ATMO ACCESS
Access to Atmospheric Research Facilities

Title	**A strategic access plan for access provision to atmospheric RIs**
Work package n°	8
Milestone/Deliverable n°	D8.1
Lead beneficiary	WMO
Author(s)	Paolo Laj, Julie Bourdeu
Deliverable Type	Report
Dissemination Level	Public
Estimated delivery date	M52
Actual delivery date	17/09/2025
Version	2 (updated 06.03.2026)
Reviewed by	Sabine Philippin, Michelle Färber, Gordon McFiggans, Matilde Oliveri
Accepted by	Project Office
Comments	V2: Following the final external review, the deliverable was corrected according to the recommendations.

This work has received funding from the European Union's Horizon 2020 research and innovation programme through the ATMO-ACCESS Integrating Activity under grant agreement No 101008004

Table of Contents

This work has received funding from the European Union's Horizon 2020 research and innovation programme through the ATMO-ACCESS Integrating Activity under grant agreement No 101008004

1 Introduction

Sustainability of access provision can only be ensured by establishing a synergistic strategy through which all stakeholders, including the RIs, European and national funders, the access providers, and the users, agree on a common vision and a share of responsibilities and resources (e.g., access cost model). The objective of WP8 is to develop a sustainable future framework for access to atmospheric RIs both at the national and European level. The aim is that the framework developed in the ATMO-ACCESS can also be proposed for other distributed RIs, in the environmental domain and beyond. In this access framework process, WP8 will work on both the scientific/technological and the operational (financial, strategic) dimensions of access provision and will base the evaluation of the best options to maximize the scientific relevance and socio-economic impact of access to atmospheric RIs considering the European Charter for Access to RIs.

The specific objective of Deliverable 8.1 is to propose a series of recommendations based on in-depth analysis of outcomes produced in ATMO-ACCESS and involving different RI communities to establish the optimal conditions for ensuring the long-term sustainability of the access provision beyond EU funding but also an optimal use of resources within ACCESS projects. D8.1 concentrates on the specific outcome of ATMO-ACCESS for the domain of Atmospheric Research. D8.1 integrates outcomes and experience gained from the other WPs – Joint Activities (JA, WP1-8), TA (WP9), VA (WP10) – into an overall access framework that will address all dimensions of access provision in the atmospheric RIs. It will be completed by Deliverable 8.2 that details a strategic access plan that extends its scope to incorporate insights from two additional Horizon 2020 pilot projects - ORP and NFFA. D8.1 and D8.2 are also completed by D8.3, not in the original plan of ATMO-ACCESS but which was requested after the mid-term review, as a basis for the Policy brief. D8.3 integrates recommendations relevant for both internal management of atmospheric infrastructure projects and for more generic access projects but focusing on co-funding aspects.

During the project lifetime, other WPs have been feeding information, experience and outcomes to task 8.1 to produce a final strategic access plan that addresses the scientific, technological and human capital conditions required at European atmospheric facilities for successfully engaging users for integrated access programme. The strategic plan done in task

8.1 is intended to be used by RI managers, atmospheric facility PIs and the national stakeholders to plan proper investments (including education and training of staff) that would make a facility suited for responding to challenges in science, technology and innovation and to constantly respond to user needs and expectations, including those of the private sector.

This work has received funding from the European Union's Horizon 2020 research and innovation programme through the ATMO-ACCESS Integrating Activity under grant agreement No 101008004

2 Methodology

The overall methodology implemented in ATMO-ACCESS is illustrated from the "ATMO-ACCESS loop" described in the proposal (Figure 1).

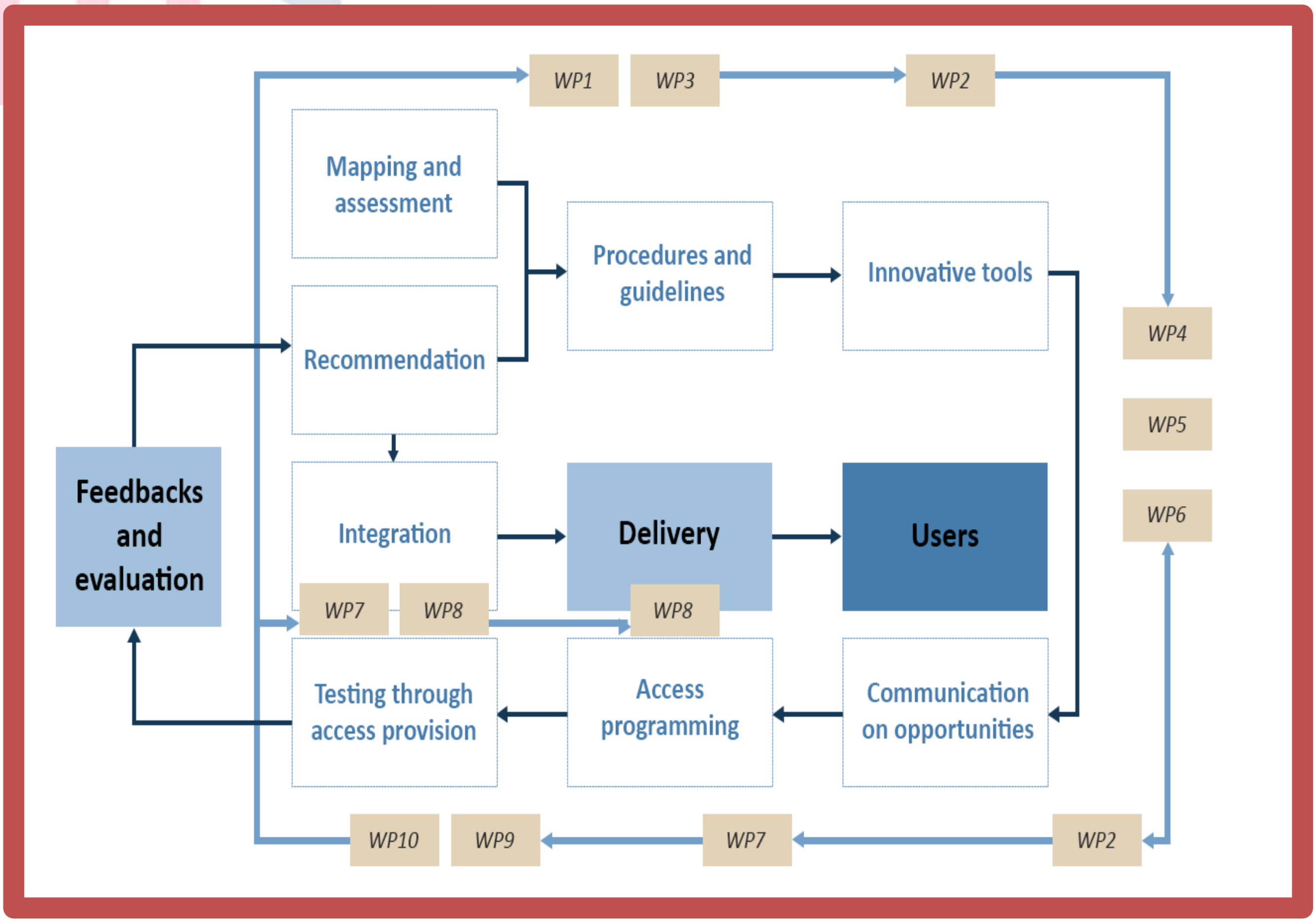

Figure 1: The ATMO-ACCESS loop, evidencing how recommendations from all WPs are feeding into WP8.

The pilot dimension of ATMO-ACCESS has been extensively tested through the range of tasks and activities outlined in WP7-WP9 and WP10, covering access strategy and access provision, including both TA and VA. Procedures are embedded in all steps of the project to ensure that each recommendation in WP8 is supported by the relevant groups within the RIs (facility operators, DC managers, RI managers), as well as by users and by national and international stakeholders. Therefore, ATMO-ACCESS has organized the work in such a way that all recommendations delivered in WP8 result from a thorough process, which starts with evaluating and mapping current access procedures and user needs, followed by exploring new solutions, raising user awareness and testing the access provision, before finally collecting

This work has received funding from the European Union's Horizon 2020 research and innovation programme through the ATMO-ACCESS Integrating Activity under grant agreement No 101008004

feedback from relevant groups and assessing outcomes based on the relevant metrics, with the results then feeding back into the access provision to continuously improve it.

Therefore, Task 8.1 integrates outcomes from deliverables in all WPs and particularly:

- D1.4, Concept and guidelines for access to atmospheric RIs
- D2.4, Report on success of the communications actions based on strategies implemented for the pilot access calls, including recommendations and best practices
- D3.4, International access modalities recommendations for 2030 in ATMO-ACCESS RIs, based on test cases
- D4.5, Report on the long-term strategy of training and TNA related to the three access modalities,
- D5.9, Final Data Management Plan for data from TNA activities and recommendation for the future
- D6.5, Report on the evaluation of the TNA pilot and future recommendation
- D7.3, Recommendations for Proposal Evaluation for a Competitive, Fair and Effective Access Programme in a Distributed RI
- D8.3, Policy brief: encouraging a co-funding approach to access for distributed Research Infrastructures
- D11.6, Report on project's carbon emissions and on compensation actions

D8.1 therefore provides guidance for defining the most suited options for a well-managed access to atmospheric research infrastructures, including all dimensions of access. The aim is to highlight both success and difficulties encountered in ATMO-ACCESS.

3 Main recommendations from ATMO-ACCESS

3.1 Recommendation for an efficient communication strategy

While acknowledging that the management team undertook initiatives to provide guidance on referencing the project across various communication channels since the beginning of the project, the mid-review of the project brought attention to capacity in ATMO-ACCESS to enhance user participation project’s influence beyond the confines of the three RIs and therefore effectiveness of communication strategies used to promote TA/VA calls and training events.

What worked particularly well was the use of a multi-channel communication strategy, which engaged actors including RIs and facility providers, and institutional networks, through diverse channels such as social media, mailing lists, and in-person promotion at conferences. The ATMO-ACCESS website saw a significant increase in traffic, with over 11,500 unique page views and LinkedIn emerged as the most successful social media platform,

This work has received funding from the European Union’s Horizon 2020 research and innovation programme through the ATMO-ACCESS Integrating Activity under grant agreement No 101008004

growing its follower base by over 850%. Social media platforms like Twitter/X and Instagram had limited impact, and the transition away from Twitter/X due to external factors disrupted continuity. Mailing lists and peer-to-peer communication were also highly effective, with most users reporting that they learned about access opportunities through colleagues or institutional contacts. The Massive Open Online Course (MOOC) and training events like AGORA and NAOK attracted hundreds of participants, demonstrating strong interest in capacity-building activities. Feedback from users was overwhelmingly positive, with high satisfaction scores for the clarity of information, ease of application, and support from the TA team (see Deliverable 2.4).

However, the project encountered difficulties in reaching some of its targets: in particular for the number of applications and users beyond the strict domain of the atmospheric sciences. The 6th call targeted multi-disciplinary users, and it received fewer applications than the other calls and lower satisfaction scores. This is possibly due to unfamiliarity with the access process or to the fact that many facilities open for access are mainly relevant to atmospheric research. Some scientific communities were particularly targeted (such as the health domain, to exploit the opportunity to use atmospheric simulation chambers for exposure studies) but success was limited, due to the significant preparation time and additional resources required. Atmospheric research facilities offering TA/VA services in ATMO-ACCESS are extremely relevant to a community who is already aware of how to use them. Going beyond these communities proved to be problematic, most probably because of difficulties understanding how atmospheric services can be used.

This has also been the case for engaging users outside the strict academic community: meaning the private sector (beyond the usual 10% of users), despite a specific continuous call offered and well-advertised, and public authorities. Issues related to reaching these two target users are different, but the absence of a simplified centralized, visual service catalogue may have hindered users' understanding of the full range of access opportunities. It may also be that those services offered by the RIs, often going beyond simple access (i.e. management of Intellectual Property Rights for the private sector) were not well-advertised. For the public authorities, one reason is probably linked to the language barrier and to the transnational dimension of access. Public authorities often are working at a very local scale, and the international dimension is perceived as a difficulty. Nevertheless, the need to get expert views from ACTRIS in relation to the new European Air Quality Directive created a specific demand and the webinars organised by the project on this topic turned out to be quite successful.

This work has received funding from the European Union's Horizon 2020 research and innovation programme through the ATMO-ACCESS Integrating Activity under grant agreement No 101008004

In conclusion, recommendations for efficient communication strategy are:

1) Raising awareness and supporting user engagement through social media, newsletters and emails is an efficient way to reach new users, but within the atmospheric research communities.
2) Future projects should benefit from clearer service descriptions, simplified application materials, more consistent feedback collection, and continued investments in targeted, audience-specific outreach.
3) Reaching users beyond the atmospheric domain, or non-academic users is a challenge, and it is not only a communication issue. Services offered by atmospheric research facilities are suited to users with knowledge of atmospheric sciences. Engaging beyond this would require both development of innovative ready-to-use service types or ambassadors within the project to promote and explain how services can be used outside the atmospheric field. In ATMO-ACCESS, successful use of facilities by non- academic users could only be implemented with significant engagement of WP/Task leaders for preparing the calls in WP6. Challenge-driven projects will require more than simply offering TA/VA to fully integrate needs from different user communities.

3.2 Recommendation for encouraging innovative access modalities

ATMO-ACCESS WP6 and WP4 were the place for innovative solutions for providing Access.

3.2.1 Use of TA/VA for training activities

Training schools remain a cornerstone of scientific education. Physical schools offer immersive experiences in measurement techniques, data analysis, and scientific writing. Hybrid schools, such as the AGORA summer school and a joint workshop on sensors and drones, demonstrated that combining remote and in-person elements can enhance training while reducing travel. These formats allow for broader participation of students, expand geographical outreach, and facilitate the inclusion of remote lecturers.

WP4 explored strategies to use TA/VA for offering training activities under different formats—physical, remote, hybrid, and virtual— to support scientific capacity building in atmospheric research. Training activities (both for early-career and experienced scientists) in air pollution and greenhouse gas monitoring, especially considering global environmental challenges, is one key activity of the three RIs.

Pilot training activities conducted under ATMO-ACCESS, including campaign-based training at observation sites, mobile platforms, and central laboratories have been successfully implemented. These activities often combined physical and remote elements, with

This work has received funding from the European Union's Horizon 2020 research and innovation programme through the ATMO-ACCESS Integrating Activity under grant agreement No 101008004

instruments shipped to sites and operated by local staff, while scientists participated remotely. Although this approach reduces travel and associated environmental impacts, it limits opportunities for on-the-job training and peer interaction.

Virtual access, including MOOCs and webinars, has emerged as a powerful tool for global knowledge dissemination. Even if opened in the second part of the project, the ATMO-ACCESS MOOC attracted hundreds of learners from around the world, and a cross-RI webinar hosted by NAOK observational facility reached participants from 39 countries. These tools offer continuous availability and global reach, making them effective for long-term impact.

Training at central laboratories was found to be particularly effective when combined with recalibration activities or when multiple users or instruments were involved. Virtual training tools, such as instructional videos and webinars, were also tested and found to be valuable, especially when supplemented with remote interaction to foster community-building.

In essence, training activities can be easily integrated in TA activities, including virtual training that could be further enhanced by incorporating regular remote interactions between trainers and trainees. However, there are obvious difficulties: all training activities were implemented with current rules in Access programmes, i.e. as defined by priority-driven access mode in the Charter for access to Research Infrastructure, selecting user proposals considering their relevance for addressing a predefined priority of education and training. This means that selection of users can be achieved on non-competitive basis principles but still maintaining access cost rules that are not fully fit-for-purpose, especially for training sessions mixing physical, remote, hybrid, and virtual formats.

In conclusion, recommendation of ATMO-ACCESS for training activities are:

1) To maintain and favor capacity in access projects to support training activities. While physical presence is essential for certain types of learning and collaboration, remote and virtual methods offer scalability, inclusiveness, and sustainability. It is however key to ensure that financial rules are made flexible enough to accommodate various modalities of access under a non-competitive selection process. The strategic use of these modalities can ensure the long-term viability of training programs in atmospheric research.

2) It is advisable that training activities are established as a core activity within each RI, independently of standard TA/VA (e.g., workshops, summer schools, and other capacity-building initiatives). Thus, training linked to access provision should be integrated where relevant.

This work has received funding from the European Union's Horizon 2020 research and innovation programme through the ATMO-ACCESS Integrating Activity under grant agreement No 101008004

3.2.2 Reaching users outside the academic sector

The evaluation of the TA pilots is done through an assessment of three pilots of transnational access (TA). These pilots were designed to engage new user groups beyond the traditional research community, specifically international stakeholders, innovators in technology, and public authorities. Each pilot was tailored to the specific needs of its audience through co-design, specialized services, and engagement strategies. Deliverable 6.5 evaluates the implementation, user feedback, and effectiveness of these pilots, and offers strategic recommendations for future access programs.

The pilot for international stakeholders involved collaboration with ESA and EUMETSAT to support calibration and validation (Cal/Val) activities for satellite missions. Three projects were implemented, focusing on aerosol and cloud data provision and validation for the EarthCARE mission, the EUMETSAT Cloud and the EUMETSAT Aerosol missions. These pilots were co-designed with stakeholders and involved multiple research facilities and access modes (physical, remote and virtual).

Feedback from stakeholders and access providers highlighted the value of multi-facility engagement, coordination, and co-design. However, concerns were raised about the limited duration of the pilots and the complexity of the selection process. Stakeholders expressed strong support for a dedicated, simplified, and co-funded TA program tailored to their needs.

The pilots highlighted the importance of codesign approach: TA does not automatically mean one-facility/one-user project, but in this case, it was rather a multi-facility access mixing different modalities of access and therefore requiring a codesign process. Participants stressed the need to account for the codesign phase, advocated for simpler procedures, and reduced administrative burden. Despite these challenges, the pilots clearly demonstrated the strategic value of sustained engagement between RIs and international organizations.

The pilot for innovators in technology focused on engaging private sector companies, particularly small and medium enterprises (SMEs), through flexible access modalities. Innovators in technology were offered access through the Atmobox, a modular sensor-testing and deployment platform. The Atmobox was introduced as a new service, although uptake was limited due to late deployment and low awareness. In contrast, the broader continuous TA call tailored to the private sector was much more successful, engaging 31 companies across 46 projects. Most of these were SMEs in the environmental and engineering sectors. About 75% of the companies that accessed RIs through TA were from the ENV-ATMO sector. Feedback from companies indicated high satisfaction with the facilities and collaboration opportunities, but also noted, again, challenges related to bureaucracy and documentation requirements. Many companies emphasized that without ATMO-ACCESS funding, they would not have been able to

This work has received funding from the European Union's Horizon 2020 research and innovation programme through the ATMO-ACCESS Integrating Activity under grant agreement No 101008004

participate due to financial constraints. Clearly, the encountered amount of bureaucracy, that may appear as a normal burden for academia, may have hindered small companies to apply for a TA again due to their missing resources and the insufficient funding to cover the time spent on the bureaucratical aspects. These projects corresponded to approximately 14% of all TA access in the project. This number is comparable to previous INFRAIA projects like ACTRIS-2 or EUROCHAMP-2020, leading to the conclusion that other parameters than those tested within ATMO-ACCESS are key to promote participation of SMEs.

The pilot for public authorities was implemented through a series of training webinars addressing emerging pollutants in the context of the revised EU Ambient Air Quality Directive. These webinars attracted a large and diverse audience, including nearly 150 participants from

92 authorities in 47 countries. Approx 50% of the participants had an environmental background. Feedback indicated that many public authorities were previously unaware of TA opportunities and appreciated the accessible format and expert involvement. Participants particularly appreciated the policy relevance and free online format. However, sustainability requires continued outreach, shorter and more targeted sessions, use of accessible language, and alignment with evolving policy needs. The webinars successfully raised awareness and provided valuable insights, with participants expressing interest in continued engagement and further training opportunities. The organization of webinars came after the limited success of the second call for TA on topics linked to the “Green Deal”, which attracted fewer users outside the academic community than expected. The revised strategy responded to a request made in the mid-term review which noted the importance of atmospheric measurements for public authorities and the potential of atmospheric RIs to support informed decision-making in this area.

Across all three pilots, common lessons emerged. Awareness of TA opportunities remains low among non-academic stakeholders, while bureaucratic and procedural barriers continue to hinder participation, especially for SMEs and public authorities. Stakeholders consistently expressed a preference for simplified and more flexible access models, emphasising co-design, multi-facility access, transparency, and institutional support. European participation dominated, but strong interest from non-European countries points to significant potential for broader international engagement. In terms of sustainability, calibration and validation projects offer long-term value, private-sector engagement can be maintained with improved processes, and public authority involvement shows potential if scientific outputs are translated into policy-relevant formats and supported by sustained outreach. The Atmobox in its current form has limited potential to contribute to long-term sustainability.

This work has received funding from the European Union’s Horizon 2020 research and innovation programme through the ATMO-ACCESS Integrating Activity under grant agreement No 101008004

Conclusions and recommendations from ATMO-ACCESS in relation to attracting more users outside the academic sector are:

1) There is a demand from outside the academic sector for using facilities and data from atmospheric research infrastructures,

2) Some targeted actions towards the non-academic sector have been very successful, leading to very positive feedback and recognition of the key role of the RIs.

3) Bureaucratic complexity, and limited flexibility within the traditional TA framework emphasises the need for tailored, stakeholder-specific access models that are collaborative, streamlined, and co-funded.

4) Access for non-academic users must be actively promoted to ensure awareness of opportunities, and understanding of access modalities

5) Users from outside the academic sector often lack the capacity to understand access modalities.

6) Additional resources were needed to organize responses from the non-academic sector. This extra work involved cannot be charged to the project and this poses a challenge.

7) Simplifying application and reporting procedures, involving stakeholders in project design and coordination, facilitating access to multiple facilities in parallel, and ensuring financial support and longer implementation timelines are key for success.

8) Institutional backing at the European level is essential to ensure the inclusivity, sustainability, and impact of future RI-based scientific collaborations

3.3 Recommendation for sustainable model for supporting TA/VA in distributed infrastructures

The European Commission has encouraged the exploration of sustainable funding solutions, prompting ATMO-ACCESS to investigate sustainable funding mechanisms. Like many distributed infrastructures, ACTRIS ERIC, ICOS ERIC, and IAGOS-AISBL, although essential for advancing scientific research and innovation, currently lack integrated access programs within their financial models. This means that while access (to facilities, to data, to services) is always indicated as a key service, modalities to support access (additional operation costs for hosting users, providing additional digital services, etc..) rely on external funds.

This work has received funding from the European Union's Horizon 2020 research and innovation programme through the ATMO-ACCESS Integrating Activity under grant agreement No 101008004

ATMO-ACCESS WP1 explored the financial option of access to distributed atmospheric Research Infrastructures focusing on identifying optimal cost models and pricing schemes that balance affordability for users with the need to recover operational costs. Conclusion from ATMO-ACCESS is that there are currently no credible alternative options to EU-funded programmes for supporting access although diversified funding strategy options, combining national, regional, institutional, project-based, and service fee sources do exist (see Deliverable 8.2).

Co-funding refers to the combination of European and national or international funding sources to support a unified access program. This approach requires coordination among multiple stakeholders and the co-management of funds to ensure a coherent and streamlined access experience.

Findings in ATMO-ACCESS outline the challenges of implementing sustainable access models in distributed RIs, whose geographically dispersed services and facilities often lack integrated financial mechanisms for access provision. ATMO-ACCESS cost collector tool used to gather data from a representative sample of facilities, including observational platforms, simulation chambers, and central laboratories, highlighted difficulties in distinguishing fixed and variable costs, although this information is key to a more sustainable funding model for access.

Fixed costs refer to the general operating costs of a facility that are not directly influenced by the level of access activity. Variable costs, on the other hand, are the additional costs that arise specifically from providing access to users. ATMO-ACCESS emphasizes the importance of distinguishing between these two types of costs to accurately assess the real operational cost of access. While fixed costs are not typically charged directly to users, understanding their magnitude is essential for financial planning and for securing funding to ensure the long-term sustainability of RI services: This is not sufficiently clarified in current projects, and clear to General Assemblies of distributed RIs.

Analysis of the collected data revealed that the variable fraction of access costs averaged 36%, with simulation chambers showing higher variability than observational platforms. Interestingly, using the financial figures of ATMO-ACCESS, it is estimated that an annual budget of around

€500,000 could support access provision by 15 facilities, depending on the mix of facility types. This budget would enable approximately 3–5 user projects per facility per year which seems a minimal number to develop a RI-scientific or technical strategy.

How to finance an access strategy within a distributed RI remains a challenge and co-funding approaches for distributed RIs are addressed in Deliverable 8.3. While €500-,000 only represents a 15% increase in budget for a RI like ACTRIS, it seems clear that increased membership contributions are uncertain, as many member countries are reluctant to commit additional funds, particularly in the current context of rising costs, inflation and national budget constraints.

Alternative options relying on funding from national Funding Agencies in Europe do not appear as credible. A survey of national funding agencies across 14 European countries revealed limited willingness to co-fund access programs, co-manage project selection, or recognize access costs incurred in other EU countries. The potential role of ERICs as trusted European organization in managing access funds provided by external funders does not seem to be a viable option for many of the national FAs which responded to the ATMO-ACCESS survey.

In conclusions, recommendation for a sustainable funding for access are:

1) Clearly differentiate fixed and operational costs with recognized procedures and ensure that only operational costs are part of the financial support for access provision. This applies to both TA and VA (and to any hybrid model of access). This strategy should reassure stakeholders that investments are not double counted, highlight the cost- benefits for potential users, and encourage RIs to advertise services emphasizing such benefits.

2) Establishing a structured pricing policy for long-term sustainability. Such a policy should be transparent, flexible, and aligned with funding mechanisms, user categories, and service types. It should also support open science principles and be adaptable to evolving financial and research landscapes.

3) User fees could be a viable option for specific users - such private sector participants or those with institutional or grant funding. These fees should only cover the variable costs to maintain the attractiveness of RI services.

4) While co-funding can play a role within projects, continued EU support is essential to maintain and expand access opportunities. The integration of access programs into broader Horizon Europe initiatives, including Pillars 1 and 2, and the European Research Council, is recommended to ensure the long-term viability of RI services. Strengthening coordination between national and European funding mechanisms is also crucial, as independent efforts by RIs are unlikely to succeed without broader policy alignment.

3.4 Recommendation for improving flexibility of access projects

The concept of access to a single facility in a specific RI has been the norm for TA over the last decade. In ATMO-ACCESS, the goal was to test new and flexible approaches for providing access, to allow RIs to deliver improved services that attract a wider range of users and stakeholders, particularly user communities such as those linked with international

This work has received funding from the European Union's Horizon 2020 research and innovation programme through the ATMO-ACCESS Integrating Activity under grant agreement No 101008004

stakeholders, innovators in industry and academia and public authorities. This was implemented through three pilot access studies (see 3.2). The pilots are expected to enhance the long-term sustainability and the impact of atmospheric RIs by establishing models for future collaboration outside the academic sector.

Clearly, new communities can be successfully engaged with European atmospheric RIs when access is made more visible and more responsive to user needs. A simplified, collaborative, and institutionally backed model will ensure inclusivity, sustainability, and greater impact of research infrastructures across Europe and beyond. Dedicated mechanisms should be developed for different stakeholder groups, including long-term frameworks for international satellite calibration, innovation-focused calls for private companies, and recurring knowledge-transfer opportunities for public authorities.

To ensure the long-term success and inclusivity of TA programs targeting beyond the academic sector, a redefined model is needed. Priorities include reducing bureaucracy, streamlining applications and reporting, and replacing competitive calls with feasibility-based or strategic selection. Access should be flexible, combining physical, remote, and virtual modalities, and designed in collaboration with users. The successful pilots were designed collaboratively rather than competitively, with an Expert Group ensuring optimal use of limited resources. The process highlighted the importance of co-design, stakeholder engagement, and flexibility in adapting TA frameworks to complex stakeholder needs.

Current mechanisms for implementing TA are not flexible enough to be well-suited for the non-academic sector in particular, but not only. In some cases, shifting from competitive selection to co-designed implementation has clear advantages..

Recommendations for improving flexibility of access projects are:

1) Implement simpler mechanisms to select multiple facilities and access modalities into a single proposal

2) Allow lump-sum approach for reimbursements

3.5 Recommendation for organization of calls in atmospheric RIs access programs

The access policy of a RI should define the general principles of access, state the specific access types, clarify the conditions for access, describe the processes and interactions involved in the access and elaborate on the support measures facilitating it, if existing.

This work has received funding from the European Union's Horizon 2020 research and innovation programme through the ATMO-ACCESS Integrating Activity under grant agreement No 101008004

Access to RIs may be provided according to different modes, i.e."excellence-driven", "market-driven", "wide virtual" and "need-driven" (technical, training needs). Acknowledging the different purposes of access, and depending on possible contractual and legal obligations, access to any RI may be regulated according to one access mode, or any combination of them.

- The excellence-driven access mode is exclusively dependent on the scientific excellence, originality, quality and technical and ethical feasibility of an application evaluated through peer review conducted by internal or external experts. It enables users to get access to the best facilities, resources and services wherever they are located. This Access mode enables collaborative research and technological development efforts across geographical and disciplinary boundaries.
- The market-driven access mode applies when access is defined through an agreement between the user and the RI that will lead to a fee to get access, and that may remain confidential.
- The wide virtual access mode guarantees the broadest possible access to scientific data and digital services provided by the RI to users wherever they are based. Research Infrastructures adopting this mode maximise availability and visibility of the data and services provided.
- In need-driven access mode the RI considers the relevance of the proposals to address a specific priority when selecting them. This includes urgent or customised access to respond to: a scientific or societal challenge; a crisis situation; education and training.

The scope of ATMO-ACCESS is to provide users with free-for-charge access to a wide range of European atmospheric research facilities, including observatories, simulation chambers, mobile platforms, and central laboratories, including logistical, scientific, and financial support offered to users, and support for travel and subsistence. For the first time, facilities from the three different RIs were made accessible through a single call. Considerable effort was required to ensure that the call texts met all requirements from the different RIs in an integrated way; implementing this approach was not straightforward.

A key issue for the project was to ensure that a specific call would be available throughout the whole duration of the project. This meant careful planning, since the organisation of each call (including communication, call opening, reviewing period, period for realizing activities) overlapped with previous and subsequent calls. Although users prefer continuously open calls, this approach was excluded, to ensure a competitive excellence-driven approach and high-quality outcomes. The final organization of calls is illustrated in Figure 2.

This work has received funding from the European Union's Horizon 2020 research and innovation programme through the ATMO-ACCESS Integrating Activity under grant agreement No 101008004

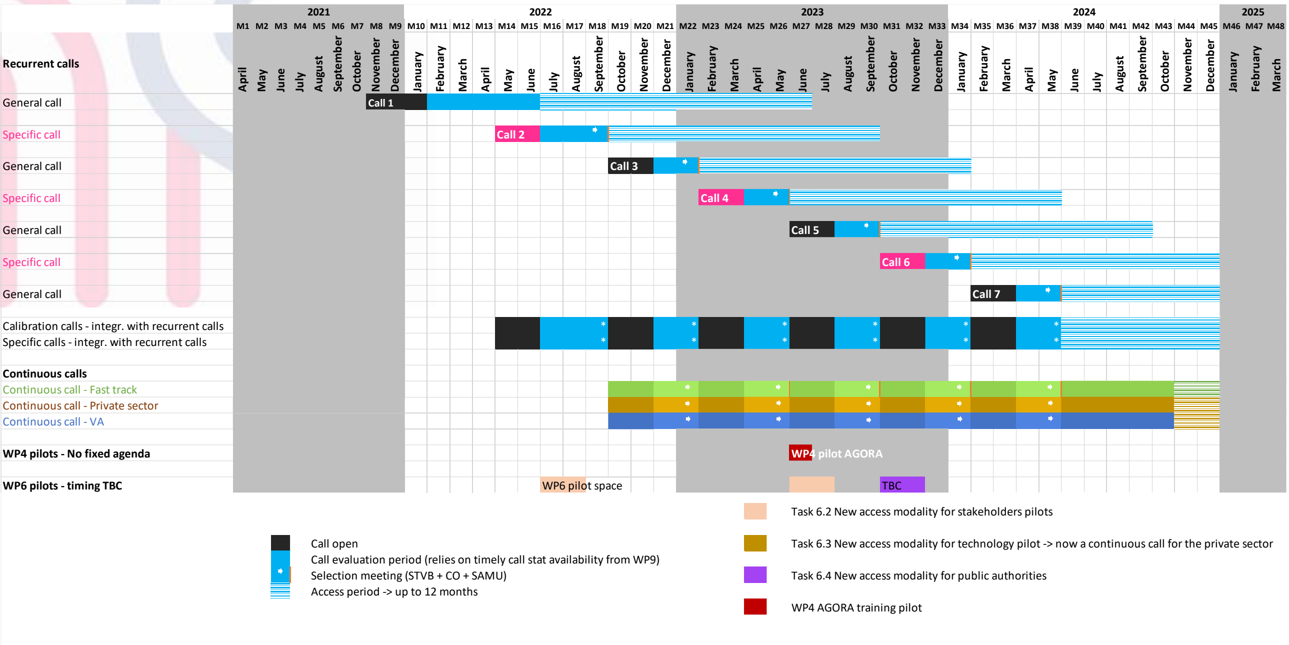

Figure 2: organization of calls within ATMO-ACCESS, over the whole duration of the project.

In spite of a >6 month delay for the first call (largely due to developing PASS but also to initial stage of ATMO-ACCESS impacted by COVID restrictions), the first call was launched in November 2021, and the activity period for TA started February 2022 and, finally, lasted until March 2025, i.e. more than 3 years of access to facilities over a 4,5-year project.

It was one of the objectives of ATMO-ACCESS to provide a comprehensive assessment of the transnational access (TA) programme implemented across sixteen calls during the project. Success of the implementation of calls was evaluated within the project through specific deliverables. D6.5 and D7.3 evaluate the effectiveness, inclusiveness, and impact of the access programme using a series of key performance indicators (KPIs) and offer recommendations for future access initiatives to atmospheric RIs.

The analysis reveals that general calls attracted more applications and had higher success rates than specific ones (i.e., ratio of selected to submitted proposals). Across all calls, 418 applications were received; 313 of them successfully passed the selection, with an overall success rate of 75%. Most applications were driven by research and innovation, followed by training and technical development. Physical access was the most requested, although hybrid access gained popularity over time.

Observatories were the most requested facilities, followed by simulation chambers, central laboratories, and mobile platforms. Success rates were generally consistent across facility types. However, a small number of facilities received the majority of applications, while a few received none. As shown in Figure 3, the number of accesses provided was very close to the

This work has received funding from the European Union's Horizon 2020 research and innovation programme through the ATMO-ACCESS Integrating Activity under grant agreement No 101008004

nominal target set at the beginning of the project, although some facilities provided more access than expected, while others provided less. Facilities that hosted twice the expected number of access projects tended to be large and well-equipped, with a long history of access. These demonstrate their strong attractiveness to a wide range of users, including those from the private sector and the international community.

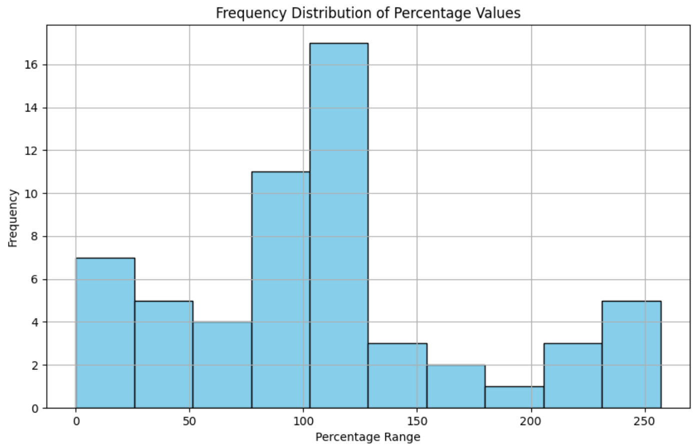

Figure 3: frequency distribution of the fraction of access provided by facility, with respect to the original plans presented in the project. 100% means that a facility used exactly the number of accesses expected at the beginning of the project.

User metrics showed that 75% of applicants were new users, and gender balance was uneven, with males accounting for 61% of applicants. Nonetheless, success rates were equal across genders, indicating no bias in the selection process. During the project, the evaluation form was modified to promote women-lead projects and this had a positive impact.

Applicants were predominantly expert scientists and graduate students, with very few early-career researchers or postdocs. Most were affiliated with universities or public research institutions, and the private sector accounted for a small but successful share. The dominant research field was atmospheric environmental sciences, and only the multi-disciplinary call attracted a broader range of disciplines.

We evaluated the duration of the selection process, noting that the review process took generally more time than foreseen, probably due to the fact the evaluators perform such task on a voluntary basis, when their schedule allows for it.

Satisfaction surveys indicated high user satisfaction with the access process and facility services, though bureaucratic additional steps were slightly less appreciated.

The review process, conducted by an independent panel, faced challenges in securing the targeted number of reviewers per each application. Despite this, most applications were reviewed by at least two experts, and the process remained consistent throughout the project.

This work has received funding from the European Union's Horizon 2020 research and innovation programme through the ATMO-ACCESS Integrating Activity under grant agreement No 101008004

As mentioned earlier, reviewing projects is key to success of a TA project. The challenge of securing reviewers may be overcome through compensation although this increases the burden of workload for the coordinating institution. The scoring system must be well defined and transparent for the entire community, particularly for the facility providers. We also highlight the importance of the scoring system in implementing project policies such as initiatives to empower women (as opposed to gender balance), which were implemented in the third call as corrective action.

Recommendations for ensuring a successful organization of calls are:

1) Using already existing application platforms to avoid delays in implementing access.

2) Implementing excellence-driven access through calls with fixed deadlines. Ensuring that access calls cover the whole project duration.

3) Adapting evaluation forms to reach specific objectives during the course of the project (i.e. promoting women leadership in projects).

4) Maintain specific targeted calls to support strategic goals, while simplifying the application process, ensuring machine-readable data to be easily processed for future analysis, and continuing feasibility checks by host facilities

5) Refine KPIs for better monitoring and considering the establishment of KPI targets in future projects.

3.6 Recommendation for a successful implementation of calls in access projects

Recommendations are based on Deliverable D7.3 which provides a comprehensive set of recommendations for designing and implementing a competitive, fair, and effective proposal evaluation process for access to distributed atmospheric RIs.

The main recommendation is the establishment of a robust, multi-layered evaluation framework that balances scientific excellence with strategic inclusivity and operational feasibility. In fact, ensuring fair and competitive access to RIs is fundamental to building trust, inclusivity, and scientific excellence not only across the user community but also among those providing access to their facilities. A transparent evaluation process that treats all proposals equally, regardless of the applicant's country, institution, gender, or career stage, reinforces the integrity of the programme and encourages broad participation. Ensuring a fair and transparent evaluation process, without preferential treatment, is crucial for user and facility engagement. Monitoring fairness in access helps maintain the engagement of all communities

This work has received funding from the European Union's Horizon 2020 research and innovation programme through the ATMO-ACCESS Integrating Activity under grant agreement No 101008004

involved, including reviewers. This overarching recommendation means that success of TA/VA requires that several issues are well-addressed. They are listed in the following sections 3.6.1 to 3.6.3.

3.6.1. Ensuring a well-structured proposal evaluation system

The proposal process is designed to be clear and consistent, with tailored fields depending on the access category (excellence-driven, technical need-driven, training need-driven, market-driven). Each category has its own evaluation criteria and scoring system, ensuring that proposals are assessed fairly and according to their specific goals. The PASS system was developed within the project, built on existing access experience from previous projects. It is fundamental that the access system is well-functioning, simple enough to accommodate all types of users (and not only the experts), and flexible enough to adapt to specific calls. The PASS system is generally praised for streamlining the process with enough flexibility to be developed to accommodate further streamlining/automation to handle even greater volumes.

ATMO-ACCESS tried to engage three expert reviewers per proposal as a minimum recommended number, with clear guidance and scoring rubrics to ensure consistency and objectivity. The challenge of securing qualified reviewers is key. In a project like ATMO-ACCESS, hundreds of projects were evaluated and ranked, requiring a huge number of trusted evaluators. ATMO-ACCESS did not implement a system where reviewers would receive financial compensation for their work, but this should be considered in the future. Experience in ATMO-ACCESS emphasizes the importance of minimizing reviewer burden while maintaining quality.

The Strategic Trans-National and Virtual Access Review Board (STVB) played a pivotal role in overseeing the access programme. It is recommended that any RI establishes a similar internal expert panel with broad representation and strategic insight to guide programme development and ensure balanced decision-making. STVB is a piece of trust-building for the community of users and facility providers.

ATMO-ACCESS implemented flexibility in evaluation criteria and scoring. Each access mode applies a distinct set of criteria and weightings. For example, excellence-driven proposals prioritise scientific and technical value, while training need-driven proposals are assessed on learning objectives and applicant quality. Bonus criteria—such as gender balance, early career participation, and new users—are applied across all categories.

3.6.2. Clarifying the Role of Access Providers

While access providers are essential for feasibility assessments, this document recommends that they should not have a formal role in the final evaluation. This is to avoid bias and ensure

This work has received funding from the European Union's Horizon 2020 research and innovation programme through the ATMO-ACCESS Integrating Activity under grant agreement No 101008004

strategic oversight across the RI. However, it is clear that access is also generally about scientific cooperation/collaboration and not a pure 100% service provision (as it could be for single site research infrastructure). ATMO-ACCESS tried to collect and take into account suggestions from providers to improve the overall access organisation.

However, a specific request, particularly from chamber facility providers, that could not be taken into account was to extend the TA period to data treatment and evaluation. This issue is unsolved as there are indeed pros and cons. A service extended to data analysis, i.e. closer to collaborative science, would have fastened scientific outputs but, apart from its elevated costs, would have required a more flexible model integrating hybrid TA/VA procedures and clearer financial rules. It is recommended that the access period of activity remains, for TA, limited to the experimental phase of a project.

3.6.3. Special Cases, Grey Zones, Decision Ambiguity and Flexibility

ATMO-ACCESS implemented special access modalities like fast-track access and pilot demonstrators (e.g., for ESA, EUMETSAT, SMEs, and public authorities). These cases require flexible evaluation approaches and often involve co-design with providers. These specific cases served to acknowledge that not all decisions are clear-cut, and that mechanisms to handle ambiguous cases, including moderation of reviewer discrepancies are reflected during STVB meetings.

A reasonable success rate threshold is suggested to keep the process competitive yet attainable. This means iterative optimization criteria and scoring thresholds could be adapted to different calls. It is clear however that, even with automated scoring systems, grey zone proposals require panel review to ensure consistent and strategically aligned decisions, while maintaining transparent communication of evaluation principles and results to users and providers. A recommendation is made for a handbook or similar resource to ensure transparency and understanding of the process. Success rate in ATMO-ACCESS has been over 70%. We believe that access projects can work efficiently with 50 to 70% success rates.

Recommendations for ensuring a successful implementation of access are:

1) Institutionalise a strategic, transparent, and adaptable evaluation process, trusted by both providers and users

2) While generic TA calls for proposals are the basis, ATMO-ACCESS was successful in designing specific calls tailored to different access types and different user communities.

This work has received funding from the European Union's Horizon 2020 research and innovation programme through the ATMO-ACCESS Integrating Activity under grant agreement No 101008004

3) Ensure fairness and competitiveness through well-defined criteria and bonus incentives, including clear guidance to independent expert reviewers, and the involvement of a strategic board (such as the STVB) to handle proposals that fall into the “grey zone”.

4) Allows flexibility and iterative improvement over time, associated with clear communication.

5) Maintain funding to travel and subsistence to users, as a cost-effective means to support and broaden access.

6) Consider remuneration for reviewers in recognition of their work.

4 Carbon emission monitoring

The ATMO-ACCESS carbon emissions and compensation actions for greenhouse gas emissions generated by the project’s activities between April 2021 and April 2025 have been assessed. Such initiative was developed in response to the European Union’s climate neutrality goals and the broader push for sustainability in research infrastructures. Within the project, we developed the methodology used to monitor emissions, quantified the carbon footprint of the different project activities, and proposed strategies for emissions’ reduction and future sustainability.

The project developed a dedicated Excel-based monitoring tool to track emissions from the project. The tool used standardized emission factors from recognized sources like the Intergovernmental Panel on Climate Change (IPCC). The scope of the analysis included travel-related emissions from physical project meetings and physical TA, as well as emissions from remote project meetings and remote TA provision. VA services were excluded due to methodological limitations.

The total emissions recorded were approximately 210,844 $kgCO_2eq$, with physical TA projects accounting for nearly 59% and physical project meetings accounting for 41%. Air travel was the dominant source of emissions, contributing to 90% of the total, followed by car and train travel. Remote meetings and remote TA projects contributed less than 0.1% of the total emissions. The report also analysed emissions by facility, year, and transportation mode, highlighting the significant impact of long-distance air travel.

Avoidance strategies were proposed and implemented in the project. These included promoting remote participation, organizing meetings in central European locations to reduce travel, offering vegetarian meals, and minimizing printed materials and giveaways. Remote access to RI services was tested and found effective in certain contexts, though it required significant support from facility staff. The project also engaged with other EU-funded initiatives to share best practices and align methodologies.

This work has received funding from the European Union’s Horizon 2020 research and innovation programme through the ATMO-ACCESS Integrating Activity under grant agreement No 101008004

Strategic recommendations for future access projects are:

1) Institutionalising carbon accounting as a formal project component, to systematically track emissions.

2) Avoid unnecessary facility duplication, favouring efficient facility sharing, and discouraging excessive travel for activities that can be conducted remotely.

3) Promote the principle of climate sobriety, integrating sustainability criteria into access provision, fostering a culture of environmental responsibility in EU projects. The ATMO- ACCESS experience demonstrates that integrating environmental sustainability into research infrastructure operations is both feasible and essential for aligning scientific practice with societal climate goals.

5 Evaluating success of ATMO-ACCESS in relation to expected impacts

Recommendation from ATMO-ACCESS WP8 D8.1 must be considered in relation to the expected project impacts and metrics.

ATMO-ACCESS has demonstrated that a coordinated, inclusive, and strategically designed access programme can significantly enhance the scientific, technological, and societal value of atmospheric RIs. Through its access programme, pilot activities, structured calls, and stakeholder engagement, the project has broadly met its objectives and delivered measurable impacts across multiple dimensions.

One of the key expected results from the project was a recommendation to harmonise access procedures at both national and European levels. The conclusion is that without specific actions at EU Commission level, a unified access framework (including financial aspects) aligned with the European Charter for Access to RIs shared at National level, remains out of reach.

This is directly connected to ATMO-ACCESS exploration of models for long-term funding beyond EU support. While co-funding mechanisms remain challenging, particularly due to limited engagement from national funding agencies, the project provided clear guidelines and cost models that differentiate fixed and operational costs. These insights are essential for future financial planning and for advocating continued European-level support. The cost-efficiency of access provision was demonstrated, with estimates showing that a modest annual budget could support meaningful scientific activity across multiple facilities.

This work has received funding from the European Union's Horizon 2020 research and innovation programme through the ATMO-ACCESS Integrating Activity under grant agreement No 101008004

Operationally, the project delivered a wide and integrated set of services, enabling multi-disciplinary research and innovation. Over 418 applications were received across sixteen calls, with a 75% success rate and a strong representation of new users. Facilities were accessed through physical, remote, and hybrid modalities, with observatories and simulation chambers proving particularly attractive. However, some of the actions in the program were complex to implement without sufficient flexibility allowed for pilot access calls. Some of these calls revealed limitations in the current procedural framework. For example, the rigid structure of competitive calls and the complexity of application and reporting requirements sometimes hindered broader participation and constrained the ability to test more experimental or hybrid access models.

Strategic synergies among RIs were enhanced through cross-RI services and joint training activities. The development of a single-entry point that links to the service catalogues of the participating RIs improved visibility and usability. Training activities, including MOOCs, webinars, and hybrid schools, reached hundreds of participants and demonstrated the value of integrating physical and virtual formats. These efforts contributed to educating a new generation of researchers and expanding the user base of atmospheric RIs.

The engagement of non-academic stakeholders was another important dimension. Dedicated pilots for international organizations, SMEs, and public authorities revealed both the potential and the barriers to broader participation. While uptake varied, the pilots highlighted the importance of co-design, simplified procedures, and sustained outreach. Addressing non-academic users with non-environmental backgrounds was challenging, this group was only a minor part of the overall users of the pilot. Feedback from these groups confirmed the strategic relevance of atmospheric RIs and their capacity to support policymaking, innovation, and societal goals. Yet, the pilots also exposed the limitations of the traditional TA framework, which was not always flexible enough to accommodate the needs of these new user groups. Success of the actions in ATMO-ACCESS strongly relied on voluntary contributions. In several cases, additional effort was required to adapt procedures, and this extra work—essential for success—was not always supported within the existing project structure.

ATMO-ACCESS also contributed to improved data management and integration. VA services complemented physical access, and user feedback confirmed the value of these offerings. The project's carbon monitoring initiative further demonstrated its commitment to environmental sustainability, with clear methodologies for tracking and reducing emissions. However, the financial procedure for VA still lacks clarity when applied to non-trivial cases such as MOOCs. This is part of the recommendation provided.

This work has received funding from the European Union's Horizon 2020 research and innovation programme through the ATMO-ACCESS Integrating Activity under grant agreement No 101008004

6 Summary and Conclusions

Overall, ATMO-ACCESS delivered strong results, performing well across all key areas, including organizational, operational, user, strategic, and financial aspects. The access process was well-managed and trusted by users and providers alike. Services were diverse and well-utilized, with high satisfaction rates and a growing user community. Strategic goals were advanced through innovation, training, and cross-RI collaboration. Financial insights provided a foundation for future sustainability planning.

In conclusion, ATMO-ACCESS has laid a robust foundation for future access programmes in RIs. Its integrated approach, stakeholder engagement, and commitment to excellence and inclusivity have positioned it as a model for transnational and virtual access provision. However, future initiatives must address the procedural rigidity that can limit innovation and responsiveness. Continued investment, policy alignment, and institutional support will be essential to build on these achievements and ensure long-term impact.

This work has received funding from the European Union's Horizon 2020 research and innovation programme through the ATMO-ACCESS Integrating Activity under grant agreement No 101008004