



D 3.5 Report: First activity report of Activity 3.7



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Table of contents

1.	<i>INTRODUCTION</i>	4
2.	<i>AGREEMENT WITH THE UNIVERSITY FOR THE XXXVIII AND XXXIX PHD CYCLES SUPPORTED BY ITINERIS</i>	5
3.	<i>TRAINING PROGRAMME DEVELOPED IN THE FIRST YEAR</i>	6
3.1	Training activities for Management and eScience (WP2)	7
3.2	Training activities for Atmospheric Domain (WP4)	9
3.3	Training activities for Marine Domain (WP5)	10
3.4	Training activities planned in Terrestrial Domain (WP6)	12
3.5	Training activities for Solid Earth (WP7)	14
3.6	Training activities for Trans Domain (WP8)	15
4.	<i>LIST OF ACRONYMS</i>	17

1. INTRODUCTION

The deliverable 3.5 was planned to be released within the framework of the ITINERIS project and it is part of the activities of the Work Package (WP)3 concerning the activities organized in the first year of the project by all the OUs involved in Activity 3.7.

This deliverable was expected to be released in Bimester 6 and to be included into the Intermediate Objective 3.3 of bimester 6; it is produced under the responsibility of the Operative Unit (OU) of the National Research Council, Research Institute on Terrestrial Ecosystems (CNR-IRET).

The main aim of the deliverable 3.5 is to provide a general overview of the training program as planned in Activity 3.7 designed by the Operative Units of WP3 in the first year of the project.

The document is structured in 4 chapters, including this chapter. Chapter 2 outlines the activities carried out by the OU CNR-IRET to finalize the protocols of agreements between the Universities and the CNR-IRET for the funding and allocation of ITINERIS fellowships for the XXXVIII and XXXIX PhD cycles foreseen in the project. Chapter 3 describes all the activities carried out in the first year of the project and the description of the courses proposed by the WGs for the scientific Domains involved in WP3 for the Activity 3.7. At the end, Chapter 4 presents the list of acronyms used in the report.

2. AGREEMENT WITH THE UNIVERSITY FOR THE XXXVIII AND XXXIX PHD CYCLES SUPPORTED BY ITINERIS

During the first year of the project, the OU CNR-IRETLE was coordinating the activities useful for the finalization of the protocols of agreements between the Universities and the CNR-IRET for the funding allocation of ITINERIS fellowships for the XXXVIII and XXXIX PhD cycles.

Regarding the XXXVIII PhD Cycle, during the first bimester a first draft of the protocols of agreement between the CNR-IRET and the Universities of Naples Federico II, Naples Parthenope, Pisa, Salento and Tuscia for the PhD fellowships supported by ITINERIS for the XXXVIII PhD Cycle, was developed and finalized. Even with the significant administrative efforts made by CNR and the universities, the signature of the protocols of agreement between the CNR-IRET was realized only for four of the five universities, i.e. Universities of Naples Federico II, Pisa, Salento and Tuscia. The University Naples Parthenope couldn't incorporate the ITINERIS fellowships in its PhD calls due to an early launch of the call in Parthenope, which didn't make possible the finalization of the protocol of agreement on time. It needs to be highlighted that even in the other four Universities the launch of the call for applicants for the XXXVIII PhD cycle has been done well before the formal start of ITINERIS (i.e., November 1st, 2022) being conditioned to the actual start of the project. The start dates of the ITINERIS fellowships of XXXVIII PhD cycle in the four Universities were: 01.01.2023 for University of Naples Federico II, 01.03.2023 for University of Pisa, 01.03.2023 for n.2 Phd fellowships and 01.04.2023 for n.1 PhD fellowship of University of Salento and 01.03.2023 for University of Tuscia. A total of n.12 PhD fellowships has been assigned as follow: n.3 PhD fellowships to the University of Naples Federico II for the Atmospheric Domain; n.3 PhD fellowships to the University of Pisa for the Solid Earth Domain; n.3 PhD fellowships to the University of Salento for the eScience Domain; n.3 PhD fellowships to the University of Tuscia for the Terrestrial Domain.

With respect to the fellowship for the XXIX Phd cycle financed by ITINERIS project, the signature of the protocols of agreement between the CNR-IRET was done only for three of the five universities, i.e. University of Naples Parthenope, University of Salento, and University of Tuscia, since for the University of Naples Federico II and University of Pisa was too challenging to include the ITINERIS PhD positions as planned since the financial support could cover only half of the budget required respect to the full fellowship costs. The start dates of the ITINERIS fellowships of XXIX PhD cycle in the three Universities were: 01.11.2023 for University of Naples Parthenope, 01.11.2023 for University of Salento and 01.11.2023 for University of Tuscia.

A total of n.8 PhD fellowships has been assigned as follow: n. 2 PhD positions to the University of Naples Parthenope, n. 3 PhD positions to the University of Salento and n. 3 PhD positions to the University of Tuscia.

Globally, a total of n.20 of PhD positions has been realized respect to the n.30 planned in the project for Activity 3.7. with the XXXIX cycle PhD fellows formally starting on B7 in the second year of the project.

3. TRAINING PROGRAMME DEVELOPED IN THE FIRST YEAR

During the first year of the project, temporary personnel with a level III Technologist profile hired under Activities 3.1-3.5 have been developed, under the supervision of OU CNR-IRET, the relative WP coordinators and the WP3 PhD programmes coordinators or University responsible for ITINERIS, a detailed training programme identifying for each course proposes a detailed list of information such as course descriptions with learning objectives, course location, lesson duration, training modules, assigned teachers, Syllabus.

To facilitate communication and collaboration within WP3, the CNR-IRETLE Operational Unit (OU) has created, within the LifeWatch Italy Community platform, a digital space dedicating a Working Group folder. This folder was used as a central hub for information sharing and discussion among key personnel of WP3, i.e. RTD and WP co-ordinators, the WP3 PhD programmes coordinators or University responsible for ITINERIS, using the facilities included in the platform such as calendar, Repository area, Wiki, Forum a brainstorming area (Mural) available to all the WG members.

Despite the commitment of the units of personnel of the WG and the universities, involved, the training courses scheduled for activity 3.7 have not yet been released due to the delays in the recruitment process of the fixed-term personnel responsible of the training activities in WP3 and the personnel that shall be subject to the training; besides the duration of the selections, in many cases the lack of candidates suitable for the specifications required by the calls led to the need to re-publish the procedures. However, these delays will not affect the quantity and quality of the training courses that will be delivered to the trainees in ITINERIS and to the organization of the courses and the selection of highly qualified trainers. The training programme will be compressed in the second half of ITINERIS workplan with 21 training courses that will be delivered starting from November 2024. It will be needed to extend the project timeline to ensure an execution of all planned activities, i.e. the remaining 8 training courses.

The courses scheduled are listed and described in the following paragraphs meanwhile the course calendar is already described in “Deliverable 3.2 - Report Training Executive Working Plan for the second year”, and the complete and updated list of courses, with precise details of dates, times, and delivery methods, it will be available in the dedicated sections of the ITINERIS training platform. Please note that the training program may be subject to modifications based on a reassessment of the training needs of the participating research infrastructures and personnel. This could involve changes to the course structure, content, period or the composition of participants and tutors.

The delivery of Reports and Deliverables planned are released on time, reporting the motivation of the absence of courses in the first year of the project and reporting the list of the courses that were planned and that will be delivered to the trainees during the second year / beginning of third year of the project.

3.1 Training activities for Management and eScience (WP2)

Given the ever-increasing importance of eScience activities in the environmental research field, the training courses have been developed to fill the gaps in this area through the units of personnel of WP3 and the coordinator of the PhD courses at the University of Salento. In order to increase the usability of such knowledge in the field of FAIRness and ICT skills to a large number of interested early career scientists of the RIs involved ITINEIRS, it is also planned to release part of the courses also in hybrid mode.

TRAINING PROGRAMME

eScience

Course N.1

Title: Research life cycle management

Description: Research life cycle management is an increasingly used approach in the research field that allows maximizing the value of scientific data produced by researchers and highlighting their potential throughout all stages of the data life cycle. This course will provide information on the various stages of the data life cycle, providing advice on how to properly plan and design data management in every domain.

Course N.2

Title: Introduction to Python language

Description: Python is a powerful programming language widely used in the research field due to its extreme versatility. This course will provide the basics of the Python programming language, allowing you to execute commands, starting from simple ones to more and more complex ones, and to become familiar with the main libraries for data cleaning, analysis and visualisation.

Course N.3

Title: Data mining and machine learning

Description: Over time, data mining and machine learning processes have become increasingly important given the large amount of data present on the internet, even though it is often present in non-standardized forms. This course will allow you to acquire knowledge on the use of AI to be able to prepare algorithms and techniques for data extraction and identification of patterns and correlations within them.

Course N.4

Title: Data harmonization, integration

Description: The course provides a comprehensive introduction to data harmonization and integration, covering the key concepts for optimizing data quality and usability. It also underlines the benefits of implementing these processes in the context of scientific research of personnel of environmental research infrastructures.

Course N.5

Title: Knowledge graph. Fundamentals, techniques and applications

Description: This course is designed for those who want to deepen their knowledge of Knowledge Graphs (KGs). The course is structured in a way that allows participants to investigate the interlinked descriptions of concepts, entities and relationships that form the basis of KGs, to learn different techniques for producing them, and their applications within specific and multidisciplinary research lines.

Course N.6

Title: Developing research projects in Virtual Research Environments

Description:

In today's world, Virtual Research Environments (VREs) are demonstrating their potential to enhance the productivity, efficiency, and quality of scientific research. Objective of this course is to provide participants with the knowledge and tools necessary to understand, implement, and effectively utilize virtual research environments. Participants will be able to develop and leverage VREs as collaborative workspaces for managing and developing their research projects.

3.2 Training activities for Atmospheric Domain (WP4)

A series of training activities for Ph.D. students working on the atmospheric domain are going to be held by University of Naples “Federico II”. A detailed description is provided in the following section.

TRAINING PROGRAMME

Course N.1

Title: Anthropogenic activities and effects on the living environment and human health

Description: The course aims at providing a detailed knowledge of the mechanisms of formation of pollutants by anthropogenic activities to correctly understand environmental problems and the relationship between anthropogenic activities and effects on the living environment and human health

Course N.2

Title: Can Science Save the Earth? (Optical advanced instruments for atmospheric monitoring design and operation)

Description: As science and supporting technologies collect more and better data about the world around us, the opportunities to study climate forcings and to detect, monitor and address climate change effects are increasing. The course aims at illustrating the Earth's climate system discussing current methods exploited in atmospheric and environmental monitoring. Emphasis will be also given to the optical design of advanced instruments and the physical principles of their operational aspects with examples of applications and atmospheric parameters measured.

3.3 Training activities for Marine Domain (WP5)

High level training to university students is crucial to create the future generation of marine scientists. In order to identify an adequate training fulfilling the gaps of knowledge in Marine science sector related to RIs, WP5 has promoted an internal dialog among the WP5 task leaders, universities and RIs reference persons to identify the specific topics to be addressed. The discussion occurred in three main moments, direct meetings with WP5 coordination and ITINERIS reference leaders at partner university, during an online survey among task leaders and during the WP5 meeting held in Rome in September 2023. Three main area of interest emerged over the others:

- Need of reinforcing the knowledge about the modelling and observational products available for the scientific community.
- Requirement to acquire a wide experience on autonomous oceanographic instrumentation.
- Necessity to expand the knowledge on advanced techniques for data processing and analysis.

In order to satisfy these requirements, WP5 team has identified the training programme detailed below.

TRAINING PROGRAMME

Course N.1

Title: Oceanographic observational and modelling products available for marine research

Description: A large number of in situ and satellite oceanographic observations as well as ocean circulation model results are available nowadays. It is very important for future researchers to be able to navigate their way through this large supply, and the purpose of this course is to provide students with a detailed description of the available data. After an initial overview, portals and products specific to the needs of attendees will be explored in depth. It is expected that the course will enable them to orient themselves independently.

Course N.2

Title: Autonomous instruments in oceanography

Description: The technology of autonomous instruments has matured tremendously in the past few decades. Autonomous instruments are especially important in an environment as difficult to access as the ocean. For this reason, the course will be devoted to an overview of the main categories of autonomous instruments, so that students can realize the current possibilities currently offered in this field. Theoretical lectures will be coupled with data processing exercises, and a day at sea is planned for instrument deployment practice (one or two drifters and/or xbt launches are planned).

Course N.3

Title: Advanced data analysis and processing techniques

Description: First and second level academic training in applied sciences typically stops at standard statistical techniques of data processing. In this course we intend to provide students with advanced notions of processing, with particular reference to two very current topics: on the one hand, the vast amount of data available (we are currently in the era of big data), and on the other hand, the spread of artificial intelligence techniques, which may find very novel applications in reconstructing 3D and 4D features of the ocean. Practical exercises will be offered to students along with theoretical considerations.

Course N.4

Title: Applications of dynamic systems theory in oceanography

Description: The course explores the integration of dynamic systems theory principles within the field of oceanography. Participants will delve into the interdisciplinary approach of applying dynamical systems concepts to analyze and model complex oceanic phenomena, such as ocean circulation patterns, climate dynamics, and ecosystem behaviour. Through a combination of theoretical frameworks and practical case studies, learners will gain a deep understanding of how dynamic systems theory can elucidate the interconnected processes governing the behaviour of the ocean. From predicting events to understanding the impact of climate change on marine ecosystems, this course equips participants with the tools and knowledge to tackle pressing oceanographic challenges through a dynamic systems lens.

Course N.5

Title: Software for processing meteorological and oceanographic data

Description: The course provides a hands-on exploration of the tools and techniques used to analyze and interpret data in the fields of meteorology and oceanography. Participants will learn how to navigate and utilize specialized software packages tailored to the unique needs of processing atmospheric and oceanic data. Through practical exercises and real-world examples, learners will develop proficiency in tasks such as data preprocessing, visualization, statistical analysis, and modeling. Whether studying weather patterns, ocean currents, or climate trends, this course equips participants with the skills necessary to effectively harness the power of software tools for extracting valuable insights from meteorological and oceanographic datasets.

Course N.6

Title: Oceans and climate

Description: The course delves into the intricate relationship between ocean and the global climate system. Participants will explore the multifaceted interactions between oceanic processes and climate dynamics, gaining insights into how ocean influence climate patterns and vice versa. Through a combination of theoretical knowledge and empirical evidence, learners will examine key topics such as ocean-atmosphere interactions, ocean circulation patterns, and the role of oceans in regulating Earth's temperature and weather systems. Additionally, the course will address the impacts of climate change on oceans, including sea level rise, ocean acidification, and shifts in marine ecosystems. By understanding the complex interplay between oceans and climate, participants will gain a deeper appreciation of the profound influence that oceans have on shaping the planet's climate and the implications for future climate scenarios.

3.4 Training activities planned in Terrestrial Domain (WP6)

Training activities for environmental scientists of the new generation regarding the Terrestrial Domain have been developed in collaboration with the PhD student coordinator of all the Universities involved in the project: University of Naples Federico II, Naples Parthenope, Pisa, Salento and Tuscia. All selected courses are integrated into the PhD students training path. Several coordination meetings with WP 6 leader Prof. Papale allowed a training program identification focused on nurturing new scientists to ensure continuity in the scientific and technological excellence of RIs staff.

TRAINING PROGRAMME

Course N.1

Title: Eddy covariance: processing and data use

Description: The course will only shortly cover the practical aspects of the eddy covariance measurements collection and focus more on the data processing, uncertainty estimation and use in environmental application, with practical activities based on data and products collected by the FLUXNET network and ICOS. The participants will know where to find eddy covariance measurements, how to correctly handle them, interpret and estimate the uncertainty and which are the possible data uses. Can be open also to RI members that followed the course on the eddy covariance setup.

Course N.2

Title: Programming with R

Description: The course will provide the basic programming skills using the R language, from the setup and basic operation to the preparation of user specific functions and codes. Although similar to the one in Python it is important to offer training also in R since it is widely used in the ecology community. The participants will have the basic knowledge of the programming language in order to continue autonomously the development of skills and capacities.

Course N.3

Title: Containers creation and use in HPC environment

Description: The course will give the basic information about containers and High Performance Computing (HPC) environment and then guide the participants step by step toward the creation of a container (e.g. Docker) with a user selected code or function and to their use in an HPC system. The participants will be able to create a docker and deploy it on an HPC system. Programming capacities needed and not covered in the course.

Course N.4

Title: Programming in Python advanced course

Description: The course will provide the programming skills using the Python language, from the setup and basic operation to the preparation of user specific functions and codes. Although similar to the one in R it is important to offer training also in Python since it is widely used in the compute science and also in the ecology community. Learning objective: participants will have the advanced

knowledge of the programming language in order to Be able to use Python for data science and machine learning and continue autonomously the development of skills and capacities.

Course N.5

Title: Build a project proposal, a presentation or a public communication

Description: The course will provide scientists with the correct tools to manage public communication with different types of interlocutors, covering all the aspects, from the level of details to the graphical tools and language. The course will also cover the preparation of a project proposal in competitive calls, covering in particular the structure, the key points to cover and text organisation. The participants will have the knowledge needed to improve their capacity to present their results in different contexts and to organise a project proposal. Possible speaker for the communication to the public Marco Castellazzi. a graphical expert also needed.

Course N.6

Artificial intelligence and data mining methods in ecology

Description: The course will introduce the different machine learning methods used in environmental applications (ANN, RF, Deep Learning), using examples of application. In the second part practical activities of machine learning applications to user specific cases will be implemented (only for attendees with programming skills). The understand potentials, risks and limitations of artificial intelligence methods and gain the needed knowledge and skills to start their use.

3.5 Training activities for Solid Earth (WP7)

Three training activities for Ph.D. students of XXXVIII cycle working on the Solid Earth domain are going to be held by the Department of Earth Sciences of University of Pisa. Training courses have been defined in collaboration with CNR-IMAA, CNR-IREA, OGS, and Firenze University.

TRAINING PROGRAMME

Course N.1

Title: Geophysical methods in geoscience and near surface geophysics

Description: Learn the basic knowledge concerning the main geophysical methods used for near surface investigation and the physical principles which form the basis for each of these methods with some examples of applications.

Course N.2

Title: Geophysics and natural risks: instruments and principles of data analysis

Description: Learning the basic concepts about the use of airborne synthetic aperture radar (SAR) systems and introduction to strategies for acquiring, processing and integrating data acquired by in situ geophysical instrumentations, with a special focus on ground penetrating radar (GPR), electrical resistivity, electromagnetic systems and passive seismic methods, and hydro-geophysical monitoring methodologies.

Course N.3

Title: Advanced technologies for monitoring and prediction of ground instabilities

Description: Introduction to the different landslide types and to the main characterization and numerical modelling methods of the triggering and runout mechanisms. Theoretical principles, data acquisition methodologies and application examples of the main surveying and monitoring technologies for ground displacements. Landslide Early Warning Systems on a local and regional scale, with particular reference to their temporal and spatial forecasting concerns.

3.6 Training activities for Trans Domain (WP8)

Training activities have been designed in two steps:

- During internal meetings with referents of university supported by ITINERIS (Universities of Naples Federico II, Naples Parthenope, Pisa, Salento and Tuscia) explained which are their needs.
- With the support of teachers and training companies the draft of the programs has been defined.

The training activities dedicated to future RI research staff are divided into three main thematic areas:

Safety with 2 courses, VRE with 2 courses and How to present your activities and results with 2 courses. The training provides theoretical notions and practical sessions. The courses scheduled for the first year are listed and described in the following two paragraphs.

TRAINING PROGRAMME

Course N.1

Title: Use open scientific infrastructure facilities and VRE - Basic

Description: Creating digital work environments that facilitate "Data -driven" research through analytical and application data streams, allowing the researchers to easily access different datasets, elaborate and use them through calculating and visualization tools is the idea behind the VREs supported by D4Sciences. The training provides notions on the Digital Objects, the FAIR principles for research products and the scientific data repositories, the VRE usability (from data collection, to data analysis up to results publication), the practical sessions on data analyses, the Cloud Storage principles and it will address possible necessities of the ITINERIS VREs.

Course N.2

Title: Use open scientific infrastructure facilities and VRE - Advanced

Description: Creating digital work environments that facilitate "Data -driven" research through analytical and application data streams, allowing the researchers to easily access different datasets, elaborate and use them through calculating and visualization tools is the idea behind the VREs supported by D4Sciences. The training provides notions on the VRE and its Spatial Data Infrastructure, execution of analytical integrated processes, implementation of algorithms/methods, use of codes in Python and R, description and practical test on the ITINERIS VREs.

Course N.3

Title: Safety in lab and field work related to RIs (UNI Pisa)

Description: The training is focused on the risks that can occur into laboratories and during field activities. The main scope is to focus the attention on precautions to adopt during activities to perform them safely and to explain which are the P.P.E. that needs to be used during activities. The course is divided into two modules, safety in the laboratory and safety in the field. Practical demonstration will be used.

Course N.4

Title: Safety in lab and field work related to RIs (UNI Salento)

Description: The training is focused on the risks that can occur into laboratories and during field activities. The main scope is to focus the attention on precautions to adopt during activities to perform them safely and to explain which are the P.P.E. that needs to be used during activities. The course is divided into two modules, safety in the laboratory and safety in the field. Practical demonstration will be used.

Course N.5

Title: How to present your activities and results (UNIPisa)

Description: Communicating scientific results to the wider scientific community is one of the main tasks of a researcher. The course will provide students with the main rules to follow in order to effectively communicate the results of a scientific research in a written (article), oral (presentation) or graphic (poster) form, using effective tools (such as tables, graphs, images) that allow to synthesize a large amount of data and facilitate the analysis, understanding and memorisation of the information contained therein. The course will also include practical sessions in which students will be able to work individually and/or in groups to applied the concepts learnt.

Course N.6

Title: How to present your activities and results (UNISalento)

Description: Communicating scientific results to the wider scientific community is one of the main tasks of a researcher. The course will provide students with the main rules to follow in order to effectively communicate the results of a scientific research in a written (article), oral (presentation) or graphic (poster) form, using effective tools (such as tables, graphs, images) that allow to synthesize a large amount of data and facilitate the analysis, understanding and memorisation of the information contained therein. The course will also include practical sessions in which students will be able to work individually and/or in groups to applied the concepts learnt

4. LIST OF ACRONYMS

AI: Artificial Intelligence

FAIR: Findable, Accessible, Interoperable and Reusable

GPR: Ground Penetrating Radar

HPC: High Performance Computing

ICT: Information and communication technology

KG: Knowledge graph

OU: Operative Unit

PPE: Personal Protective Equipment

RI: Research Infrastructure

SAR: Synthetic Aperture Radar

VRE: Virtual Research Environment

WP: Work Package