It is clear, simple, and designed to:

- Help users quickly find and access the course.

- Provide filtering tools for managing enrolled and available courses.
- Offer a clear and intuitive entry point to training content.

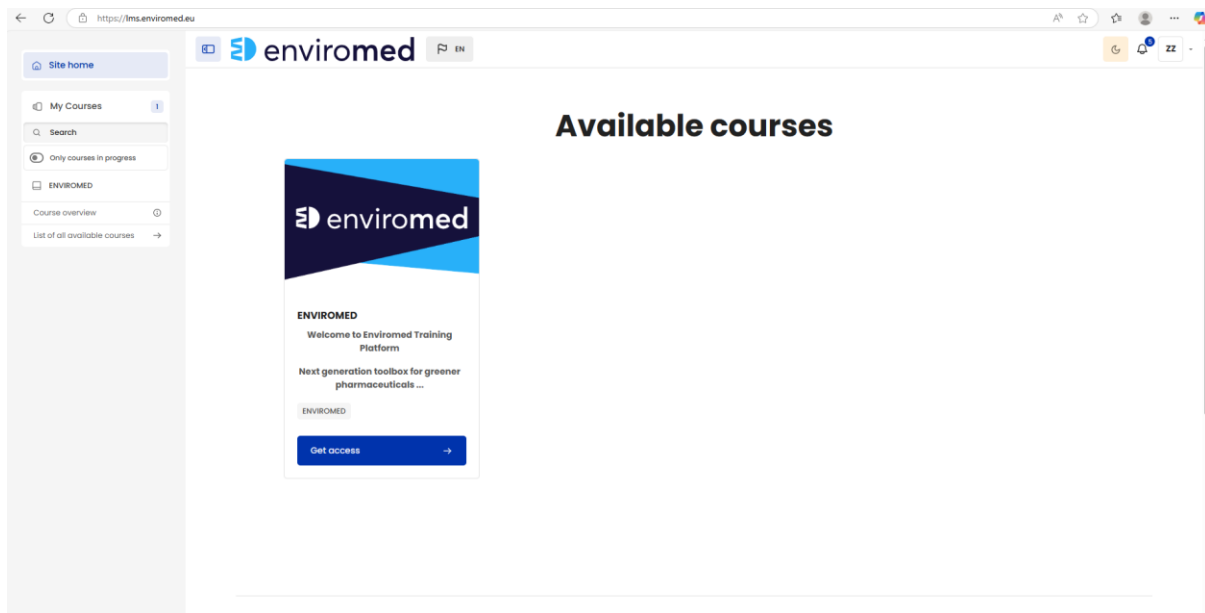


Figure 2: Course selection

2.2.2.1 Left Sidebar Navigation

This is the main control panel for navigating the learning platform. Currently the platform offers only the ENVIROMED course:

- **Site home:** Returns to the main homepage showing all course offerings.
- **My Courses:** A shortcut of the courses the user is currently enrolled in.
- **Search:** Allows to find specific courses by keywords.
- **Only courses in progress:** Filters the course list so that only the courses that the user has started are displayed.
- **ENVIROMED:** Directs to the ENVIROMED course content.
 - **Course overview (sub-option):** Provides a high-level summary of the course structure, goals, and units.
- **List of all available courses:** Currently no other courses are available

2.2.2.2 Main Content Area (Center of the Page)

Heading: "Available courses": The page displays the course available for access, namely "ENVIROMED", and a blue button labeled "Get access", allowing users to enter the course.

Other Notable UI Elements

- **Language Toggle (EN)** at the top, allowing users to switch language. It should be noted that the platform and its content are currently available only in English, however multiple languages could be supported.
- **User Profile Icon** on the top-right corner for accessing account settings or logging out.
- **Website URL** visible in the browser: <https://lms.enviromed.eu> — this confirms the platform is web-based and accessible through standard browsers.

2.2.3 ENVIROMED course layout breakdown

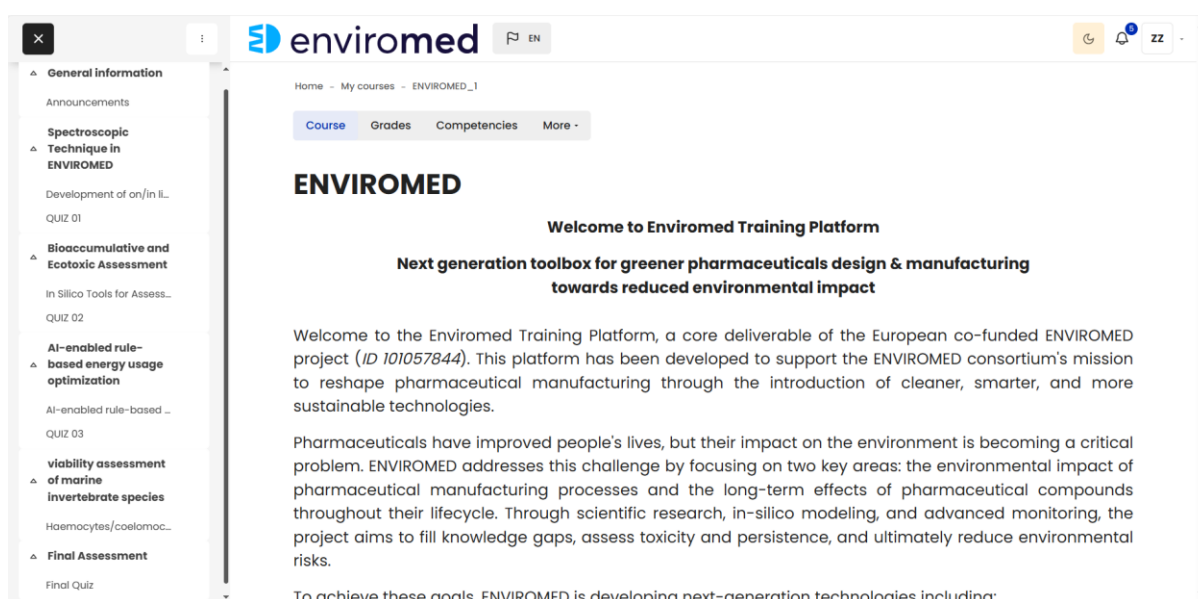


Figure 3: ENVIROMED course

2.2.3.1 Sidebar Menu (Left Panel)

This panel helps the user navigate the different training units and assessments:

- **General Information:** Includes future announcements mainly on the updates of the platform.
- **Training Units:** The titles of the currently available units are as follows:
 - Spectroscopic Technique in ENVIROMED
 - Bioaccumulative and Ecotoxic Assessment
 - AI-enabled Rule-based Energy Usage Optimisation
 - Viability Assessment of Marine Invertebrate Species

- **Quizzes:** Each unit contains a quiz to evaluate the understanding (Quiz 01, Quiz 02, etc.).
- **Final Assessment:** There is also a Final Quiz with questions covering all the training units.

2.2.3.2 *Top Navigation Bar (Top)*

This navigation bar contains options such as:

- **Course** – Overview of the current course.
- **Grades** – View quiz scores and progress.
- **Competencies** – Skill achievements and completed learning outcomes.
- **More** – Unenrollment from the course.

2.2.3.3 Main Training Content Area (Center)

The main training content area displays the learning content, starting with an introduction and the training objectives, followed by the actual training content and concluding with a quiz.

Depending on the type of training content that the partners have provided, different features of the platform were used, such as accordion sections for collapsible text, embedded videos for visual demonstrations, interactive quizzes for knowledge assessment, and hyperlinks to external references and citations, ensuring a flexible and engaging learning experience tailored to various user needs.

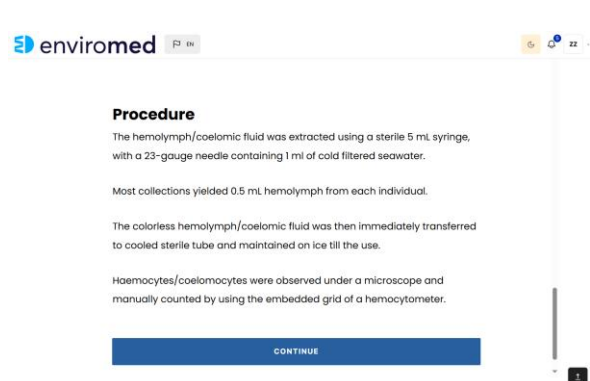
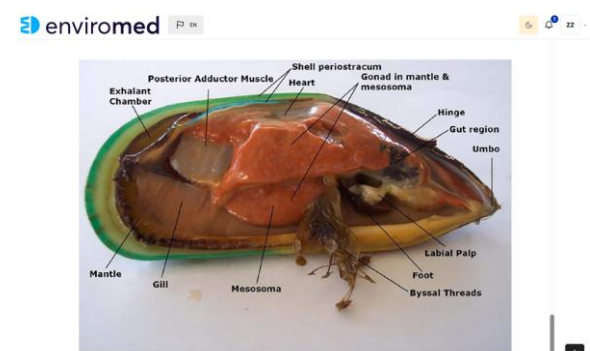
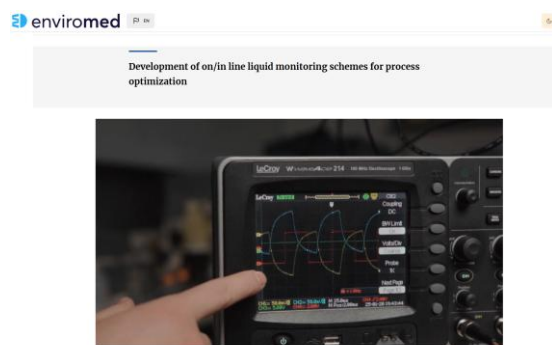
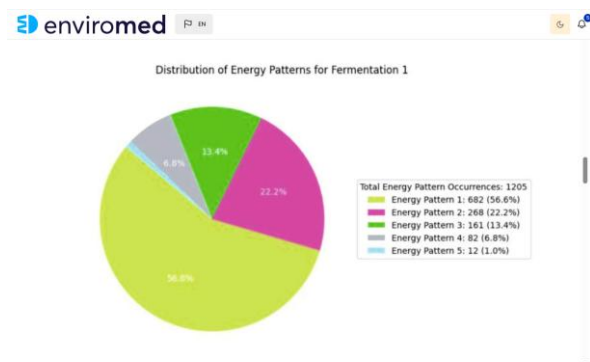
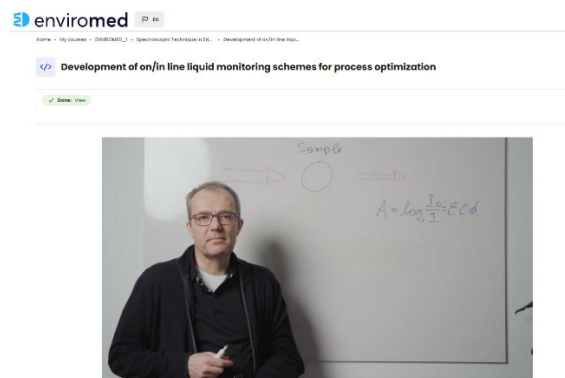


Figure 4: Training content

2.2.3.4 Quizzes & Final Quiz

Each training session is followed by a Quiz with self-assessment questions that are scored to reinforce and self-assess knowledge and correct misconceptions.

The platform supports different types of quizzes such as:

- Multiple Choice
- Fill in the blank
- Matching

At the end of the course, there is a Final Quiz for comprehensive evaluation, designed to assess the user's overall understanding of all training units. The ENVIROMED training platform allows the user to repeat the quizzes multiple times to consolidate knowledge and ensure key concepts are retained.

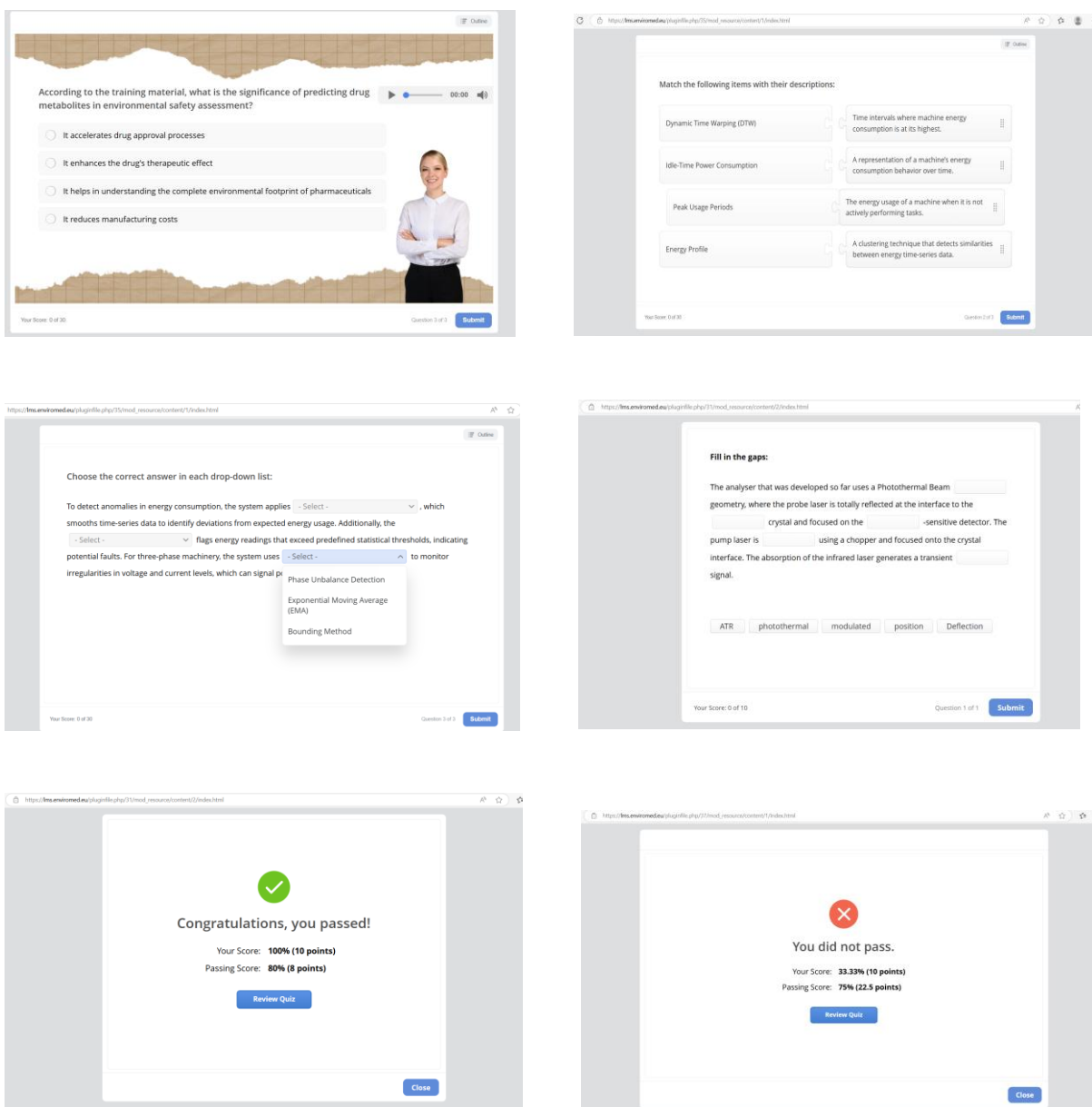


Figure 5: Quizzes

2.2.4 Footer

The footer is structured to provide key navigation links, organisational information, contact details, and legal disclaimers, making it an informative and functional end section of the platform (Figure 6). It appears on every page of the platform and is divided into several columns and sections:

- **ENVIROMED Website:** A list of quick links related to the ENVIROMED website pages like Home, About, Consortium, Collaborations, News, Contact, Resources, Deliverables & Publications, Communication Material and Media.
- **Project Coordinator:** The organisation coordinating the ENVIROMED project.
- **The EU flag and text: "Funded by the European Union"**, highlighting that the project is EU-supported.
- **EU Funding Acknowledgement**
- **Contact details**
- **Links to:** Contact site support and Data retention summary
- **Copyright**

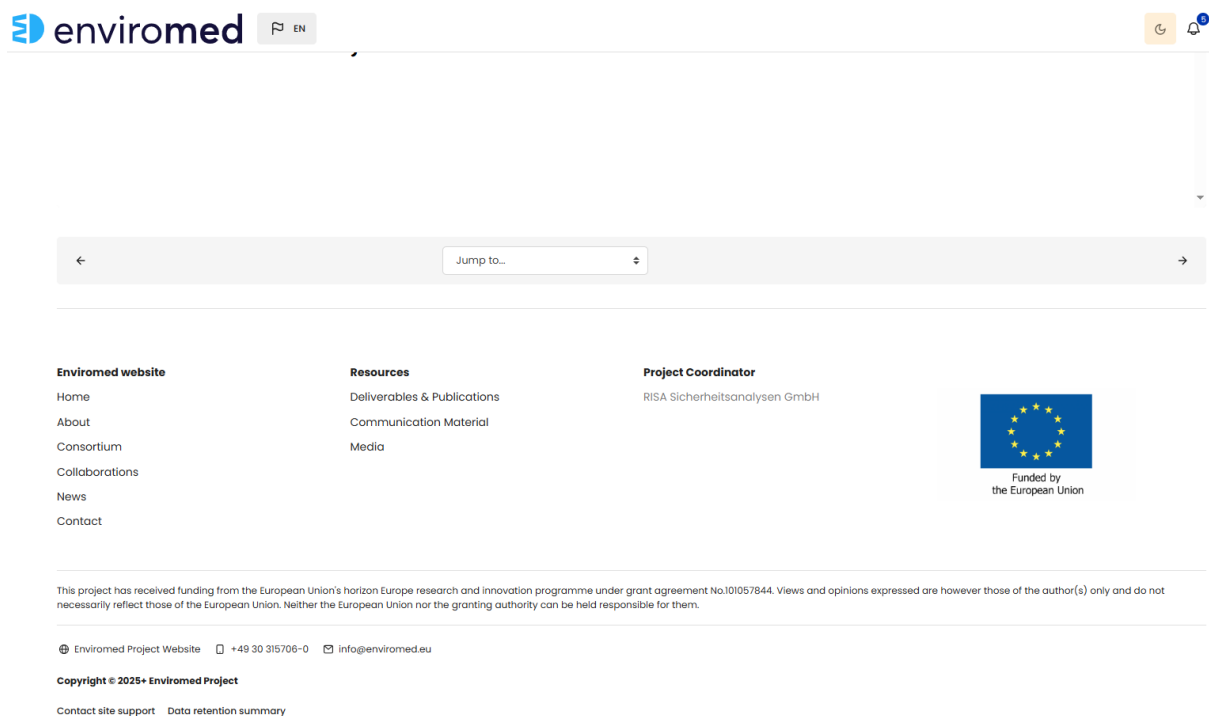


Figure 6: Footer

3 Conclusions

This report has provided a detailed presentation of the ENVIROMED training platform, showcasing its technical foundation, structure, content organisation, and user interface. Built using the Moodle Learning Management System, the platform is designed to offer a user-friendly and accessible environment. The development process involved extensive collaboration with project partners, including identifying training needs, content planning, and design customisation. Various training units, multimedia resources and assessment tools have been integrated to support an engaging and effective learning experience.

Looking ahead, the ENVIROMED training platform is envisioned as a dynamic resource that will continue to evolve throughout the project's duration. By centralising educational content in a digital format, the platform is expected to play a key role in facilitating the adoption of the innovative and sustainable technologies developed under the ENVIROMED project, while supporting the broader goals of knowledge sharing and reducing environmental impact.