



**D4.3.1: Progress report on the acquisition of equipment that will be integrated in the facilities of the CNR ISAC Lamezia OU and harmonized with the network. [B8]**



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## 1. INTRODUCTION

This deliverable is prepared in the context of the ITINERIS project, within the Work Package 4 that deals with the integration of Research Infrastructures (RI) working in the atmospheric domain through synergistic approaches and cross boundaries developments.

This deliverable reports the progress in acquisition of equipment for the WP4.3 activities for integration and harmonization of CNR ISAC Lamezia Terme with the Italian Network of Environment RIs.

The main aim of D4.3 regards the instrumental strengthening of the observational capacity of the facility of Lamezia Terme. This reinforcement will act mainly in the context of the ICOS RI as Lamezia Terme hosts a HUB for the ICOS Italian nodes of the Atmospheric Italian community. These instrumental improvements of the Lamezia Terme ICOS Italian Hub, will consolidate the Italian contribution to the ICOS RI.

Concerning ICOS RI, we will assure a long-term commitment of GHG observations by implementing new greenhouse gas (GHG) instrumentations. In particular, we will extend the observational capacities of CO<sub>2</sub>, CH<sub>4</sub> and C isotopes through C<sup>13</sup> analyser, C<sup>14</sup> sampler, and <sup>222</sup>Rn measurement improvement. Furthermore, the long-term commitment will also rely on: i) a reorganization of the Lamezia Terme ICOS hub logistics and related services: ii) set up of an external area for hosting future campaigns for open-fire tracer detection.

The reinforcement of observational capabilities of Lamezia Terme site are mainly linked to the scientific activities of RIs integration and pilot forest fire implementation.

The development of new tools is foreseen on some previous database collected through instrumentation compliant to ICOS, ACTRIS RI, and actives at Lamezia Terme research unit since 2014. The integration will be possible with the new equipment purchasing activity.

The document is structured in four different sections. Annexes and references are reported at the end of the document.

## 2. CNR ISAC LAMEZIA TERME ATMOSPHERIC OBSERVATORIES AND ROLE IN ATMOSPHERIC RIS

The Lamezia Terme observatory (LMT) and ICOS Italian Atmospheric HUB is an integrated site, that is a semi-rural coastal observatory in Southern Italy's "toe" in the center of Mediterranean area. The LMT includes the CNR observatory of Lamezia Terme (LMT) (6 m s.l.m. 600 m. from the coastline), the Regional GAW-WMO station in Italy and the ICOS Italian Atmospheric HUB developed under the project PRO- ICOS-MED to serve Monte Cimone ISAC, IMAA Tito Scalo and Lampedusa ENEA, Italian Atmospheric ICOS Nodes. At LMT Regional GAW-WMO station, GHG, reactive gases, observations of pollution have been performed in the last 10 years.

Since 2012, the CNR-ISAC Lamezia Unit has been involved in Italian and European projects for the use of integrated atmospheric observations (meteo gases and aerosols), for the environmental impact of measures on renewable energy, coastal erosion, hydrological effect, and forest fire. This integration can contribute to a reliable and sustainable operational service in support of air quality policies, and climate change and its impact. The institute also has decadal experience on the synergic use of remote sensing and in situ measurements of aerosol, gases and clouds.

Furthermore, a mobile laboratory for ICOS network is available at LMT ISAC unit to characterize GHG and Radon, equipped also with autosampling flasks and a ceilometer for PBL height detection at possible different locations, in order to integrate the permanent observatories time series. The mobile laboratory observational capabilities are planned to be used in several field campaigns across the country, addressing gases, reactive gases, integrating aerosols related problems.

The list of current available instruments is included in the *ANNEX I*

### 3. IDENTIFIED GAPS AND NEEDS FOR INTEGRATION

The main needs for the observatories maintenance and reinforcement are linked both to human capital and technical infrastructure.

#### Human capital

Human resources are one of the key factors for the long-term sustainability of the RIs. A lot of efforts are targeted to the selection of suitable personnel; trained and prepared to infrastructures maintenance and research activity.

#### Technical infrastructure

The sustainability of the observations is linked to a good state and continuous maintenance of instrumentation and technical installations in both fixed and mobile observatories. In particular, there is the need to implement the observatory with electrical and network connections, UPS, gas inlet compliant with the recent standard operating procedures defined in the RI network.

The implementation plan and integrated measures were conceived considering gaps and needs for the integration.

To understand the nature of fossil or biomass in fire emissions, C13 and C14 isotopes measurements would be valuable as additional information respect to current observational capability. For filling this gap, a sampler and an analyser for C13 and C14 measurements in CO<sub>2</sub> and CH<sub>4</sub> will be acquired during ITINERIS project. This will support a comprehensive measurement of carbon atmospheric circulation, including the one linked to open fire, and a better understanding of the nature (fossil or biomass) of burning carbon source. Together with measurement with C14, C13 isotope sampler/analyser and <sup>222</sup>Rn will be improve the detection of combustion products nature and increased the understanding of their combination. To integrate greenhouse gases and gaseous pollutant concentration, some particulate matter concentration and sampler are planned to be integrated together with equipment allowing to improve the quality of the measurements such as dryers or deep freezer refrigerators.

Additionally, to the above reported equipment, a reorganization of the logistic of ICOS hub located at the OU and related services, are foreseen. Furthermore, an external area will be settled with, power and internet connection, ready to be hosting the planned campaigns for the open fire tracer detection.

Furthermore, it is planned to guarantee an optimal instrumentation hosting assuring power, connection, and environmental condition preservation; and a local data center preservation system that will be connected to the institute infrastructure.

Other actions foresee the implementation of: i) hardware and software systems for platform development to store, integrate and harmonize collected data in natural and anthropic fires occurrences; ii) instruments for collection of open fires tracers data like automatic ionic chromatograph, CO<sub>2</sub> analyzer and aethalometer.

#### 3.1 LIST OF INSTRUMENTS/GOODS TO BE ACQUIRED WITHIN ITINERIS:

AE43 (aethalometer)

Picarro G5310 (N<sub>2</sub>O, CO, H<sub>2</sub>O),  
NOx analyser  
ICOS Dryer,  
<sup>14</sup>C ICOS sampler,  
Rn222 sampler equipped with dryers  
Hardware and software platform for integration  
Data Storage  
CH<sub>2</sub>O analyzer  
Automatic ionic chromatograph

#### 4. EQUIPMENT PROCEDURES

The Operative Unit of Lamezia Terme organized the purchase procedures at ISAC level, together with Lecce and Bologna Units. For Lamezia Terme we planned 1 EU tender procedures, 1 derogation purchases for uniqueness, 11 procedures under threshold on the Italian market for public administration.

The following table (Table 1) reports the instrument description, the typology of purchasing procedure, the type of procedure according to ISAC organization among the OU, involved WP4 task, and the status of the procedure.

*Table 1 – Status of integration equipment and works purchasing procedures*

INSTRUMENT DESCRIPTION	PROCEDURE	Internal Organization	Activity	Status
AE33 (aethalometer for black carbon concentration, BB fraction)	EU tender	EU-1-ISAC L1	4.16	Procedure in DAC signing
Analizzatore 13C (CRDS for 13C in CO <sub>2</sub> and CH <sub>4</sub> )	EU tender – unicity	EU 3 ISAC	4.3	OE Assigned (DAC signed)
ICOS Dryer	RDO-MEPA		4.3	OE selected
Refrigeratory	RDO-MEPA		4.3	OE selected (DAC signed)
RN222 integration (flux chambers and integrated dryer)	RDO-MEPA		4.3	Market analysis
C14 analyser	RDO-MEPA		4.3	Market analysis
Hardware and software platform	RDO-MEPA		4.16	Market analysis
CH <sub>2</sub> O <sup>1</sup> analyzer	RDO-MEPA		4.16	Operator selected (signing contract)

<sup>1</sup> In correction of COH<sub>2</sub>.

NOx analyser	RDO-MEPA	4.3	Market analysis
Data Storage	RDO-MEPA	4.3	Market analysis
Automatic ionic chromatograph	RDO-MEPA	4.16	Operator selected (DAC signed)
Structural adaptation of Pilot experimental area (structural and building works)	RDO-MEPA	4.16	Waiting for permission-renewing hosting
Civil infrastructures and related systems for HUB integration (structural and building works)	RDO-MEPA	4.3	Waiting for permission renewing hosting

Despite the initial purchasing time schedule, all the acquisition procedures were delayed due to the new procurement code introduction in July 2023 which implied significant changes in the purchasing procedures at national level, thus forcing CNR to deliberate new internal purchasing procedure rules.

Furthermore, in January 2024, there was the adoption of digitalised MEPA platform as purchasing framework. The spin-up of this process was not fully prepared and taught to administration and this furtherly slowed down the procedures' calendar.

We plan to restart process in the upcoming months in order to start all the procedures for the equipment before the summer. This will allow to close the contracts for the procedures in which the operators were already individuated.

## ANNEX 1 – CNR-ISAC LT AVAILABLE INSTRUMENTS

### Lamezia Terme Observatory and ICOS Italian HUB

MAAP Thermo 5022 : aerosol absorption coefficients, Black carbon, scattering corrected

Nephelometer, TSI 6735: Aerosol light scattering coefficients.

SMPS Tropos: Aerosol size-distribution (range: 10 - 800 nm) CPC-TSI 3772: Fine particles  
Number concentration

Aerodynamic Particle Sizer, TSI 3321: Aerosol size-distribution (range: 0.5 - 30  $\mu\text{m}$ )

Picarro G2401 (CO<sub>2</sub>, CH<sub>4</sub>, CO, H<sub>2</sub>O),

Los Gatos G5310 (N<sub>2</sub>O, CO, H<sub>2</sub>O),

Thermo 49i (O<sub>3</sub>),

ICOS Flask Sampler

Celiometer Luft CHM15K,

Radon analyser MIAM,

Diluitore Thermo 146i