

# SOIL BIP

## Soil protection and management of degraded and industrial lands

### The call for applicants

#### DESCRIPTION OF THE PROGRAMME

Soil is an important and largely non-renewable resource that performs a number of functions crucial for human life and environmental sustainability. Basically everyone knows that agriculture and forestry are dependent on soil that ensures the supply of water and nutrients as well as root fixation. Soil plays also an important role in ecosystem services, including water protection and carbon sequestration, thus being of great importance for climate protection. Soil is also a habitat and biodiversity pool, an element of landscape and cultural heritage as well as a source of raw materials. In order to perform its numerous functions, soil should be maintained in healthy condition. However, human activities pose several threats to the soil that can cause various degradation processes, including erosion, a decline in organic matter, local and diffuse contamination, sealing, compaction, and a loss of biodiversity. Environmental scientists and politicians have recognized the importance of soil protection and the urgent need to improve the properties of disturbed soil and to reclaim and revitalize degraded lands.

The SOIL BIP is aimed at making students conscious of crucial soil functions and the main threats to soil, as well as at showing the examples of solutions that can be undertaken to protect soil and to reclaim lands negatively impacted by various kinds of human activity. The BIP will cover the following issues:

- Introduction to soil properties and functions, and the main threats to soil,
- Principles of soil protection and the methods that can be applied to improve soil properties, with focus on farmlands and urban soils,
- Remediation of contaminated soils and reclamation of technically disturbed lands

The SOIL BIP programme will be divided into two parts planned to be carried out in the in-presence and online modes. The in-presence part will include 40 teaching hours to be carried out in Wrocław, Poland, in July 3-7, 2023. In this part, two days are foreseen for stationary lectures and lab classes and three days for field trips. The online part, planned in October, 16-26, 2023, will include 30 teaching hours based on pre-recorded lectures and on-line meetings. This part will be divided into four thematic modules M1-M4, as described below.

#### INVOLVEMENT OF EU GREEN PARTNERS IN SOIL BIP

All the universities that form an EU GREEN alliance participate in the programme, thus playing in its organization various roles:

- Wrocław University of Life Sciences and Environment (WUELS): coordinating and organizing university
- University of Parma (UNIPR): co-organizing university
- University of Extremadura (UNEX): co-organizing university
- Universidade de Evora (UE): co-organizing university
- University of Oradea (UO): co-organizing university
- University of Angers (UA): partner university
- University of Gävle (HiG): partner university
- Otto von Guericke Universität Magdeburg (OVGO): partner university

- Atlantic Technological University (ATU): partner university

## **MOTIVATION AT THE BASIS OF THE SOIL BIP**

The SOIL BIP is born with the idea of sharing competences and skills present in the five organizing universities that participate in this initiative (WUELS, UNEX, UNIPR, UO and UE) and share them with students coming from different regions in Europe.

## **PROGRAM LEARNING OBJECTIVES**

Attendance in this BIP programme will give both the students and the teaching staff an opportunity to exchange experiences and knowledge. The main learning objective of the program is to make students aware of the importance of soil in the economy, ecosystem services and other environmental protection-related functions that can only be performed by the soil maintained in good condition and in good health. The course aims to develop students' ecological awareness and show them that soil is a highly dynamic and fragile system. The program is designed to provide students not only with theoretical knowledge, but also to develop practical skills in assessing soil properties, identifying soil threats and planning practical solutions for soil protection and restoration of soil in degraded areas. The program will include a discussion on the choice of the best solutions in soil management, which will develop students' social competences, including those necessary to conduct discussion and use rational arguments.

## **PROGRAMME CONTENT, DETAILS ON THE IN-PRESENCE AND ONLINE PARTS OF THE COURSE**

The SOIL BIP programme covers the issues crucial to develop students' awareness of soil functions and threats to soils, as well as to present in theory and practice the methods that can be applied to improve soil properties and revitalize degraded lands. Legislative means aimed to protect soils and to enforce their reclamation will also be presented – both on the example of the common EU law and particular solutions implemented in various countries. Field trips will provide the examples of reclamation and remediation measures that have been applied in industrial areas and in the sites of contemporary and historical mining, and will illustrate a well designed and successful restoration of soil functions. In each of such cases, several optional solutions will be discussed and rationale for the optimal ones will be presented.

## **DESCRIPTION OF THE IN-PRESENCE PROGRAMME**

This part of the course, scheduled for 5 days, will include stationary lectures accompanied by lab classes (two days) and field trips (three days). The first lectures will be aimed at introducing crucial soil properties and the factors responsible for soil diversity, as well as making students conscious of soil functions and the main threats to the soil environment. Additional, apart from the productive, functions of the soil will be described and a range of ecosystem services provided by soil will be emphasized. Particular attention will be given to soil importance for maintaining clean water, protection of biodiversity, cycling of nutrients and regulating climate. The emphasis will be placed on the role of organic matter in soil - both in the context of soil productivity and ecosystem services, including the process of carbon sequestration and its importance on a global scale. During lab classes, students will learn more about the methods and conditions of soil enrichment with exogenous organic matter, such as compost, biochar and various waste materials. The second part of the in-presence lectures will focus on the impacts of industrial activities on soils as well as on the functioning of soil in the urban environment. Various local and diffuse sources of soil pollution will be presented, and the effects of soil

pollution and the rules of dealing with contaminated lands will be discussed. Students will also learn the principles of EU policy in the field of soil protection, remediation and reclamation. More detailed issues in this matter will be discussed in the online part of the course.

During field classes, various examples of practical measures aimed at restoring functional and environment-related properties of soils in the areas degraded by industrial activity will be presented. Students will also visit some historical mining and ore processing facilities that left behind the heaps of mine waste and tailings containing high concentrations of potentially hazardous substances, which caused contamination of surrounding areas. On the example of such sites, students will learn the principles of risk-based approach to the assessment of soil pollution and will be able to discuss the need for remediation and reclamation.

At the end of the field classes, there will be an opportunity to discuss the efficiency of remediation measures and, in general, the perspectives of soil protection and justification and to successfully revitalize degraded lands.

### **Detailed programme of the in-presence part:**

**Day 1:** Lectures (4h) + lab classes (4h):

- Lecture 1: Factors determining the diversity of soils (case study: Lower Silesia) 2h
- Lecture 2: Basic soil functions and ecosystem services 2h
- Lab classes: Compost and organic wastes – importance for carbon sequestration 4 h

**Day 2:** Lectures (4h) + lab classes (4h):

- Lecture 3: Properties of urban and industrial soils. Soil contamination 2h
- Lecture 4: Soil protection policy in EU countries 2h
- Lab classes: Biochar in carbon cycling and soil remediation 4h

**Day 3-5:** Field classes (24h)

- Day 3. Soil contamination and remediation measures applied in the areas affected by copper ore mining and processing. Reclamation and revitalization of copper tailings impoundments. 8h
- Day 4. Degradation and reclamation of soils contaminated by historical gold mining and arsenic industry. 8h
- Day 5. Degradation and reclamation of lands technically disturbed by mining activities - the areas disturbed by hard coal mining in Lower Silesia. 6h  
Achievements and shortcomings of remediation and revitalization of degraded lands. Summary and discussion. 2h

### **DESCRIPTION OF THE ONLINE PROGRAMME**

The online part, planned in October, 16-26, 2023, will include 30 teaching hours based on pre-recorded lectures and on-line meetings. Half-hour pre-recorded lectures will be made available to students at the beginning of October 2023. Online meetings with lecturers will take place in the afternoons, from Monday to Thursday, over a 2-week period: October, 16-19 and 23-26, 2023. This part of the course will be divided into four thematic modules M1-M4.

**Module 1** entitled **Main threats to soil in Europe** will focus on the most important causes and mechanisms of soil degradation, in reference to the first official EU communication in this regard "Towards a thematic strategy for soil protection" (2002) as well as subsequent studies and reports on the condition of European soils and the latest data. Particular attention will be

paid to threats to soil productive functions and ecosystem services resulting from ongoing climate changes. The issues of erosion, decline in soil organic matter, soil sealing and compaction as well as poor water retention in soils and desertification, when soil entirely loses its capacity to carry out its functions, will be presented in more detail.

**Module 2** is entitled **Management of soil protection in the areas used for food production**. This thematic block will mainly concern the soils of rural areas used for agricultural purposes. The concept of soil health, the most important indicators of soil health and general assumptions of the EU Mission "Soil health and food" will be presented and discussed. The importance of biological factors in the proper performance of its functions by soils will be emphasized. In this module, the issues related to rationale soil fertilization will be presented, as both deficiencies and excesses of nutrients are undesirable for soil and other compartments of the environment. This topic is related in particular to the issue of water eutrophication, which is one of the main environmental problems. The issue of soil enrichment with organic matter will be taken up again and the role of bioeconomy in achieving this goal will be emphasized. An additional issue that will be included in this module will be the possibility of safe food production in urban areas, e.g. in allotment gardens.

**Module 3**, entitled **Remediation of contaminated soils**, will cover specific issues related to soil contamination. Various approaches to the assessment of soil contamination will be presented, including an approach based on soil screening values, which are usually the total concentrations of substances in soil, as well as an approach based on environmental risk assessment that takes into account various exposure pathways to hazardous substances. Basic methods that can be applied for remediation of contaminated soils will be discussed, including technical methods as well as bioremediation and phytoremediation. Students will gain knowledge of the methods used in practice in a variety of settings.

**Module 4** will focus on **Reclamation of technically disturbed lands**. The impact of various types of mining activities, such as underground mining, open-cast mining and quarrying, on the natural environment, and in particular on soils, will be presented. Although soil destruction through mining and quarrying is usually a local problem, the environmental impacts caused by mining are particularly strong, which is why the mining areas require special measures to restore soils with their productive or environmental functions. Mining of metal and metalloid ores has particular negative effects on the environment, as the extracted ore usually contains small concentrations of the target element and therefore requires enrichment, which produces waste (for instance tailings) that constitute an additional burden for the soil environment and require special treatment. The module 4 will also include the issues of abandoned historical mining sites and the solutions for their safe management.

### **Detailed programme of the online part:**

#### **Module 1 (M1): Main soil threats in Europe**

5 h (on-line meetings) + 2.5 h (pre-recorded lectures)

- 1.1. Soil functions and ecosystem services under the influence of climate change and human activities
- 1.2. Soil erosion by water/wind
- 1.3. Decline in soil organic matter in mineral soils and organic soils (peatlands)
- 1.4. Soil sealing and compaction
- 1.5. Desertification (problems of water retention in soils)

#### **Module 2 (M2): Management of soil protection in the areas used for food production**

5 h (on-line meetings) + 2.5 h (pre-recorded lectures)

- 2.1. Soil health and the ways to keep soil healthy
- 2.2. Biodiversity in soil and decline in soil biodiversity
- 2.3. Soil nutrients - shortage and overfertilization
- 2.4. Bioeconomy – solution for restoring soil organic carbon
- 2.5. Safe food production in urban gardens

### **Module 3 (M3): Remediation of contaminated soils**

5 h (on-line meetings) + 2.5 h (pre-recorded lectures)

- 3.1. Soil contamination. Approaches to assess soil contamination
- 3.2. Principles of environmental risk assessment
- 3.3. Techniques of remediation applied for contaminated soils
- 3.4. Bioremediation
- 3.5. Phytoremediation

### **Module 4 (M4): Reclamation of lands technically disturbed by mining activities**

5 h (on-line meetings) + 2.5 h (pre-recorded lectures)

- 4.1. The areas affected by mining of rocky and loose raw materials
- 4.2. The areas disturbed by hard coal mining
- 4.3. The lands disturbed by opencast mining, an example of lignite mines
- 4.4. Contemporary metal ore mining and processing
- 4.5. Reclamation and revegetation of abandoned lands.

**Schedule of the online part:**

Week and day	Monday 16.00-18.00	Tuesday 16.00-19.00	Wednesday 16.00-19.00	Thursday 16.00 – 18.00
<b>October 16-19, 2023</b>	Introduction 15.30-16.00, 1.1, 1.2,	1.3, 1.4, 1.5	2.1, 2.2, 2.3	2.4, 2.5
<b>October 23-26, 2023</b>	3.1, 3.2	3.3, 3.4, 3.5	4.1, 4.2, 4.3	4.4, 4.5, Summary 18.00-18.30

**Total number of participants:** The SOIL BIP is open to a limited number of participants (45) i.e. 5 students from each partner institution. In case one of the participating universities have assigned less students than the maximum allowed, the places left will be made available to other universities.

Minimum number of foreign students (except Polish students): 15 students

### **LANGUAGE OF TEACHING**

Both online and in-presence lectures will be taught in ENGLISH, and a B2 level is required to have a successful learning experience.

### **ECTS credits**

6 ECTS

## THE RULES FOR COMPLETING THE COURSE

Students will complete the in-presence part of the course based on the reports on lab classes and field classes, as well as on answering questions prepared by lecturers. The on-line part will be completed online, based on the answers to the sets of questions concerning each of the modules.

## LEARNING OUTCOMES

1. Become familiar with the crucial soil functions and the main threats to soil.
2. Become familiar with main reasons and mechanisms of soil degradation and the scale of occurrence of these processes in Europe.
3. Become familiar with principles and documents of the European soil protection strategy.
4. Become familiar with principles of soil protection and the methods that can be applied to improve soil properties.
5. Understand principles of remediation of contaminated soils and reclamation of technically disturbed lands.
6. Understand how to maintain the soil in good condition and in good health.
7. Is aware of the human impact on the natural environment and is ready to take action to protect it.

## ASSOCIATED SOCIAL EVENTS AND LOCAL ATTRACTIONS

The organization of the in-presence part of the course will be accompanied by social events that will allow for a better understanding of the region in which Wrocław University of Environmental and Life Sciences is located, i.e. Wrocław and a region of Lower Silesia, as well as the Sudetes mountain range and their foothills. Students participating in the course will be able to take part in the following social events: sightseeing of the city of Wrocław, visiting the historic gold mine in Złoty Stok and the Książ castle.

**Wrocław** is one of the oldest and most beautiful cities in Poland. Situated by the Oder river, crossed by its tributaries and channels, it is called a city of 100 bridges. The Wrocław city hall belongs to the most splendid Gothic-Renaissance buildings in Central Europe. It is located in the centre of the large market square, enclosed by impressive, thoroughly renovated, colourful tenement houses. Ostrów Tumski, “the Cathedral Island”, a reminder of the early Middle Ages, belongs to the most beautiful surviving sacred architecture sites in Europe. The main building of Wrocław University is proud to have the longest baroque facade of the world that faces the Oder river.

**Złoty Stok** is an old town known as the site of gold mining with a tradition stretching back more than 1,000 years. Gold has been extracted there from rich veins or alluvial deposits since medieval times. In the 18th century gold mining declined, and Złoty Stok became the world's largest producer of arsenic. The mine operated until 1962. In 1996 the historical mine was opened to the public by launching the “Złota Mine” Underground Tourist Route. It leads original passageways of the old gold mine and includes a tour of the “Gertrude Mineshaft” Museum, a visit to an underground waterfall and a ride on an mine tram.

**Książ castle** is the largest castle in the region of Lower Silesia, and the third-largest in Poland. It was built in the 13th century as a fortified castle situated on the bend of the Pelcznica River, overlooking its gorge. Over the history, the castle belonged to many noble families, including

the Hochberg's, who expanded the building and contributed to its splendour. The defensive walls of former fortress have been converted into garden terraces. During the World War II the castle was taken over by German military forces who created a system of tunnels underneath the building, the function of which still remains a mystery. Presently, visitors can admire the majesty of chambers, terraces, surrounding gardens and the walking trails along the gorge. The underground tunnel is also available to the public.

## **ELIGIBILITY CRITERIA**

To apply for this program, students must be regularly enrolled at one of the participating universities.

Applicants must be enrolled in a Bachelor's, Master's or PhD level degree.

At the time of the application submission, applicants must demonstrate proof of English language competence at the B1/B2 level (CEFR). This can be certified by the applicant's home University (see application procedures below. Level B2 will be a preferential criterion.

Participation to the program is open to students of any disciplines and degree programmes related to the contents of SOIL BIP.

## **HOW TO APPLY**

Students interested in participating should fill out the [APPLICATION FORM](#) by **June 1st, 2023**, as well as send the following documents to [eugreen.bip@upwr.edu.pl](mailto:eugreen.bip@upwr.edu.pl)

1. Copy of valid ID or passport;
2. Transcript of Records (A certificate of enrolment at the home University with a list of passed exams and grades);
3. Language certificate (If not already present as an exam in the Transcript of Records)
4. Motivation letter (containing, if any, experiences abroad)
5. Other documents and certificates (optional)

## **DEADLINE FOR APPLICATIONS**

JUNE 1, 2023

## **SELECTION CRITERIA AND PROCEDURES**

An appointed Committee formed by selected representatives of: the organizer University (WUELS – 2 persons) and 1 person from co-organizing University: UNIPR, UNEX, UO, UE, will carry out the selection procedures. Selection is based on the following criteria:

- Academic performance
- Motivation
- English language competence
- Evaluation of further qualifications and skills

Students should expect to hear back about the result of their application by June 5, 2023. The students selected at their universities as potential participants in the programme must communicate their acceptance or withdrawal within 5 days (by 10 June) from the publication of the selection results by contacting their university program coordinator (see below).

Further instructions will be provided upon completion of the selection procedures, not later than on JUNE 12, 2023.

**CONTACT**

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