

Deliverable 8.5: Application to GEO initiative on short-lived climate species

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1. Background and purpose of this document

Grand research and societal challenges addressed by ACTRIS are of international dimension by nature and require not only a pan-European approach but also a global effort to consolidate partnerships in science and technology, to enhance exchange of information and interoperability, and ensure advanced training goals are proposed to a worldwide community of users, .

Ambition in ACTRIS is to solidify its leadership as a global distributed research infrastructures in the field of climate, atmospheric composition and air quality sciences, to intensify its cooperation with the corresponding partners in other World regions and with the relevant international institutions. ACTRIS must also engage in developing stronger liaison in developing/emerging countries where the demand for capacity building is high and the need for provision of reliable atmospheric information a scientific necessity. WP8 addresses this ambition with, for the specific objective of the present deliverable 8.5 to explore ways to consolidate ACTRIS as a Global Research Infrastructure;

ACTRIS is, by nature, a Research Infrastructure of global relevance, evidently addressing global research challenges (climate-change, air quality, atmospheric hazards). As a landmark projects in ESFRI, ACTRIS will be monitored for its scientific relevance which includes a well-identified position in the EU RIs landscape, cooperation/synergies with other RIs, but also, its impact in a larger international landscape and its geographical extension. For ACTRIS, engaging in international cooperation with the appropriate coordination capacity is essential.

ACTRIS must ensure its services are offered to different communities of users and stakeholders that will extend beyond its member and observer countries, and must be clearly recognized as key player in the EO system, especially with respect to the current effort to highlight and upgrade the role of in-situ and ground-based RS on par with the satellite information within the EO definition and frame. ACTRIS must be managing data and data-products that are not limited to the European dimension but must be of value and utility to a broad scientific community and to policy-makers outside of Europe political boundaries, and for this it needs to be part of a global ecosystem that on one hand deals with data management and sharing and on the other hand combines endeavors at the global scale, facilitates links with international conventions and relevant UN bodies as well as provides links with national mechanisms. In essence, attractiveness of ACTRIS services to international users must be considerably enhanced in the next decade.

2. Group on Earth Observation (GEO) - An opportunity for ACTRIS

The strategy towards reinforcing the establishment of ACTRIS as a Global Research Infrastructure requires a recognition of the RI in the international landscape. In D8.3, we have described the contribution of ACTRIS to several networks and frameworks for the observation of atmospheric composition and properties related to aerosol, cloud and trace gases, such as AERONET, NDACC, GAW, and EMEP. These frameworks and networks are also operated under the umbrella of other research performing organizations such as NASA or under global or European initiatives such as GEO, GCOS, or Copernicus. In

D8.5, we address the specific role of GEO (Group on Earth Observation) and the possible advantage for ACTRIS to be recognized within this framework.

[GEO](#) is a growing intergovernmental partnership of member countries and participating organisations that is entering its third decade and is working to improve the availability, access and use of open Earth observations, including satellite imagery, remote sensing and, under a reaffirmed strategy, [in situ data as an integral part of the EO value chain](#), to impact policy and decision making in a wide range of sectors. GEO's global priorities include the Sustainable Development Goals (SDGs), Climate Action, Disaster Risk Reduction and Resilient Cities and Human Settlements, which are linked to the relevant global policy frames (i.e. SDG 2030 Agenda, Paris Agreement, Sendai Frame for DRR and New Urban Agenda). In these aspects, GEO is instrumental in integrating Earth observation data into the methodology of monitoring indicators and achieving the SDGs, makes data available in support of effective policy responses for climate change adaptation, mitigation and other specific provisions, working with partners to enhance global observation systems for climate action, it supports the delivery of data and methods to increase resilient of societies to natural disasters and is in the pursue of creating bridges with cities to help them address modern urban pressures, including air quality.

The GEO work programme is the primary instrument used by GEO to facilitate collaboration among its members, participating organizations, and other partners on activities to realize GEO's Mission and Vision. The activities that comprise the GEO Work Programme are conceived, planned and implemented by teams of researchers, technical experts, policy analysts, commercial sector representatives, and many other stakeholders to address information needs in particular domains for which Earth observations are critical. In most of these activities, the teams work to develop Earth observation-based applications, products and services to support decisions by defined sets of users.

GEO Work Programme activities are largely funded through in-kind contributions on a voluntary, best-efforts basis, supplemented by financial contributions where possible. The transitional GEO Work Programme 2023-2025 was approved by the GEO-18 Plenary in Ghana on 3 November 2022, while the new Work Programme for the next period is currently being designed, adjusting to the post-25 strategy approved during the GEO Ministerial Summit in Cape Town, South Africa, during 6-10 November 2023. The current GEO work program is divided into different categories: GEO Flagships, Initiatives, Pilot Initiatives and Regional GEOs.

- GEO Flagships develop and provide services based on global policy mandates. Flagships exemplify GEO's Vision of providing globally-coordinated observations in support of decision making at multiple levels.
- GEO Initiatives help to transition innovative results and prototypes from the research community into Earth observation-based products and services to support a wide range of users. GEO Initiatives also build communities of stakeholders that work together to identify needs and gaps and develop capacity with these communities to maximize the value of the products and services being developed.
- GEO Pilot Initiatives is a new category that range from communities of practice, to early-stage projects or pilots, to well-established services. Pilot Initiatives should intend to progress to GEO

Initiative status and should do so within a reasonable period of time. GEO Pilot Initiatives offer an opportunity for GEO Members and Participating Organizations to collaborate and to:

- contribute to realizing GEO's Vision and Mission with minimal requirements or structure
- serve as an entry point for new activities that may go on to become GEO Initiatives

Regional GEOs leverage the level of coordination needed at the continental scale and act as the implementing arms of the GEO Caucuses, which are groups of GEO Member countries within five defined regions of the world.

It exists an opportunity for ACTRIS to become a (or part of a) GEO Pilot Initiative.

3. Rationale for a GEO Pilot Initiative on Air pollution, Climate and Human and Ecosystem Health

Ongoing climate change, caused by the accumulation of greenhouse gases in the atmosphere, is happening on a timescale of decades to centuries and is driving environmental changes worldwide. In contrast, the air pollution that occurs near the Earth's surface happens on a timescale of days to weeks, and across spatial scales that range from local to regional. Traditional pollutants include short-lived reactive gases such as ozone and other reactive gases or particulate matter which are detrimental to human health and whose complex characteristics can either cool or warm the atmosphere.

In fact, despite wide-ranging differences, air quality and climate change are strongly interconnected because the chemical species that affect both are linked, and because changes in one inevitably cause changes in the other. The interaction between climate change and air pollution is inevitable, and there are many studies showing that human and ecosystem health under climate change depends on air pollution (and vice versa). The nexus among air pollution, climate change and health, is a major challenge to be addressed in both future climate and air quality policies. This of course echoes directly the so-called triple planetary crisis of climate change, biodiversity loss and pollution, a major theme in GEO post-2025 Strategy.

In addition to research on air pollution effects on health under climate change, potential measures and methodologies addressing the issue of protecting human (and ecosystem) health under air pollution and/or climate change is of wide interest worldwide. Coordination of Earth observation activities from different actors in different regions of the world dedicated to solutions for efficient AQ management under climate change may enable and accelerate a breakthrough in EO-based services for preserving human and ecosystem health.

The rationale for a pilot initiative on Air Pollution, Climate and Human and Ecosystem Health would be to deliver a comprehensive portfolio of concrete EO-derived services serving better AQ management solutions for the decision-makers, the citizens, the industry and the researchers.

A better coordination between the major actors worldwide, including ACTRIS for Europe, under the umbrella of an international organization like WMO, would be extremely useful. The pilot initiative would

foster exchange of EO-services for the users, support the coordinated exploitation of Earth observation data for AQ management across different world region and provide the necessary forum for exchanging in the technical and scientific challenges ahead.

Currently, none of the GEO flagships, initiatives or pilot initiatives are dealing with the Air Pollution, Climate and Human and Ecosystem Health nexus. Some initiatives are related in scope, but with different objectives:

- Earth Observations for Health (EO4HEALTH) is to support the systematic collection, analysis, and application of relevant information about areas of impending risk that inform the development of strategic responses to anticipate risks and opportunities and their evolution and communicate options to critical actors for the purposes of decision-making and response. It is not however specifically dedicated to the atmospheric exposome
- Earth Observations for Disaster Risk Management (EO4DRM) is to increase the use of satellites for disaster risk management activities relating to natural hazards.
- Global Observation System for Persistent Organic Pollutants (GOS4POPS) is to further enhance functionalities to support the implementation of the Stockholm Convention and the UN Economic Commission for Europe Convention on Long-range Transboundary Air Pollution (LRTAP) and of ongoing international programs, including the Global Monitoring Plan (GMP) of the Stockholm Convention on POPs and the European Monitoring and Evaluation Programme (EMEP).
- Global Urban Observation and Information (GUOI) and the Human Planet Initiative (HPI) are to generate various data products of global urban areas using Earth Observation (EO) data, provide EObased urban data services through various systems and tools, develop new models and algorithms to assess and monitor urban environments, create a better knowledge of cities and to develop essential urban variables and indicators for sustainable cities within the targets of SDG Goal 11.
- Global Observation System for Mercury (GOS4M) is designed to support nations, UNEP and all interested parties to support the evaluation of the impacts and effect of mercury contamination of Earth system on human health and provide EO data sets and validated interoperable tools.

Such a Pilot Initiative recommendation and its nexus approach would be fully aligned with the incubators paradigm that were endorsed in the most recent GEO Plenary in Cape Town, i.e. Global Ecosystems Atlas and Global Heat Resilience Service, the latter, mostly focusing on heat stresses, still containing an even stronger air quality component. Moreover, the recommendation takes into account the recent Open Data & Open Knowledge Workshop ([ODOK 2023](#)) where requirements for in situ data within the GEO community expanded over various essential variables across thematic domains such as climate and urban resilience. Catalysing this further, ACTRIS is already mature regarding GEO Data Sharing & GEO Data Management Principles and FAIR principles. Finally, as also endorsed in Cape Town Declaration, National Coordination Mechanisms will be at the forefront within the post-2025 era in order to increase GEO's local impact, which aligns perfectly with ACTRIS' vision to become of world wide interest and exploit bridges directly with country and city stakeholders.

4. Shaping a proposal for a GEO Pilot initiative on Air pollution, Climate and Human and Ecosystem Health

Following the recommendation for establishing a GEO pilot initiative, this section is organized to provide the main responses to be provided in the GEO pilot initiative template.

4.1 Basic Information about the pilot initiative

Full title of the Initiative: Observations for the air pollution - climate change – Human and Ecosystem Health Nexus

Short Title or Acronym: to be defined

Current category in the 2020-2022 GWP: No category

Proposed category in the 2023-2025 GWP: Pilot Initiative

Points of Contact: to be defined

4.2 Purpose Objective of the GEO pilot initiative

Main Objectives

- To coordinate activities of different organizations involved in addressing the Air Pollution, Climate and Human and Ecosystem Health worldwide, in particular, but not exclusively, on the ground-based segment
- To engage experts to discuss about Earth observation needs (e.g. variables, methodologies, data) supporting the initiatives, to share experiences and converge towards harmonizing operations, and methodologies for delivering services, in particular to connect ground-based and space-based observations
- to deliver a clear roadmap for sustainable global cooperation between key organisations in Europe and the world to provide all users with the best possible services for accessing and using information from EO climate- and air quality-relevant properties of aerosol, cloud and trace gases in the atmosphere.
- To connect with different international initiatives like Early Warning for all of WMO EW4ALL, the WHO AQ Guidelines and to provide guidance to UNFCCC on short-lived climate species and the health argument for climate action
- To consolidate the ground-based segment not well represented in GEO
- To contribute to science-based development of policies and legislation for reducing the impact of short-lived pollutants on Human and Ecosystem Health and promote, inform and support the prevention, reduction and control of air pollution to minimize threats to the health of ecosystems and people

Short description of the initiative

Traditional pollutants include short-lived reactive gases such as reactive gases, including ozone, and particulate matter are detrimental to human and ecosystem health. Some of them are also climate

forcers (so-called Short-Lived Climate Forcers). Because air quality and climate are interconnected, changes in one inevitably cause changes in the other. For example, the combustion of fossil fuels (a major source of carbon dioxide (CO₂)) also emits nitrogen oxide (NO) into the atmosphere, which can lead to the photochemical formation¹ of ozone and nitrate aerosols. Similarly, some agricultural activities (which are major sources of the greenhouse gas methane) emit ammonia, which then forms ammonium aerosols. Air quality in turn affects ecosystem health via atmospheric deposition (the process by which air pollutants settle from the atmosphere to Earth's surface), which therefore also links air quality to climate. Deposition of nitrogen, sulfur and ozone can negatively affect the services provided by natural ecosystems such as clean water, biodiversity and carbon storage, and can impact crop yields in agricultural systems. And, obviously, bad air quality has considerable impacts on Human Health, as reported in many scientific studies.

The overarching goal the Air Pollution, Climate, Human Ecosystem Health Pilot Initiative is to deliver a clear roadmap for sustainable global cooperation between key organisations in Europe and in the World to provide all users, in the scientific community and beyond, with the best possible services.

Services to be jointly delivered in the pilot initiative are the following

- Cross-network consistency in operations from the raw instrument data collection, to quality controlled data and, finally, to the geophysical products. observations to data stewardness and access. Organizations involved in the ground-based segment of Earth Observations for Air Pollution, Climate and Health need to reach a global interoperability, exchanging good practices as regard for instance for harmonisation of measurement protocols, standards, or data handling;
- Organizations need to discuss their long-term strategy for sustainability and aligning global objectives, including strategy for enabling common access procedures. The work package for management actions, WP7 Project coordination, management and ethics, will deliver the successful high-quality management procedures developed in ACTRIS-IMP for the implementation of ACTRIS following the ethical requirements of the Horizon-2020 program and updated for the requirements of the Horizon Europe programme.
- Integrating new knowledge on Air Pollution, Climate and Human and Ecosystem Health and Providing harmonized recommendation and data to support Early Warning systems of WMO, in particular the Vegetation Fire and Smoke Pollution Warning and Advisory System (VFSP-WAS) and the Sand and Dust Storm Warning Advisory and Assessment System (SDS-WAS).
- Coordinate actions for capacity building, training and education to ensure that new generations of researchers acquire the knowledge and skills for exploiting services.

Why is this Initiative needed and what evidence is there to support this need?

Despite the presence of WMO as an international authority in the field of atmospheric observations for climate and air quality, there is a lack of exchanges between partners worldwide on the technical solutions for monitoring the key variables needed to address the Air Pollution, Climate and Human and Ecosystem Health nexus. A Pilot Initiative, under the umbrella of GEO and in close collaboration with WMO which is one of the Participating Organizations of GEO, is therefore timely in bringing together Research Infrastructure like organizations across regions, each having invested in facilities and services with a long-term perspective.

We are not aware of other projects or initiatives at a global or regional scale (both in GEO and externally) that provide similar products or services, besides the ARCH working group of WMO/GAW which can be the overarching WG of the pilot initiative.

Most important outputs (products, services, etc.) produced by the Initiative.

- Output 1: New or enhanced, effective cooperation of Research Infrastructures like organizations Worldwide. The pilot initiative shall bring together international partners concerned with integration towards the delivery of harmonised global datasets for Air Pollution, Climate and Health. The cooperation will intensify the convergence in methodologies, standards and data interoperability imbuing users and stakeholders with confidence in the traceability and consistency of global datasets
- Output 2: Strengthened position of European RIs in the global RI landscape. Participation of a European RI in a global GEO initiative is of key importance and will demonstrate the influence and impact that ACTRIS has at the global level and deliver new opportunities for interaction with standards bodies and metrology institutes. ICOS, eLTER and EPOS are for example closely connected to GEO initiatives.
- Output 3: Increased opportunities for the development of global research infrastructures. In harmony with the needs of all participating groups to the initiative (particularly for satellite-related, monitoring, modelling target groups), Air Pollution, Climate and Human and Ecosystem Health will strengthen cooperation under the umbrella of WMO to deliver pathways to effective global integration of different initiatives Worldwide, such as ACTRIS in Europe. Paths to convergence for all aspects of global interoperability will be investigated, with particular emphasis on provenance (traceability) key for satellite monitoring, software development for quality control, metadata, and the propagation of uncertainties.
- Output 4: Increased capacity to address societal challenges with a global dimension but also local impact. The initiative will contribute to producing reliable predictions of climate, weather, air-quality and human/ecosystem health at the global and local scale and responds to the pressing need that satellite missions have for globally-consistent datasets for calibration and validation. The measurement networks have demonstrated that they can deliver early warnings for volcanic eruptions, dust storms, and forest fires; since these events can extend beyond regional scales to have impacts on society, the improvement in interoperability between international networks is crucial

4.3 Project's pathways towards impact

How will these decisions benefit from the outputs of this Initiative? What kinds of impacts are anticipated as a result of the use of the outputs of this Initiative?

Impacts are summarized in the Table below.

Scientific Impact	Economical Impact	Societal Impact
Foster research on climate and air quality Benefits to all categories of researchers Seamless access to services	Favour establishing common standards for instrument performance Create business opportunities for instrument and service provider start-ups and spin- offs	Favour development of Green Technologies by setting joint standards for life cycle of scientific technologies Extensive training opportunities for researchers
Increased uptake of data and products Higher visibility of resources available	Drive FAIRness in Global Earth Observing Systems Favour establishment of joint operation standards	Optimization of national investments Engage additional stakeholders worldwide
Support to science-based assessments for climate and AQ policies Consolidate existing partnerships	Identification of future needs Support to establishing standards	Support in providing better management of environment crisis Support to UNFCCC policies Support to One-Health initiative
Foster collaboration in an international context Consolidate contributions to international networks Capacity development? especially for undeveloped countries this would be instrumental	New methodologies, prototypes or designs in conjunction with National Metrology Institutes	Training and education

Links to international convention, organization, or other multilateral body

- One Health: Action 6.1. Protect, restore and prevent the degradation of ecosystems and the wider environment
- UNFCCC: SLCPs can reduce the local disease burden while acting on climate forcing. Mitigation policies can address both long and short term climate forcers, in particular Black Carbon and Ozone, and have rapid impact on both local and regional air quality and regional climate.
- EU Green Deal: tackles the grand challenges of the EGD Policy in relation to responding to environmental degradation, which are an existential threat to Europe and the world and achieving AQ targets in synergy with climate neutrality in the Union by 2050.

- Early Warnings for all of WMO to ensure that everyone on Earth is protected from hazardous weather, water, or climate events through life-saving early warning systems by the end of 2027.
- Zero pollution action plan, new WHO guidelines and the updated EU limit values/procedures

4.4 Technical synopsis

Brief description of the methods used by the Initiative to produce its outputs

The main tasks of the pilot initiative must be the following:

- Addressing the Technical issues towards interoperability of services. In this tasks, participants will harmonise and develop whenever necessary, the best practices in instrument operation, measurement traceability and calibration methodology, data formatting and vocabularies to ensure the best level for multi-network interoperability. Working with expert groups to identify and recommend research, operational requirements, and capacity needs for the provision of sufficient and relevant data, products, services and capacities for the generation and application of scientific evidence related to atmosphere, climate, weather, pandemic disease, solar UV radiation, and environmental impacts on health.
- Engaging in joint activities for technical cooperation and study exchange, training and capacity building, outreach, and dissemination.
- Coordinating service portfolios of the participating institutions including the strategy for enabling a common international open access framework to atmospheric research facilities, data, data-products and services. Develop a joint catalog of activities and related productssupporting the health, air pollution, climate interface across the institutions.
- Coordinating governance, agreements and aligning global objectives between participating institutions, identifying and responding to global research needs, and representation on global bodies. Identifying opportunities and mechanisms to strengthen the exchange, collaboration and network within the research community.

4.5 Resources

Resources are for the irrigation model has been provided internally with some support from NASA (JPL). Applications have been submitted in partnership with the Swedish Meteorological Service to implement the service on a national basis.

Work linking snowfall in Sweden with the electrical output from the country's hydropower stations is being funded until 2024 by Vinnova (the Swedish Government's Innovation Agency) and a possibility may exist for an extension.

Services are also expected to arise from the work of models for agrivoltaic systems using remote sensing data (especially short wave radiation measurements). Although practical services are anticipated based on financial support available these will be developed throughout the Work Plan period and if successful prototypes should be available for testing by 2025.

Current resourcing for the long term elements involves NSF funding, with plans to engage specific stakeholder groups for dedicated funding requests. These include, for example, new opportunities anticipated

- to arise from: ongoing dialogue with the US EPA Region 2 Office and its Office of Research and Development; the new US Inflation Reduction Act and its numerous energy and climate-resilience elements; and FEWS-relevant industrial consortia (Public Service Enterprise Group, EPRI).
- The MDU has recently sent out a research proposal to one of the Swedish research councils. More research proposals will be sent out nationally and internationally. In 2022, MDU has been involved in an EU proposal led by the German Aerospace Center to apply the above-mentioned concepts in a basin in Africa to support the decision-making process (Decision Pending). There are several projects on agriphotovoltaic systems and the use of earth observation for agriphotovoltaic systems that can be used to support those research activities.

4.6 Stakeholder Engagement and Capacity Building

Specific countries or organizations that could be engaging in the initiative

Many organizations could join in different areas of the World and the plan to engage with them will be using the WMO/GAW authoritative voice in the process to organize the country level organization. We plan to engage with experts from key countries and would propose to make contacts with national GEO principals for their help. For now we can list:

- Europe: ACTRIS
- United States: NOAA, ARM, NASA, ASCENT
- Canada: Environment Canada
- China: Chinese Academy of Science
- Brazil: University of Sao Paulo

At the organization level, we will solicit the interest of key players by personal consultation. In the case of the countries, like India, where no specific organization can be currently identified. The capacity development strategy can be addressed through the newly established Expert Team on Capacity building of WMO/GAW.

The pilot initiative will be strongly connected to the newly established working group on Air Pollution - Climate Change - Health Effects Nexus (ARCH) in GAW. ARCH WG supports the implementation of Global Atmosphere Watch Science and Implementation Plan (GAW SIP) 2024 and in particular, the achievement of strategic objective C (SO-C): Advance the application of atmospheric composition information in support of policies and conventions, and expand societal services related to air quality, human and ecosystem health, climate change and food security. ARCH is designed to help coordinate GAW activities that support the high level WMO health related strategies. It will assist GAW in its contributions to requests 1 and 2 in the resolution in WMO Cg-19/Doc. 4.1(8), which are: 1) to work with the Research Board to establish appropriate mechanisms for the effective support of the WMO-WHO Joint Climate and

Health Office (JCHO) and implementation of WMO Integrated Health Services; and 2) to help support the technical commissions and the research Board to responsively co-design with the research an health community, products and services required to effectively support public health by all Members, and to assist in strengthening the capacities of the NHMHSs, and other providers and users of health-tailored information services. Specifically, the ARCH WG works with various GAW Expert Teams and Scientific Advisory Groups, the WMO-WHO (JCHO) and the GAW Scientific Steering Committee, with the aims to i) identify and catalogue on-going GAW activities involving health effects of air pollution, climate change, and solar UV radiation, ii) identify important gaps and potential needs for other possible activities, iii) propose an action plan for GAW to address the identified gaps, iv) and coordinate GAW activities that support the high level WMO health related strategies.

4.7 Governance and potential participants

At present, the Pilot Initiative is not in place and it is premature to discuss a governance structure for the project. As for many GEO action, co-chairs will need to be identified with a stronger leadership role in the management of the activity. When an increased number of projects arise, program leads will be identified for the various groups of tasks. At some point in time, a Board of Directors and/or an advisory group is anticipated. A very strong connexion with ARCH WG in GAW must be anticipated.

As indicated earlier, potential participants may be the following

- Europe: ACTRIS
- United States: NOAA, ARM, NASA, ASCENT
- Canada: Environment Canada
- China: Chinese Academy of Science, Peking University
- Brazil: University of Sao Paulo

5. A process delayed until post-2025 GEO and the role of CARGO-ACT

Delays in the creation of ACTRIS-ERIC, but also engagements in other priorities in ACTRIS-IMP delayed the process of elaborating this deliverable. Opportunities to integrate the GEO work program were missed at the early stage of ACTRIS IMP (2019-2021) but neither the community in ACTRIS nor the international partnership were ready to engaging into a GEO initiative. The GEO workprogram 2023-2025 is now about to finish and the GEO Post-2025 strategy has already been approved in GEO Plenary and Ministerial 2025, which gave the green light for the design of structure and implementation means of the new Work Programme.

As a first step in connecting with RI-like organizations worldwide, and in relation to the subject of Air Pollution, Climate and Health and Ecosystem Health, ACTRIS is establishing the CARGO-ACT project. CARGO-ACT will be funded by the European Commission over the 2024-2027 period with the overarching goal of CARGO-ACT is to deliver a clear roadmap for sustainable global cooperation between key

organisations in Europe and in the United States to provide all users, in the scientific community and beyond, with the best possible services for accessing and using information from monitoring climate- and air quality-relevant properties of aerosol, cloud and trace gases in the atmosphere. Moreover, GEO in its own phase of transition towards post-2025, redefines parts of its structures and functionalities, introducing new elements, like the Incubator Projects, a process which is expected to complete by the end of 2024.

6. Conclusions

It is a significant challenge for ACTRIS to establish itself as a Global Research Infrastructure. ACTRIS manages data and data products that extend beyond the European dimension, providing value and utility to a broad scientific community and policymakers outside European political boundaries. ACTRIS must become a central element in an international framework addressing global research challenges. The challenges faced by ACTRIS as a GRI include:

- Developing sustainable partnerships and decision-making processes with relevant partners worldwide.
- Demonstrating the benefits of converging interoperability and standards to stakeholders and the global research community.
- Establishing mechanisms for providing international access to facilities.
- Developing a roadmap for upscaling towards an integrated GRI for aerosol, cloud, and trace gases.

While ACTRIS has strong relations with WMO and other international institutions, the concept of Research Infrastructure is strictly European. Therefore, it requires a specific strategy to connect with RI-like organizations to reinforce its global dimension at the same time pursuing more awareness and finally impact at the local scale throughout the globe. A GEO Pilot Initiative, strongly connected to the GAW program of WMO, would enhance this international dimension, opening a forum for high-level interactions with counterparts. A Pilot Initiative on Air Pollution, Climate, and Human and Ecosystem Health would be relevant for ACTRIS, considering the scope of current GEO initiatives.

However, submission of such a Pilot Initiative will require additional discussion with potential partners and WMO and better understanding of the transitional phase and transformative evolution of GEO itself towards post-2025. It will need to be delayed until the next GEO Work Programme post-2025 is completed and put in action to make sure that no overlaps exist or every opportunities of cross-fertilization with existing GEO activities are taken into account. Equally important, it would be of major importance for ACTRIS to better connect with EUROGEO, the European component of GEO, in order to serve in parallel to increase the visibility and leadership of European endeavors and initiatives within the global GEO context, while at the same time preparing better for the submission of a proposal aligned to new GEO status and operations. Therefore, the recommendation is to continue investigating willingness from partners (potentially within the CARGO-ACT project for the US partnership), with the EUROGEO through the

EUROGEO Secretariat which is currently being formulated as a result of an EC funded project, and with GEO country representatives to support the initiative.