

# LABPLAS

## Land-Based Solutions for Plastics in the Sea

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D8.3 Action-oriented online course on SMNP in the environment and the governance of plastics

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Nº	Participant name	Acronym	Country	Type
1	UNIVERSIDADE DE VIGO	UVI	SPAIN	HES
2	UNIVERSIDADE DA CORUÑA	UDC	SPAIN	HES
3	Bundesanstalt fuer Gewaesserkunde	BfG	GERMANY	RTO
4	LABORATORIO IBERICO INTERNACIONAL DE NANOTECNOLOGIA	INL	PORTUGAL	RTO
5	KATHOLIEKE UNIVERSITEIT LEUVEN	KUL	BELGIUM	HES
6	HELMHOLTZ ZENTRUM FUR OZEANFORSCHUNG KIEL	GEOMAR	GERMANY	RTO
7	NATIONAL OCEANOGRAPHY CENTRE	NOC	UNITED KINGDOM	RTO
8	SORBONNE UNIVERSITE	SU	FRANCE	HES
9	OPEN UNIVERSITEIT NEDERLAND	OUNL	NETHERLANDS	HES
10	LEIBNIZ INSTITUTE FOR BALTIC SEA RESEARCH	IOW	GERMANY	RTO
11	ASSOCIACAO PARA O DESENVOLVIMENTO DO ATLANTIC INTERNATIONAL RESEARCH CENTRE	AC	PORTUGAL	RTO
12	UNIVERSIDADE FEDERAL DO SAO PAULO	UNIFESP	BRAZIL	HES
13	BASF SE	BASF	GERMANY	LE
14	TG ENVIRONMENTAL RESEARCH	ER	UNITED KINGDOM	SME
15	CONTACTICA S.L.	CTA	SPAIN	SME
16	STICHTING EGI	EGI	NETHERLANDS	Non-P
17	STICHTING RADBOUD UNIVERSITEIT	RU	NETHERLANDS	HES
18	UNIVERSIDADE FEDERAL DO PARÁ	UFPA	BRAZIL	HES



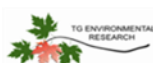


















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## DELIVERABLE DETAILS

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<b>Executive summary:</b>	This report describes the development and the first trial run of the 'Action-oriented course on micro- and nanoplastics'. The course was created with the help of stakeholders whose work involves micro- and nanoplastics issues, who were contacted about the desirability, scope and content of such a course. The actual content emerged from the various work packages of the LABPLAS project and therefore provides insight into the results of this project. The course covers sampling, analysis, (eco)toxicity, modelling and mitigation of micro- and nanoplastics in the (aquatic) environment. The course is in English and free for anyone interested in the subject and forms part of the Open University's course offering.

Version	Date	Comments
1		First draft, reviewed by Prof dr A Ragas, leader of WP8
2	26-03-2025	Final version

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## TABLE OF CONTENTS

PROJECT INFORMATION .....	1
DELIVERABLE DETAILS .....	2
TABLE OF CONTENTS .....	3
LIST OF FIGURES AND TABLES .....	4
ABBREVIATIONS AND ACRONYMS .....	5
PREFACE .....	6
1. Introduction .....	7
2. Stakeholder participation .....	7
2.1. Stakeholder inventory .....	7
2.2. Online survey to indentify the stakeholders' training needs .....	8
2.3. Stakeholder workshop to identify training needs .....	9
3. Course design .....	9
3.1. Target audience of the course .....	10
3.2. Learning goals of the course .....	10
3.3. Learning environment (publication platform) .....	10
4. Course content .....	11
4.1. Short outline of the learning units .....	12
4.2. Examples of the course content .....	16
5. First run of the course .....	18
5.1. Online survey on the stakeholders' findings using the course .....	19
5.2. Future outlook .....	19
6. Conclusion .....	19
 APPENDICES	

## LIST OF FIGURES AND TABLES

Figure 1 The homepage of the action-oriented course on micro- and nanoplastics in the environment .....	9
Figure 2 The Welcome page of the action-oriented course.....	16
Figure 3 Example of the course content (LU1) .....	17
Figure 4 Example of the course content – expert video (LU6).....	17
Figure 5 Example of an assignment: Sampling on the North Sea (LU2) .....	18
Figure 6 Example of an assignment: Modelling of MNPs in the Scheldt estuary (LU5).....	18
Table 1 Overview of the learning units of the action-oriented course.....	11

## ABBREVIATIONS AND ACRONYMS

Abbreviation / Acronym	Description
<b>MNPs</b>	Micro- and nanoplastics
<b>SMNPs</b>	Small micro- and nanoplastics
<b>WWTP</b>	Wastewater treatment plant
<b>LU</b>	Learning unit

## PREFACE

This report describes the development of the action-oriented course on micro- and nanoplastics, reflecting the different work packages of the LABPLAS project, and makes these accessible to various stakeholders whose work is directly or indirectly related to the issue of micro- and nanoplastics in the environment.

This deliverable is the result of Task 8.2 of the LABPLAS project, Action-oriented knowledge transfer to policymakers and other relevant stakeholders (Subtask 8.2.1: Action-oriented course on SMNP in the environment and the governance of plastics). We aimed to develop a course that is relevant and interesting to different stakeholders and we therefore involved these stakeholders in the development of the course.

To identify the stakeholders' training needs, we started with a stakeholder inventory and sent all identified stakeholders an online survey about the desired content of the course. We organised a workshop with the stakeholders who filled in the survey to learn more about their needs. We then selected the content for the course and structured it into learning units.

Finally, we asked the LABPLAS members to write content for the different learning units. We held a little workshop during the GAM in Ludwigshafen to collect ideas for action-oriented content. We received nice contributions from everyone. With these, we were able to fill the different learning units. The result is an informative course, which does justice to the results of the work packages.

We want to thank the LABPLAS members for all their efforts; without all your contributions, the course would never have turned out so well!

Sya Hoeke and Jikke van Wijnen

## 1 INTRODUCTION

One of today's urgent environmental issues is the pollution of oceans, lakes and rivers with small micro- and nanoplastics particles (SMNPs) and their adverse effects on human health and ecosystems. The LABPLAS project aims to provide the knowledge needed to fight plastic pollution on solid scientific grounds. In the various work packages of the project, different aspects of SMNP pollution are studied, e.g., sampling, analysis, (eco)toxicology, modelling and mitigation options.

Knowledge about SMNPs, their behaviour in the environment and potential mitigation options is also relevant for stakeholders involved in plastic governance such as regional, national and EU policymakers, plastics producers, branch organizations, water managers, recyclers, waste managers and NGOs. It is important to share the results of the work packages of the LABPLAS project with these stakeholders to support them in managing plastics adequately.

To this end, we developed an online action-oriented course, taking into account the training needs of the different stakeholders. The course offers them training aimed at understanding the processes that determine the emission and behaviour of SMNPs in the environment, that they can use to plan mitigation measures.

In this report, we describe the steps that led to the development of the action-oriented course on SMNPs in the environment. First, we made an inventory of the relevant stakeholders and their training needs. Then, taking into account these wishes, we structured the course and defined the course content. Next, we implemented the course contributions of the LABPLAS members and added action-oriented components. Finally, we activated the course on the OU course platform.

## 2 STAKEHOLDER PARTICIPATION

To develop a course that meets the training wishes of the stakeholders, we performed a stakeholder inventory and sent the selected stakeholders a survey on their training needs. In this survey, we suggested some topics that could suit an action-oriented course, leaving a lot of space for individual suggestions. We also asked respondents to further discuss the course content and the course set-up by participating in an online workshop on this topic.

### 2.1 Stakeholder inventory

To identify stakeholders that are directly or indirectly involved in SMNP issues, we first identified a number of stakeholder clusters: research institutes (e.g. universities and environmental research institutes), government agencies (e.g. water authorities and boards of municipalities/provinces), industries (e.g. of car tyres, clothing, coatings and macroplastics) and environmental organizations. Then we selected over a hundred stakeholders from these groups to whom we sent an online survey (see below) on SMNP-related training needs via email. For social media (e.g., LinkedIn), we wrote a post to which interested parties could respond to participate in the survey.



## 2.2 Online survey to identify stakeholders' training needs.

### Design of the survey

An online survey (see Appendix A) was developed to ask the stakeholders about their training needs. In this survey, we suggested some topics that could suit an action-oriented course, but also left abundant opportunity for individual suggestions of the stakeholders.

The survey includes three clusters of questions: starting with some general questions, e.g., the sector in which the stakeholders work and how microplastics are related to this sector/their work. Then a cluster about the topics they would like to see covered in an action-oriented course. Finally, a cluster about some of the organizational issues of the course, such as the desired number of hours to finish the course and what additional features would be desirable.

'LimeSurvey' was used to conduct the survey. The survey was approved by the Open University Research Ethics Committee (cETO).

### Results of the survey

We widely distributed the survey to potential stakeholders (via direct emails (about a hundred) to stakeholders in our network and via LinkedIn). We encouraged stakeholders to distribute the survey further.

A group of 49 people completed the survey. Respondents represented many different sectors, but the majority came from research institutions and government organizations. Industry responses were limited to those from the tyre industry. The majority of respondents indicated that their work is indirectly related to microplastics, i.e., because their work deals with the effects of plastics or additives to plastics, because they have to comply with regulations around (micro)plastics, or because they do research on microplastics.

Issues indicated as important to take action on show a wide range of interests, mainly focusing on the effects, analysis methods and possible interventions and tools to implement interventions (the responses are listed in Appendix A).

The survey mentioned a number of topics that could be included in the course, and all received a significant number of responses; no specific preference by sector could be identified. This indicates that the respondents considered all topics relevant to include in the course, including an introduction to what microplastics are. Analysis and detection methods are mentioned by several respondents as the most important topic.

Additional topics mentioned by respondents are:

- Legislation around microplastics (current in place and those coming soon);
- Standards and reference material;
- Identification of current knowledge gaps;
- The contribution of microplastic to the overall environmental impact of products;
- Long-term impacts of microplastics;
- The role of industry in reducing microplastic contamination.

Respondents indicated 1-8 hours as the ideal time investment for the course, with a preference for half a day. Most respondents indicated that they would like to take the course at least partly in a group setting. A mixed setting with a plenary moment, such as in the form of an interactive workshop, was therefore recommended. The survey showed interest in a discussion or forum feature and links or resources for additional information in the course.

## 2.3 Stakeholder workshop to identify training needs

On August 30, 2024, we organised an online workshop with the stakeholders who indicated in the survey that they would like to participate in a discussion about the content of the action-oriented course. This workshop aimed to present the results of the survey to the stakeholders and to get more suggestions for the content of the course.

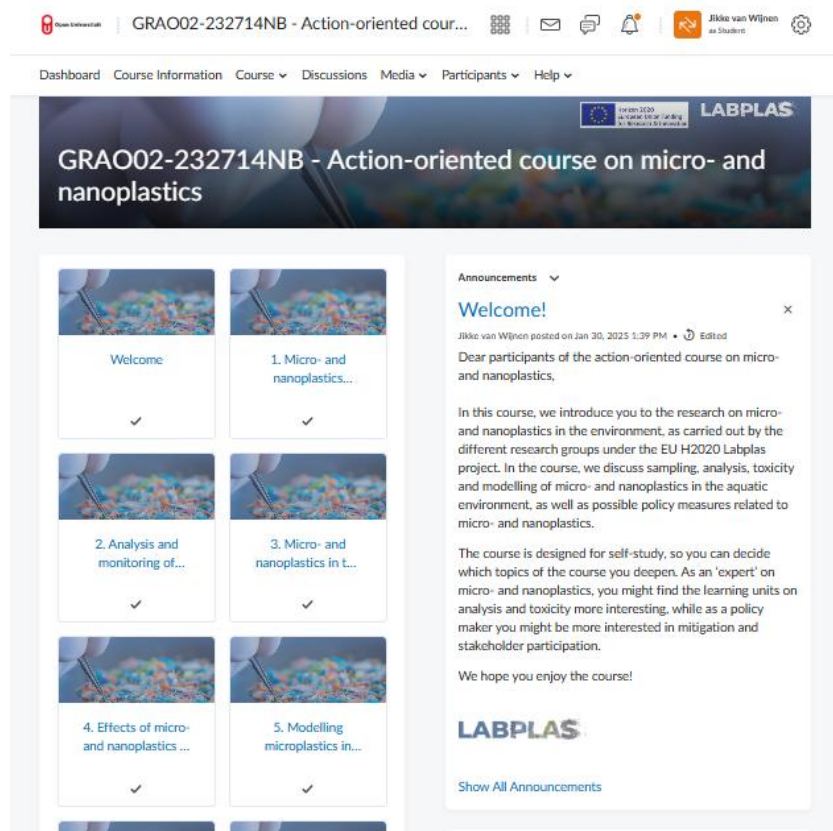
Sixteen participants, with different backgrounds and nationalities, attended the workshop. In the workshop, they commented on the content and design of the course as we put it together based on the survey results.

The appropriateness of the content of the course as designed based on the answers given in the survey, was confirmed by the workshop participants. The participants preferred a relatively short course, in which both general and more specific topics concerning micro- and nanoplastics pollution are discussed. In addition, they would like to have an opportunity to get in touch with other stakeholders via the course.

A more extensive report of the workshop can be found in Appendix B.

## 3 COURSE DESIGN

The 'Action-oriented course on micro- and nanoplastics in the environment' is implemented in the course environment of the Open University. This environment determined the look and feel of the course. Figure 1 gives an overview of the course structure, as visible to participants.



**Figure 1:** The course homepage of the 'Action-oriented course on micro- and nanoplastics in the environment' on the Open University course environment.

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The course has a number of tabs, including the ‘Course information’, ‘Course’ and ‘Discussion’ tabs. The actual course content is available on the ‘Course’ tab (and via the tiles on the homepage). General information about the course is separately given on the ‘Course information’ tab, providing information about the organisation of the course, the learning goals and the LABPLAS consortium. The ‘Discussion’ tab leads to the discussion forum where participants can ask questions, discuss topics and connect with each other.

### 3.1 Target audience of the course

The course is developed to support a diverse group of stakeholders involved in plastics governance (e.g., policymakers, branch organizations, water managers, waste managers, plastic producers, and NGOs). These stakeholders have different backgrounds, which was taken into account when developing the course by designating some paragraphs in the course as ‘more for experts’. This allows participants to choose which parts they want to study more intensively or less intensively.

### 3.2 Learning goals of the course

We formulated general learning goals for the course and more detailed learning goals for each learning unit. On the ‘Course information’ tab the general learning goals are formulated as follows:

*After finishing this course the participant of the course is able to:*

- *Discuss the different types of micro- and nanoplastics and the properties of these particles*
- *Understand the sources of micro- and nanoplastics and indicate their share in the total emission*
- *Discuss and explain the environmental pathways of micro- and nanoplastics*
- *Review the (adverse) effects of micro- and nanoplastics in the environment*
- *Indicate methods for monitoring and analysing micro- and nanoplastics*
- *Propose mitigation measures for micro- and nanoplastics pollution (for individuals or industries)*
- *Discuss the importance of stakeholder participation*

Each learning unit starts with the specific learning goals for that learning unit. In the short descriptions of the learning units (paragraph 4.1), the detailed learning goals for each learning unit are provided.

### 3.3 Learning environment (publication platform)

Finding a suitable platform to publish the course turned out to be rather difficult: At the start of the project, it was easy to realise the course was within the electronic learning environment of the Open University at the time (yOUlearn). Unfortunately, this changed when the Open University changed the learning environment to Brightspace, in which this was no longer possible. The search for another platform began, but it wasn’t easy to find an online platform that met the requirements. Most (commercial) platforms are not free and perform extensive checks on the content and authors of the course. Eventually, the Open University agreed to implement the course in the new learning environment (Brightspace), which was made possible with additional help from the technical staff.

The course is designed to make the knowledge gained in the LABPLAS project accessible to stakeholders. Therefore, registration for the course is free of charge and without any obligation. The Open University electronic learning environment (Brightspace) meets these wishes and makes it possible to create a clearly

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structured, English-language course in which videos can easily be incorporated. Interested parties can register for the course via the Open University website (see Appendix C); registration is free and without obligation.

## 4 COURSE CONTENT

The course consists of a number of learning units on different topics. Each learning unit contains the same elements: an introduction to the learning unit, the learning objectives, the course text, one (or more) expert videos and a number of assignments (with feedback). We aimed to include at least one ‘activating assignment’ in each learning unit, which the participants can actively work on. These activating assignments are added to better understand the content or apply a topic to the participants’ individual situations. The course includes a lot of visual material. Much of this material was created by the LABPLAS consortium themselves. In addition, material was used from iStock and from science articles to which a reference has been added.

The course starts with a welcome and a brief introduction to the LABPLAS project. This is followed by an introductory learning unit, in which the problem of SMNPs is introduced. Subsequent learning units cover the various topics investigated by the LABPLAS consortium. The researchers of the different work packages of the LABPLAS project provided the content of these learning units (Table 1).

**Table 1** Action-oriented course, overview of the learning units (LUs).

	Topic	LABPLAS project work package
	Welcome	
<b>LU1</b>	Micro- and nanoplastics pollution	
<b>LU2</b>	Analysis and monitoring of micro- and nanoplastics	WP2, WP3, WP4
<b>LU3</b>	Micro- and nanoplastics in the (aquatic) environment	WP4, WP7
<b>LU4</b>	Effects of micro- and nanoplastics in the environment	WP6
<b>LU5</b>	Modelling of micro- and nanoplastics in the (aquatic) environment	WP7
<b>LU6</b>	Mitigation of microplastic pollution	WP8, WP5
<b>LU7</b>	Policies and governing microplastic pollution	WP8
<b>LU8</b>	Turning knowledge into action	

## 4.1 Short outline of the learning units

In this section, the content, the learning goals and the authors that contributed to the content of the learning units are summarised.

### 4.1.1 LU1 – Micro- and nanoplastics

#### Summary of the contents

In this first learning unit, micro- and nanoplastics are defined (size, shape and composition) and sources of micro- and nanoplastics are mentioned. The case of tyre wear particles, which function as a running case throughout the course, is introduced.

Finally, participants are invited to calculate their own emissions of microplastics, i.e., tyre wear and laundry fibres, using the ‘Personal Microplastic Calculator’. This allows them to understand their own share of microplastics emissions in the environment.

#### Learning goals LU1

*After completing this learning unit, the participant will be able to:*

- Give a definition of micro- and nanoplastics based on particle size
- Give examples of different types of micro- and nanoplastics (e.g., fibres, tyre wear) in relation to their source
- Roughly indicate the share of the various micro- and nanoplastics in total MNPs emissions
- Formulate the difference between primary and secondary micro- and nanoplastics

#### Contributors to LU1

LU1 was created with contributions from the Open University and Radboud University; The Personal Microplastic Calculator was developed by Y. Sun, from the Radboud University

### 4.1.2 LU2 - Analysis and monitoring of micro- and nanoplastics

#### Summary of the contents

This learning unit provides an in-depth exploration of sampling techniques used to collect micro- and nanoplastics from various environments. Limitations of these techniques and the use of satellite imagery and machine learning to monitor and analyze (micro)plastic pollution in marine environments are discussed too. Finally, the analytical methods for identifying and quantifying micro- and nanoplastics and the challenges faced in these processes are explored.

This learning unit includes a guided demonstration of the Pos2idon tool to help participants understand how the theoretical knowledge in this learning unit can be applied in a practical context.

#### Learning goals LU2

*After completing this learning unit, the participant will be able to:*

- Give examples of sampling techniques and discuss sampling limitations
- Understand how the analysis of micro- and nanoplastics is done
- Indicate problems that may arise when analysing micro- and nanoplastics
- Understand the fundamental concepts of remote sensing and earth observation and their potential and limitations to monitor (micro)plastic pollution in the marine environment
- Understand how machine learning can be used to detect (micro)plastic pollution in marine environments



### Contributors to LU2

LU2 was developed using contributions of the Federal Institute for Hydrology (BfG), Atlantic International Research Center (AIRC), Iberian Nanotechnology Laboratory (INL) and University of A Coruña (UDC). The videos were developed or made available by Laura Rodriguez-Lorenzo (Monitoring and sampling techniques for nanoplastics and The potential of Lab-on-a-Chip (LOC) technology to monitor small micro- and nanoplastics), Emanuel Castanho, Andrea Giusti and Natalia Ospina-Alvarez (Introduction video) and Emanuel Castanho, Andrea Giusti and Natalia Ospina-Alvarez (Lecture on satellite detection of plastic pollution, including the guided demonstration of the Pos2idon tool).

## 4.1.3 LU3 – Micro- and nanoplastics in the (aquatic) environment

### Summary of the contents

Learning unit 3 builds on the knowledge from LU1, which introduced you to the nature of micro- and nanoplastics (MNPs) and the main sources of MNPs in the environment. Upon release from the source, MNPs can take various paths before reaching the (aquatic) environment, including runoff by rainwater, wind transportation, or transport through the sewer system and wastewater treatment plant (WWTP), before being released into surface water. Once in the environment, microplastics can undergo processes such as aggregation into larger particles, fragmentation, and further transportation. These processes determine the ultimate fate of MNPs in the environment. This learning unit explains how MNPs enter the environment after release at the source and discusses the relevant fate processes of MNPs in the environment, focusing on the aquatic environment.

### Learning goals LU3

*After completing this learning unit, the participant will be able to:*

- *List the main terrestrial sources of (micro- and nano)plastics and a few aquatic sources*
- *Identify the main pathways of micro- and nanoplastics to the (aquatic) environment*
- *Summarise the main processes affecting the fate of microplastics in the aquatic environment.*

### Contributors to LU3

LU3 was developed using the contributions of the Radboud University and the Open University.

## 4.1.4 LU4 – effects of micro- and nanoplastics in the environment

### Summary of the contents

Plastic objects are composed of one or more synthetic polymers and a series of chemicals called additives. These additives are added to provide the items with the functional properties they need to be useful, such as flexibility, mechanical strength, resistance to light and temperature, low flammability or colour. These chemicals easily leach into the surrounding media since they are weakly bonded to the polymeric matrix. All plastic items carry several of these chemicals, with amounts ranging from a few units to tenths in weight percentage. Plasticizers are the most abundant chemical additives. Some of them are suspected to be endocrine disruptors, meaning

they may act as hormones or interfere with their metabolism. Disclosing the chemical composition of plastic items, particularly those approved for food contact, is a must to allow consumers to make informed decisions and protect human health. In this learning unit, you will learn more about additives and the potential risks plastics may pose to organisms and the environment.

At the end of the learning unit, an assignment is included in which the participant is asked to choose which plastic is best suited for fishing gear based on data on the biodegradability of six different plastics.

#### Learning goals LU4

*After completing this learning unit, the participant will be able to:*

- *give an overview of the adverse effects of macro, micro and nanoplastics in the environment*
- *discuss the dangers of (toxic) substances added to plastics and (toxic) substances adhering to plastic particles*

#### Contributors to LU4

LU4 was developed using the contributions of the Universidade de Vigo and the Sorbonne Université. The question about biodegradability was made by Prof. Dr. R. Beiras from the Universidade de Vigo.

### 4.1.5 LU5 – Modelling microplastics in the aquatic environment

#### Summary of the contents

This learning unit builds on LU3, about the processes that determine the fate of micro- and nanoplastics in the (aquatic) environment. This learning unit explains how these processes can be translated into a set of mathematical expressions, resulting in a model, to quantitatively predict the fate of micro- and nanoplastics in the (aquatic) environment. LU5 focuses on models that aim to calculate the amounts of MNPs particles transported from rivers into the sea and where they accumulate (i.e., determine their sinks). First, the concept of modelling is explained. Next, the difference between the two major modelling approaches applied to MNPs is explained, as well as the possibilities to increase the model complexity by including more detailed process descriptions. The learning unit concludes with a reflection on dealing with uncertainties in model predictions and measured data.

To experience the usefulness of working with models the participants can complete an assignment in which they use the output of the Scheldt model (an animation) to predict the distribution of microplastics in the Scheldt estuary.

#### Learning goals LU5

*After completing this learning unit, the participant will be able to:*

- *Discuss the usefulness of modelling*
- *Distinguish two types of modelling concepts and indicate the difference between them*
- *List some pros and cons of using models*
- *Interpret the (simplified) output of a model*
- *Discuss the uncertainties of models and field data*

#### Contributors to LU5

LU5 was developed using contributions of the Radboud University and the Katholieke Universiteit Leuven. In the discussion about uncertainties videos about this subject were contributed by Dr. K. Pabortsava of the National Oceanography Centre in Southampton and Prof. Dr. R. Beiras of the Universidade de Vigo.

The animation of the Scheldt estuary model was kindly contributed by N. Shettigar from the Katholieke Universiteit Leuven.

### 4.1.6 LU6 – Mitigating microplastics pollution

#### Summary of contents

Mitigation in the context of microplastics refers to the strategies and actions aimed at reducing the release, presence, and impact of microplastics in the environment. Mitigation involves many different types of interventions, instruments, levels of governance and responsibilities from stakeholders.

This learning unit introduces the topic of mitigation, gives potential mitigation interventions and explains the role stakeholders can play in creating better mitigation solutions. We will also dive into biodegradable plastic and whether it has potential as a mitigating intervention.

In an activating assignment, the participant is challenged to create their own mitigation strategy using the example of mitigation of tyre wear particles.

#### Learning goals LU6

*After completing this learning unit, the participant will be able to:*

- *Give an overview of different mitigation interventions to minimize (micro)plastic pollution*
- *Formulate possible mitigation strategies for (micro)plastics from different sources*
- *Compare biodegradable polymers to traditional plastics*
- *Understand how stakeholder involvement can enhance the analysis and mitigation of (micro)plastic pollution*

#### Contributors to LU6

LU6 was developed using contributions of Open University, Radboud University and BASF. The videos were developed or made available by Sya Hoeke and Maurice Erven from the Open Universiteit (Lecture on mitigation interventions and strategies and Stakeholder participation). Concerning the Stakeholder participation video, special thanks go to the stakeholders: Kees van Oostenrijk, Director, Stichting Fonds Band en Milieu, The Netherlands, Anne Kok – civil servant, municipality of The Hague, The Netherlands, Harm Zeven, advisor public affairs, ANWB, The Netherlands.

The activating assignment ('Create your own mitigation strategy') was made by S. Hoeke from the Open University.

## 4.1.7 LU7 – Policies and governing plastic pollution

### Summary of contents

This learning unit explores the complex political landscape surrounding plastic pollution, with a specific focus on how European Union (EU) regulations address the issue and how local authorities contribute to their implementation.

### Learning goals LU7

After completing this learning unit, the participant will be able to:

- Indicate relevant European policies on plastic pollution
- Indicate the tension between European regulations and the role of local authorities with regard to microplastics
- Describe some measures governments (can) take to mitigate (micro)plastic pollution

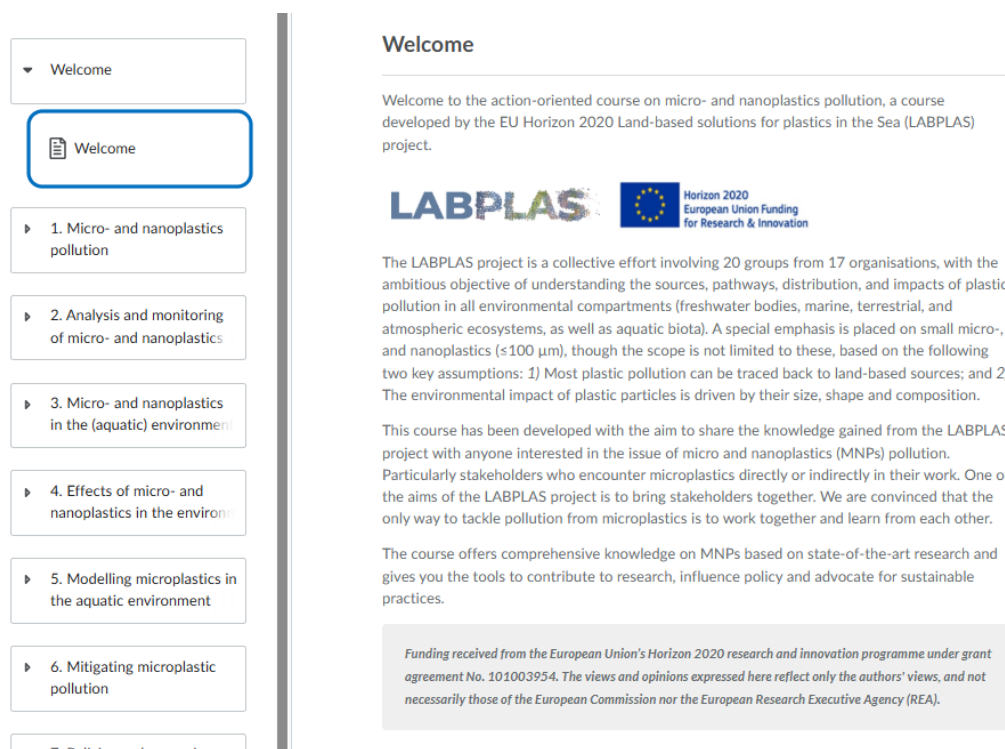
### Contributors to LU7

LU7 was developed using the contributions of Open University.

The video was made available by AIRC (Panel on plastic governance: roadmap for the upcoming decade).


## 4.2 Examples of the course content

In this section, we provide some examples of course implementation. Using a number of screenshots, we show some typical elements of the course, which give an impression of what the course looks like for a participant.



**Welcome**

Welcome to the action-oriented course on micro- and nanoplastics pollution, a course developed by the EU Horizon 2020 Land-based solutions for plastics in the Sea (LABPLAS) project.

**LABPLAS** 

The LABPLAS project is a collective effort involving 20 groups from 17 organisations, with the ambitious objective of understanding the sources, pathways, distribution, and impacts of plastic pollution in all environmental compartments (freshwater bodies, marine, terrestrial, and atmospheric ecosystems, as well as aquatic biota). A special emphasis is placed on small micro- and nanoplastics ( $\leq 100 \mu\text{m}$ ), though the scope is not limited to these, based on the following two key assumptions: 1) Most plastic pollution can be traced back to land-based sources; and 2) The environmental impact of plastic particles is driven by their size, shape and composition.

This course has been developed with the aim to share the knowledge gained from the LABPLAS project with anyone interested in the issue of micro and nanoplastics (MNPs) pollution. Particularly stakeholders who encounter microplastics directly or indirectly in their work. One of the aims of the LABPLAS project is to bring stakeholders together. We are convinced that the only way to tackle pollution from microplastics is to work together and learn from each other.

The course offers comprehensive knowledge on MNPs based on state-of-the-art research and gives you the tools to contribute to research, influence policy and advocate for sustainable practices.

*Funding received from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 101003954. The views and opinions expressed here reflect only the authors' views, and not necessarily those of the European Commission nor the European Research Executive Agency (REA).*

**Figure 2** The Welcome page of the action-oriented course

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On the left side of the course pages, you will find the course structure, as shown in Figure 2. This makes it easy to navigate through the course. An example of the course content is given in Figure 3. Examples of the expert videos that are included and assignments are provided in Figures 4 - 6.

▼ 1. Micro- and nanoplastics pollution

- Introduction
- Micro- and nanoplastics - size and
- Micro- and nanoplastics - compo
- Sources of micro- and nanoplastics
- Personal emissions of some microplastics
- Additional reading

▶ 2. Analysis and monitoring of micro- and nanoplastics

▶ 3. Micro- and nanoplastics

emissions of micro- and nanoplastics that pass through the sewerage system and waste water treatment plants.

**Diffuse sources** are widespread origins of microplastics, released over large areas rather than from a single location, such as micro- and nanoplastics from agricultural plastics.

In 2022, Europe accounted for 58.7 million tonnes of plastic, approximately 14% of the global plastic production of 400.3 million tonnes (Plastics Europe, 2023).

Plastics are used in different sectors, for example, in agriculture, construction, the automotive industry and in the packaging industry. Figure 1.4 shows the use of plastics in different sectors.

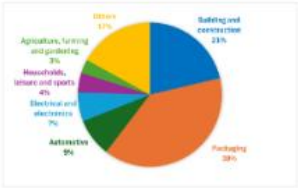


Figure 1.4  
The share of sources of micro- and nanoplastics in Europe in 2022 (source: PlasticsEurope 2022).

The amount of micro- and nanoplastics that actually enter the environment through these sources depends on a number of factors, such as the proportion of plastic that can be collected and processed by the waste sector. Therefore, the micro- and nanoplastic emissions




Figure 3 Example of course content (LU1)

- Introduction
- Mitigation interventions and stra
- Biodegradable plastics - introduction
- Biodegradable plastics - theoretical backgrou
- Biodegradable plastics - testing biodegradab
- Stakeholder participation
- Interviews with stakeholders
- Stakeholder participation - theoret
- Additional reading

▶ 7. Policies and governing plastic pollution

### Video on stakeholder participation

As we've mentioned in the video on mitigation, stakeholder acceptance is an important factor for the sustainability of a mitigation strategy. One way to increase stakeholder acceptance is involving stakeholders in creating the strategy. But there are also other reasons why involving stakeholders can give better results.

### Study instructions

Watch the following video to learn more about the importance of stakeholder participation and how stakeholder participation was incorporated in a research project.

Note that one of the stakeholders speak Dutch. Subtitles are available.

Video: stakeholder participation







Figure 4 Example of course content – expert video (LU6)



- ▼ 2. Analysis and monitoring of micro- and nanoplastics
  - Introduction
  - Introduction to sampling
  - Sampling microplastics in surface waters
  - Things to consider for sampling
  - Analysis of SMNPs in the lab
  - Satellite detection on plastics
  - Additional reading

[Click here to learn more about the sampling campaign of the LABPLAS project](#)

**Question 2.2**

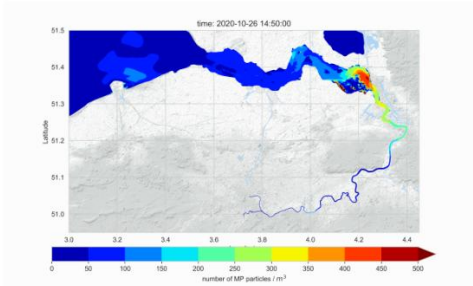




In the first photo, you see a ship involved in a sampling campaign. The second photo shows a manta net taken from that ship in the North Sea. While the water looks clean, it still contains various plastic particles. Some places are more polluted than others. Where do you think the concentration of plastic particles per cubic meter of water is highest? The North Sea, the Elbe, or the Thames?

[Click here for feedback](#)

**Figure 5** Example of an assignment: Sampling on the North Sea (LU2)

- ▼ 5. Modelling microplastics in the aquatic environment
  - Introduction
  - Why modelling?
  - Modelling concepts
  - Example - Microplastics flow in the Scheldt estuary
  - Example: Microplastics in European riverbasins
  - Uncertainties in modelling
  - Dealing with Uncertainties
  - Additional reading



**Figure 5.3**  
Microplastics concentration in the Scheldt estuary during one day, calculated by the river model of the KU Leuven. The time (20-minute intervals) is displayed at the top of the animation.

Using the animation, answer the following questions:

**Question 5.6**

Starting at October 26<sup>th</sup>, 0.00 hours, the Scheldt river pours out microplastics in the estuary towards the sea. When arrive these microplastics in the sea?

[Click here for feedback](#)

**Figure 6** Example of an assignment: Modelling of MNPs in the Scheldt estuary (LU5)

## 5 FIRST RUN OF THE COURSE

The course was opened to interested parties in the Open University's online learning environment on February 1, 2025. We announced the course through previous stakeholder contacts, the LABPLAS site (labplas.eu) and through media such as LinkedIn and invited stakeholders to register for the course.

Up to now (March 2025), a group of 30 participants have registered for the course.

We got a lot of positive responses on the content of the action-oriented course. Participants told us that they find it 'a nice overview of recent knowledge' and that they could use it 'to educate students that lack knowledge on the field of MNPs'.

Critical comments were about the registration for the course, which was described as a bit complicated. Although registration is free of charge and without any obligations, participants of the course have to register as students of the Open University. Due to a poor English translation of the registration site and the several registration steps, some participants found it challenging to complete their registration. We therefore wrote a 'Registration help' to ease the registration process.

### 5.1 Online survey on the stakeholders' findings using the course

We asked the stakeholders about their findings using the course through an online survey (see the survey Appendix D). We sent this survey to the stakeholders who helped us throughout the development of the course by completing the previous survey and attending the workshop on their training preferences.

Unfortunately, not enough surveys have been returned so far for analysis.

### 5.2 Future outlook

In the last two months of the project (April and May 2025) we want to explore the possibility of making the action-oriented course suitable for publication on the LABPLAS site. Previously this was not an option, but recently there appears to be a possibility to incorporate a tool that enables this.

If transferring the course to the LABPLAS platform is desirable and feasible within a short timeframe, we will offer our support to facilitate this process.

## 6 CONCLUSION

In the past four years, the LABPLAS project has produced many results on various aspects of the problem of micro- and nanoplastics pollution of the (aquatic) environment. These results have been reported in articles in international journals and at meetings of scientists in Europe. One of the strengths of the project was that scientists from different institutes and different European countries worked together to find solutions to the spread of SMNPs in the environment.

The LABPLAS project aimed, among other things, to provide scientific information to inform stakeholders and to support regulatory decision-making on micro- and nanoplastics. Therefore, so-called 'policy briefs' have been written on various subjects, in which recent knowledge on these subjects is summarised.

To share the knowledge on micro- and nanoplastics in the environment with a larger audience, the action-oriented course on micro- and nanoplastics in the environment has been developed. With this course, stakeholders can gain or refresh their knowledge about the presence, the (eco)toxicity and the fate of micro- and nanoplastics in the environment. To match the specific interests of the various stakeholders, activating assignments have been included in the course.

## APPENDICES

### Appendix A - Analysis of the survey for the action-oriented course

Analysis of the survey for the action-oriented course LABPLAS project  
July 14, 2023 | Number of responses: 49

As of July 14, a number of 49 people filled in the survey. The respondents represent a wide range of sectors, though the majority came from research institutes and governmental organizations. Responses from the tyre industry were included, however no actors from other lines of industry filled in the survey. The majority of the respondents filled in that their work is indirectly related to microplastics, either as their work deals with the effects of plastics or substances in plastics, as they need to comply with regulations around (micro)plastics or as they are researching microplastics.

The survey asked respondents in which areas they want to take action, but do not yet have the tools for. These mentioned areas show again a wide range of interests, mainly focusing on the effects, analysis methods and possible interventions and tools to implement interventions. The responses are listed here:

“How to involve more stakeholders with respect to creating awareness”

“Recycling is difficult in the UK because every regional council collects different types of items and polymers, this is not consistent across the country. So it is difficult to know what can be recycled”

“Before thinking about actions I first would like to establish knowledge about the distribution of microplastics in estuaries (and other marine and riverine ecosystems) and the effects of microplastics on these ecosystems”.

“I want to add fungi to remove or break down microplastics in stormwater”.

“What are meaningful actions in river management to reduce the outflow of microplastics via the estuary”.

“Clean up seafloor litter hotspots”.

“As a lab, we are looking for a standardized method to apply in our lab to help customers determine microplastics in water, soil conditioners, soil and food”.

“Water operators are struggling with methods to quantify microplastics' presence on wastewater and measures to remove them from outlets”.

“Circular economy and sustainability”

“How to measure the volume of microplastics in the environment? What has been measured and reported in a scientific sound way? What is the definition of microplastics, especially in terms of size?”

“Implementing solutions on different dimensions in actual landscape development, planning and engineering. We need to start developing guidelines to really include prevention/reduction and correct use of plastics in those fields. And how can we use regulations to do that better”.

In the survey, a number of topics were mentioned that could be included in the course. All listed topics received a considerable amount of responses. In addition, no specific preference per sector could be identified. This indicates that all topics are considered relevant to include in the course, including an introduction to what microplastics are. Interestingly, analysis and detection methods seem to be one of the main topics of interest for a number of the respondents. Additional topics that are mentioned by respondents are: legislation around microplastics (current in place and those coming soon), standards and reference material, identification of current knowledge gaps, the contribution of microplastics to the overall environmental impact of products, the long-term impacts of microplastics and the role of industry in reducing microplastic contamination. The first two of these topics are in line with the topics already mentioned. The role of industry is in line with the interest of stakeholders mentioned in the previous question. The contribution of plastics to the overall environmental impact of a product might be the most difficult to include in a course, but it could be an interesting discussion topic.

The ideal time investment for the course is 1-8 hours, with a preference for half a day. Most respondents indicated that they would like the course to be at least partly in a group setting. A mixed setting with a plenary moment, for example in the form of an interactive workshop, is therefore recommended. The survey showed that there is interest in a discussion or forum functionality and links or sources for additional information in the course.

## Appendix B – Report of the stakeholder workshop on August 30, 2024

‘Creating an action-oriented course on microplastics’

Workshop 30082024, Sya Hoeke and Jikke van Wijnen

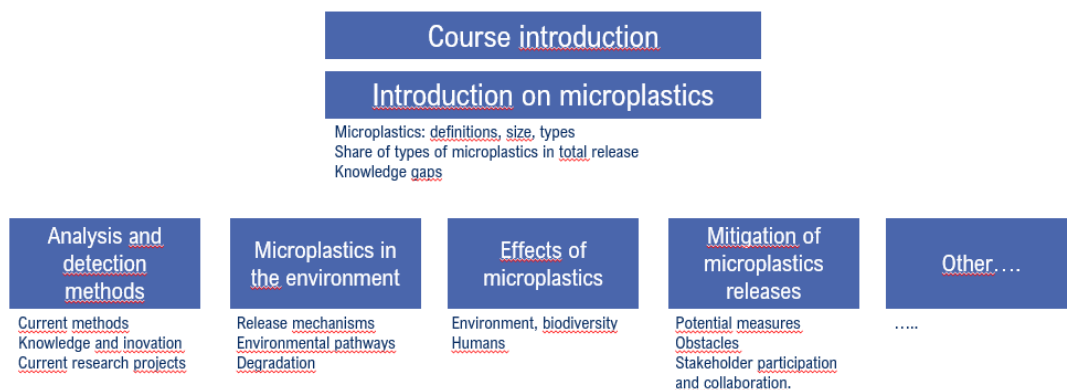
On August 30, 2024, an online stakeholder workshop was organised to discuss the content of the ‘Action-oriented course on micro- and nanoplastics’ of the LABPLAS project. This workshop followed the course survey that had previously been sent to stakeholders.

The aim of this workshop was:

- Informing the stakeholders on the results of the survey
- Discussing the stakeholders’ wishes on course content
- Discussing the set-up of the course

The workshop participants were able to give their opinions on the desired content of the course on the basis of a number of questions.

We first showed the participants an overview of the results of the survey. We showed them an overview of the course structure (with possible topics), that had popped up in the survey (Figure B1).



**Figure B.1** Preliminary course structure (based on the surveys’ outputs)

We then asked the participants a number of questions to gain better insight into their wishes regarding possible course topics and the course setup.

The questions were:

1. On which sources would you like to focus in the course?
2. How would you design the topic on mitigation measures?
3. How would you design the topic on mitigation measures?
4. The survey showed that many of you would prefer a mixed setting; why is this important to you?
5. How could we integrate a mixed option that suits your learning needs best?

To answer the questions we used poll functions, rating functions and word clouds.



## Results of the workshop:

Sixteen participants attended the workshop. They had different backgrounds and nationalities. Figure B.2 gives the reactions of the participants to the different questions. The main results of the workshop polls were:

1. The participants indicated that they were basically interested in mitigation options and they like to have contact with other stakeholders about it.
2. They like a focus on general sources of microplastics
3. Regarding mitigation options: They would like to focus on mitigation options and legislation.
4. They would prefer a course with a mixed setting; they indicated discussion groups, presentations (of experts) and workshops.

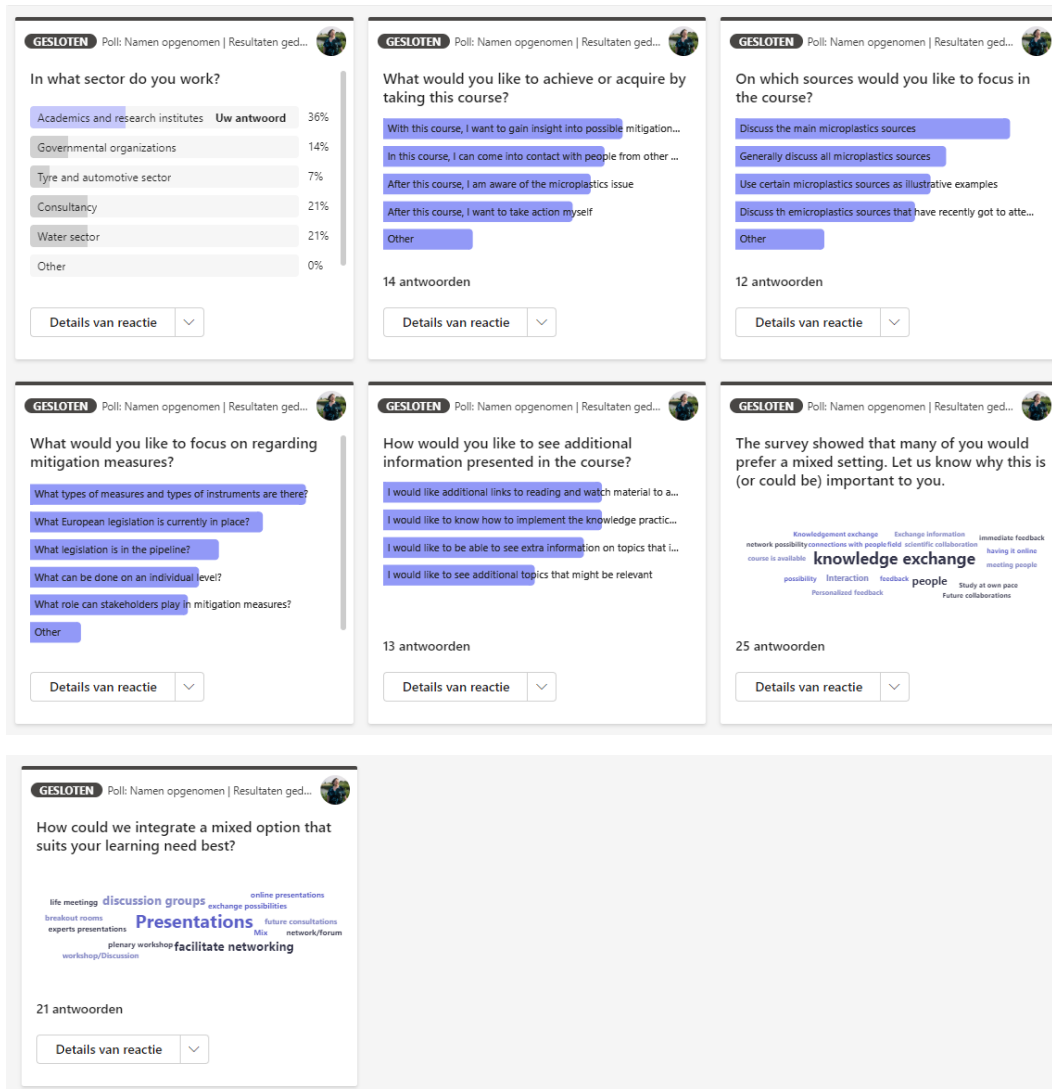


Figure B.2 Responses to the workshop questions

## Conclusion:

The content of the course, designed based on the answers given in the survey, is confirmed by the workshop participants. The participants prefer a relatively short course, in which both general and more specific topics concerning micro- and nanoplastics pollution are discussed. In addition, they would like to have an opportunity to get in touch with other stakeholders via the course.

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### Appendix C - Registration to the Action-oriented course on micro- and nanoplastics in the environment.

As part of the LABPLAS project, an action-oriented course was developed on micro- and nanoplastics in the (aquatic) environment. The course covers fundamental concepts along with specific insights gained from the LABPLAS project. The course is free of charge and available in English. It is designed for professionals working directly or indirectly with (micro)plastics.

The course is hosted by the Open University. You can [register for the course here](#). After registering, you can access it via [MyOU \(MijnOU\) here](#). The course is available in English and is completely free of charge.

Please note that while the course is in English, unfortunately, the registration platform is not fully available in English yet. We recommend using your browser's translation function. Additionally, we have created a step-by-step **registration help**:

#### Instructions to Sign Up for the Action-oriented course on micro- and nanoplastics in the environment:

1. **Switch Website Language:** Change the website language to English by selecting it in the top-right corner
2. **Click "Subscribe":** Click the "subscribe" button to start the registration process.
3. **Translate the Login Page:** You'll see a Dutch login window. Use your browser's translate function: right-click on the page and select "Translate to [your preferred language]."
4. **Register an Account:**
  - a. Click on the blue text "register now."
  - b. Fill in the required information, create a username, and choose a password.
  - c. Click the "register" button in the bottom-right corner.
5. **Verify Your Account:** Check your email for a verification message and follow the instructions to verify your account
6. **Log In and Finalize Registration:**
  - a. Log into the platform.
  - b. Use your browser's translate function again if needed.
  - c. Click on "to elect" in the top-right corner, then "to register."
  - d. Complete the required information and click "complete registration."

You now have access to your MY OU environment. Navigate to Brightspace to access the course materials and start your learning journey.

## Appendix D – Survey on stakeholders’ findings using the action-oriented course

Thank you for participating in our course! Your feedback is important to us as we work to improve the learning experience. Please take a few minutes to share your thoughts.

1. What is your field of work? [comment]
2. Why did you decide to take this course? [comment]
3. How long did it take for you to complete the course? [comment]
4. How would you rate the overall content of the course?
  1. Excellent
  2. Good
  3. Average
  4. Poor
5. Were you missing any topics, resources, or information in the course?
 

Yes

No
6. Please explain which topics, resources or information you were missing if any.
7. Was the course content relevant to your needs and expectations?
  1. Yes
  2. Somewhat
  3. No
8. How could the content be made more relevant to you?  
[comment]
9. Did the course provide sufficient depth and detail on the topics?
  1. Too detailed
  2. Just right
  3. Not detailed enough
10. Please which topics or areas were too detailed or not detailed enough.  
[comment]
11. Were the materials (videos, slides, readings, etc.) helpful and easy to understand?
  1. Yes
  2. Somewhat
  3. No
12. Please elaborate which course materials were not helpful or easy to understand
13. What did you like most about the course?  
[comment]
14. What did you dislike or could be improved in the course?  
[comment]
15. What additional topics or improvements would you like to see in this course?  
[comment]
16. Would you recommend this course to others?
  1. Yes
  2. No
17. Do you have any additional feedback or comments?  
[comment]