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1. Executive Summary

The ATMO-ACCESS project aims to enhance the international dimension of European atmospheric research facilities by addressing the need for structured access programs. European facilities have attracted substantial interest from researchers outside Europe, highlighting their global appeal, but access requests are often driven by individual initiatives, underscoring the need for more organized access frameworks. Vice-versa, discussion with international partners emphasized the need of international access to unique facilities outside Europe, particularly in the US and China, which have made significant investments in atmospheric research. The concept of Reciprocal access programs (i.e. coordinated programs but funded independently in different World regions), that are being discussed in the European project CARGO-ACT (Cooperation and AgReements enhancing Global interOperability for Aerosol, Cloud and Trace gas research infrastructures [1]) with the US, are of key importance to demonstrate the benefits of structured access. For now, partnership with China lacks such programs, and current Horizon Europe regulations prevent integrating Chinese partners into INFRA-SERV projects. Establishing a joint structured access program with China would be mutually beneficial. Despite a huge interest in accessing facilities in other world regions, defining how better structured access programs could be implemented seems premature but the groundwork for future collaborations should be considered. Additionally, integrating international facilities operated jointly with European partners into INFRA-SERV projects would be highly beneficial, ensuring financial benefits for host institutions and increasing the opportunities of access for European users. Solutions from the astronomy networks for international access should be evaluated for atmospheric research.

2. Introduction

Research Infrastructures (RIs) are naturally hubs for global scientific cooperation and can make notable contributions to tackling global problems, where global cooperation and data sharing are essential to design solutions. The role of RIsfor supporting international research has been proven essential in many scientific fields. The most obvious examples are the very large research facilities in physics or astronomy that are also expensive, thus requiring international cooperation to construct and run them. But almost all fields of research do require state-of-the-art facilities that are inherently global in scope as they respond to global challenges, and international as they must attract scientists beyond national or regional borders.

The atmospheric RIs are international by nature, and they are involved in supporting research of pressing global challenges such as climate change and air quality deterioration. Many advances in the field of atmospheric science achieved over the last decades are largely a result

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of the ability to utilise new analytical techniques, new instruments, and state-of-the-art instrument platforms. These enable the measurement of atmospheric species, the investigation of chemical mechanisms, the maintenance of calibration facilities, etc. Being able to make measurements in three dimensions, defining the vertical heterogeneity of the atmospheric composition, requires vectors to probe the atmosphere such as aircrafts, or drones. Similarly, testing model predictions requires access to large data centres that often are operated within large consortia.

Maintaining and further developing atmospheric facilities (fixed sites, measurement towers, aircrafts, calibration centers, data centers, simulation chambers, etc..) is expensive and their existence in the long-term is an imperative for collaboration at international level. While most forms of access to facilities and digital services are in principle open to research communities from outside the European Member and Associated countries, atmospheric RIs are currently not organized to provide sustainable physical and remote access besides the specific case of funding from the European Commission (EC) in INFRAIA/INFRA-SERV projects. Establishing long-term sustainable access programmes will improve the position and scientific leadership of the European atmospheric RIs as a whole and support their strategic aim and impact on a global level.

There is clearly a need to create governance models for the international research infrastructures in the coming years, leading to a more global approach and further develop sustainable partnerships and collaborations for access beyond the current dimension of ATMO-ACCESS.

The ORP (Opticon RadioNet-Pilot) Horizon 2020 (H2020) project [2], funded under the same framework as ATMO-ACCESS, opens transnational access (TNA) / virtual access (VA) in an integrated approach, providing the tools for facilitating scientific research and research data exchange at an international level across multiple facilities. ORP facilities are large astronomy facilities located around the world, and providing access that is not limited to the European dimension, making the access much more attractive for the users.

Similar to the astronomy community, the demand for access to atmospheric research facilities located outside European borders is expected to grow in the future. This is due, first, to the global nature of atmospheric and climate research, which requires observations and field campaigns in diverse environments, including those most affected by human activity. Second, advanced facilities that are not available in Europe have been developed in other countries, offering services that European researchers currently lack access to.

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This deliverable D3.3 aims to assess the need to extend the scope of TNA/VA programs beyond European geopolitical borders, with a particular focus on the specific needs and importance of collaboration with the United States and China. The choice of United States and China, although limited to 2 countries, are informative as they are countries with similar number of atmospheric research facilities as those in ATMO-ACCESS and good benchmarks for implementing reciprocal activities in future projects. The aim of this deliverable is to summarize and analyze the challenges of international access provision based on the work done in the ATMO-ACCESS project and provide recommendations to enhance international access to atmospheric RIs.

3. The international dimension of atmospheric research facilities

Investments in atmospheric facilities and their governance were key to establishing the European RIs. Existing European Research Infrastructure Consortia (ERICs) ensure coherence and complementarity of the national efforts conducted at European level, their sustainability, and efficient use by research communities and, thus, contribute to enhancing their socio-economic impact. But the efforts must also be addressed at the international levels: global cooperation in environmental monitoring is essential, and a number of countries already cooperate, e.g., Euro-Argo ERIC (global network of drifting floats), EMSO-ERIC (deep sea observatories), or ICOS ERIC (global carbon observation). Atmospheric data centers (DC), including Carbon Portal [3]l, ACTRIS DC [4] and IAGOS DC [5]) are international by nature offering seamless virtual access to data regardless of user provenance.

3.1. Measuring international attractiveness of ATMO-ACCESS physical and virtual services

Physical services

Atmospheric research facilities have been considered strategically an important investment in Europe over the past decades, attracting researchers all over the world. Considering past and present TNA projects in the field (ACTRIS, ACTRIS-2, ATMO-ACCESS, EUROCHAMP-1, EUROCHAMP-2, EUROCHAMP-2020), close to 10% of access has been provided to international users (i.e. by users affiliated to institutions from outside the European Member and Associated countries). International TNA beneficiaries mostly come from the USA, China and India. In total in ATMO-ACCESS, we have funded 37 physical Access (TNA) projects requested by international applicants. Moreover,134 TNA activities were carried out by teams involving international users (mostly from the US, Turkey and China) but led by users from European institutions.

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Facilities that were most requested by international users are listed below. Interestingly, these facilities are either observation sites with ICOS and ACTRIS capabilities, calibration facilities or atmospheric simulation chambers. They are all highly instrumented.

- ATMOS, GR (OBS)
- AGORA, ES (OBS)
- CESAR, NL (OBS)
- SAPHIR, DE (ASC)
- KASCs, FI (ASC)
- ISOLAB-UU @CESAR, NL (CL)
- FKL, GR (OBS)
- PACS-C2, CH (ASC)
- ACD-C / LACIS-T, DE (ASC)

Figure 1: The Athens Supersite (ATMOS) is a distributed Research Infrastructure in Greece and the Eastern Mediterranean. It is operated by the National Observatory of Athens and NCSR-Demokritos. It offers sites representing urban background, suburban and regional background for several atmospheric research applications and new instrument testing.

OBS = Observational platform; ASC = Atmospheric Simulation Chamber; CL = Central Laboratories.

Virtual services

The Virtual tools developed within ATMO-ACCESS comprise different virtual services including footprint analyses, the “Homeless Data Portal”, and timeseries services [6]. These virtual services were only made available in the second half of the project but have attracted a fairly high number of international users. While European users remain the dominant user group for virtual services, accounting for the majority of users and visits, a substantial number of users come from North America, Asia, and other regions. International users represent from 12% to more than 30% of users from outside Europe. North America was the most active non-European region, followed by Asia and Africa. This is consistent with the fact that IAGOS DC, ICOS Carbon Portal and ACTRIS DC themselves have a substantial fraction of data users from outside Europe, reaching around 50% for IAGOS DC. This suggests the need for specific outreach efforts beyond Europe, potentially through enhanced collaborations and targeted engagement strategies.

2.2 International atmospheric research facilities

In recent years, several countries outside Europe have announced substantial investments for atmospheric research, generally aimed at improving capacity to predict weather and climate but also upgrading or developing new research facilities. For example, through the funding of the US National Science Foundation (NSF) Mid-Scale Research Infrastructure program, the Atmospheric Science and Chemistry mEasurement NeTwork (ASCENT [7]) was recently established as a comprehensive, high-time-resolution, long-term measurement network in the

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U.S., including a comprehensive data infrastructure, for the characterization of aerosol properties. ASCENT leverages existing networks across the country and includes rural/remote/background, urban, and tribal sites.

Another example is from China, which demonstrated significant commitment to atmospheric research through substantial investments in infrastructure and technology. The Institute of Atmospheric Physics (IAP) under the Chinese Academy of Sciences (CAS), established in 1928, has evolved into a comprehensive institution with 11 research laboratories, including two "State Key Laboratories" and three international joint research centers, as well as state-of-the-art-facilities for atmospheric research at several universities and research organizations in the country. Among the most recent achievements, China inaugurated, in December 2024, its first overseas atmospheric background station in Antarctica, "the Zhongshan National Atmospheric Background Station". This facility conducts continuous, long-term monitoring of atmospheric composition and concentration changes and provides crucial data to enhance global efforts against climate change.

The aim to enhance global cooperation in atmospheric research through extending international access must be considered while keeping in mind both EU-level and national strategies and targets, particularly in the current geopolitical era. In practice, liaising with RI-like organizations or networks in other regions of the world, or directly with the agencies in specific countries, offers a potential to define conditions that would reinforce existing engagements to the benefit of European RIs and the European Research Area. D3.3 will, therefore, focus on the specific relevance of connecting with the US and Chinese partners to further develop the international dimension of TNA/VA, and on the lessons learned from ATMO-ACCESS to integrate international facilities to TNA/VA services in the future.

2.2.1 Developing the European-US framework for access to atmospheric research facilities

The organisation of atmospheric research observation facilities on short-lived species in the US is not centralized around the concept of Research Infrastructures and operates in an independent manner between different organizations. Figure 2 below illustrates the different US-based networks for monitoring short-lived atmospheric species and cloud properties.

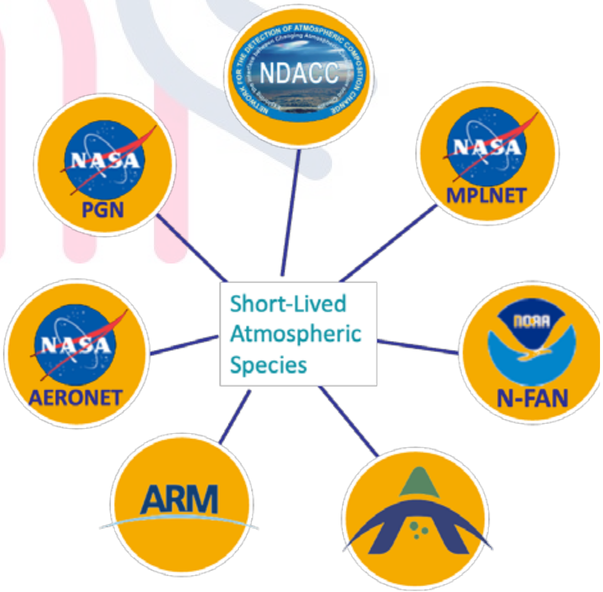

Figure 2: Networks for the observation of short-lived species in the US, comprising, illustrating counter-parts for ACTRIS:

- NOAA Federated Aerosol Network (NOAA-FAN)
- NASA Aerosol Robotic Network (AERONET)
- NASA Micropulse Lidar Network (MPLNET)
- NSF Atmospheric Science and Chemistry mEasurement NeTwork (ASCENT)
- NASA Pandonia Global Network (PGN)
- U. Colorado Network for the detection of Atmospheric Composition Changes (NDACC)
- DoE Atmospheric Radiation Measurement (ARM) user facilities

A similar figure for ICOS would show a higher level of integration in the US, but yet not one single counterpart. Among all the US measurement networks for the observation of short-lived atmospheric species, only the Atmospheric Radiation Measurement (ARM) of the Department of Energy (DoE) ARM provides access, through a structured proposal-based system. Scientists worldwide can request the use of ARM's ground-based and airborne observational facilities to support their research on cloud formation, atmospheric radiation, and climate processes. Ground-based facilities include fixed, mobile, and third-arm observatories equipped with advanced meteorological instruments, while airborne platforms feature specialized aircraft for high-altitude data collection. Access is granted through a peer-reviewed proposal process, ensuring alignment with ARM's mission and scientific goals. Researchers submit detailed requests specifying their study's objectives, required instruments, and observational periods. Approved proposals receive free logistical, technical, and data-processing support from ARM. ARM also supports field campaigns, enabling intensive observational studies in diverse environments. Users must adhere to ARM's data-sharing and reporting policies, contributing findings to its extensive database.

There is no organized coordination of the atmospheric simulation chambers in the US, although US universities have historically been at the forefront of research in atmospheric science and in the use of atmospheric simulation chambers. In fact, several universities in the United States operate atmospheric simulation chambers for research purposes. Here are some notable examples:

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- at the University of California, Riverside (UCR), the Atmospheric Processes Laboratory at UCR's Center for Environmental Research and Technology houses advanced smog chambers designed to study chemical processes in the troposphere. These chambers allow precise control over variables such as temperature, pressure, humidity, light, and heat.
- At the University of Colorado, Boulder, the Center for Atmospheric Chemistry Research at the University of Colorado Boulder operates two temperature-controlled enclosures, each housing approximately 20 m^3 Teflon FEP chambers. These chambers are surrounded by UVA blacklights and visible wide-spectrum fluorescent lights on four walls, facilitating diverse atmospheric studies.
- At the Georgia Institute of Technology, the Georgia Tech Environmental Chamber Facility features dual 12 m^3 Teflon chambers within a temperature-controlled enclosure (4-40°C). Illumination is provided by UVA blacklights and natural sunshine fluorescent lights, supporting various atmospheric research projects.
- At the University of California, Davis, the UC Davis Environmental Chamber consists of a 10 m^3 Teflon chamber in a temperature-controlled enclosure. Illumination is achieved using UVA blacklights and UVB lamps as needed, enabling studies on atmospheric processes.
- At the University of California, Irvine, the UC Irvine Environmental Chamber includes a 5 m^3 Teflon chamber illuminated with UVB lights, facilitating research into atmospheric chemistry.
- CalTech Indoor Chamber (20m^2) – Led by PI Paul Wennberg, this dual-chamber facility at the California Institute of Technology is used for studying atmospheric chemistry, particularly the formation and aging of secondary organic aerosols (SOA). It allows researchers to simulate various environmental conditions, including different levels of oxidants, temperature, and humidity, to understand how pollutants evolve in the atmosphere.
- At Carnegie Mellon University, the Indoor Chamber (12m^2) is used for comprehensive studies of organic aerosol dynamics, including formation, oxidation, and phase changes. It plays a key role in understanding the impact of anthropogenic emissions on atmospheric chemistry and air quality, integrating experimental data with atmospheric models.
- At MIT, the Indoor Chamber (7.5m^2) specializes in studying the oxidation mechanisms of organic pollutants. It is equipped with real-time analytical instruments to track the chemical evolution of atmospheric species, contributing to a deeper understanding of pollution sources and their transformations.

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- at the Pacific Northwest National Laboratory, the PNNL Indoor Chamber ($20m^2$) is designed for research on aerosol formation, aging, and climate-relevant processes. It enables controlled experiments that mimic real-world atmospheric conditions to study aerosol-cloud interactions and improve climate and air quality models.

The US-EU cooperation including the access dimension was recently fostered by the EU project CARGO-ACT. CARGO-ACT involves ACTRIS and three agencies in the US, and it is a first step towards a global Research Infrastructure. CARGO-ACT does not directly involve Universities with advanced atmospheric simulation chamber facilities and is restricted to observations in the natural atmosphere. The overarching goal of CARGO-ACT is to deliver a clear roadmap for sustainable global cooperation between key organizations 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. One of the specific objectives of CARGO-ACT is to establish the mechanisms for providing international access to distributed, global atmospheric Ris, relevant to D3.3.

2.2.2 Enhancing Structured Access to Atmospheric Research facilities with China

China has made significant investments in atmospheric research in the past decades. It has rapidly expanded its capabilities through state-of-the-art infrastructures and cutting-edge scientific programs. Leading research centers, such as the Chinese Academy of Sciences (CAS) and major universities, have established world-class atmospheric observatories, atmospheric simulation chambers producing date feeding high-resolution climate/air quality models. A list of facilities operated by the China Meteorological Administration (CMA), by research centers and Universities in China is included in the annex and, where available, with detailed descriptions of the facilities, their locations and general information, services offered, modalities of access, on-site support offered (similar to the TNA information provided in INFRA-SERV projects). The country has also developed a fleet of research aircraft enhancing its ability to study cloud processes, air pollution, and climate change. These advancements have positioned China as a key player in atmospheric sciences and an attractive hub for international collaboration.

The analysis of Transnational Access (TNA) projects funded under ACTRIS IA, EUROCHAMP, and ATMO-ACCESS indicates that Chinese researchers have primarily benefited from access due to individual professional relationships rather than structured communication efforts from EU projects. While personal connections have played a crucial role in fostering collaboration, this ad hoc approach limits broader participation, transparency, and the full potential of scientific exchange. To truly establish an open and inclusive research environment, there is a need for a

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coordinated access framework and associated communication strategy. Vice-versa, there is currently no structured program in China that would permit access to their atmospheric research facilities beyond the professional relationships/connections, in a similar way as for Chinese scientists benefiting from TNA supported by EU funding.

Within the framework of the ATMO-ACCESS project, a meeting was organized on November 27th, 2024, with Fudan University (FDU), China Meteorological Administration (CMA), Peking University (PKU) and the National Natural Science Foundation of China (NSFC). The meeting focused on explaining the ATMO-ACCESS project and its relevance within the EU Horizon Europe framework. Key topics included the concepts of Transnational Access (TNA) and Virtual Access (VA), and the importance of these mechanisms for supporting European RI.

The status of China's participation in Horizon Europe calls was reviewed, highlighting the need for more organized collaboration frameworks. The discussion emphasized the value of international cooperation, particularly between China and the EU, and the necessity of developing shared infrastructures.

A structured approach to access requires dedicated outreach strategies, ensuring that opportunities are widely disseminated beyond already established networks. This could include targeted workshops, joint EU-China information sessions, and translated resources outlining access procedures. Additionally, formal agreements between European research infrastructures and leading Chinese institutions could provide a framework for access, reducing barriers related to administrative processes, funding uncertainties, and logistical coordination.

Developing a structured access program would also foster long-term collaboration beyond individual projects. Establishing a dedicated EU-China research access platform, for instance, could facilitate the implementation of streamlined application procedures, improve the visibility of European RIs within the Chinese research community, and encourage participation from a wider range of institutions. Furthermore, fostering two-way access where European scientists also benefit from Chinese research infrastructures would reinforce mutual scientific engagement, strengthening global atmospheric research efforts.

There are several issues that still need to be addressed for implementing a reciprocal access program, including data sharing principles.

By shifting from an individually driven process to a well-structured and widely communicated access strategy, European RIs could maximize their global impact, enhance international collaboration, and ensure that cutting-edge atmospheric research benefits from the expertise and contributions of a diverse scientific community, including those from China.

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Developing an access framework similar to the EU project CARGO-ACT with China would offer significant benefits, given China's prominent role in atmospheric science. The goal is to further develop the conditions for a more structural approach to establishing reciprocal access to atmospheric research infrastructures. Establishing such a collaborative program would offer significant opportunities to European researchers and be highly beneficial for advancing excellent science in Europe. It also faces challenges due to current conditions within the EU's Horizon Europe framework.

Individual European countries and China have a longstanding history of scientific cooperation, generally formalized through bilateral agreements that have facilitated joint initiatives in the field of atmospheric science. An example is the partnership between the German Research Foundation (Deutsche Forschungsgesellschaft, DFG) and NSFC in China which was established to promote networking and intensify contacts. Joint calls for proposals are organized to support bilateral research projects, conducted collaboratively between researchers at institutes based in each respective country.

However, a more structured research and innovation partnership targeting the use of atmospheric facilities operated jointly at EU and NFSC levels is limited by the fact that Chinese entities are not automatically eligible for EU funding under Horizon Europe. In principle, they can participate as associated partners but must secure their own funding, often through separate national programs. Consequently, and also considering some restrictions in place at national levels in Europe, there is no formal way to integrate Chinese facilities in an INFRA-SERV initiative under the actual eligibility rules.

Despite these challenges, the strategic importance of Chinese atmospheric research facilities cannot be overlooked. China has made significant investments in advanced monitoring infrastructures, contributing valuable data on air quality and climate change. European researchers would greatly benefit from structured access to these resources, which could enhance global climate models and improve mitigation strategies. Given the growing urgency of environmental challenges, fostering a structured partnership would be mutually beneficial.

2.3. Access to facilities in and from other world regions

The development of the Research Infrastructure concept in other international countries, e.g, in Latin-American Countries (LA)C or Africa is at an early stage, despite some EU-funded initiatives as the INFRA-DEV projects like KADI (Knowledge and climate services from an African observation and Data research Infrastructure) or EU-LAC ResInfra Plus (Towards a Sustainable EU-LAC Partnership In Research Infrastructures) projects.

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For example, KADI expands the SEACRIFOG Inventory Tool mapping the existing greenhouse gas observation infrastructure in Africa and includes data on air quality in the urban areas in Africa. KADI fosters equitable international partnerships, which supports the co-design of a long-term African-led research infrastructure for climate and environmental monitoring. The project promotes best practices in governance, data sharing, and capacity building—key components for the establishment of a coordinated RI roadmap. Access to the RIs needs to be included as part of the RI services.

KADI's outcomes can serve as a foundational step towards a structured and strategic environmental research infrastructure roadmap in Africa, contributing to global climate goals and regional sustainable development.

2.4. The specific case of international facilities co-operated by European partners

Several facilities located in third countries are jointly operated by local institutions and European partners. This is the case of the Cape Verde Atmospheric Observatory (CVAO) which is part of a bilateral United Kingdom-German initiative to undertake long-term ground- and ocean-based observations in the tropical North Atlantic Ocean region. There is a long-term global outlook in the provision of key atmospheric measurements representative of the wider remote marine atmosphere, which are important for understanding changes in atmospheric composition and climate. Even though access to CVAO was granted within ATMO-ACCESS and no request for physical access was made for any project (only participation through remote access to ESA's Earthcare mission), there is an interest in proposing access to these international sites, often located in under-sampled regions.

In ATMO-ACCESS, the costs for accessing CVAO only consider the European activities at the site, and exclude expenses incurred by the local institutions hosting the facility. This means that the access costs only partially cover the real costs for access provision of the facility, as only the "European" share of costs are considered. It is, in some ways, a co-funding activity where the host institution, possibly located in a developing country, supports the additional costs induced by TNA. The resources provided by the host institution are not reimbursed, making the situation clearly unfair. There are currently about 10 to 20 potential international sites co-operating with European partners in ACTRIS and ICOS.

The astronomy infrastructure concept and organization could be a potential solution to this issue. For example, in the case of the Square Kilometre Array (SKA), the Institut de Radioastronomie Millimétrique (IRAM), or the Canada-France-Hawaii Telescope (CFHT), the RIs are managed by private non-profit entities. Calculating the unit cost is fairly straightforward since a certified accountant provides an official financial statement at the end of each fiscal year. The cost is then simply divided by the number of observation hours. This financial statement serves as justification to the European Commission. For these facilities, the choice of a private entity is driven by the need to avoid money transfers between stakeholders. For example, in the case of IRAM, Max-Planck Institute does not transfer funding to the French National Centre for Scientific Research (CNRS), even though the headquarters are in Grenoble. For other infrastructures, such as the telescopes in South Africa or Australia, the European partners must be included in their statutes. In the unit cost, only the European partner's contribution to the infrastructure can be accounted for. For certain infrastructures, if the European partner has only a very minor share, the resulting cost is naturally low. In this case, the situation is similar to that of atmospheric research facilities. It is clear that ERICs play a key role in developing a financial model for integrating international facilities in INFRA-SERV projects.

4. Recommendations

The attractiveness of European atmospheric research facilities and virtual services can be assessed through ATMO-ACCESS, which has seen substantial requests from researchers outside Europe. This demonstrates the global appeal and the high demand for access to these facilities.

Historically and still today, requests for access are often driven by individual initiatives. To streamline and enhance access, it is recommended to develop structured programs within or among RIs to facilitate easier and more organized access for international researchers.

There is a significant need for international access to atmospheric research facilities because unique facilities are operated outside Europe. Atmospheric science requires access to diverse environments, which is particularly true for countries like the US and China that have made substantial investments in atmospheric research in recent years.

Reciprocal access to facilities and services between European Research Infrastructures and US organizations is an objective of CARGO-ACT. In the US, the ARM program offers structured access to its facilities. Expanding similar reciprocal access programs would greatly benefit both European and US researchers.

Key facilities for atmospheric research are operated in China, but no structured access program currently exists. Establishing a structured access program with China would be mutually beneficial, enhancing scientific collaboration and access to unique facilities.
The current regulations in Horizon Europe prevent the integration of Chinese partners in the INFRA-SERV program or in CARGO-ACT-type projects with China. Finding solutions for a joint

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structured access program supporting atmospheric research would be a win-win situation for both the EU Commission and Chinese authorities.

It is too early to imagine structured access programs with other regions in the world. However, laying the groundwork for future collaborations and access programs should be considered as global atmospheric research needs evolve.

For international atmospheric research facilities operated jointly with European partners, integrating these facilities into INFRA-SERV projects would be extremely useful. It is important that the host institution in the country also benefits financially from the access provision. Solutions developed in astronomy for international access should be evaluated and potentially adapted for atmospheric research.

5. References

[1] CARGO-ACT website: https://www.cargo-act.eu/

[2] Opticon Radionet Pilot: https://www.orp-h2020.eu/

[3] ICOS Carbon Portal: https://www.icos-cp.eu/observations/carbon-portal

[4] ACTRIS Data Centre: https://data.actris.eu/

[5] IAGOS Data Centre: https://www.iagos.org/iagos-data/

[6] ATMO-ACCESS virtual tools: https://www.atmo-access.eu/virtual-access/#/

[7] ASCENT network: https://ascent.research.gatech.edu/

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6. Annexes

Atmospheric Facilities located in China that could potentially be providers of International Transnational Access

(1) General information	
Infrastructure name and acronym	Halogenated greenhouse gases measurement at Xichong Station
Name of its installations[1], if applicable	Tianji ODS5-Pro
Location (town, country)	Xichong Observatory, Shenzhen, Guangdong, China
Website address:	upgrading
Legal name of organisation(s) operating the infrastructure / installation(s):	South University of Science and Technology of China
(2) Description of the infrastructure	
Brief general description of the infrastructure to which access is offered (max 100-200 words): *State-of-the-art equipment and services offered to users that make it rare or unique, Outline the areas of research supported by the infrastructure, as well as new areas opening to users, if any. If the infrastructure is composed of several installations, describe these including their specific features.*	Offers the state-of-art systems for high precision measurement of ozone depletion substances (ODSs) and greenhouse gases, including CFCs, HCFCs, Halons, CCl_4, CH_3CCl_3, CH_3Br, HFOs, CH_2Cl_2, $CHCl_3$, CH_2Br_2, $CHBr_3$ as well as HFCs, PFCs, NF_3, SF_6

[1] *'Installation' means a part or a service of a research infrastructure that can be used independently from the rest and for which the operating costs can be singled out. A research infrastructure may consist of one or more installations. Give a justification for considering them as a single infrastructure. In case of several installations that costs must be calculated for each installation separately.*

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Are parts of the infrastructure still under construction?	☑ No ☐ Yes. *Specify the starting date of construction and indicate the date when access can realistically be made available:*
Services currently offered by the infrastructure and its research environment (max 30-50 words) *(How will the infrastructure enable scientists to carry out high-quality research, how will the quality of scientific environment stimulate the research of any user?)*	The infrastructure provides top-tier tools for long life-time climate forcers or ozone depletion substances.
Summarise some of the most interesting scientific achievements already obtained by users (max 20-30 words)	Notable achievements include detecting the mixing ratios of different groups of ODSs and F-GHGs of Southern China
Demonstrate that there is a potential interest from users in other countries to conduct research at the infrastructure (or make otherwise use of its services) (max 20-30 words)	Xichong Station is the first in-situ station of ODS and F-GHG in Southern China which is an important industrial area.
(4) Modalities of access and support offered under ATMO-ACCESS	
Type of planned access	☐ Physical access: "hands-on" access of users to the facility ▯ Remote access: access to the facility without users physically visiting the facility (online access to data or other digital services excluded)
Type of services offered (max 30-40 words)	Access to analysis for atmospheric ODS, F-GHG
Expected user type /user community served?	Researchers from the fields of atmospheric studies, environmental science, and climate change.
Expected location and typical duration of work (max 20 words) (*including type of equipment/service used, estimated number of days spent at the infrastructure)*	
Integration of users (max 30 words) (*how will the users be integrated into the scheduling*	

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of the infrastructure and the degree of independence they will experience with respect to the normal research activity of the infrastructure?)	
Specific on-site support offered by facility for TNA	
● Scientific and technical support	
● Logistic and administrative support offered	
● Is above listed support already routinely provided to all users?	
● Other (max 30 words): *(where relevant, emphasise the quality of the scientific environment in which the users will be working and explain how this might stimulate their research)*	
Facility-specific access modalities	
● Indicate any additional facility-specific access modalities, if any (max 30 words)	
● Do users need to comply with any specific terms of use of services at the facility, if any? (max 30 words)	
(8) Facility PI	
Person in charge of TNA at facility and principal contact point (name, position, affiliated organisation, e-mail)	Dr. Lei Zhu Associate Professor of College of Environmental Science and Engineering South University of Science and Technology of China zhul3@sustech.edu.cn

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(1) General information	
Infrastructure name and acronym	China Global Atmospheric Watch Background Observatory (CGAWBO)
Name of its installations[2], if applicable	Picarro G2401, Angilent 6890, Tianji ODS5-Pro, Brewer
Location (town, country)	Mt. Waliguan, Gonghe, Qinghai, China
Website address:	upgrading
Legal name of organisation(s) operating the infrastructure / installation(s):	China Meteorological Administration
(2) Description of the infrastructure	
Brief general description of the infrastructure to which access is offered (max 100-200 words): *State-of-the-art equipment and services offered to users that make it rare or unique, Outline the areas of research supported by the infrastructure, as well as new areas opening to users, if any. If the infrastructure is composed of several installations, describe these including their specific features.*	CGAWBO offers high quality measurement of total ozone, ozone depletion substances (ODSs) and greenhouse gases, including O_3, CO_2, CH_4, N_2O, HFCs, PFCs, NF_3, SF_6, etc
Are parts of the infrastructure still under construction?	☑ No ☐ Yes. *Specify the starting date of construction and indicate the date when access can realistically be made available:*
Services currently offered by the infrastructure and its research environment (max 30-50 words)	The infrastructure provides top-tier tools for long life-time climate forcers or ozone depletion substances, as well as key atmospheric reactants.

[2] *'Installation' means a part or a service of a research infrastructure that can be used independently from the rest and for which the operating costs can be singled out. A research infrastructure may consist of one or more installations. Give a justification for considering them as a single infrastructure. In case of several installations that costs must be calculated for each installation separately.*

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(How will the infrastructure enable scientists to carry out high-quality research, how will the quality of scientific environment stimulate the research of any user?)	
Summarise some of the most interesting scientific achievements already obtained by users (max 20-30 words)	The longest continuous record of CO_2, CH_4 mixing ratios in China has been obtained at Mt. Waliguan
Demonstrate that there is a potential interest from users in other countries to conduct research at the infrastructure (or make otherwise use of its services) (max 20-30 words)	Mt. Waliguan in the only one GAW Global Background Station in China.
(4) Modalities of access and support offered under ATMO-ACCESS	
Type of planned access	☐ Physical access: "hands-on" access of users to the facility ☐ Remote access: access to the facility without users physically visiting the facility (online access to data or other digital services excluded)
Type of services offered (max 30-40 words)	
Expected user type /user community served?	
Expected location and typical duration of work (max 20 words) (*including type of equipment/service used, estimated number of days spent at the infrastructure)*	
Integration of users (max 30 words) (*how will the users be integrated into the scheduling of the infrastructure and the degree of independence they will experience with respect to the normal research activity of the infrastructure?)*	
Specific on-site support offered by facility for TNA	
• Scientific and technical support	

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• Logistic and administrative support offered	
• Is above listed support already routinely provided to all users?	
• Other (max 30 words): *(where relevant, emphasise the quality of the scientific environment in which the users will be working and explain how this might stimulate their research)*	
Facility-specific access modalities	
• Indicate any additional facility-specific access modalities, if any (max 30 words)	
• Do users need to comply with any specific terms of use of services at the facility, if any? (max 30 words)	
(8) Facility PI	
Person in charge of TNA at facility and principal contact point (name, position, affiliated organisation, e-mail)	Dr. Jianqiong Wang

(1) General information	
Infrastructure name and acronym	Halogenated greenhouse gases measurement at Mt. Qomolangma Station
Name of its installations[3], if applicable	Tianji ODS5-Pro Ecotech UoW FTIR

[3] *'Installation' means a part or a service of a research infrastructure that can be used independently from the rest and for which the operating costs can be singled out. A research infrastructure may consist of one or*

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Location (town, country)	Base camp of Mt. Qomolangma, Tibet, China
Website address:	upgrading
Legal name of organisation(s) operating the infrastructure / installation(s):	Peking University, China
(2) Description of the infrastructure	
Brief general description of the infrastructure to which access is offered (max 100-200 words): *State-of-the-art equipment and services offered to users that make it rare or unique, Outline the areas of research supported by the infrastructure, as well as new areas opening to users, if any. If the infrastructure is composed of several installations, describe these including their specific features.*	Offers the state-of-art systems for high precision measurement of ozone depletion substances (ODSs) and greenhouse gases, including CFCs, HCFCs, Halons, CCl_4, CH_3CCl_3, CH_3Br, HFOs, CH_2Cl_2, $CHCl_3$, CH_2Br_2, $CHBr_3$ as well as HFCs, PFCs, NF_3, SF_6, ,CO2, CH_4, N_2O, CO
Are parts of the infrastructure still under construction?	☑ No ☐ Yes. *Specify the starting date of construction and indicate the date when access can realistically be made available:*
Services currently offered by the infrastructure and its research environment (max 30-50 words) *(How will the infrastructure enable scientists to carry out high-quality research, how will the quality of scientific environment stimulate the research of any user?)*	The infrastructure provides top-tier tools for long life-time climate forcers or ozone depletion substances.
Summarise some of the most interesting scientific	Notable achievements include detecting the mixing ratios of different groups of ODSs and GHGs of global background at high altitude

more installations. Give a justification for considering them as a single infrastructure. In case of several installations that costs must be calculated for each installation separately.

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achievements already obtained by users (max 20-30 words)	
Demonstrate that there is a potential interest from users in other countries to conduct research at the infrastructure (or make otherwise use of its services) (max 20-30 words)	Mt. Qomolangma Station is one of the highest atmospheric observatory in the world
(4) Modalities of access and support offered under ATMO-ACCESS	
Type of planned access	☐ Physical access: "hands-on" access of users to the facility ☐ Remote access: access to the facility without users physically visiting the facility (online access to data or other digital services excluded)
Type of services offered (max 30-40 words)	Access to analysis for atmospheric ODS, GHG, reactive gases
Expected user type /user community served?	Researchers from the fields of atmospheric studies, environmental science, and climate change.
Expected location and typical duration of work (max 20 words) (*including type of equipment/service used, estimated number of days spent at the infrastructure)*	
Integration of users (max 30 words) (*how will the users be integrated into the scheduling of the infrastructure and the degree of independence they will experience with respect to the normal research activity of the infrastructure?)*	
Specific on-site support offered by facility for TNA	
• Scientific and technical support	
• Logistic and administrative support offered	
• Is above listed support already routinely provided to all users?	

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●Other (max 30 words): *(where relevant, emphasise the quality of the scientific environment in which the users will be working and explain how this might stimulate their research)*	
Facility-specific access modalities	
●Indicate any additional facility-specific access modalities, if any (max 30 words)	
●Do users need to comply with any specific terms of use of services at the facility, if any? (max 30 words)	
(8) Facility PI	
Person in charge of TNA at facility and principal contact point (name, position, affiliated organisation, e-mail)	Prof. Dr. Tong Zhu Professor of College of Environmental Science and Engineering Peking University tzhu@pku.edu.cn

(1) General information	
Infrastructure name and acronym	Longfengshan Regional Background Station
Name of its installations[4], if applicable	Brewer MkIII Spectrophotometer
Location (town, country)	Wuchang, Heilongjiang, China
Website address:	upgrading

[4] *'Installation' means a part or a service of a research infrastructure that can be used independently from the rest and for which the operating costs can be singled out. A research infrastructure may consist of one or more installations. Give a justification for considering them as a single infrastructure. In case of several installations that costs must be calculated for each installation separately.*

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Legal name of organisation(s) operating the infrastructure / installation(s):	China Meteorological Administration
(2) Description of the infrastructure	
Brief general description of the infrastructure to which access is offered (max 100-200 words): *State-of-the-art equipment and services offered to users that make it rare or unique, Outline the areas of research supported by the infrastructure, as well as new areas opening to users, if any. If the infrastructure is composed of several installations, describe these including their specific features.*	Offers high quality measurement of total ozone, etc
Are parts of the infrastructure still under construction?	☑ No ☐ Yes. *Specify the starting date of construction and indicate the date when access can realistically be made available:*
Services currently offered by the infrastructure and its research environment (max 30-50 words) *(How will the infrastructure enable scientists to carry out high-quality research, how will the quality of scientific environment stimulate the research of any user?)*	The infrastructure provides top-tier tools for total ozone column.
Summarise some of the most interesting scientific achievements already obtained by users (max 20-30 words)	
Demonstrate that there is a potential interest from users in other countries to conduct research at the infrastructure (or make otherwise use of its services) (max 20-30 words)	

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(4) Modalities of access and support offered under ATMO-ACCESS	
Type of planned access	☐ Physical access: "hands-on" access of users to the facility ☐ Remote access: access to the facility without users physically visiting the facility (online access to data or other digital services excluded)
Type of services offered (max 30-40 words)	
Expected user type /user community served?	
Expected location and typical duration of work (max 20 words) (*including type of equipment/service used, estimated number of days spent at the infrastructure)*	
Integration of users (max 30 words) (*how will the users be integrated into the scheduling of the infrastructure and the degree of independence they will experience with respect to the normal research activity of the infrastructure?)*	
Specific on-site support offered by facility for TNA	
• Scientific and technical support	
• Logistic and administrative support offered	
• Is above listed support already routinely provided to all users?	
• Other (max 30 words): *(where relevant, emphasise the quality of the scientific environment in which the users will be working and explain how this might stimulate their research)*	

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Facility-specific access modalities	
• Indicate any additional facility-specific access modalities, if any (max 30 words)	
• Do users need to comply with any specific terms of use of services at the facility, if any? (max 30 words)	

(8) Facility PI	
Person in charge of TNA at facility and principal contact point (name, position, affiliated organisation, e-mail)	Prof. Dajiang Yu yu_dajiang@163.com

(1) General information	
Infrastructure name and acronym	Lin'an Regional Background Station
Name of its installations[5], if applicable	Brewer MkIII Spectrophotometer
Location (town, country)	Lin'an, Zhejiang, China
Website address:	upgrading
Legal name of organisation(s) operating the infrastructure / installation(s):	China Meteorological Administration
(2) Description of the infrastructure	
Brief general description of the infrastructure to which access is offered (max 100-200 words):	Offers high quality measurement of total ozone, etc

[5] *'Installation' means a part or a service of a research infrastructure that can be used independently from the rest and for which the operating costs can be singled out. A research infrastructure may consist of one or more installations. Give a justification for considering them as a single infrastructure. In case of several installations that costs must be calculated for each installation separately.*

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ATMO ACCESS
Access to Atmospheric Research Facilities

State-of-the-art equipment and services offered to users <u>*that make it rare or unique*</u>*, Outline the areas of research supported by the infrastructure, as well as new areas opening to users, if any. If the infrastructure is composed of several installations, describe these including their specific features.*	
Are parts of the infrastructure still under construction?	☑ No ☐ Yes. *Specify the starting date of construction and indicate the date when access can realistically be made available:*
Services currently offered by the infrastructure and its research environment (max 30-50 words) *(How will the infrastructure enable scientists to carry out high-quality research, how will the quality of scientific environment stimulate the research of any user?)*	The infrastructure provides top-tier tools for total ozone column.
Summarise some of the most interesting scientific achievements already obtained by users (max 20-30 words)	
Demonstrate that there is a potential interest from users in other countries to conduct research at the infrastructure (or make otherwise use of its services) (max 20-30 words)	
(4) Modalities of access and support offered under ATMO-ACCESS	
Type of planned access	☐ Physical access: "hands-on" access of users to the facility ☐ Remote access: access to the facility without users physically visiting the facility (online access to data or other digital services excluded)
Type of services offered (max 30-40 words)	

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Expected user type /user community served?	
Expected location and typical duration of work (max 20 words) (*including type of equipment/service used, estimated number of days spent at the infrastructure)*	
Integration of users (max 30 words) (*how will the users be integrated into the scheduling of the infrastructure and the degree of independence they will experience with respect to the normal research activity of the infrastructure?)*	
Specific on-site support offered by facility for TNA	
• Scientific and technical support	
• Logistic and administrative support offered	
• Is above listed support already routinely provided to all users?	
• Other (max 30 words): *(where relevant, emphasise the quality of the scientific environment in which the users will be working and explain how this might stimulate their research)*	
Facility-specific access modalities	
• Indicate any additional facility-specific access modalities, if any (max 30 words)	

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● Do users need to comply with any specific terms of use of services at the facility, if any? (max 30 words)	
(8) Facility PI	
Person in charge of TNA at facility and principal contact point (name, position, affiliated organisation, e-mail)	Prof. Honghui Xu forsnow@126.com

(1) General information	
Infrastructure name and acronym	Atmospheric observation and monitoring platform (AOMP)
Name of its installations[6], if applicable	1. Tianji ODS5-Pro and standard gas preparation system at National Observation Station for Wetland Ecosystems of the Yangtze Estuary 2. Tianji ODS5-Pro, Tianji ODS6-Pro, Picarro 1301 and Picarro 5310 at central calibration and analysis lab 3. Aerosol chemical speciation monitor (ACSM, Aerodyne Inc.), VOCUS-PTR-ToF-MS (Tofwerk), electrospray ionization (EESI) ToF-MS (Tofwerk), sizing mobility particle sizer (SMPS, TSI 3789), condensation particle counter (CPC,3787), and two atmospheric flow tube reactors
Location (town, country)	Jiangwan Campus, Fudan University & National Observation Station for Wetland Ecosystems of the Yangtze Estuary, Shanghai, China
Website address:	upgrading
Legal name of organisation(s) operating the infrastructure / installation(s):	Department of Atmospheric and Oceanic Sciences & Institute of Atmospheric Sciences, Fudan University
(2) Description of the infrastructure	
Brief general description of the infrastructure to which	1. AOMP offers the state-of-art systems for high precision measurement of ozone depletion substances (ODSs) and

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access is offered (max 100-200 words): *State-of-the-art equipment and services offered to users that make it rare or unique, Outline the areas of research supported by the infrastructure, as well as new areas opening to users, if any. If the infrastructure is composed of several installations, describe these including their specific features.*	greenhouse gases, including CFCs, HCFCs, Halons, CCl_4, CH_3CCl_3, CH_3Br, HFOs, CH_2Cl_2, $CHCl_3$, CH_2Br_2, $CHBr_3$ as well as CO_2, CH_4, N_2O, HFCs, PFCs, NF_3, SF_6, in which ODS6-Pro is the new generation of ODS and florinated greenhouse gases (F-GHGs) measurement system developed in 2024 by AOMP. 2. AOMP offers ambient air level standard gases for ODS and F-GHG measurements. 3. AOMP offers advanced observation capabilities to measure atmospheric components and their properties and to simulate their reactions on molecular level, including volatile organic compounds (VOC), oxygenated organic gases, chemical composition of aerosol (ammonium, sulfate, nitrate, organics), aerosol number concentration and size distribution. The equipment including: aerosol chemical speciation monitor, VOCUS-PTR-ToF-MS, electrospray ionization (EESI) ToF-MS (Tofwerk), sizing mobility particle sizer (SMPS), condensation particle counter (CPC), and two atmospheric flow tube reactors with controlling temperature, relative humidity and illumination to simulate dark and photochemical reactions
Are parts of the infrastructure still under construction?	☑ No ☐ Yes. *Specify the starting date of construction and indicate the date when access can realistically be made available:*
Services currently offered by the infrastructure and its research environment (max 30-50 words) *(How will the infrastructure enable scientists to carry out high-quality research, how will the quality of scientific environment stimulate the research of any user?)*	The infrastructure provides top-tier tools for long life-time climate forcers or ozone depletion substances, as well as key atmospheric reactants including aerosols and volatile organic compounds. Researchers will have access to highly precision analytical equipment, expert scientific support, detailed instruction manual, and high qualities standard gases.
Summarise some of the most interesting scientific achievements already obtained by users (max 20-30 words)	Notable achievements include detecting the mixing ratios of different groups of ODSs and F-GHGs of key regions in China, as well as in polar regions, and emission was estimated based on the atmospheric data. Elucidating new formation mechanisms of biogenic oxygenated compounds, identifying sources of organic aerosols in Shanghai.
Demonstrate that there is a potential interest from users in other countries to conduct research at the infrastructure	The increasing global emission of F-GHGs and continuous unexpected emissions call for expanding the monitoring network of atmospheric ODSs and F-GHGs. AOMP has worked for years to develop the high

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(or make otherwise use of its services) (max 20-30 words)	precision analysis system, and qualified standards gases, SS flask to enhance observation capability.
(4) Modalities of access and support offered under ATMO-ACCESS	
Type of planned access	☑ Physical access: "hands-on" access of users to the facility ▯ Remote access: access to the facility without users physically visiting the facility (online access to data or other digital services excluded)
Type of services offered (max 30-40 words)	Access to analysis instruments for atmospheric ODS, F-GHG, and aerosol sample analysis, or standard transfer, as well as a testing platform for studying ODS and GHG emission or source. Users can either remotely access data or conduct hands-on experiments.
Expected user type /user community served?	Researchers from the fields of atmospheric studies, environmental science, and climate change.
Expected location and typical duration of work (max 20 words) *(including type of equipment/service used, estimated number of days spent at the infrastructure)*	The duration of stay at the facility can vary depending on the specific requirements for sample analysis or testing.
Integration of users (max 30 words) *(how will the users be integrated into the scheduling of the infrastructure and the degree of independence they will experience with respect to the normal research activity of the infrastructure?)*	Users will be integrated into the lab's schedule with support, and have the opportunity to collaborate closely with the on-site research teams, gaining both guidance and autonomy in their research.
Specific on-site support offered by facility for TNA	
• Scientific and technical support	On-site experts will provide hands-on training and guidance in the operation of analysis equipment and the research platform, as well as data analysis.
• Logistic and administrative support offered	The facility provides support with equipment usage and standard gases.
• Is above listed support already routinely provided to all users?	Yes.
• Other (max 30 words): *(where relevant, emphasise the quality of the scientific environment in which the*	The facility's scientific environment promotes interdisciplinary collaboration, enhancing the research experience and accelerating the achievement of meaningful results in atmospheric sciences, environmental sciences and climate change studies.

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users will be working and explain how this might stimulate their research)	
Facility-specific access modalities	
● Indicate any additional facility-specific access modalities, if any (max 30 words)	Users will have flexible access to the infrastructure for tailored research needs, particularly in the interdisciplinary areas of extremely low concentration species.
● Do users need to comply with any specific terms of use of services at the facility, if any? (max 30 words)	Users are required to adhere to the facility's safety protocols, proper use of equipment, and ethical standards in conducting their research.
(8) Facility PI	
Person in charge of TNA at facility and principal contact point (name, position, affiliated organisation, e-mail)	Prof. Dr. Bo Yao, Deputy Dean of Department of Atmospheric and Oceanic Sciences, Fudan University, Shanghai 200438, China yaobo@fudan.edu.cn

(1) General information	
Infrastructure name and acronym	1. Environmental Mass Sspectrometry Laboratory (EMSL); 2. Atmospheric Temperature on Human Comfort and Cognitive Performance Assessment Platform (ATHCCPAP).
Name of its installations[7], if applicable	4. Thermo Scientific Orbitrap Exploris 120, SHIMADZU PY-GC/MS, SHIMADZU GC/MS-QP2010 Ultra, SCIEX ZenoTOF® 7600, Agilent1290 Infinity II-6475, Agilent 1290 Infinity II-6545, Agilent ICP-MS7850; 5. TOFWERK Vocus-B4 CI-TOF, TOFWERK Vocus 2R PTR-TOF. Wearable devices for monitoring human physiological parameters
Location (town, country)	First Floor, Building A8, Guoquanbei Road 1688, Shanghai Bay Valley, Shanghai 200438, China
Website address:	upgrading

[7] *'Installation' means a part or a service of a research infrastructure that can be used independently from the rest and for which the operating costs can be singled out. A research infrastructure may consist of one or more installations. Give a justification for considering them as a single infrastructure. In case of several installations that costs must be calculated for each installation separately.*

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Legal name of organisation(s) operating the infrastructure / installation(s):	Shanghai International Green low-carbon Proof of Concept Centre, Shanghai 200438, China
(2) Description of the infrastructure	
Brief general description of the infrastructure to which access is offered (max 100-200 words): *State-of-the-art equipment and services offered to users that make it rare or unique, Outline the areas of research supported by the infrastructure, as well as new areas opening to users, if any. If the infrastructure is composed of several installations, describe these including their specific features.*	4. EMSL offers advanced mass spectrometry capabilities to quantitatively detect molecular components of the emergent pollutants, microplastics, organic components, heavy metals, and metabolites in environmental samples. The equipment includes: Thermo Scientific Orbitrap Exploris 120, SHIMADZU PY-GC/MS, SHIMADZU GC/MS-QP2010 Ultra, SCIEX ZenoTOF® 7600, Agilent1290 Infinity II-6475, Agilent 1290 Infinity II-6545, Agilent ICP-MS7850. 5. ATHCCPAP investigates the impact of climate change on human health, focusing on comfort and cognitive performance under varying temperature conditions. The infrastructure includes three climate chambers with precise and controllable temperature, humidity, and wind speed, several sets of wearable devices for monitoring human physiological parameters (EEG, ECG, EDA, EMG), equipment for detecting human body fluid metabolites (SCIEX ZenoTOF® 7600), and online monitoring equipment for respiratory components (TOFWERK Vocus-B4 CI-TOF, TOFWERK Vocus 2R PTR-TOF).
Are parts of the infrastructure still under construction?	☑ No ☐ Yes. *Specify the starting date of construction and indicate the date when access can realistically be made available:*
Services currently offered by the infrastructure and its research environment (max 30-50 words) *(How will the infrastructure enable scientists to carry out high-quality research, how will the quality of scientific environment stimulate the research of any user?)*	The infrastructure provides top-tier tools for environmental pollutant analysis and human health impact assessments. Researchers will have access to highly accurate analytical equipment, expert scientific support, and a conducive research environment, ensuring the delivery of high-quality data and insights. The multi-disciplinary research environment fosters cutting-edge research and novel findings.
Summarise some of the most interesting scientific achievements already obtained by users (max 20-30 words)	Notable achievements include detecting previously unrecognized nano-microplastics in Shanghai atmosphere, and identifying the potential effects of temperature and RH on human metabolism and cognitive function.

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ATMO ACCESS
Access to Atmospheric Research Facilities

Demonstrate that there is a potential interest from users in other countries to conduct research at the infrastructure (or make otherwise use of its services) (max 20-30 words)	There is growing international interest in conducting research in the context of global climate change, extreme weather, molecular composition of chemicals, and emergent pollutants.
(4) Modalities of access and support offered under ATMO-ACCESS	
Type of planned access	☑ Physical access: "hands-on" access of users to the facility ☐ Remote access: access to the facility without users physically visiting the facility (online access to data or other digital services excluded)
Type of services offered (max 30-40 words)	Access to mass spectrometry equipment for environmental pollutant analysis, as well as a testing platform for studying human health impacts related to climate change. Users can either remotely access data or conduct hands-on experiments.
Expected user type /user community served?	Researchers from the fields of environmental science, atmospheric studies, public health, and climate change.
Expected location and typical duration of work (max 20 words) (*including type of equipment/service used, estimated number of days spent at the infrastructure)*	The duration of stay at the facility can vary depending on the specific requirements for sample analysis or health testing.
Integration of users (max 30 words) (*how will the users be integrated into the scheduling of the infrastructure and the degree of independence they will experience with respect to the normal research activity of the infrastructure?)*	Users will be integrated into the lab's schedule with support, and have the opportunity to collaborate closely with the on-site research teams, gaining both guidance and autonomy in their research. Prof. Dr. Jianmin Chen, Director, Shanghai Key Laboratory of Atmospheric Particle Pollution and Prevention (LAP3), Department of Environmental Science and Technology, & Institute of Atmospheric Sciences, Fudan University, 2005 Songhu Road, Shanghai 200438, China Tel: +86(021)3124-2298, Fax: +86(21)3124-2080 jmchen@fudan.edu.cn
Specific on-site support offered by facility for TNA	
• Scientific and technical support	On-site experts will provide hands-on training and guidance in the operation of mass spectrometry equipment and the human health test platform, as well as data analysis.
• Logistic and administrative support offered	The facility provides support with equipment usage and reagents.

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• Is the above listed support already routinely provided to all users?	NO.
• Other (max 30 words): *(where relevant, emphasise the quality of the scientific environment in which the users will be working and explain how this might stimulate their research)*	The facility's scientific environment promotes interdisciplinary collaboration, enhancing the research experience and accelerating the achievement of meaningful results in environmental health and climate change studies.
Facility-specific access modalities	
• Indicate any additional facility-specific access modalities, if any (max 30 words)	Users will have flexible access to the infrastructure for tailored research needs, particularly in the interdisciplinary areas of environmental monitoring and public health.
• Do users need to comply with any specific terms of use of services at the facility, if any? (max 30 words)	Users are required to adhere to the facility's safety protocols, proper use of equipment, and ethical standards in conducting their research.
(8) Facility PI	
Person in charge of TNA at facility and principal contact point (name, position, affiliated organisation, e-mail)	Prof. Dr. Jianmin Chen, Distinguished Professor, MAE Directors of EMSL, ATHCCPAP and Shanghai International Green low-carbon Proof of Concept Center, National Eastern Tech-Transfer Centre, Shanghai 200438, China Vice Director of IRDR International Center of Excellence on Risk Interconnectivity and Governance on Weather/Climate Extremes Impact and Public Health, Institute of Atmospheric Sciences, Fudan University, Shanghai 200438, China Director of Shanghai Key Laboratory of Atmospheric Particle Pollution and Prevention, Department of Environmental Science and Engineering, Fudan University, Shanghai 200438, China jmchen@fudan.edu.cn

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