A future centre for climate and weather research in the Eastern Mediterranean: the ATARRI project

Funded by the European Union

GA No 101160258

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Synergies of clusters

1. Atmosphere | Climate and Environment
2. Energy | Resilient Society

Francesco Scarlatti

THE PROJECT

THE ATARRI PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON EUROPE FRAMEWORK PROGRAMME (HORIZON-WIDERA-2023-ACCESS-02, TWINNING CALL) UNDER THE GRANT AGREEMENT NO 101160258.

Start date: 01/10/2024
End date: 30/09/2027
Duration: 36 Months
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Coordinator: ERATOSTHENES Centre of Excellence

Prepared
05/2023

Submitted
10/2023

Awarded
02/2024

Start
10/2024

Amendment
12/2024

New consortium
01/2025

SWOT Analysis

Strengths	Opportunities
• Strong research collaborations arising from the position of Cyprus both geographically and geopolitically • Newly established Research center of Excellence supported by H2020-Teaming Phase 2, EXCELSIOR • **Advanced data collection: Quality assured atmospheric and climate related** parameters available by CARO facility. • Continuous RT monitoring of atmospheric conditions • Data processing and analysis: ECoE acquired a dedicated server for running different applications. • Participation in national and international committees (RS Society, SPIE, COST etc.) • Collaboration with Public Authorities • **Connection with relevant European networks (EARLINET, ACTRIS, AERONET, WMO-GAW)** • Expertise in ground-based lidars, sun photometry, aerosol characterization, algorithms • **CARO National facility at ACTRIS-ERIC**	• Efficient and holistic staff training • **Technological advances, including the synergy of new techniques and the development of new methodologies** • links with the regional/European authorities/organizations and/or networks • ECoE will be further promoted in the international research area • Establishment of a solid, high-level research unit in the field of climate changes, atmospheric sciences etc. • Joint authorships and future collaborative proposals with experts from the partnering organizations • **development of tailored products used by government agencies, and private sectors** • Funding initiatives and policies focused on green deal can provide a favourable environment for the project's sustainability and growth.
Weaknesses	**Threats**
• **Lack of modeling skills for reaching the next level of expertise for various applications** • **Limited experience in model assimilation and evaluation** • **Limited experience in solar radiation/energy measurements and exploitation** • Inability to follow research advances due to the limited funds and interaction with research pioneers • Shortage of human resources in certain levels, limited number of post-doctoral and PhD students • Limited visibility at international level • Limited representation in expert working groups and committees	• Uncertain economic conditions are likely to hinder research investments by the industry • Growing competition from research institutes in the European Research Area • Future projects are more likely to be attributed to the institutions with more complementary facilities • Competition: Call for projects or local initiatives focusing on the field of ATARRI and CARO observations may not be launched in the next years. • **Long term sustainability: instruments need permanent maintenance and calibration, and when needed, repair.**

THE PROJECT

The overreaching objective of the ATARRI Twinning activity is to exploit the full potential of the ERATOSTHENES CoE **CARO National Facility and Solar Network** towards scientific excellence and application development in the atmospheric and solar fields of research enchasing the Earth Observation R&I and modeling capacities of **ERATOSTHENES Center of Excellence.**

CARO National Facility and Solar Network

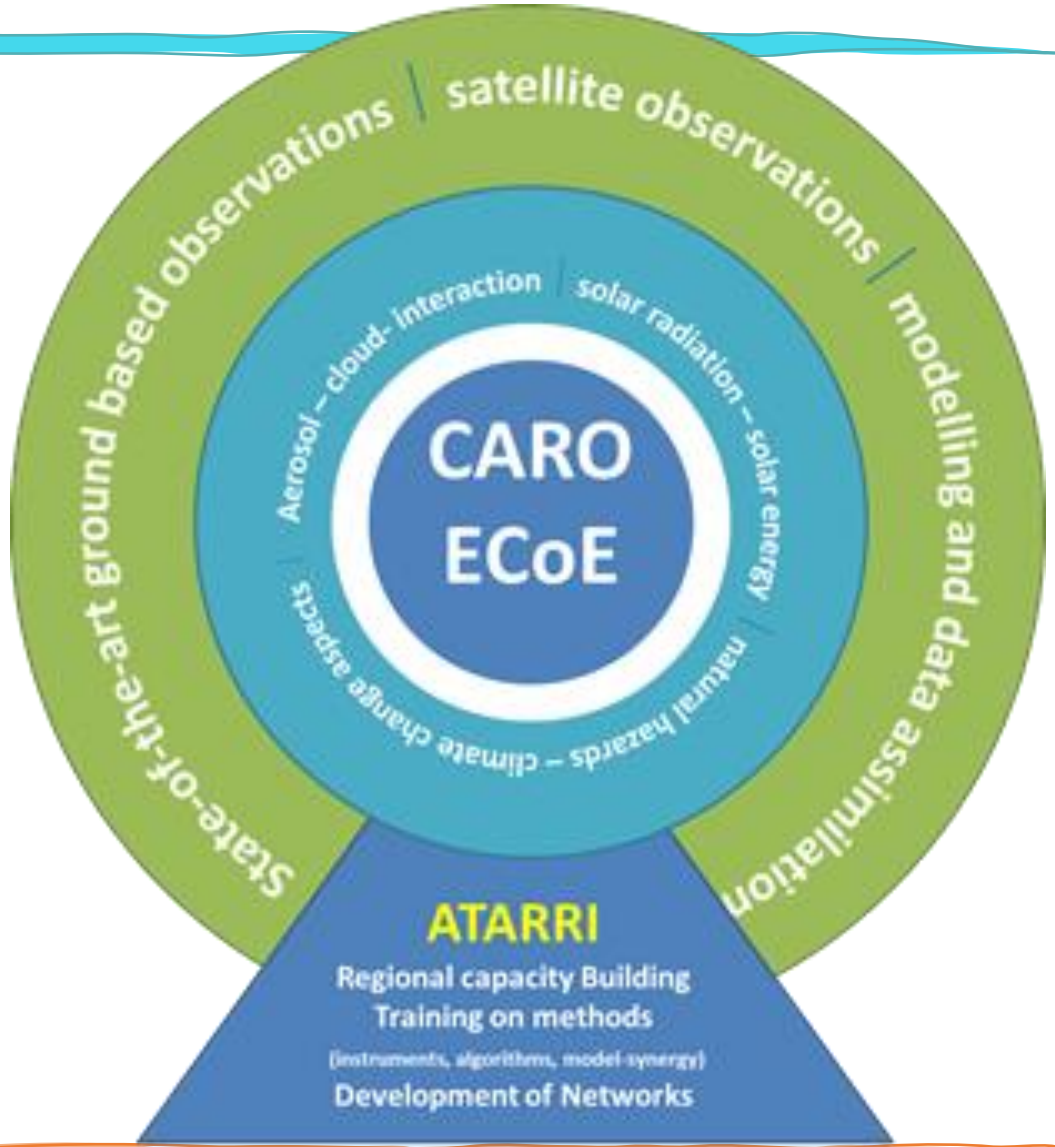
Overall objetive

Collaboration with research institutes and its affiliated universities

With respect to the basic concept of the TWINNING call, the overarching objective of ATARRI **is to establish ECoE as an excellence cluster for atmospheric remote sensing and modeling research and services in the Eastern Mediterranean.** More specific, to significantly strengthen the scientific expertise of ECoE through the **collaboration and networking with top-class leading** counterparts at European Union level in the field of atmospheric and climate research.

Building on the huge potential of networking for excellence, the project involves strategic partners that are considered as pioneers

- in aerosol modelling **(BSC/CNS)** and the effects of dust in the ecosystem,
- modelling and measurements synergetic algorithms **(GRAPS SAS)** towards characterizing optical and physical properties of atmospheric aerosols,
- solar measurements and products related with atmospheric composition and satellite validation **(PMODWRC)**
- solar energy applications in different spatiotemporal scales **(ARMINES/ ENSMP and FC.ID/ CIENCIAS UL).**



SPECIFIC OBJECTIVES

STO.01

Strengthen the expertise and *improve the research profile of ECoE*, through strategic collaborations with highly capable and renowned partners in the field of atmospheric modelling and satellite calibration/ validation (cal/val) through modelling and remote sensing synergies.

STO.02

Enhance research management capacity and administrative skills of the ECoE infrastructure and applications towards widening access, increased mobility and collaboration.

STO.03

Strengthen the position of ECoE and spreading excellence at the regional research and innovation ecosystem

PARTNERS ROLE and CONTRIBUTION

BSC/CNS: increasing dust modelling knowledge and capabilities.

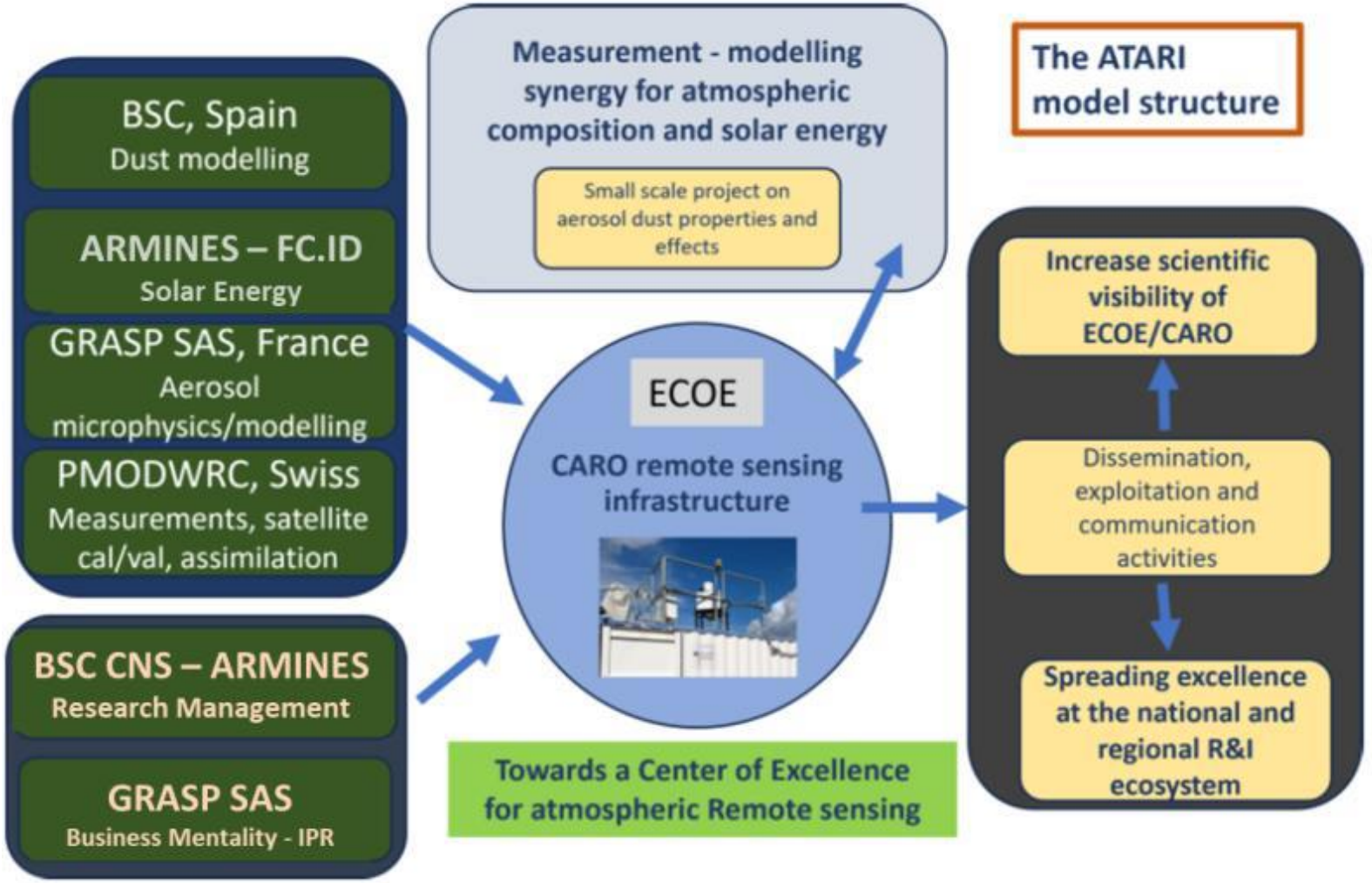
GRASP SAS: develop synergistic products for enhanced atmospheric characterization (e.g. aerosols and clouds).

PMOD/WRC: enhancing ground-based aerosol remote sensing and solar measurement capabilities and satellite validation activities.

ARMINES/ ENSMP: Being capable of valorizing the acquired knowledge, competences, and data in urban photovoltaic (PV) solar energy applications.

FC.ID / CIENCIAS UL: Solar energy modelling at urban scales, Impact of strong dust intrusions on solar energy.

OBJECTIVES


BSC, Spain
Dust modelling
ARMINES – FC.ID
Solar Energy
GRASP SAS, France
Aerosol microphysics/modelling
PMODWRC, Swiss
Measurements, satellite cal/val, assimilation
BSC CNS – ARMINES
Research Management
GRASP SAS
Business Mentality - IPR
Measurement - modelling synergy for atmospheric composition and solar energy
Small scale project on aerosol dust properties and effects
ECOE
CARO remote sensing infrastructure
Towards a Center of Excellence for atmospheric Remote sensing
The ATARI model structure
Increase scientific visibility of ECOE/CARO
Dissemination, exploitation and communication activities
Spreading excellence at the national and regional R&I ecosystem

WORK PACKAGES

From
6 to 10 WPs

2 Review periods
Month 18
Month 36

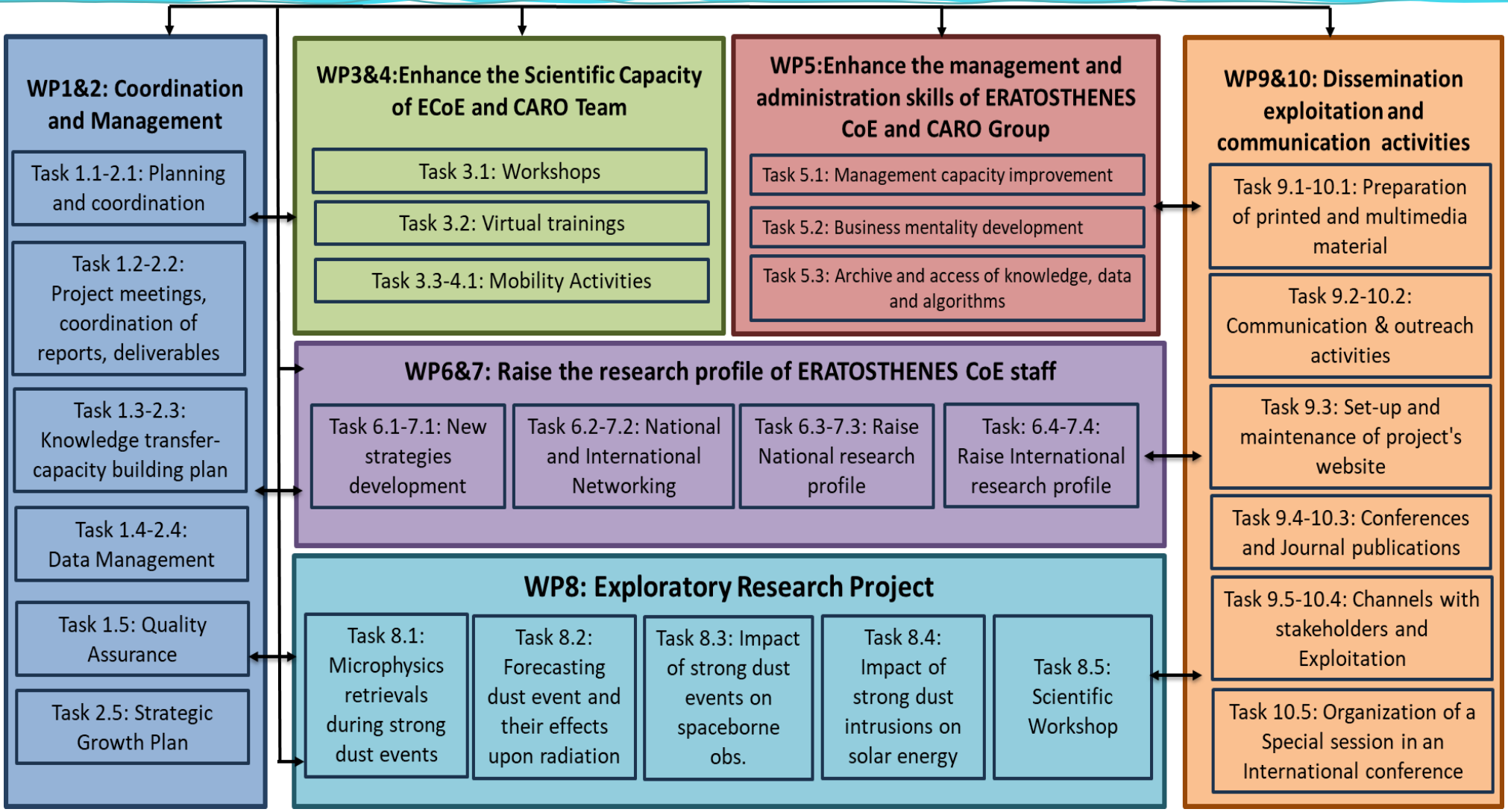
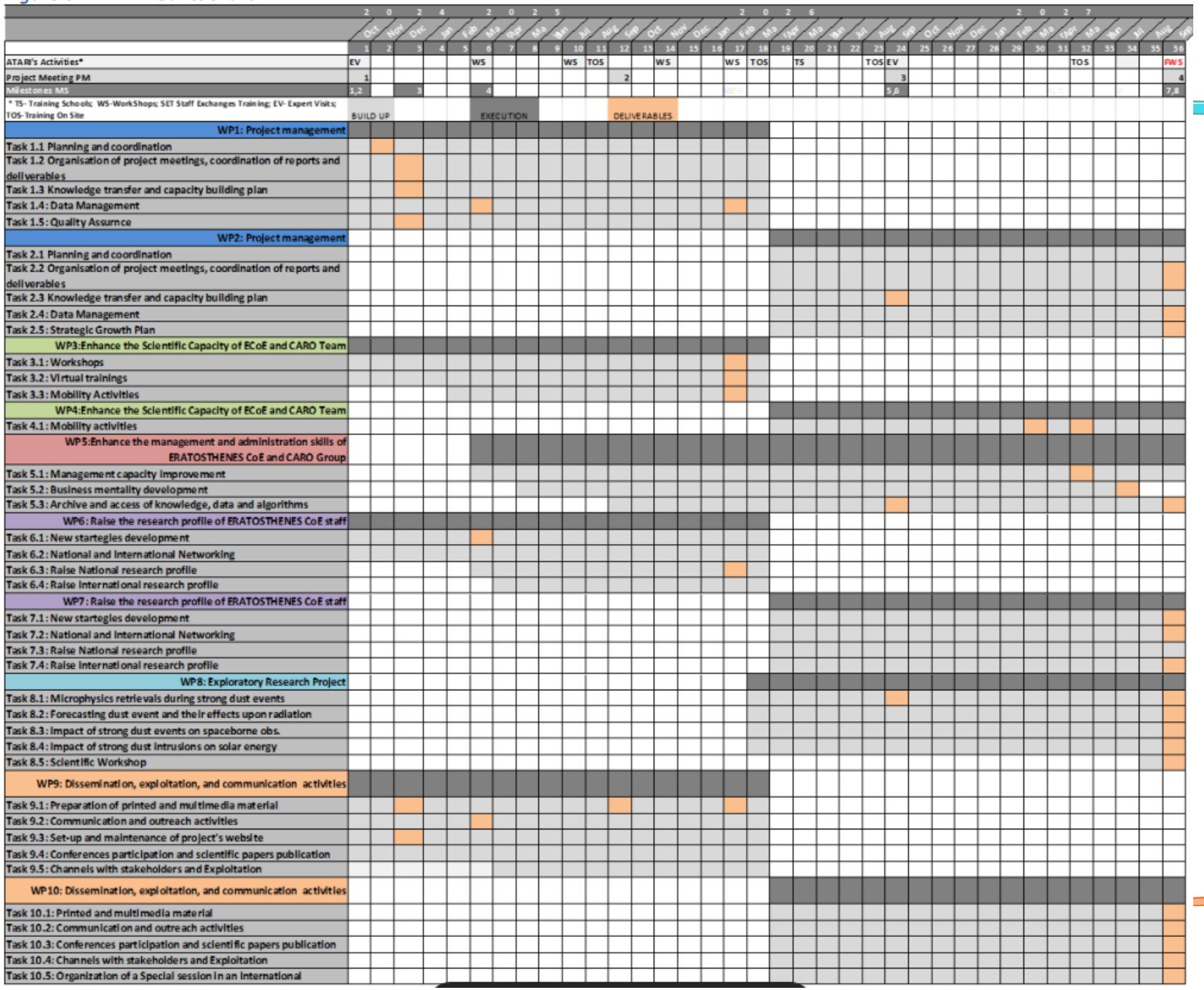


Figure 6: ATARRI Gantt chart.



WORK PACKAGES

WP8

Exploratory Research Project: “The role of Dust to the climate”

In order to test the transferred knowledge and tools the **Exploratory Research Project** is foreseen to be organized and executed in the second part of the project. It will be a small scale scientific project on different aerosol types and especially different dust types (of N. African or M. East origin) using the experience, model tools and scientific directions defined by the experience partners in the first part of the project.

More specific the ERP is focused on extreme dust intrusions in Cyprus, where CARO observations will show the importance of measurements in this region.

It aims for ECoE/CARO team to test the newly gained knowledge, evaluating the extend of the transferred knowledge, identifying gaps and suggest correction actions if needed. The ERP is structured in a way that all partners are involved in at least one task aiming on synergistically provide answers to specific scientific questions on aerosol dust origin, aerosol properties and interaction with radiation etc by using real observation of ground-based and spaceborne measurements, to test, improve and optimize the different models and retrievals.

CARO team will be supervised by the partners in performing an analysis with the new expertise, while the leading institutions will be able to test, adapt and improve their algorithms using real observations. Scientific outputs will be of benefit for both ECoE/CARO team and the leading institutions

month	Oct24	Nov24	Dec24	Jan25	Feb25	Mar25	Apr25	May25	Jun25	Jul25	Aug25	Sep25	Oct25	Nov25	Dec25	Jan26	Feb26	Mar26
meetings	M1											M2						
Trainning Schools																		
Workshops						WS1			WS2			WS3			WS4			
Virtual trainings						VT1	VT1	VT1,4	VT2,3	VT2,3	VT2,3	VT4	VT4	VT4	VT5	VT5	VT5	
Short term staff exchanges								ST1				ST2						ST3
Experts visits	EV1																	
Short term on site						SV2			SV3/SV4						SV1			SV2
Buisness Mentality																		
Researh Project																		PPP

month	Apr26	May26	Jun26	Jul26	Aug26	Sept26	Oct26	Nov26	Dec26	Jan27	Feb27	Mar27	Apr27	May27	Jun27	Jul27	Aug27	Sept27
meetings						M3												M4
Trainning Schools		SS1												SC2				
Workshops																		WS5
Virtual trainings	VT5	VT5																
Short term staff exchanges			ST4				ST5											
Experts visits		EV2				EV3								EV4				
Short term on site		SV1	SV3			SV1		SV4		SV2								
Buisness Mentality						BM1		BM2		BM3		BM4						
Researh Project	PPP	PPP	PPP	PPP	PPP	IMP	IMP	IMP	IMP	IMP	IMP	IMP	IMP	IMP	IMP	IMP	IMP	WS5

STRATEGIC SCIENTIFIC DOMAIN

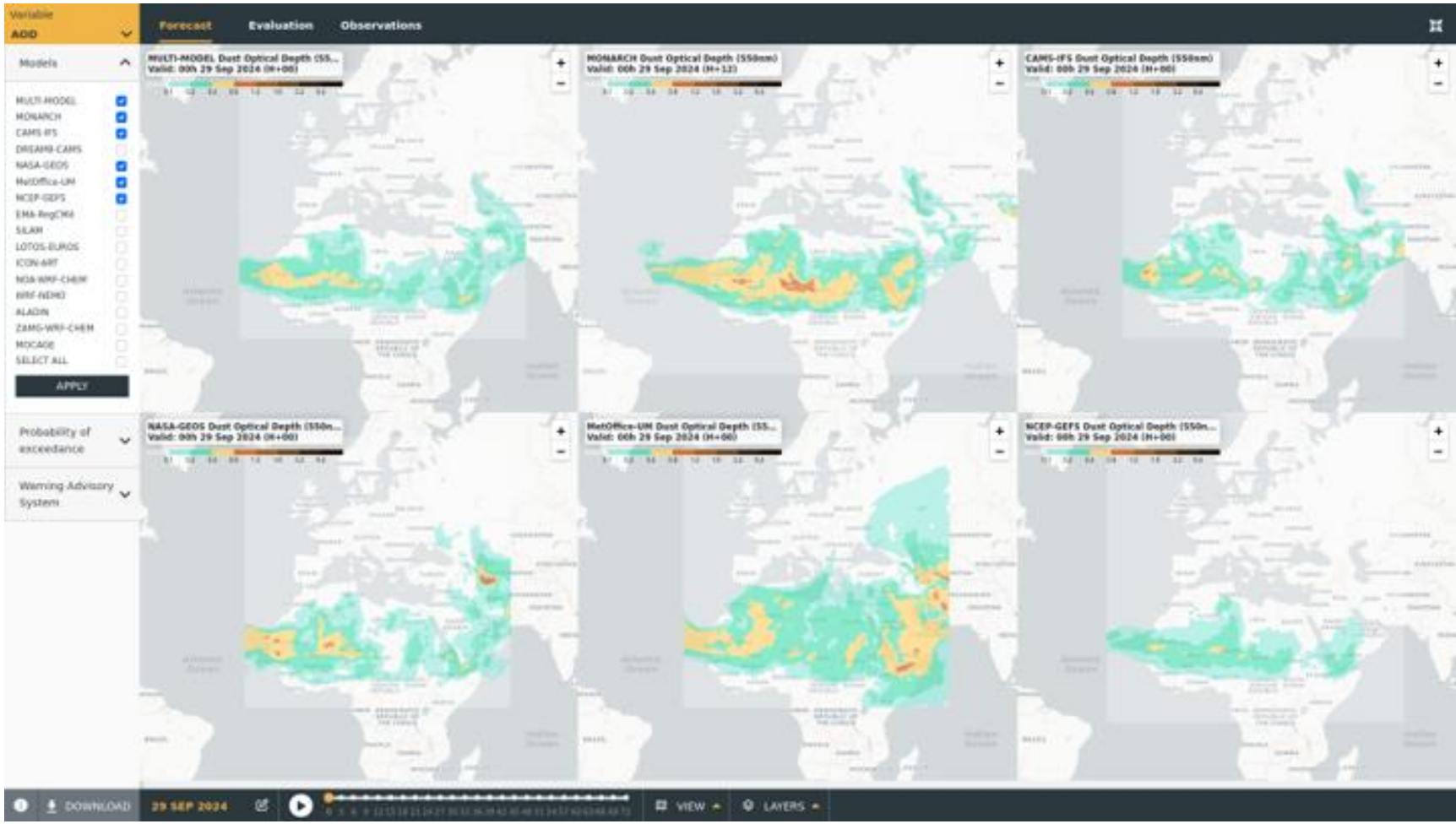
SSD1 | BSC / CNS

DUST MODELING AND FORECASTING

Dust sources transport and Dust minerology

Understanding, managing and mitigating desert dust risks and effects requires fundamental and cross-disciplinary knowledge underpinned by state-of-the-art scientific research, the availability of reliable information on dust trends and current conditions, the provision of skillful forecasts and projections tailored to a diversity of users, and the capacity to use the information effectively. **A full training program on state-of-the-art dust research, modelling and forecasting to advance ECoE's capacity** is foreseen. The training scheme will focus on the capacity building of ECoE team on **1) dust sources, emission, transport, and variability across multiple time scales, 2) dust effects upon weather, climate, atmospheric chemistry, and ocean biogeochemistry, and 3) dust forecasts, and reanalysis datasets using data assimilation.** This strong knowledge transfer will be provided by the BSC team.

Use of CARO observations for model evaluation and assimilation

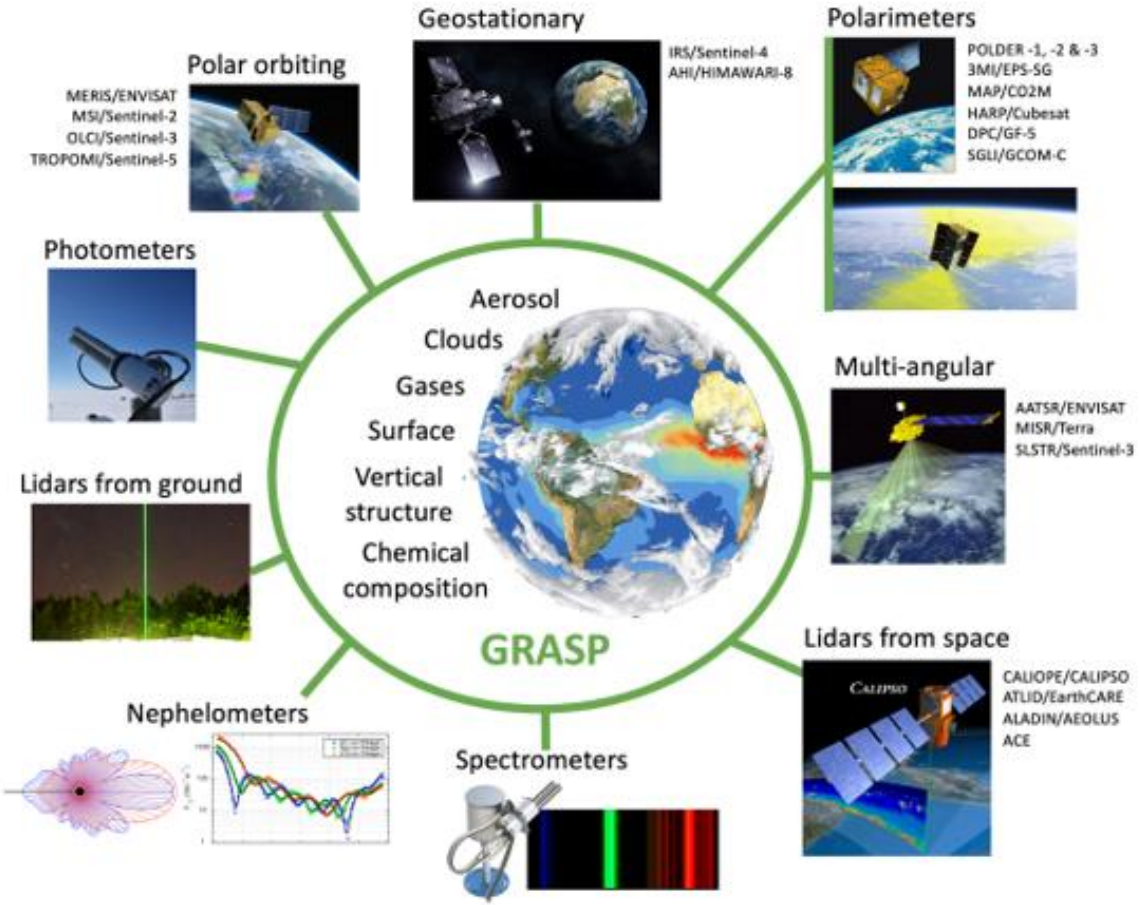


STRATEGIC SCIENTIFIC DOMAIN

SSD2 | GRASP SAS
AEROSOL MICROPHYSICS CHARACTERIZATION
Inversion modelling for aerosol characterization)

Ground-based passive and active remote sensing can identify and categorize airborne dust particles as well as other aerosol types. The observational data required for characterization of aerosol is significantly enhanced and extended by the combination of sun-photometers and lidar observations. To achieve this, retrieval methods have been developed that take advantage of co-located active and passive remote sensing measurements. The starting point for advancing ECoE's capacity will be the **integration of ground-based monitoring capabilities, together with existing space-based observational infrastructures to the Generalized Retrieval of Atmosphere and Surface Properties (GRASP) algorithm.** The state-of-the-art GRASP algorithm, built on the heritage of the well established AERONET retrieval, derives both vertically resolved and columnar information about aerosol particles. The ATARRI training scheme will focus on the capacity building of ECoE team **on the application of GRASP for the characterization of dust particles and their diurnal cycles as well as aerosol mixtures, e.g., for dust and smoke and for dust and marine particles that often influence Easter Mediterranean.** GRASP SAS team is expected to assist greatly in theoretical and practical knowledge transfer required to achieve these goals.

Synergy of CARO observations for retrieval of Aerosol Microphysical Properties



STRATEGIC SCIENTIFIC DOMAIN

SSD3 | PMOD/WRC
DUST RADIATIVE EFFECT AND SOLAR RADIATION

Relationship between aerosol, clouds and solar radiation, data assimilation in models, satellite validation

Aerosol radiative effects play an important role in Eastern Mediterranean, Northern African and Middle East regions. Model simulations and solar radiation measurements at ECoE will be compared and assimilated into model calculations to better understand both climate aspects and regional effects on solar radiation. In addition, Cyprus area is ideal in order to investigate the differences in the radiative properties of N. African and Middle East dust, as they are both affecting the area depending on meteorological conditions and dust transport pathways. Finally, aerosol and dust-related measurement and model outputs (extinction coefficient, optical depth and concentrations) will be qualitatively and quantitatively evaluated against satellite-based observations (current and upcoming e.g. Earth-Care) in order to investigate satellite algorithm uncertainties linked with the radiative properties of different aerosol types and overall increase the readiness of CARO/ECoE towards supporting cal/val for future satellite missions.

STRATEGIC SCIENTIFIC DOMAIN

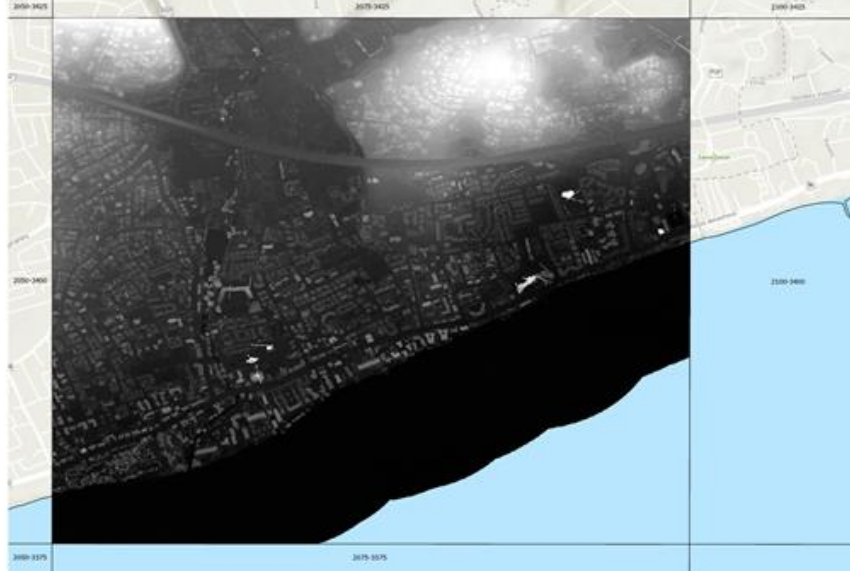
SSD4 | ARMINES/ENSMP and FC.ID/CIENCIAS ULIS
SOLAR RADIATION APPLICATIONS

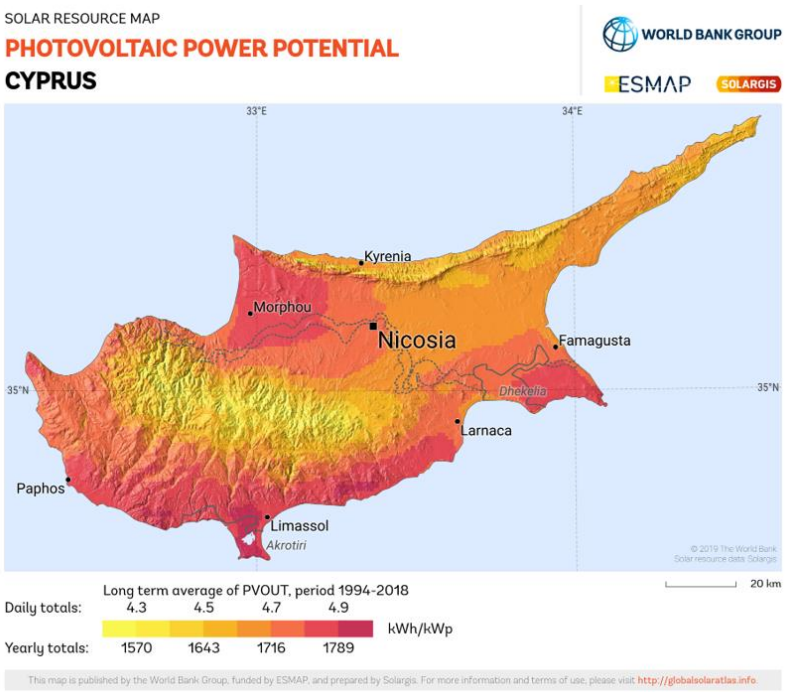
Solar radiation modelling in urban areas, solar energy assessment in different spatiotemporal scales

Cyprus is characterised by high year-round insolation (320 sunny days per year); however, it presents a complex and highly variable climatology, in terms of clouds and aerosol patterns that directly affect the incoming solar radiation. This poses a challenge to the modelling and, thus, understanding of the potential, inherent variability, and financials of photovoltaics. One which can only be tackled by a multidisciplinary effort, combining atmospheric sciences, remote sensing and ground-based instrumentation, and engineering.

Therefore, hands-on training will be provided in what concerns the assimilation of complementary sources of information: aerosol data, satellite imagery, ground-based measurements and, particularly for urban contexts, digital surface models – 3D representations of the urban orography. **This will involve the modelling of atmospheric attenuation of incoming solar radiation, as well as of the urban shadowing effects and of the PV energy conversion.**

Developing competences regarding these data and modelling elements unlocks the capability of **developing high-resolution solar cadastre-like products, which are of essence for present and prospective studies, identifying the most suitable urban areas to deploy PV and quantifying the technical potential for regions at given spatial scales to provide renewable electricity.** All this is of great interest to various stakeholders, such as the national electricity transmission system operator, public policy makers, private investment funds, as well as researchers and society).





Trainings and Transfer of Knowledge

Training Event	No	Topic	Lead Partner	Estimated Month	Duration-days	WP	Partcipants
Workshops	WS1	Aerosol forecasting modeling	BSC /CNS	M6	2	4	5-8
	WS2	Aerosol microphysical properties and solar radiation	GRASP SAS and PMOD/WRC	M9	2	4	5-8
	WS3	Solar energy modeling at urban scales	ARMINES. PMOD, FC.ID	M12	2	5	5-8
	WS4	Research management skills + Research proposal preparation	BSC/CNS	M18	2	4	5-8
	WS5	Exploratory research project - Scientific outcomes	ALL	M36	2	8	5-8
Virtual Trainings	VT1	Evaluation of dust models and dust analysis datasets	BSC/CNS	M6-M9	0.5 X 4	4	5-8
	VT2	GRASP model use	GRASP SAS	M10-M12	0.5 X 4	4	5-8
	VT3	Solar cadastre and solar modelling use	ARMINES and FC.ID	M12-M18	0.5 X 4	4	5-8
	VT4	Measurement assimilation and satellite cal val	PMOD/WRC	M11-M18	0.5 X 4	4	5-8
	VT5	Research management skills-04 (Management and Administrative skills)	BSC/CNS	M18-M20	0.5 X 4	5	5-8
Buisness mentality I	BM1	Launch a spin-off	GRASP SAS	M24	0.5	5	5-8
	BM2	Discover entrepreneurship	GRASP SAS	M28	0.5	5	5-8
	BM3	Co-operation with industry	GRASP SAS	M30	0.5	5	5-8
	BM4	Intellectual property rights (IPR)	GRASP SAS	M32	0.5	5	5-8

Experts Mentoring and Common Activities

Training Event	No	Topic	Lead Partner	Estimated Month	Duration-days	WP	Partcipants
Summer Schools	SC1	Solar and aerosol measurements and modeling	BSC, GRASP, PMOD	M20	4	7	10-15
	SC2	Aerosol and solar radiation interactions	PMOD,ARMINES, FC.ID	M32	4	7	10-15
Short term staff exchanges	ST1	Visit at BSC premises	ECoE-BSC/WRC	M18	2	6	1-2
	ST2	Visit at ARMINES premises	ECoE-ARMINES	M16	2	6	1-2
	ST3	Visit at PMOD premises- linked with measurement campaign	ECoE-PMOD/WRC	M14	10-15	6	1-2
	ST4	Visit at GRASP SAS premises	ECoE-GRASP SAS	M22	2	6	1-2
	ST5	Visit at FC.ID and CIENAMES premises	ECoE- FC.ID	TBD	2	6-7	1-2
Expert visits at ECoE	EV1	Link with WP 6 objectives	ALL	M2	2	6	1-2
	EV2	Linked with the summer school I	ALL	M20	4	7	1-2
	EV3	Linked with the Exploratory Research Project	ALL	M24	2	8	1-2
	EV4	Linked with the summer school II and Progress of the Exploratory Research Project	ALL	M32	2	7	1-2
Short Term on site at ECoE	SV1	Linked with SD1: Dust forecast model installation/progress at ECoE	BSC/CNS	M15/M28	2 each	3,4,8	1-2
	SV2	Linked with SD2: Aerosol Microphysics: GRASP use / use with ECoE data	GRAPS SAS	M6/ M22	2 each	3,4,8	1-2
	SV3	Linked with SD3: Solar and aerosol instrumentation / satellite cal val	PMOD/WRC	M8/M24	2 each	3,4,8	1-2
	SV4	Linked with SD4: Solar energy model/application in Cyprus	ARMINES. FC.ID	M10/M26	2 each	3,4,8	1-2

Coordination and support Actions

CSA01	Three Technical workshops	CSA05	one industry info day
CSA02	One session in international conference	CSA06	Four targeted visits at advance partners' premises
CSA03	Two training schools	CSA07	One multidisciplinary advanced research project
CSA04	Five virtual trainings	CSA08	Six Webinars

Fig. 4 Strategic Activities and Expected Impacts

ATARRI KPIs

ATARRI Dissemination & Exploitation Timeline	Target	Year1	Year2	Year3
			acc.	acc.
Dissemination Activities				
Scientific Publications	**4**	**0**	**1**	**3**
Open webpage for dissemination & exploitation – ATARRI website	**650-3500 visits**	**150-500**	**200-1000**	**300-2000**
Participation in working groups, committees and networks (e.g. Cost Actions participation, Working Groups in ESFRI Ris, ESA working groups)	**2-4 scientists**	**1**	**2**	**4**
International Conferences	**9 participations**	**3**	**3**	**3**
Seminars/Workshops/Webinars	**6 sessions**	**1**	**2**	**3**
Dust workshop at the RSCy 2027	**1 session**	**0**	**0**	**1**
CARO NF Open Days	**3 days**	**1**	**1**	**1**
Exploitation Activities				
ATARRI Summer School (June 2026 and June 2027)	**2 events**	**0**	**1**	**1**
Open webpage for dissemination & exploitation – ATARRI website	**650-3500 visits**	**150-500**	**250-1000**	**300-2000**
Stakeholders and industry info day/participants	**1 event**	**0**	**0**	**1**

ATARRI KPIs

ATARRI Communication Timeline	Target	Year1	Year2	Year3
			acc.	**acc.**
Communication Activities				
ATARRI website	**650-3500 visits**	**150-500**	**200-1000**	**300-2000**
Social Media presence (e.g. YouTube, Facebook, Twitter, etc)	**30000-60000 views**	**5000-10000**	**10000-20000**	**20000-30000**
CARO Virtual Tour	**600-900views**	**100-200**	**200-300**	**300-400**
Communication through Media	**6 articles**	**2**	**2**	**2**
ECoE Communication Hub (e.g. CARO Virtual Tour Screenings, Researcher Night (2025, 2026 and 2027), Open lab day	**4 events**	**1**	**2**	**1**
The educative action of science Ambassadors in schools/ school visits	**6events-3 visits**	**1**	**3**	**2**

First month's activities….

Funded by the European Union

GA No 101160258

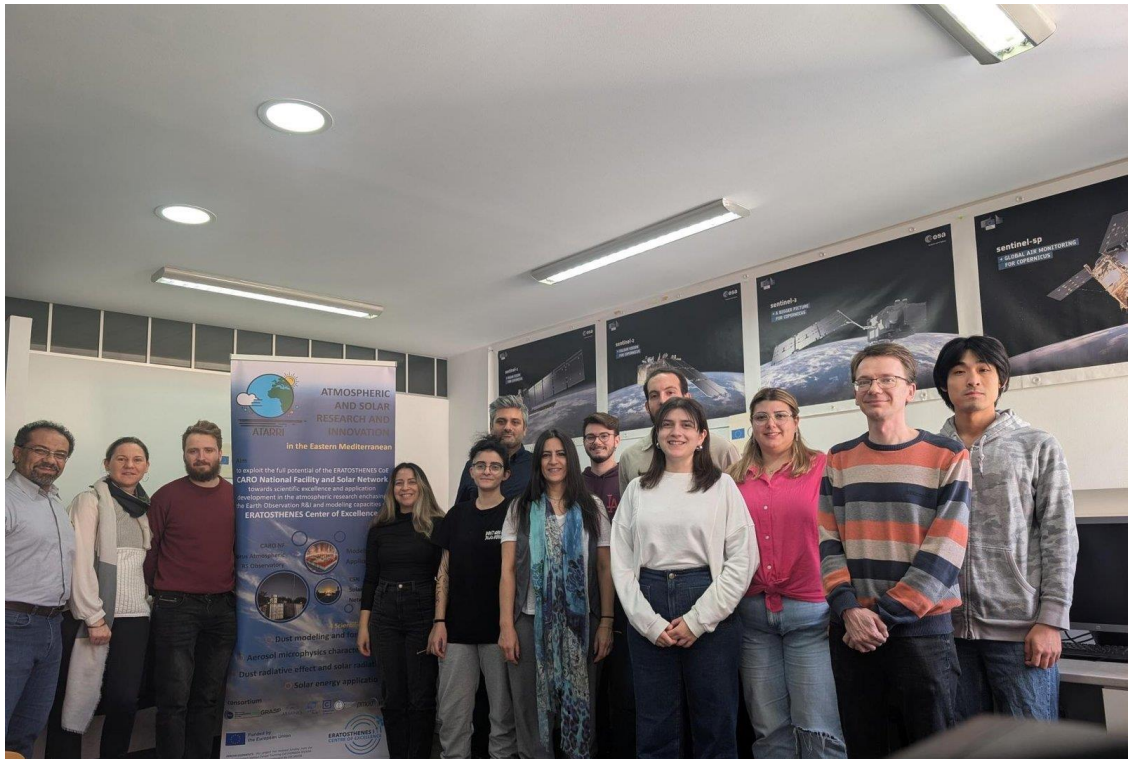
Kick off Meeting 3-4 Oct 2024

Office work

Lot of paper works and communications

- **Amendment**
  - **ATARRI site and intranet**
  - **Outlook/Teams group and mailing list**
  - **Agreed dates for upcoming events**

SSD2: GRASP model



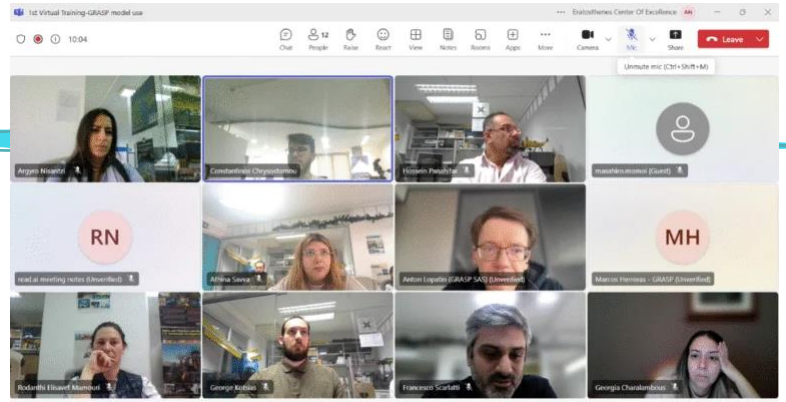
ATARRI transfer of knowledge by GRASP

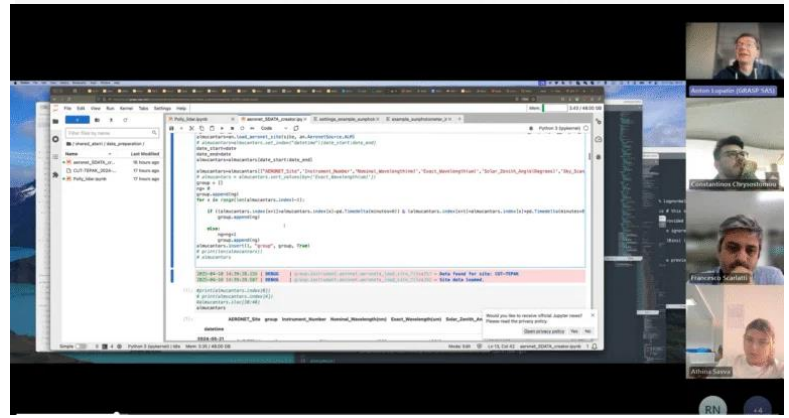
Physical Workshop: 6-7 March 2025

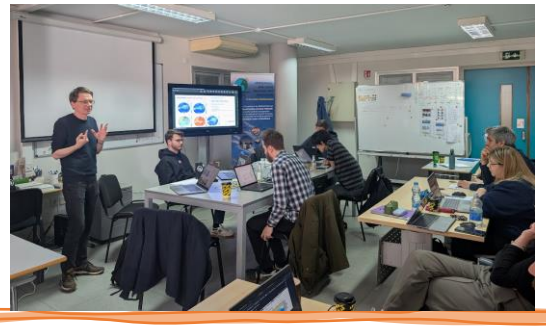
VT1: 28.03.2025

VT2: 11 April 2025

VT3: 5 May 2025



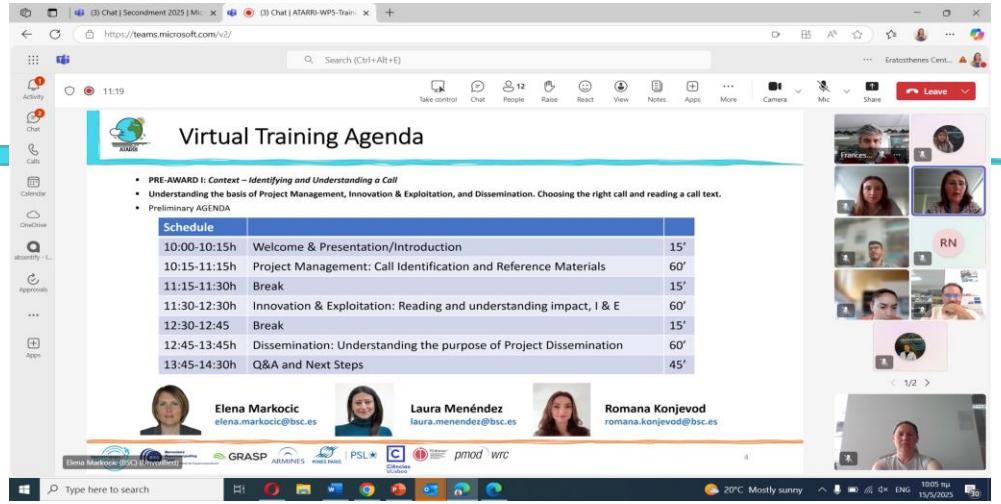




Research Management

The ECoE staff will receive training from the experts of BSC/CNS on best practices for improving the management capacity of ECoE, in relation also to managing the activities and services of CARO.

Four VT are proposed on the following topics:
VT5-1 Pre-Award I (Project Management, Exploitation and Dissemination) BSC/CNS – **Done 15.05.2025 – recording available via education office of ECoE**
VT5-2 Pre-Award II (Project Management, Exploitation and Dissemination) BSC/CNS – **Scheduled for 19.06.2025**
VT5-3 Post-Award I (Project Management, Exploitation and Dissemination) BSC/CNS
VT5-4 Post-Award II (Project Management, Exploitation and Dissemination) BSC/CNS



Dissemination Activities

RSCY2025

LINKS SOCIAL MEDIA CARO/ATARRI

TWITTER
https://x.com/ECoE_CARO (X, Eratosthenes CARO)
https://x.com/ATARRI_EU (X, ATARRI)

LINKED IN
https://www.linkedin.com/in/eratosthenes-caro-503021339/(LinkedIn, Eratosthenes CARO)

FACEBOOK
https://www.facebook.com/profile.php?id=61569065991525 (FB, Eratosthenes CARO)
https://www.facebook.com/profile.php?id=61568771609696 (FB, ATAR RI eu)

INSTAGRAM
https://www.instagram.com/eratosthenescaro/ (Instagram, Eratosthenes CARO)

YouTube
https://www.youtube.com/@CARO_ERATOSTHENES (YouTube, Eratosthenes CARO)

Website
https://atarri.eu/

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ATARRI

Funded by the European Union

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