



D 3.4 Report: First activity report of Activity 3.6



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1. INTRODUCTION

The deliverable 3.4 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 3.6.

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 3.4 is to provide a general overview of the training program as planned in Activity 3.6 designed by the Operative Units of WP3 in the first year of the project.

The document is structured in 3 chapters, including this chapter. Chapter 2 of the report describes all the activities carried out in the first year of the project and the description of the courses proposed by the OUs of the WPs involved in WP3 for Activity 3.6. Finally, Chapter 3 presents the list of acronyms used in the report.

2. 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-IRETLE and the relative WP coordinators, 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, etc.

To facilitate communication and collaboration within WP 3, 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, 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 involved, the training courses and resources for Activity 3.6 scheduled 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 a total of 25 courses that will be delivered starting from October 2024. It will be needed to extend the project timeline to ensure an execution of all planned activities, i.e. the remaining 11 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.

2.1 Training activities for Access Management and eScience (WP2)

The training activities dedicated to the technical and scientific personnel are divided into two main thematic areas: Management Area with 2 courses and eScience Domain with 6 courses, spread over two years.

TRAINING PROGRAMME

Access and Management courses

Course N.1

Title: Access process and modalities

Description: This compact training course intends to provide RIs' staff involved in serving and supporting users with an adequate base of concrete knowledge for access management. The course conveys the essential concepts, practical applications, processes, main activities and requirements to successfully provide access that meets user needs and earns their trust and engagement in the RI. The course will enrich and professionalize RI personnel whether they are beginners or seeking to improve their operations.

Course N.2

Title: Access process and modalities

Description: The course is a repetition of Course 1, designed to train new infrastructure personnel.

eScience courses

Course N.1

Title: Open FAIR Science

Description: This training course aims to provide to the IR staff a solid knowledge and skills related to Open FAIR Science, which nowadays plays a central role in the international scientific community. The aim of the course is to support the scientific and technical staff in understanding the basic principles of Open FAIR Science and in implementing research practices that are accessible to the scientific community.

Course N.2

Title: FAIR Awareness

Description: The FAIR Principles call for findable, accessible, interoperable, and reusable data for humans and for machines, but they don't provide detailed instructions on how to achieve these goals. This course provides a rigorous understanding of the FAIR Principles and ideas on how to roadmap your FAIR implementation ambitions using the Three-Point-FAIRification Framework.

Course N.3

Title: FAIR Assessment via FAIR Implementation Profiles

Description: This follow-up course leverages the understanding gained in FAIR Awareness. The course focus is on how to conduct FAIR assessment using FAIR Implementation Profiles (FIPs), one of the three parts of the Three-Point-FAIRification Framework. This approach aims to help participants to better understand implementation solutions and drive convergence across communities.

Course N.4

Title: Enabling Open Science on Cloud using Jupyter Notebooks

Description: the goal of this course consists in improving the capabilities of the staff of the research infrastructures in sharing scientific data, results and documents, using the tool *Jupyter notebook* for interactively developing and presenting scientific research. The main objectives of this course are to learn the basics of installing *Jupyter* to develop a notebook, to explore how easily notebooks can be shared and published online and *Jupyter* interaction with general-purpose programming language such as Python.

Course N.5

Title: Harmonization of remote sensing data and geospatial modelling

Description: this course is aimed at research infrastructure personnel and the objective is to facilitate the discussion of remote sensing data, synchronizing scientific results through the use of geospatial modelling. During the course, participants learn how to use this tool to decipher, simulate and predict complex real-world scenarios to allow a comprehensive and available sharing of scientific results.

Course N.6

Title: Artificial Intelligence applied to environmental monitoring

Description: this course promotes the use of the Artificial Intelligence to analyze datasets from various sources like satellite imagery, sensors, and drones to monitor water/air quality and to make biodiversity analysis. This approach improves the understanding of ecosystems by assisting scientists of RI in analyzing Bigdata and identifying intricate patterns, that might evade detection through conventional methods. The objective of the course is to simplify and to improve the accessibility of research data in order to facilitate scientific communications.

2.2 Training activities for Atmospheric Domain (WP4)

The training program of the WP4 has been designed to guarantee a balanced and complete learning path both on the in situ and remote sensing parts. A total number of six courses are foreseen: two courses on atmospheric standardized observations, one for the in situ and one for the remote sensing parts; two courses on the data acquisition and management, one for the in situ and one for the remote sensing parts; one course on the exploitation of atmospheric composition data; one course on climate change and urban pollution. A detailed description of the six courses is provided in the following section.

TRAINING PROGRAMME

Course N.1

Title: Atmospheric standardized observations: Methods and maintenance in observatories – In-Situ

Description: The course is mainly intended to people related to the in-situ atmospheric measurements at the National Facilities. It is open for any interested student from final year of Master to Postdoc level; but also, engineers and scientists from the ACTRIS and ICOS RIs are welcome. Lectures give an overview of the scientific topics and the methodologies, operative procedures recommended for in situ long term measurements of trace gases, aerosol, clouds.

Course N.2

Title: Atmospheric Data acquisition, processing, and submission. Remote Sensing

Description: The course is mainly intended to people related to the aerosol remote sensing observations at the National Facilities. It is open for any interested student from final year of Master to Postdoc level; but engineers and scientists from the ACTRIS are welcome as well. Lectures give an overview of the scientific topics and the methodologies, operative procedures recommended for aerosol remote sensing measurements. The major scientific and technical steps required to be an ACTRIS Aerosol Remote National Facilities will be covered.

Course N.3

Title: Atmospheric composition data exploitation

Description: The course aims to provide an overview of atmospheric composition data in terms of content and access possibilities. The training is addressed to researchers and technologists recently hired at the RIS as well as to PhD students and research fellows working at RIs and more in general in atmospheric field.

Course N.4

Title: Atmospheric Standardized observations: Methods and maintenance in the labs – Remote Sensing

Description: This course is aimed at providing the knowledge to manage the laboratorial activities confidently and autonomously, for Remote Sensing Atmospheric Standardized Observation. Lectures give an overview of the scientific topics and the methodologies, operative procedures recommended for Remote Sensing long term measurements of trace gases, aerosol, clouds. The

training course is open to students from final year of Master to Postdoc level; engineers, technologists and scientists from the ACTRIS and ICOS RIs.

Course N.5

Title: Climate change and urban pollution: challenges and objectives for the atmospheric research

Short description of the course: The course will give the students the knowledge to better understand the key elements to be considered when addressing climate change and urban pollution from an atmospheric research perspective. The training is addressed to researchers and technologists recently hired at the RIS as well as to Ph.D. students and research fellows working at RIs and more in general in the atmospheric field. Possible location: Rome. Period: Spring 2025. Course delivery method (online course/in-person/mixed): mixed.

Course N.6

Title: Atmospheric Data acquisition, processing, and submission. In-Situ

Short description of the course: The course will provide information on modalities of data submission, processing and curation for the ACTRIS aerosol in situ component. The course is mainly addressed to people dealing with aerosol in situ observations, even outside ACTRIS. It is open for any interested student from final year of Master to Postdoc level; but engineers and scientists are welcome as well. Period: Spring 2025. Location: TBD. Course delivery method (online course/in-person/mixed): in-person.

2.3 Training activities for Marine Domain (WP5)

Training of scientific and technical personnel is a key asset of a Research Infrastructure. In order to identify an adequate training fulfilling the gaps of knowledge of the RIs personnel, WP5 has promoted an internal dialog among the WP5 task leaders and RIs reference persons to identify the specific topics to be addressed. The discussion occurred in two main moments, 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 ability in oceanographic data management taking into account the FAIR and TRUST principles
- Requirement of expanding the knowledge about the functioning, the management, and the opportunities of the Research Infrastructures
- Necessity to acquire a wide experience on oceanographic instrumentations, from data collection to science divulgation.

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

TRAINING PROGRAMME

Course N.1

Title: Introduction to Marine Research Infrastructures: managing complexity

Description: This course offers a comprehensive introduction to the management of complexity within marine research infrastructures. Participants will gain insights into the multifaceted aspects of research infrastructures and their management within both the Italian and European contexts. The course covers various types of marine research infrastructures under ITINERIS, exploring governance models, financial considerations, policy frameworks, and the scientific data production process from sensor installation to data sharing and publication.

Course N.2

Title: Marine data management and data quality control.

Description: The course will provide general information on data management and quality control of different marine data types and an overview of the main EU Blue Data Infrastructures, their tools and services. The FAIR data management principles will be used as guidelines to introduce interoperability solutions (metadata and standards) and discuss the data life cycle and how to develop data management plans (DMP). Technical aspects and specific tools (i.e. Ocean data View, ERDDAP) will be introduced together with practical examples and exercises. Data and data products publication (i.e. DOI) best practices will also be introduced.

Course N.3

Title: Ship-based training initiatives in marine-related sciences.

Description: This course provides comprehensive ship-based training in marine-related sciences, emphasising practical skills and theoretical knowledge essential for research activities aboard oceanographic vessels. Participants will undergo Basic Offshore Safety Induction & Emergency Training (BOSIET) and gain hands-on experience in operating oceanographic instruments,

conducting field activities, and processing collected data. The training aims to prepare technical-scientific personnel for effective research engagement in marine environments.

Course N.4

Title: Structure of the Marine Data Access at the European Level

Description: The course provides a comprehensive overview of the infrastructure and mechanisms facilitating access to marine data across Europe. Participants will delve into the intricate network of data repositories, platforms, and protocols established to collect, manage, and disseminate marine data. From oceanographic research to environmental monitoring and maritime activities, the course examines the crucial role of data accessibility in understanding and managing the marine environment. Through case studies and practical examples, learners will gain insights into the challenges and opportunities inherent in harmonizing marine data access on a continental scale, contributing to informed decision-making and sustainable marine resource management.

Course N.5

Title: Introduction to Marine Research Infrastructures: managing complexity

Description: This course offers a comprehensive introduction to the management of complexity within marine research infrastructures. Participants will gain insights into the multifaceted aspects of research infrastructures and their management within both the Italian and European contexts. The course covers various types of marine research infrastructures under ITINERIS, exploring governance models, financial considerations, policy frameworks, and the scientific data production process from sensor installation to data sharing and publication.

Course N.6

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2.4 Training activities planned in Terrestrial Domain (WP6)

The training activity programme for Terrestrial Domain was defined through a careful assessment of training needs of the various RIs. An exploratory survey on training needs has been subjected to all RIs coordinators. Several coordination meetings were held with WP 6 leader Prof. Dario Papale to analyse exploratory survey results and define RIs training priorities. All the activities carried out aimed at defining an effective multi-year learning path that will increase RIs operational potential.

TRAINING PROGRAMME

Course N.1

Title: Eddy Covariance theory and practice: from sensors setup to preliminary data processing

Description: The course will provide the basics of the eddy covariance technique. Principles of atmospheric physics, sensor characteristics and setup, fluxes calculations and aspects to consider in the measurement. Participants will have the essential knowledge to design and implement an eddy covariance tower and calculate the fluxes.

Course N.2

Title: Datalogger programming and sensors connection - basic course

Description: Dataloggers are widely used in environmental monitoring. The course will provide the basic information needed to prepare a data logger, connect the different sensors and understand the possible options, setup the data collection scheme, list the metadata needed and collect and download data. The participants will have the needed knowledge to connect and collect data from a range of environmental sensors.

Course N.3

Title: Datalogger programming and sensors connection - advanced course

Description: To be scheduled after the basic course and dedicated only to specific participants, the course will provide a deep knowledge of the datalogger potentialities and programming in order to solve complex needs in the data collection, pre-processing, formatting and automatic submission.: the participants will have a deep knowledge of the data logger and their programming, building an Italian team of experts useful for all the RIs.

Course N.4

Title: Use of Isotopes in environmental investigations

Description: The course will introduce the use of isotopes in the environmental applications in the different domains and then dedicate time (in parallel or sequential) to use in different components (atmosphere, vegetation, soil, water). It includes practical activities in the laboratory. Learning objective: participants will have an overall idea of the possible isotope based methods and basics of data collection.

Course N.5

Title: Programming in Python

Description: The course will provide the basic programming skills using the Python language, from the setup and basic operation to the preparation of user specific functions and codes. Learning objective: participants will have the basic knowledge of the programming language in order to continue autonomously the development of skills and capacities.

Course N.6

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. Learning objective: participants will be able to create a docker and deploy it on an HPC system. Programming capacities needed and not covered in the course.

2.5 Training activities for Solid Earth (WP7)

The training program of the WP7 has been designed to guarantee a complete learning path surveying and monitoring technologies for geosphere and land surface. A total number of five courses are foreseen on collection and archiving of geophysical data, new instruments purchased with ITINERIS project, surveying and monitoring technologies for ground displacements, data mining using Machine Learning and Deep Learning. A detailed description of the courses is provided in the following section.

TRAINING PROGRAMME

Course N.1

Title: Digital collection and archiving of drilling data with mDIS

Description: Presentation of the the mDIS system, developed ad hoc in GFZ Potsdam for the archiving of ICDP Drilling data and now adopted by ECORD. Discussion with the developers the needs of the Italian ITINERIS scientific community for the delivery of an ITINERIS-mDIS version of the software. Train the operators to the use of the m-DIS.

Course N.2

Title: Distributed Acoustic Sensing (DAS) for high-resolution and large-scale geophysical imaging

Description: Introduction to DAS technology and how it can improve geophysical prospections in different contexts such as: VSP, reflection/refraction seismic, and reservoir monitoring. Theoretical principles, data acquisition methodologies and application examples of the main surveying. Survey design approaches, and processing techniques with hands-on practice, both on real datasets and actual field equipment

Course N.3

Title: Data mining and machine learning for Geophysics

Description: The course aims to provide the basics of artificial intelligence and the paradigms of machine learning and deep learning, starting from the history and principles of artificial intelligence, areas of applicability, principal approaches and deep learning.

Course N.4

Title: Geophysical instruments and data processing

Description: The course is held at the pilot sites of the WP7 in Friuli Venezia Giulia and Basilicata regions, with a presentation of the geophysical-airborne approach for near-surface, land surface monitoring and natural risk mitigation, based on the new leading-edge instrumentation acquired, elements of data processing; field activities; and demonstration of data analysis.

Course N.5

Title: Advanced technologies for landslides

Description: Introduction to landslide processes. 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.

2.6 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, spread over two years. The training provides theoretical notions and practical sessions. The courses scheduled for the first year are listed and described in the following two paragraphs.

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TRAINING PROGRAMME

Course N.1

Title: Safety in the field work related to RIs (fire risk and sea activities)

Description: the training provides notions of fire-fighting and Sea rescue. It includes theoretical and practical lessons (Fire Fighting Certification Level 3-FOR and Sea Rescue Certification) that reconstruct possible situations that researchers might experience during outdoor activities.

Course N.2

Title: Safety in the field work related to RIs (towers climbing and hiking principles)

Description: the training is about high altitude safety (theoretical and practical lessons with final practical test for certification) and provides notions of safety and first aid (BLS course with practical test for BLS certification; First Aid course - how to handle emergencies; Adaptation to altitude) during hiking and activities including extreme environments.

Course N.3

Title: How to write a successful proposal

Description: The course will analyse the components of the preparation of a successful proposal, including the ability to carefully read and interpret the call text, the need for international collaborations and networking, and the role of clarity and conciseness.

Course N.4

Title: VRE operating mode - 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.5

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.

3. LIST OF ACRONYMS

BLS: Basic Life Support

BOSIET: Basic Offshore Safety Induction & Emergency Training

DAS: Distributed Acoustic Sensing

FAIR: Findable, Accessible, Interoperable and Reusable

FIP: FAIR Implementation Profile

OU: Operative Unit

RI: Research Infrastructure

VRE: Virtual Research Environment

VSP: Vertical Seismic Profile

WP: Work Package