

Milestone 10.4: Analysis of the best practices to engage ACTRIS user groups

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Preface

The objectives of ACTRIS Implementation project (ACTRIS IMP) are based on the overall ACTRIS implementation phase objectives, which aim at elevating ACTRIS to a new level of maturity and set the framework for implementing actions at national and European level.

One crucial element is represented by stakeholder engagement, an activity shared by several work packages of the ACTRIS IMP project. This milestone is part of ACTRIS-IMP WP10 “ACTRIS communication and public relations”. The main objective of this work package is to identify and develop strategic and efficient communication practices that are essential for ensuring ACTRIS long-term sustainability by supporting actions strengthening and expanding ACTRIS coverage at European level and promoting ACTRIS as a global research infrastructure in the research and innovation landscape. This document proposes best practices for stakeholder engagement that should be considered by ACTRIS Central Facilities and National Consortia. These findings should not be of interest only for ACTRIS leadership but also to those interested in taking part in communication and dissemination activities in behalf of ACTRIS.

This report is the first step towards the development of the updated version of ACTRIS communication strategy. The strategy will provide a cohesive approach to all ACTRIS members, and it will take in consideration the distributed structure of ACTRIS, including internal and external stakeholders. This report is a living document: we will periodically evaluate our stakeholder engagement strategy and, accordingly, the document will be enriched and updated throughout the project lifetime and beyond.

1. Introduction

After many years of community building, design, and preparatory phase, ACTRIS is in a five-year implementation phase (2020-2025) dedicated to ensuring and raising the quality of data and use of up-to-date technology applied in ACTRIS and the quality of services offered to our user. To achieve this goal, ACTRIS continuously involves partners from the scientific communities and private sector as well as promotes the training of our operators and users.

ACTRIS drives scientific excellence and advances in the field of atmospheric research by focusing on great leadership and continuous development. Our stakeholder values are built on reliability, cutting-edge technology, long-term high-quality observations, attractive services, industry expertise, talented and skilled employees and fruitful partnerships. ACTRIS places its stakeholders at the centre of ACTRIS operations and strategic development by creating value through continuous interactions with them. With ACTRIS services stakeholders can make reliable decisions and improve their assessments beyond the area

of environment and climate. To this end, ACTRIS has the strategic goal to creating a synergetic community. Efforts are being made to (i) connect with new users and attract new member countries, (ii) develop international collaboration and partnerships, and (iii) connect ACTRIS at different strategic levels (national, European, and internationally) to societally relevant value-added service delivery chains.

In this document we identify a set of best practices to engage with ACTRIS stakeholder groups. The proposed best practises are defined considering the efforts put in place to engage with ACTRIS user groups during these three years of the ACTRIS IMP project. We note that a complete assessment and evaluation of the communication success is beyond the scope of this milestone. Furthermore, in this study the experiences and activities organized by or in collaboration with other project or research infrastructures were also considered.

1.1. Definition of ACTRIS user groups and stakeholder engagement

In this document we consider the same categories of user groups as defined in the ACTRIS Catalogue of Services ([link](#)). The user group categories are very comprehensive and extend beyond the end-user of ACTRIS services (e.g., the scientific community) and include national representatives as well as policy makers, other research infrastructures and international networks. In this view, the construct “user group” is used as a synonym of “stakeholders”. Many definitions of stakeholder engagement have been reported in literature. For this analysis report we refer to stakeholder engagement as “the practices that organizations undertake to involve stakeholders in a positive manner in organizational activities” (Greenwood, 2007, pp. 317-318). Complimentarily, we also consider as part of stakeholder engagement any process and strategy that enhance the bidirectional interactions between ACTRIS and stakeholders with the aim of creating long-term value for both parties. The wide range of interactions between ACTRIS and its internal and external stakeholders includes information sharing, discussion, involvement and collaboration in decision-making processes, and empowered activities in informal groups or formal partnerships. Therefore, stakeholder engagement consists in (i) making stakeholder groups aware of ACTRIS, (ii) engaging them to actively participate in ACTRIS activities and (iii) retaining them withing the ACTRIS community.

1.2. Definition of best practices

As a preliminary step in our analysis, we conducted an integrative literature review (including peer reviewed publications and shared experience from projects and other research infrastructures) to provide a deeper understanding of what should be considered as a best practice for stakeholder engagement.

We consider the following definitions:

A **best practice** is an effective, standardized way of performing a task that can work in a range of contexts and it is supported by observable and measurable outcomes or results. Best practices are built upon strategies and means. With **strategies** we refer to frameworks and planning to implement ACTRIS vision and mission; basically, ACTRIS strategy represents the “what” of the stakeholder engagement – for example, “ACTRIS will deliver specific actions to bridge the industry sector”. Strategies are plans developed to pursue and achieve goals. **Means** are context-specific, concrete, measurable actions that define the approaches to implement strategies: means represent the “how” of the stakeholder engagement and their effectiveness heavily relies on timing of their deployment (deadlines) and the required resource (money, manpower, time).

Utilizing stakeholder engagement is a growing priority to ACTRIS, as it ramps up to become an ERIC, and continuous work is being done to understand how the various user groups can be included and acknowledged in various activities and processes. These are presented and evaluated in Section 3.

1.3. Evaluating engagement practices

As ACTRIS is a distributed research infrastructure, because of the uniqueness of the different ACTRIS members, in terms of their Central and National Facilities, the amount of resources they have and previous experiences with stakeholder engagement, we define best practices at strategy level rather than at the level of means. We consider a strategy to be a best practice if it was successfully implemented by one or more components of ACTRIS (e.g., member, Central Facility or National Facility), and relevant **benefits** or **outcomes** have been noted.

The evaluation of strategies and means is key to assess the success of stakeholder engagement practices and identify possible unintended consequences and gaps in our activities, and explain which strategies and means are to be considered as best practices. We refer to **metrics**, as the counts and descriptions of what has been done during engagement activities. The Plan for the Exploitation and Dissemination of Results and the Communication strategy of ACTRIS IMP already includes several qualitative and quantitative measures to monitor and assess key aspects of engagement [ACTRIS IMP Deliverable 10.1](#).

The evaluation of best practices doesn't duplicate the evaluation of communication plans and activities and user satisfactions. For that, dedicated resources were allocated within the project framework (ACTRIS IMP Deliverable 7.1, ACTRIS IMP Deliverable 11.5, ACTRIS IMP Milestones 6.6, ACTRIS IMP Milestone 9.2). For example, ACTRIS user strategy involves users, ascertain their needs, provide clear and practical recommendations for services and process development, and base continuous improvements on user feedback. Moving forward with ACTRIS communication and stakeholder engagement, we particularly will consider the input provided via the PASS- The ACTRIS Platform for managing user Access to ACTRIS Services. These feedbacks will be accounted for and integrated in the communication planning process.

Both user and communication strategies are living documents and represents the result of a continuous effort to find a proper combination and composition of the evolving stakeholder needs and the evolving ACTRIS capabilities. The ACTRIS strategy ensures that service development/ improvement efforts will meet user expectations and fulfil their needs and will continue to do so over the research infrastructure's lifespan. Our stakeholders influence the future of ACTRIS, and we work in an open and continuous interaction with them. We identify and evaluate our stakeholders as part of our sustainability management and preparatory work for strategy updates. The process can be an internally conducted, or it can include surveying or interviewing key stakeholders. Hence, we determine the impact of various stakeholders on our research infrastructure and analyse how our actions in turn impact on them.

2. Analysis report

This section presents a selection of the main activities organized for each stakeholder group. We stress that the purpose of the milestone is not the evaluation of such activities, but rather to use the information to elaborate best practices.

2.1. Stakeholder group: Academia & Researchers

Actions	Description	Key Performing indicators
ACTRIS Science Conference	Link	188 abstracts received (link) No. Participants: 700
Thematic workshops/trainings organized by ACTRIS Central Facilities (CFs)	The focus is usually to present the new developments at ACTRIS CFs, and to discuss the status of the instruments and data products	16+ workshops during 2020-2022
Measurement Campaigns	Data sampling, calibrations, inter-comparison of instruments	More than 13 campaigns during 2020-2022
International science conferences (e.g., EGU)	Raising and strengthening awareness around ACTRIS	EGU 2022: 400 flyers handed out
ACTRIS Inter-journal Special Issue	Link	7 publications
TNA calls	TNA calls within the frameworks of the ACTRIS IMP and ATMO-ACCESS project are timely advertised through digital	ACTRIS IMP 1 st call: 19 applications, 18 accepted, 1 rejected, 17 feasible

	media. Metrics are regularly monitored and reported. Link	2 nd call: 19 applications, 17 accepted, 2 rejected, 14 feasible ATMO-ACCESS 1st call: 75 applications, 68 accepted, 4 rejected, 2 ineligible, 1 pending final decision 2nd call: 42 applications, 42 eligible, 36 feasible
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2.2. Stakeholder group: Early Career Scientists

Actions	Description	Key Performing indicators
ACTRIS Science Conference	Link	188 abstracts received (link) No. Participants: 700
Training school: Atmospheric observations of aerosols, clouds and trace gases	Link	No. registered for the tutorials/course: 193 No. students who completed the full course: 32
Course on Atmospheric observation of aerosols, clouds and trace gases	Link	No. registered for the lectures/course: 83 No. students who completed the full course: 37
Hackathon Hack-the-Arctic	Link	Over 300 people from 5 continents registered to the events
TNA calls	TNA calls within the frameworks of the ACTRIS IMP and ATMO-ACCESS project are timely advertised through digital media. Metrics are regularly monitored and reported. Link	ACTRIS IMP 1 st call: 19 applications, 18 accepted, 1 rejected, 17 feasible 2 nd call: 19 applications, 17 accepted, 2 rejected, 14 feasible ATMO-ACCESS 1st call: 75 applications, 68 accepted, 4 rejected, 2

		ineligible, 1 pending final decision 2nd call: 42 applications, 42 eligible, 36 feasible
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2.3. Stakeholder group: Research Performing Organizations

Actions	Description	Key Performing indicators
ACTRIS Week	The event brings the ACTRIS Community together to discuss the ACTRIS progress and challenges	No. Participants in 2020: ~300 No. Participants in 2021: ~200 No. Participants in 2022: TBD
ACTRIS Science Conference	Link	188 abstracts received (link) No. Participants: 700
Workshop on innovation in atmospheric measurement techniques	Link	Submitted abstracts: 43 No. participants: 330
Workshop on innovation in atmospheric sciences	Link	Submitted abstracts: 48 No. participants: 380
TNA calls	TNA calls within the frameworks of the ACTRIS IMP and ATMO-ACCESS project are timely advertised through digital media. Metrics are regularly monitored and reported. Link	ACTRIS IMP 1 st call: 19 applications, 18 accepted, 1 rejected, 17 feasible 2 nd call: 19 applications, 17 accepted, 2 rejected, 14 feasible ATMO-ACCESS 1st call: 75 applications, 68 accepted, 4 rejected, 2 ineligible, 1 pending final decision 2nd call: 42 applications, 42 eligible, 36 feasible

2.4. Stakeholder group: Research and Research Infrastructure Managers

Actions	Description	Key Performing indicators
ACTRIS Week	The event brings the ACTRIS Community together to discuss the ACTRIS progress and challenges	No. Participants in 2020: ~300 No. Participants in 2021: ~200 No. Participants in 2022: TBD
Project meetings	Cross-RIs collaborations is implemented through projects such as ENVRI-FAIR, ATMO-ACCESS and RI-URBANS. The EU RIs involved are IAGOS, ICOS ERIC, ACTRIS.	ENVRI-FAIR ATMO-ACCESS RI-URBANS

2.5. Stakeholder group: Research Networks

Actions	Description	Key Performing indicators
ACTRIS Science Conference	Link	188 abstracts received (link) No. Participants: TBA
First meeting for building an application to GEO initiative	The meeting was attended by representatives from GEO, WMO, and relevant RPOs, and was followed from the meeting with the ACTRIS Scientific and Implementation Advisory Board in 2021. The meeting discussed the importance of an organized representation of short-lived species (SLCS) research in the GEO, and the possibility of building a joint GEO initiative on SLCS and climate.	Detailed minutes taken by GAW secretariat.
Workshop on innovation in atmospheric measurement techniques	Link	Submitted abstracts: 43 No. participants: 330

Workshop on innovation in atmospheric sciences	Link	Submitted abstracts: 48 No. participants: 380
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2.6. Stakeholder group: Monitoring Agencies

Actions	Description	Key Performing indicators
ACTRIS Science Conference	Link	188 abstracts received (link) No. Participants: 700
Calibration campaigns	Link	More than 13 campaigns during 2020-2022
RI-URBANS outcomes	Link	Ongoing project
CAMS pilot contracts	Link	Two contracts stipulated
Workshop on innovation in atmospheric measurement techniques	Link	Submitted abstracts: 43 No. participants: 330
Workshop on innovation in atmospheric sciences	Link	Submitted abstracts: 48 No. participants: 380

2.7. Stakeholder group: Industry

Actions	Description	Key Performing indicators
ACTRIS Science Conference	Link	188 abstracts received (link) No. Participants: 700
IndTech	Link	N.A.
ESA's Aeolus Cal/Val and Science Workshop	Link	No. Participants: 100
Workshop on innovation in atmospheric measurement techniques	Link	Submitted abstracts: 43 No. participants: 330
Workshop on innovation in atmospheric sciences	Link	Submitted abstracts: 48 No. participants: 380

Prototype collaborations with U-earth Biotech LTD	Link	Campaign held
Collaboration with ENI, the Italian national oil company, to work on PM emission from vehicular exhausts	Link	Campaign held
TNA calls	TNA calls within the frameworks of the ACTRIS IMP and ATMO-ACCESS project are timely advertised through digital media. Metrics are regularly monitored and reported. Link	ACTRIS IMP 1 st call: 19 applications, 18 accepted, 1 rejected, 17 feasible 2 nd call: 19 applications, 17 accepted, 2 rejected, 14 feasible ATMO-ACCESS 1st call: 75 applications, 68 accepted, 4 rejected, 2 ineligible, 1 pending final decision 2nd call: 42 applications, 42 eligible, 36 feasible
Tailored communication		Flyers: 300 Business Cards: 200

2.8. Stakeholder group: Facility Providers

Actions	Description	Key Performing indicators
ACTRIS Central Facility Webpages	Link	Website online and actively used by the Central Facility teams
ACTRIS National Facility Technical and Scientific Forum first meeting	Link	No. Participants: 226
ACTRIS Science Conference	Link	188 abstracts received (link) No. Participants: 700

ACTRIS Central Facility meetings	Meetings within each Central Facilities are organized with high frequency. Central Facility Leaders meeting occur every 3 months.	Meetings held Minute available in ACTRIS intranet
NF labelling process and meetings	Meetings within the Task Force following the process are organized with high frequency Discussions with ACTRIS RI committee and CF leaders are organized regularly.	Meetings held Minute available in ACTRIS intranet

2.9. Stakeholder group: Country representatives

Actions	Description	Key Performing indicators
ACTRIS Week	The event brings the ACTRIS Community together to discuss the ACTRIS progress and challenges	No. Participants in 2020: ~300 No. Participants in 2021: ~200 No. Participants in 2022: TBD
Interim ACTRIS Council Meetings	The meetings bring together ACTRIS members, country representatives nominated by the ministries or organisations mandated to act on the behalf of the country.	Meeting regularly held Minutes available in ACTRIS intranet (confidential)
ACTRIS Science Conference	Link	188 abstracts received (link) No. Participants: 700
ACTRIS National Facility Technical and Scientific Forum first meeting	Link	No. Participants: 226
ACTRIS-Finland National Symposium	Link	No. Participants: 100
ACTRIS-Germany annual conference	Link	No. Participants: 110
ACTRIS Stakeholder handbooks	Link	Online: Free for downloads

		500 printed copies
National website	Many of the countries participating in ACTRIS have developed webpages/websites promoting ACTRIS in their native language. Link	10 National websites/webpages are online

2.10. Stakeholder group: Policy Makers & ministry representatives

Actions	Description	Key Performing indicators
Presentation at COP26	Link	Presentation held
ACTRIS Science Conference	Link	188 abstracts received (link) No. Participants: 700
Workshop on innovation in atmospheric measurement techniques	Link	Submitted abstracts: 43 No. participants: 330
Workshop on innovation in atmospheric sciences	Link	Submitted abstracts: 48 No. participants: 380
ACTRIS response to the Cumbre Vieja volcanic emergency	Link	Six ACTRIS stations were deployed as a response Near-real time data provided
Finnish President visit at Hyytiala Smear II station	Link	Visit held
Ambassadors visit Hyytiala Smear II station	Link	Visit held

3. Three recommendations for stakeholder engagements in ACTRIS

Based on the results of our discussions, and literature review, we make the following three recommendations that all ACTRIS components should consider.

3.1. First recommendation: Implement best practices for engagement

Below, we present a concise “to-do list” of four engagement best practices that each ACTRIS component should consider implementing. It should be viewed as a foundation or a first step for engagement.

Best Practice #1 - Build the foundation

ACTRIS is unique in its scope and reach into becoming a global research infrastructure. Such a vision can be implemented only with the active participation of the ACTRIS internal community. For this reason, building the foundation is a key practice that help raising awareness and interest about ACTRIS by developing a scheme that makes ACTRIS understandable, accessible, attractive, and motivating to potential internal and external stakeholders. Within the ACTRIS IMP project, we have developed specific strategies to reach target stakeholders. Overall, we recognize that the best practice for enlarging the ACTRIS community is designed to build and boost awareness and understanding of ACTRIS, its services and added values and pave the groundwork for future rooting into the international landscape. The different components of ACTRIS can use several means, based on their resources, to pursue this goal. Investing in partnership and collaboration could be seen as foundational engagement strategy that is crucial to ensure engagement effectiveness at larger scale. These approaches not only help ACTRIS to understand the needs of its user communities, but they also build relationships of trust, respect, and mutual understanding that can facilitate the next steps of ACTRIS.

Strategies & Means	Purpose	Elements of effectiveness
Strengthen existing community		
Link community-relevant events to the excellence of the science and services offered by ACTRIS	<ul style="list-style-type: none"> • Increase awareness • Increase scientific literacy 	<ul style="list-style-type: none"> • Community members provide an engagement supporting infrastructure around ACTRIS • ACTRIS core values and messages are well-defined and available to ACTRIS representatives
Prompt inputs directly from internal and external stakeholders	<ul style="list-style-type: none"> • Obtain input on drawing messages and selecting means • Discuss and elaborate complex issues 	<ul style="list-style-type: none"> • Involved stakeholders already understand the scope of work of ACTRIS, its mission and vision
Proactively involve ACTRIS components in stakeholder engagement	<ul style="list-style-type: none"> • Coherent communication • Build a balanced and synergetic community 	<ul style="list-style-type: none"> • Resources are available and easy to use • Periodical result and progress presentation (online channels, meetings, and events)

Continuous user relationship development	<ul style="list-style-type: none"> • Meet users' needs for product and services 	<ul style="list-style-type: none"> • Conduct regular user assessment • Feedbacks are key part of internal communication
Expand community		
Create ties between relevant research performing organizations and networks	<ul style="list-style-type: none"> • Partnerships and collaborations with academic and scientific institutions 	
Demonstrate operational use of cutting-edge science and technology	<ul style="list-style-type: none"> • Continuous relationship development and management of new member and partners 	<ul style="list-style-type: none"> • High-quality purposeful data and services • Efficient and easy access to data, tools and services • Easy, transparent access and FAIR data management policies
Use data to select what community outreach actions to prioritize	<ul style="list-style-type: none"> • Maximize effectiveness and success of ACTRIS outreach activities 	<ul style="list-style-type: none"> • ACTRIS CF regularly monitor and report analytic data on dissemination efforts • Data are stored for future references and reporting
Embrace a broad outreach approach		
Provide reminders for community inputs	<ul style="list-style-type: none"> • Involve internal community in communication activities 	<ul style="list-style-type: none"> • Development and update of communication action to highlight the added value in joining ACTRIS
Adopt unique touchpoints	<ul style="list-style-type: none"> • ACTRIS messages resonates within each stakeholder group 	<ul style="list-style-type: none"> • Development and update of communication action to highlight the added value in joining ACTRIS
Invest in national efforts	<ul style="list-style-type: none"> • Attract new members and funding • Ensure local relevance 	<ul style="list-style-type: none"> • Development and update of communication action to highlight the added value in joining ACTRIS

Best practice #2 - Lead by example

We note that endeavor in the field of Research and Innovation and with private sectors, well-placed partners can make enormous differences in the effectiveness of the endeavor. We recognize that a successful engagement approach may start with fostering a force of leadership support. Building partnerships and outreach is not simple nor intuitive. We expect that efforts from expert leadership will incentive staff with less experience and serve as mentoring and support. These approaches will build support from the top and kickoff a cascade effect through the research infrastructure encouraging participation from other members of the community.

Strategies & Means	Purpose	Elements of effectiveness
Foster leadership support		
Make senior management leadership visible	<ul style="list-style-type: none"> Promote proactive engagement Facilitate ACTRIS activities 	<ul style="list-style-type: none"> Efficient organization Motivated people
Secure involved expertise at leaders and staff levels	<ul style="list-style-type: none"> Be a flexible forward-thinking innovative organisation, inspiring and hiring the best experts 	<ul style="list-style-type: none"> The organizational structure is decentralized ACTRIS liaisons have credibility
Consider opportunities for ACTRIS employee developments	<ul style="list-style-type: none"> Facilitate human capital development Attract skilled and motivated people 	<ul style="list-style-type: none"> There is employee interest in ACTRIS Focus on people and scouting talents
Engage influential community leaders		
Bring forward community leaders at national and international levels	<ul style="list-style-type: none"> Demonstrate ACTRIS legitimacy and credibility Capture the attention of different communities 	<ul style="list-style-type: none"> Connections with a range of trusted community leaders

Best practice #3 - Tailor unique messages

Tailoring ACTRIS messages can be achieved by making ACTRIS relevant to the priorities and interest of the stakeholders by presenting ACTRIS services, benefits and impacts in tangible and clear facet of our societal needs. Examples of real-world applications, such as XXX, can be described in a resonant way to stakeholders. This approach entails that the ACTRIS needs to actively listen and gauge what make ACTRIS attractive to stakeholders and elaborate on the message that may be effective for engagement. ACTRIS teams could work together to review the messages and scenarios to share with stakeholders. So far, ACTRIS had considerable success in tailoring and personalizing its messages to communities (Link, Link,

link). We recognize that ACTRIS has been considerable successful in elaborating personalized messages not only for awareness. We have set up means and actions to implement a retention strategy for stakeholder management. Examples are: sending a welcoming email to new subscribers to ACTRIS community mailing lists, emailing periodical newsletter that share relevant information. We recommend moving forward with this strategy including returning results, outcomes and success stories that are comprehensible and resonant with each stakeholder group.

Strategies & Means	Purpose	Elements of effectiveness
Share personal connections to ACTRIS		
Show that ACTRIS staff are personally invested in ACTRIS mission	<ul style="list-style-type: none"> • Demonstrate confidence is sharing personal experiences • Communicate shared risks and benefits • Promote long-term engagement 	<ul style="list-style-type: none"> • Staff are actively willing to share their experiences • Coercion to participate is minimal • Personal information is respected
Link ACTRIS values and goals to the interest of ACTRIS staff	<ul style="list-style-type: none"> • Explain ACTRIS with real-life experiences • Frame ACTRIS as a key component of the future of the excellence of atmospheric science 	<ul style="list-style-type: none"> • Staff are actively willing to share their experiences • Coercion to participate is minimal
Make ACTRIS added values relevant to stakeholders		
Link ACTRIS to the interests of the stakeholder	<ul style="list-style-type: none"> • Increase interest and motivation to become part of ACTRIS 	<ul style="list-style-type: none"> •
Explain ACTRIS and its goals to the real world	<ul style="list-style-type: none"> • Develop messages that are easy to understand and relatable • Explain potential benefits of ACTRIS • Expand scientific knowledge and literacy around short-lived atmospheric constituents and their process 	<ul style="list-style-type: none"> • Engagement staff have multiple analogies and examples available.
Make ACTRIS relevant to community priorities		

Highlight ACTRIS impacts	<ul style="list-style-type: none"> • Increase interest and motivation to get involved with ACTRIS • Explain potential benefits of ACTRIS 	<ul style="list-style-type: none"> • This strategy can be used as a default engagement approach • Local communities express social justice concerns. • Connections with a range of trusted community leaders already exist. • Engagement staff have credibility within communities.
Emphasize ACTRIS contributions to the grand challenges faced by our society	<ul style="list-style-type: none"> • Increase interest and motivation to get involved with ACTRIS • Explain potential benefits of ACTRIS 	<ul style="list-style-type: none"> • This strategy can be used as a default engagement approach • Local communities express social justice concerns. • Connections with a range of trusted community leaders already exist. • Engagement staff have credibility within communities.
Emphasize the importance of studying environmental factors	<ul style="list-style-type: none"> • Address social determinants of human health and climate change 	<ul style="list-style-type: none"> • Local communities express environmental concerns • Engagement staff are skilled in discussing environmental factors and health.
Use ad-hoc messaging to sustain engagement		
Show immediate appreciation for engaging with ACTRIS	<ul style="list-style-type: none"> • Improve onboarding • Improve user experiences • Improve retention 	<ul style="list-style-type: none"> • Stakeholder satisfaction is a priority
Find ways to make each stakeholder valued	<ul style="list-style-type: none"> • Improve retention • Minimize attrition 	<ul style="list-style-type: none"> • Stakeholder satisfaction is a priority
Personalize follow-up in communication	<ul style="list-style-type: none"> • Improve networking and retention, minimize attrition 	<ul style="list-style-type: none"> • Engagement staff can identify information of value to participants

		<ul style="list-style-type: none"> • Infrastructure and capacity to track participants and send personalized communications already exist
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Best practice #4 - Build an engagement network

The strategy of assembling an informal engagement network with a diversity of skills and backgrounds includes involving/hiring staff marketing, customer care or public relations experience who also understand the vision and mission of ACTRIS and its scientific and societal importance. Key actors of the engagement network also involve representatives of the ACTRIS components, e.g., from ACTRIS National Facilities, the backbone of the research infrastructure. A strong communication and interactions shall be implemented via effective channels that allows the provision of new facts about ACTRIS outcomes and the elaboration of this information into messages targeting stakeholders. Such engagement network may also represent the place for discussing learning experiences and, as ACTRIS advances towards its operational phase, talk about uncertainties that may affect ACTRIS communications and stakeholder management. We recognize that is important to keep track and discuss “open questions” at national and European, and international levels and preventively organize a communication risk management plan. This strategy could help mitigate or anticipate future roadblocks and opportunities. These discussions may also influence how ACTRIS plan for follow-up communication with stakeholders and address potential challenges with a digitally focused retention strategy.

Strategies & Means	Purpose	Elements of effectiveness
Assemble an Engagement network with Diverse Expertise		
Hire staff with a deep understanding of community priorities	<ul style="list-style-type: none"> • Increase community interest in ACTRIS • Improve representation in atmospheric research • Obtain input for developing messages and implement actions 	<ul style="list-style-type: none"> • Engagement team includes many members with a overview perspective on ACTRIS vision and mission
Hire resilient, flexible, outgoing staff and offer appropriate training	<ul style="list-style-type: none"> • Increase team’s problem solving ability • Improve morale and resilience among staff • Increase staff satisfaction 	<ul style="list-style-type: none"> • Engagement staff use multiple outreach methods • Uncertainty, changes, crisis and risks are handled professionally

	• Improve staff safety	
Listen to Engagement Staff		
Solicit and incorporate staff ideas regarding engagement efforts	• Increase interest and motivation to become part of ACTRIS	• ACTRIS CF and NF relies on their own teams

3.2. Second recommendation: Evaluate the success of engagement activities

Each component of ACTRIS should consider a periodical evaluation of the processes and outcomes of its engagement activities. Evaluating engagement activities includes the following steps:

1. Define desired outcomes
2. Measure what was done to engage.
3. Identify and test hypotheses about how a given engagement strategy may lead to desired outcomes.

It may be worth considering a comprehensive perspective of the desired outcomes for engagement at the general level for ACTRIS. For example, some overarching outcomes could be such as increased trust in and improved public perception of research, science, academic/research institutions and facilities, increased awareness around ACTRIS and scientific literacy, strengthening ACTRIS positioning in international landscape, and narrowing the divide between industry and research.

Evaluating the engagement activities could lead to important findings and gaps with high significance to ensure the long-term sustainability of ACTRIS. Improving the understanding of the mechanisms that connect engagement activities to outcomes may yield to improve the effectiveness of the stakeholder engagement with the scientific thematic of ACTRIS. Evaluating, for instance, whether is a video showing the cutting-edge National Facilities, or a post promoting a success user story, or a review of ACTRIS benefits that generate the most enthusiasm among stakeholder groups will help ACTRIS components (Central Facilities, National Facilities) to identify which approaches work the best, and fine tunes engagement strategies.

3.3. Third recommendation: Incorporate retention strategies

During this project, we have identified one main gap in our engagement practices that is related with how we retain ACTRIS communities by building a strong and synergetic connection and retain their interest and commitment in ACTRIS on the long run. To overcome the gap, we recommend the following best practices to be incorporated in ACTRIS strategy.

Best practice #1 - Minimize follow-up requests.

ACTRIS shall consider reducing the attrition when making request for additional information from ACTRIS communities that may have already been asked in parallel project. Frequent request for additional information may be perceived as a burden by the community members and make any upcoming (and new) activities less appealing. Additional factors that may impact on the willingness of taking part in follow-up requests are the time requirements, the complexity of the tasks, the amount of work required (e.g., very long and detailed surveys), but also how the community members perceive the topic (whether the requested information is relevant directly to them, to a community or society), as well as their previous experiences in similar activities (e.g., a negative previous involvement may lead to a drop out).

Best practice #2 - Develop a strategy for sampling community members for future projects

In order to minimize attrition and dropout in follow up requests, we shall consider a strategy to determine how to sample members in our communities for future activities (e.g., follow-up request for information, surveys). To provide clear and coherent communication about the expected involvement of stakeholders and make a fully informed decision when they consent to participate in a follow-up activity, we shall consider the follow key points:

- How much follow-up should occur when respondent fail to fulfill a request?
- What are the possible reasons for the missed response (e.g., refusal to participate, incorrect contact information, irrelevant topic) and how are these motivations tracked?
- How to handle nonresponse, when a potential participant cannot participate at the given time window but potentially could participate in the future?

Best practice #3 - Build relationships and stress the impact and benefits of ACTRIS to encourage retention.

It is important to inform all members of ACTRIS stakeholder groups from the outset and establish good relationships with them to normalize the idea that ACTRIS require commitment. Members of ACTRIS stakeholder groups are likely to stay engaged in the long run if there is follow-up and continued contact with ACTRIS. This contact sustains feelings of trust and support for the study and self-motivation and altruism on the part of the members of the stakeholder groups.

Best practice #4 - Maintain regular contact with stakeholder.

Build and maintain relationships with members of the ACTRIS stakeholders' groups as stakeholders are likely to stay engaged in the long run if there are follow-ups and continued contacts with ACTRIS. It is also important to remind stakeholders about the relevance of their role in the sustainability of ACTRIS. Engagement with existing members of ACTRIS communities and stakeholder groups should be regularly planned to show that they are valued with a key role in the success of ACTRIS and reminded about the benefits of staying engaged with ACTRIS. In the field of marketing and communications, there are many

strategies and means for contacting and keeping relationships with stakeholders and strengthening the sense of community. Keep-in-touch-exercises (KITES) are one example: updates about key findings, change-of-information requests, survey, thank-you messages or holidays cards.

4. Mapping the future of ACTRIS stakeholder engagement

ACTRIS is an innovative research infrastructure intended to chart the future of atmospheric science focussing on short-lived components and their processes. ACTRIS enables free access to high-class long-term atmospheric data through a single entry point and offers access to our world-class facilities providing research, from academia as well as from the private sector, with the best research environments and expertise promoting cutting-edge science and international collaborations.

Making potential users aware of ACTRIS, onboard them, and retaining them over a long period of time will require continuous commitment from the ACTRIS community. The first crucial steps for stakeholder engagement are to explain the ACTRIS' goals and potential benefits in ways that users can understand and to nurture an environment of trust with external communities, as well as across and within ACTRIS components (e.g., ACTRIS Central Facilities, National Facilities, Member Countries). For these purposes, in this document we highlight a set of best practices for stakeholder engagement that should be considered as an integrative element of ACTRIS strategy:

- **Build the foundation** – approaches to work with communities to identify and implement scientifically and societally appropriate engagement activities. The aims are to expand existing user community to build awareness of ACTRIS, its services and benefits as well prepare new members for considering entering ACTRIS.
- **Lead by example** – ways to set up internal and external support for ACTRIS to facilitate stakeholder engagement.
- **Build an engagement network** with diverse backgrounds and expertise who also understand the mission and vision of ACTRIS and its priorities.
- **Tailor unique messages** that make ACTRIS resonate with stakeholders.

References

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