



E-RIHS

EUROPEAN RESEARCH INFRASTRUCTURE
FOR HERITAGE SCIENCE

E-RIHS IP

European Research Infrastructure for Heritage Science

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D5.8 E-RIHS ERIC User Strategy

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ABSTRACT

The European Research Infrastructure for Heritage Science (E-RIHS) aims to be a leading, user-centred research infrastructure, fostering interdisciplinary collaboration and innovation in heritage science. In line with this goal, the E-RIHS ERIC User Strategy establishes a user-centric framework to enhance services and user engagement. This strategy focuses on user interaction, feedback collection, and attraction of new users. It emphasizes a continuous and adaptive approach to service improvement based on user needs and feedback.

Drawing on over 20 years of experience and extensive consultation with E-RIHS stakeholders, the User Strategy sets a foundation for user-focused development that aligns with the E-RIHS mission and vision, and complements its Business Plan, Access, Training and Communication strategies. The strategy outlines key principles for ethical research, continuous service enhancement, and engagement of emerging research communities.

It also outlines pathways and processes to expand the user base, gather user feedback, and integrate this into E-RIHS decision-making processes. It includes a detailed plan for user engagement via diverse community building activities, and regular user consultation mechanisms and feedback analysis to ensure service quality and relevance. By systematically collecting and analysing data, E-RIHS will maintain high standards, support cutting-edge research, and adapt to technological advancements and user needs. This forward-looking strategy underscores E-RIHS's commitment to a dynamic, inclusive, and responsive research infrastructure that meets the evolving needs of the heritage science community.

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Abstract (for dissemination)	E-RIHS ERIC User Strategy outlines pathways and processes to expand the user base, gather user feedback, and integrate this into E-RIHS decision-making processes. It includes a detailed plan for user engagement via diverse community building activities, and regular user consultation mechanisms and feedback analysis to ensure service quality and relevance.
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ABBREVIATIONS

BIM	Building Information Modelling
CCI	Cultural and Creative Industries
CNN	Committee of National Nodes
E-RIHS	European Research Infrastructure for Heritage Science
E-RIHS PP	European Research Infrastructure for Heritage Science Preparatory Phase
ECCCH	European Collaborative Cloud for Cultural Heritage
ENCORE	European Network for Conservation-Restoration Education
EOSC	European Open Science Cloud
ERIC	European Research Infrastructure Consortium
FAIR	Findability, Accessibility, Interoperability, and Reusability
GIS	Geographic Information Services
HS	Heritage Science
ICOM-CC	International Council of Museums Committee for Conservation
ICOMOS	International Council on Monuments and Sites
ICON	The Institute of Conservation
IPERION HS	Integrating Platforms for the European Research Infrastructure on Heritage Science
RI	Research Infrastructure
SSH	Social Sciences and Humanities
STEM	Science, Technology, Engineering, and Mathematics
TNA	TransNational Access

1. INTRODUCTION

1.1 Aim and purpose

This document specifically addresses aspects of user engagement that are not otherwise covered in the E-RIHS Training Strategy and the E-RIHS Communication Strategy, such as (i) how E-RIHS interacts with users with the aim of collecting and acting on user feedback, and keeping existing users engaged, (ii) how E-RIHS interacts with new potential users with the aim of attracting their interest to apply for access, and (iii) how user feedback is collected and evaluated, and the learning from this used to improve services and inform future strategy development. The overall aim is to set out a user-centred forward-looking strategy for E-RIHS centred on enhancing its services to an expanding user community, with the overall aim of strengthening heritage science (HS) and advancing research in this domain to meet new needs.

1.2 Scope

The strategy presented is core to the achievement of E-RIHS's mission and vision and is intended to work synergistically with the Business Plan, Access and Training strategies, while at the same time being mindful to avoid duplication of these in its content. Importantly, the User Strategy is to be seen as a living document, that will be periodically reviewed and updated as part of the ongoing development of E-RIHS' strategic plan.

1.3 Background

The User Strategy set out in this document draws on over 20 years of experience of providing transnational access and training through E-RIHS community projects. Throughout this time, a user-centred approach to the evolution of these services has been informed through continued and direct interaction with users prior to, during and post-access and training events, as well as through direct engagement through social media and questionnaires. Specifically, the strategy was informed and shaped by a broad consultation of E-RIHS platform coordinators, providers and users, in particular through a series of three E-RIHS stakeholder workshops organised in February 2024, as well as E-RIHS IP project side meetings, and regular weekly discussion meetings held with E-RIHS community members as part of Work Package 5.

This document also builds on previous user-related strategies developed during the previous E-RIHS related European projects (e.g. E-RIHS PP and IPERION HS projects), which are available on Zenodo).¹ The following strategy also considers relevant deliverables of the E-RIHS IP project, such as those concerning the E-RIHS Governance Structure, Business Plan, Access Strategy and Training Strategy.

¹ <https://zenodo.org/communities/e-rihs/>

2. WHERE WE STAND

This section provides an overview of the current situation concerning E-RIHS users – who they are, how they are engaging with E-RIHS and how their needs are currently being met.

2.1 Who are E-RIHS Users and how do they engage with E-RIHS?

E-RIHS users are individuals and interdisciplinary teams from academic institutions, research centres or other public and private institutions involved in HS. Teams of users can include STEM and SSH researchers, curators, cultural heritage conservation and management professionals, PhD students and technical staff. Further information concerning the number, disciplinary and geographic background, and gender identity of E-RIHS users, drawn from statistics gathered during the IPERION HS project for Transnational Access (TNA) and HS Academy services, is available in the Appendix.

E-RIHS is in continuous dialogue with its users through various channels including its TNA platforms [ARCHLAB, MOLAB, and FIXLAB], the capacity-building activities offered through HS Academy, and at local level through its National Nodes.² Additionally, user meetings and conferences at both the national and E-RIHS ERIC levels provide opportunities for in-person interaction, sharing experiences, and best practices, allowing E-RIHS ERIC to engage directly with users.

The HS Academy also administers a regular user questionnaire to understand the global heritage science community's needs and gather recommendations for improved engagement. This questionnaire is a primary source of information about the user community, and its analysis is reviewed by the E-RIHS central Coordination Office and the Committee of National Nodes (CNN) to develop recommendations for better services, training, and communications. The questionnaire also provides valuable longitudinal data on the heritage science community's development, of value to policymakers and educational institutions.

An overview of these different types of engagement is given in the following table:

Table 1: E-RIHS-User engagement channels

ENGAGEMENT POINT	USER-RELATED FUNCTIONS	RELEVANT ASSOCIATED DOCUMENTS
E-RIHS Communications and dissemination	– inform and engage past, current and potential users	E-RIHS Communications Strategy
HS Academy	– engage past, current and potential users – provide training and knowledge to develop capacity in the field – organise user events and enable peer-to-peer interaction – enable effective knowledge exchange	E-RIHS Training Strategy

² See Appendix for descriptions of E-RIHS TNA services (MOLAB, FIXLAB, ARCHLAB and DIGILAB) and the HS Academy.

	<ul style="list-style-type: none"> – regularly collect user feedback through HS Academy questionnaire 	
E-RIHS Access Platforms	<ul style="list-style-type: none"> – provide assistance to users through the helpdesk – ensure effective service provision and knowledge exchange during access – collect post-access feedback 	E-RIHS Access Strategy
E-RIHS National Nodes	<ul style="list-style-type: none"> – interact with users at national levels to build and strengthen the HS community – collect user feedback at national levels 	E-RIHS Statutes

2.2 Gathering user perspectives

To ensure the opinion of users is taken into consideration so that E-RIHS can become better equipped to meet their needs, an evaluation system comprising user feedback surveys has been implemented in previous E-RIHS community projects (such as IPERION HS) to gather information from: i) users of the access services (FIXLAB, MOLAB, ARCHLAB); and ii) participants in HS Academy training. For FIXLAB, MOLAB, ARCHLAB services, the user survey was collected as part of the obligatory post-access duties carried out by user group leaders, and its results communicated periodically to the platforms. From the collected data, the overall satisfaction rating out of 10 was 8,9 for the User Helpdesk support and the 9,3 for access quality.

Similarly, following dissemination and training events provided through IPERION HS a feedback survey was sent to all participants. The overall satisfaction out of 10 was 8,7 for dissemination events (webinars, user meetings and lectures) and 9,4 for training events (training camps and doctoral summer schools).

An update of the content for all user feedback evaluation surveys is currently underway in E-RIHS IP, to ensure that regular, comparable data is gathered going forward.

2.2.1 Heritage Science community survey

In November 2022 a survey of the Heritage Science community was launched to probe: i) their research and academic interests; ii) their place and country of employment/education; iii) their engagement with E-RIHS, and iv) potential barriers to such engagement.³ The survey ran until February 2023 and collected 413 responses. Of the respondents, 34% were existing E-RIHS users while 22% were otherwise actively associated with E-RIHS access provision or governance. The remaining 44% identified either more broadly as E-RIHS stakeholders or had no established link with E-RIHS. These can thus be categorized as ‘potential future’ users. 84% of the respondents self-identified as heritage scientists, despite a large diversity of primary academic backgrounds.

³ The questionnaire is available in the Appendix to D7.5 of the IPERION HS project.

The questionnaire respondents come from diverse fields and often work across disciplines. While almost half of respondents (50%) are working at least partly in heritage conservation related positions, followed by chemistry (27%), archaeology and archaeological science (25%), art history (9%), physics (7%), art (6%), building science and engineering (6%). Other subjects represent less than 5% each. The prevalence of conservators, chemists, archaeologists and archaeological scientists leads to the conclusion that more effort is needed to engage other humanities and arts disciplines, as well as building conservation and science.

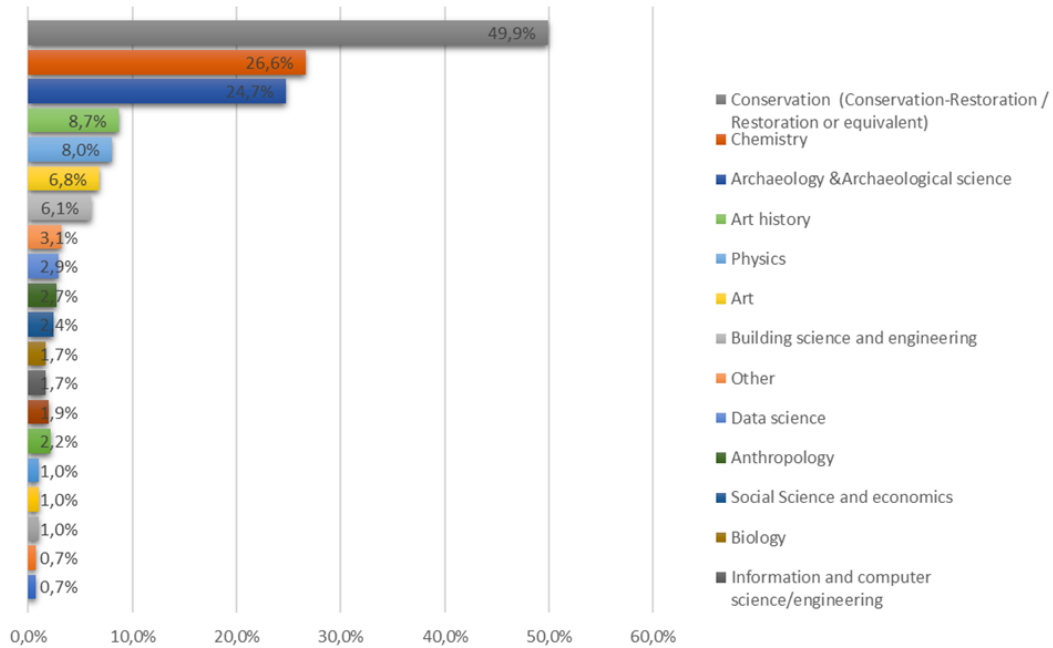


Figure 1: Disciplinary background of respondents to the Heritage Science community questionnaire

The questionnaire responses also show excellent potential to engage with junior users: about a quarter of the respondents could be categorised as early career professionals and a further quarter represents researchers up to mid-career level. Interaction with such users requires specific activities, particularly with users still actively taking part in formal education.

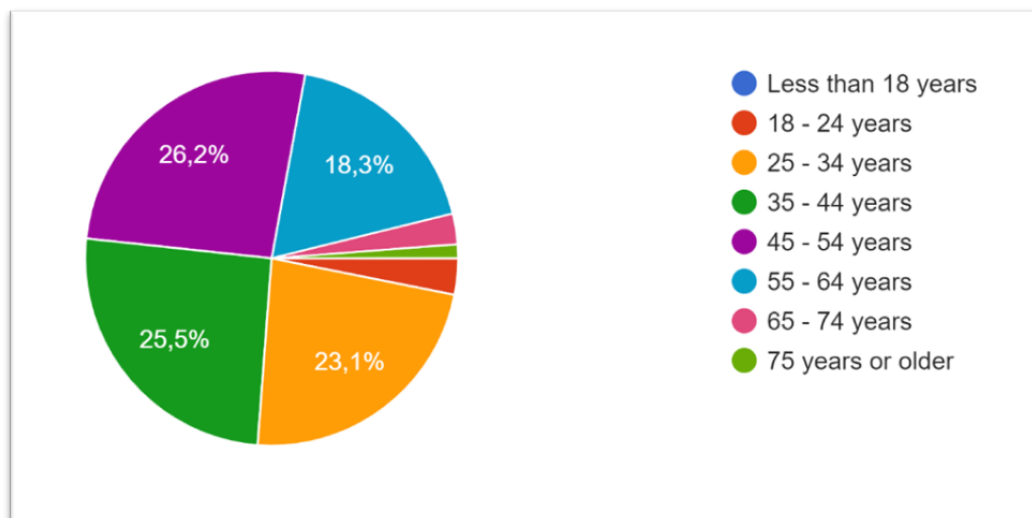


Figure 2: Age distribution of respondents to the Heritage Science community questionnaire

From the responses collected, factors that would strengthen HS as a research domain (in addition to funding) include opportunities to connect through conferences and networking events, increased access to technical facilities and knowledge resources, enhanced training and formal education offer, greater professional organization, and public engagement (see figure 6).

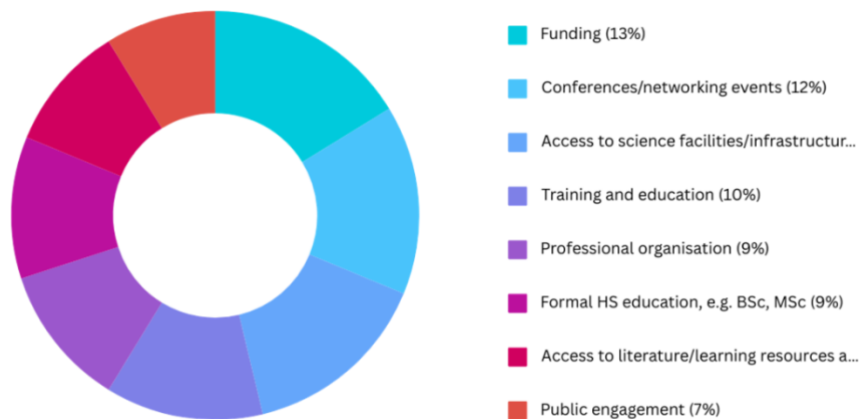


Figure 3: User needs identified by the Heritage Science community questionnaire

From this, it is concluded that in addition to providing access to the research infrastructure, the E-RIHS User Strategy should also consider ways to strengthen the HS community and its engagement with E-RIHS through:

- a. Enhanced opportunities for hybrid engagement in training activities
- b. Organisation of a regular E-RIHS user conference
- c. Organised interactions between users at local and international level

It is also recommended to repeat the questionnaire, at regular intervals to take the pulse of the community of current and future/potential users (see section 4.2 User Consultation Plan).

2.3 Emerging Services in development

In addition to providing access to its platforms, E-RIHS is continuously working to develop complementary soft services that are important for the user community such as training, networking, proposal development support. To augment and make better use of the existing infrastructure, new services in development include activities to build better databases, provide training in the use of research equipment and databases, and expand reference collections. Examples are basic courses on how to extract samples, and tools as well as training to upload existing data in the right, persistent formats. Efforts are also ongoing to develop and provide new services such as research support services (e.g. information sharing, proposal development support) and community building (networking) services, and advice on good practices. Thus, in addition to providing ongoing access, at the same time the infrastructure and the community are being actively fostered and extended.

3. WHERE WE WANT TO GO

Our vision for E-RIHS is to be a dynamic, user-centred research infrastructure that sets the standard for interdisciplinary and hybrid research, seamlessly integrating SSH and STEM within heritage science. We aim to provide integrated access to both physical and virtual platforms, complemented by comprehensive training and community-building activities.

E-RIHS is committed to continuously evolving, expanding its reach, and diversifying its services to meet the ever-changing needs of a growing and diverse research community. By fostering interdisciplinary collaboration and pushing the boundaries of heritage science, we aim to stay at the forefront of innovation.

This vision emphasizes our dedication to adapting and enhancing our services to address the emerging needs of current and future user communities. We aim to promote sustainable growth and create varied research opportunities, cultivating a collaborative environment that ensures the preservation and understanding of cultural heritage for generations to come.

User-provider interaction is fundamental to this vision, to identify new and emerging HS challenges and co-creatively foster new ideas and solutions for these. E-RIHS access platforms and HS Academy will facilitate this interaction, identifying unmet needs and translating these into new research areas, to keep E-RIHS at the forefront of heritage science.

Going forwards, key challenges include:

1. Keeping services and access modes open and relevant to users by embracing new needs and communities.
2. Ensuring high-quality interaction between users and providers, particularly in remote access services.
3. Providing inclusive access options with a lower carbon footprint.

3.1 Guiding principles

E-RIHS ERIC is committed to promoting ethical HS research fully aligned with Open Science principles, within an inclusive research environment that is conducive to co-creation. These principles are fundamental to E-RIHS, and adherence to E-RIHS' codes of practice is mandatory for both access providers and users. The E-RIHS Scientific and Ethics Advisory Board ensures compliance with these codes and addresses any cases of noncompliance.

Looking ahead, it is crucial to further develop and establish ethical and responsible HS research principles in partnership with the HS community. Here E-RIHS can serve a valuable normative role, as it is well-positioned to lead this effort through open and inclusive collaboration with a wide array of HS stakeholders – e.g., through direct engagement, the HS Academy, and user associations. It is also important to gather input from prospective users such as those in the Cultural and Creative Industries (CCI) and other private stakeholders in the Cultural Heritage sector. The HS Academy can play a key role in this effort by developing training opportunities for infrastructure users, access providers, and managers on applying these principles within HS research practice.

3.2 Improving E-RIHS services to users

At its start, E-RIHS will provide access to over 30 facilities and 140 techniques and archives, offered through the National Nodes as in-kind contributions to the E-RIHS ERIC, subject to the legal and

statutory boundaries of their providers. Initially, E-RIHS is projected to serve 300 users per year, with the goal to increase to 650 users annually once fully operational.

However, E-RIHS cannot stand still. E-RIHS aims to continually enhance and expand its services to users, developing next-generation instruments and methods to advance heritage science.⁴

3.2.1 New services

DIGILAB

The three existing physical platforms (ARCHLAB, MOLAB and FIXLAB) will be enhanced by a fourth virtual platform, DIGILAB, providing broad digital access to scientific data and digital services to users worldwide. DIGILAB will provide a *Virtual Research Environment*, giving users online access to data from ARCHLAB, FIXLAB, and MOLAB. It will also offer advanced tools for data interrogation, processing, analysis, and interpretation, enabling the co-creation of new heritage-related knowledge. Fully aligned with FAIR, Open Access and EOSC principles, DIGILAB will enhance data interoperability, creating shared knowledge organization systems while ensuring data and services are as open as possible and as closed as necessary.

The full development and operativity of DIGILAB is an ambitious endeavour given the challenges of standardizing metadata collected on extremely diverse cultural assets using different multidisciplinary methodologies tailored to specific research questions. The future DIGILAB will offer advanced services for data driven research, including computing, storage, information extraction, data analysis, modelling, enrichment, curation, digital preservation, GIS representation, hyper and multi-spectral imaging, and 3D rendering. Integrating DIGILAB into the European Collaborative Cloud for Cultural Heritage (ECCCH) will enhance knowledge co-creation across disciplines and heritage practitioners.

Cultural heritage risk management

To meet the needs of users engaged in cultural heritage risk management and preventive conservation (i.e., measures to anticipate and pre-emptively mitigate possible threats to cultural heritage) long-term/continuous access services will be developed. The challenge is to ensure the provision of flexible, affordable and robust access pathways for ongoing risk management and preventive conservation measures, which require continuous monitoring and adjustment to identify potential threats and adapt conservation strategies.

Supplementary services

In addition to providing excellence-driven access services, E-RIHS will also develop supplementary needs-based services for users lacking research equipment and expertise but needing simple analyses, such as those required for conservation decisions. To this end National Nodes may offer matchmaking services to connect these users with local providers, thereby providing effective support to local communities and small institutions.

⁴ For example, identified areas of innovation include non-destructive analytical techniques and spectrochemical methods, novel sensors, and sampling methods for cultural heritage materials, ancient genomics applications, green materials assessment methods, laser cleaning, and gamma irradiation for heritage conservation and imaging technologies.

As an ERIC, E-RIHS is entitled to engage in limited economic activities related to its mission, as long as these activities do not undermine its goals. While E-RIHS will not offer direct market-driven access, it may provide services like scientific consultancy and matchmaking to connect for-profit users with interested providers, as long as they follow the E-RIHS code of practice. These services can help secure additional funding to foster the sustainability of the RI, support public-private collaboration, and generate benefits for the community as a whole.

3.3 Engaging new research communities

Effective outreach and engagement of new user communities is pivotal for fostering innovation, collaboration, and sustainable growth. Drawing upon insights collected from previous projects, a multi-faceted approach will be pursued built around the following overarching principles:

- a) **Tailored Community Engagement**
Identify and understand the unique needs of each user group through national assessments and discussions at the level of the ERIC to design tailored engagement strategies that ensure relevance and foster meaningful connections also with new user communities.
- b) **Diversity, Inclusivity and Collaboration**
Engage diverse stakeholders from different disciplinary, geographic and cultural backgrounds, including academics, practitioners, and community representatives, to enrich dialogue and promote meaningful community engagement, and foster local and international cross-disciplinary collaboration. Encourage joint projects, shared events, and mutual learning to help build relationships and cultivate a sense of shared ownership and purpose.
- c) **Transparency and Communication**
Maintain open, frequent, and transparent communication across all levels of the E-RIHS hierarchy to build trust and rapport with new user communities, and promote an environment conducive to collaboration and knowledge exchange. Share success stories and testimonials from current users to enhance credibility and attract new parties.
- d) **Capacity Building**
Equip new users with necessary skills and knowledge to facilitate their effective participation through specialized training sessions, workshops, and accessible educational materials, and thereby promote self-learning and foster a culture of continuous improvement. The E-RIHS Training Strategy also supports this principle.
- e) **Technological Innovation**
Leverage digital platforms and innovative technologies to expand outreach and facilitate dialogue with new user communities. Use online forums, webinars, and social media, as well as technologies such as virtual reality and interactive databases to enhance user experience and engagement, encourage the growth of virtual communities and foster immersive and impactful interactions.
- f) **Feedback and Adaptation**
Establish feedback mechanisms to gather user insights and continuously refine engagement strategies to ensure alignment with evolving user needs.
- g) **Monitoring and Evaluation**
Effective monitoring and evaluation is essential to ensure continuous improvement and inform future strategic decisions. Set and collect clear metrics for success, and regularly review and adjust engagement strategies based on the gathered data.
- h) **Sustainability and Long-term Engagement**

Plan for sustainability and design engagement activities with a long-term perspective, cultivating community leaders and encouraging community members to take on leadership roles, to foster a self-sustaining community capable of driving continued growth and innovation.

By applying these principles, E-RIHS can effectively engage and maintain relationships with new user groups, ensuring a vibrant, diverse, and active user community aligned with its goals and initiatives.

3.3.1 Target new user communities

E-RIHS aims to engage a diverse range of potential heritage science communities, each with unique professional interests and methodologies. Building on previous European projects, we plan to engage the following newly identified user communities:

- Social Sciences and Humanities: Engaging curators, conservators, heritage managers, and scholars through collaborations with organizations like ICOM-CC, ENCORE, and ICON.
- The Built Environment: Reaching building surveyors, facility managers, construction engineers, and climate scientists, in partnership with entities such as ICOMOS and the Building Information Modelling (BIM) community.
- Palaeontology and Palaeoanthropology: Involving researchers in anthropology, palaeontology, DNA studies, and taphonomy through specialized workshops and fieldwork integrating new analytical methods.
- Archaeology: Focusing on archaeological science and conservation, with an emphasis on skills development and training in proposal writing and research facility use.

Looking to the future, we aim to further expand the E-RIHS User community towards emerging disciplines and domains such as:

- Digital Heritage and Data Science Specialists: As heritage science increasingly adopts digital technologies, we will focus on engagement initiatives related to digital preservation and computational analysis.
- Environmental Scientists: Collaborating on the impact of climate change on heritage sites, with potential workshops and joint research efforts.
- Educational Institutions and Young Researchers: Fostering long-term engagement through tailored programs and internships for students and early-career researchers.

By continually expanding and diversifying our community, E-RIHS aims to push the boundaries of heritage science and create a collaborative environment for researching, understanding and preserving cultural heritage.

3.4 Incorporating User perspectives

Incorporating user needs and perspectives within E-RIHS decision making is key to improving and evolving E-RIHS services from both a scientific and operational point of view, and therefore fundamental to the future sustainability of the Research Infrastructure.

This will be achieved through two main channels:

- At the operational level, the Central Hub will directly address and integrate comments related to the functioning of the E-RIHS services. For example, it could update dashboard features, include missing information on the website, or adjust its communication strategy

based on evolving user needs and practices. Feedback will be directly gathered from surveys or individual interactions between users and E-RIHS staff.

- At the strategic and scientific level, user perspectives will be represented through the Committee of National Nodes (CNN), the main scientific body of the E-RIHS. This representation will be first organised at the national level in a way that best corresponds to local challenges and institutional layout. The results of this national representation will be aggregated at CNN through dedicated groups or activities that will also involve European users and professional organisations.

In addition, the Scientific and Ethics Advisory Board of E-RIHS, composed of experts selected for both their long-term vision for Heritage Science and their capacity to represent key aspects of the E-RIHS community, will offer advice on the scientific strategy and its future updates to the General Assembly and will evaluate the scientific, technical and general activities of E-RIHS annually. This evaluation will include the capacity of E-RIHS to address user needs and to provide them with excellent services.

4. HOW WE WILL GET THERE

A strategy for engaging users and responding to their needs.

This section sets out a strategy to achieve the vision detailed above. It outlines key pathways for 1) strengthening and enlarging the E-RIHS user base; 2) Gathering information on user experiences, profiles, and needs; and 3) incorporating user perspectives in E-RIHS decision making, to improve services and inform the future development of the E-RIHS ERIC. For ease and brevity, the pathways and associated workflows are also represented in a schema at the end.

4.1 Strengthening and enlarging the E-RIHS user base

In this section we outline future E-RIHS community-building activities to strengthen engagement and knowledge exchange. This strategy considers user communities in non-E-RIHS and non-EU member states (in line with the E-RIHS Enlargement Plan), as well as users from the cultural and creative sectors (CCS) and the private sector.

Cultural Heritage transcends national boundaries, representing the shared history and identity of diverse communities worldwide. International cooperation in heritage science is crucial not only to enhance the quality, scope, and impact of research, but also to drive solutions for global heritage challenges. Therefore, within this strategy, E-RIHS will specifically reach out also to users within non-ERIHS member states, including from beyond the EU, so that its activities can serve to strengthen the global heritage research community.

This open outlook is vital in positioning E-RIHS as a global leader in the field, raising visibility and securing future membership in E-RIHS. Key channels for this outreach include the National Nodes, the HS Academy, as well as cooperation with external user organisations, associations and groups, to further extend its reach, and open opportunities to bridge to wider disciplines and communities.

4.4.1 Reaching and engaging new users

E-RIHS aims to advance knowledge and promote collaboration in heritage science, by engaging diverse user communities, including those from non-E-RIHS countries both within and beyond the

EU. This approach builds on experience gained in previous E-RIHS community European projects and follows a three-stage framework:

- 1) **Community Needs Assessment**
This initial stage involves identifying and understanding the specific requirements and interests of potential user communities. Methods include surveys (such as the regular HS Community Survey – see section 4.2 below) as well as direct engagements with academic and research institutions, professional associations, societies and groups. Gathering insights from these stakeholders helps to establish a comprehensive understanding of their needs forming the basis for tailored engagement strategies.
- 2) **Outreach and Engagement**
In this stage, actionable and measurable strategies for community engagement are developed and executed. Activities include: Joint events, webinars, and conference sessions to showcase projects; online forums to facilitate discussion and information sharing; specialized training and workshops tailored to community needs; outreach activities for early and mid-stage researchers, including students (based on the feedback from the Heritage Science community questionnaire).
In all of these, National experts can serve as facilitators for initiating dialogue and fostering an environment conducive to knowledge exchange and collaboration.
- 3) **Monitoring and Evaluation**
The final stage involves monitoring the effectiveness of the engagement strategies and evaluating their impact, ensuring ongoing improvement and adaptation to meet community needs.

While pursuing this framework, specific channels for reaching and engaging users a) through the national nodes and CNN; and b) through the Central Hub and HS Academy are identified as follows:

4.1.2 User outreach through E-RIHS National Nodes and the CNN

National coordinators play a vital role in convening, capturing and communicating the perspectives of existing and potential new users, particularly as they have insight into the wider academic and research communities in their own countries, and hence a sense of where to reach out to potential new users. Establishing contact at national level with diverse users, e.g. through organising outreach meetings &/or webinars and through working with established communities (e.g. national associations of conservators), could be a route to provide spaces to collect and aggregate these voices. The way this might be achieved is a matter for each national node to decide, nevertheless National Nodes are recommended to:

- 1) Develop a National User Strategy to promote the principles identified in E-RIHS User Strategy and implement it at national level.
- 2) Organise user (ex-post) representation, through the appointment of specialised representatives such as a User Relationship Officer.
- 3) Liaise with the Central Hub regarding the users' access to national research infrastructure. Monitor KPIs, user services and post access duties, and make this data available to the Coordination Office.

Through the CNN, the National Nodes are expected to represent their user communities' perspectives, aggregating their suggestions, needs, and concerns at the level of E-RIHS ERIC.

4.1.3 User outreach through the Central Hub and HS Academy

The Central Hub and the CNN will play a central role in organising community building activities at international level, reaching out to existing and new users, to strengthen and enlarge the user community.

Principal among these activities which will be the E-RIHS User Conference. This regular (biennial or triennial) event will be organised by the Central Hub together with the CNN, and hosted (as an in-kind contribution) on a revolving basis by the national nodes. This event will bring together existing and potential users in the field of heritage research and serve as a dynamic platform for exploring new and emerging topics, fostering knowledge sharing, and strengthening ties within the heritage science community.

In particular it will showcase advancements in heritage science, highlight and address contemporary challenges, and provide a platform for exchanging best practices, and insights across disciplines, stimulating new collaborations and inspiring the future development of E-RIHS services.

In this way, the E-RIHS User Conference will become an essential gathering for those dedicated to advancing heritage science, providing a unique opportunity to drive innovation, build a stronger research community, and enhance the preservation and understanding of cultural heritage.

4.2 User Consultation Plan

In addition to providing platforms for convening users through activities at national level and the E-RIHS User Conference, regular information gathering should be carried out to better understand user experiences, profiles, and research needs, and to integrate these within E-RIHS decision making processes.

By systematically gathering and analysing user feedback E-RIHS aims to enhance its services, ensure high user satisfaction, and continuously evolve to meet the needs of the heritage science community.

Three levels of information gathering are envisaged:

1) Post-Access/Education Event User Surveys (Continuous)

Objective: Assess outcomes and satisfaction with current activities.

Method: After each access or event, users will complete: i) a mandatory User Satisfaction Survey within two weeks to gather comprehensive feedback on the user experience. ii) In addition, completion of a User Report, will be mandatory within two months post-access and its delivery will be a requisite to any future access. iii) Finally, two years post-access, a short follow up survey will request updates regarding the publication of research data and other dissemination efforts of E-RIHS access services. The three surveys will be automatically distributed and collected by the Central Hub. Data may be analysed using the SEVQUAL model⁵ to assess service quality factors like tangibles, reliability, responsiveness, assurance, and empathy.

Purpose: Identify strengths and weaknesses in services and personnel performance, providing valuable feedback to service providers for continuous improvement. E-RIHS

⁵ A. T. Namin et al, Management Science Letters 2 (2012) 933–938.

Central Hub will make sure that the gathered information is passed to the access or education services providers.

2) User Community Survey (Every 2 Years)

Objective: Profile current and potential users and gain insights into long-term satisfaction and unmet needs.

Method: A comprehensive survey conducted every two years, coordinated by the HS Academy, to gather feedback on existing services and features.

Purpose: Track changes in user experience over time, assess the impact of improvements, and prioritize future enhancements based on user requirements. This will allow E-RIHS to remain responsive to evolving demands, foster stronger relationships with researchers, and ensure its services support high-quality, cutting-edge research.

3) Gap Analysis of Heritage Science Research Needs (Every 2 Years)

Objective: Enable the infrastructure to respond to users' needs by identifying gaps in research capabilities.

Method: A questionnaire to survey users' research interests and needs, coordinated by the CNN, followed by an analysis by National Nodes of the availability of research equipment and expertise. The Gap Analysis will be performed every two years by the Committee of National Nodes, whose responsibility is to represent user communities and propose improvements to infrastructure, procedures, and practices.

Purpose: Identify potential new developments or upgrades needed in research infrastructure to support meaningful research in Heritage Science.

The results from all three levels of consultation will be reviewed by the Scientific Advisory Board, who on the basis of this information will provide recommendations to the CNN, Central Hub and the General Assembly. The consultation plan will be further developed to gather feedback from DIGILAB users once this platform is established.

4.3 Developing E-RIHS services

Collecting data and monitoring are pivotal for driving improvements in E-RIHS by providing actionable insights and ensuring continuous enhancement. By systematically gathering data on key performance indicators (KPIs) such as user demand, resource utilization, user satisfaction, and research output, E-RIHS can identify areas of strength and weakness. Quality monitoring allows for real-time detection of issues like bottlenecks and inefficiencies. Analysing this data facilitates evidence-based decision-making, enabling targeted interventions to optimize performance, enhance the user experience, and ensure compliance with E-RIHS quality standards. Moreover, tracking trends over time helps forecast future needs and scale resources accordingly. By fostering a culture of continuous improvement through regular assessment and adaptation based on collected data, E-RIHS can maintain high standards of service, support cutting-edge research, and adapt swiftly to emerging technological advancements and user requirements.

Pathway for Data Collection and Quality Monitoring:

- 1) Data Gathering: Data is collected through service platforms, National Nodes, and the HS Academy according to the consultation plan.
- 2) Central Hub: The data is sent to the Central Hub Quality Officer.
- 3) Analysis and Reporting: The Quality Officer collates and analyses the data, then sends a periodic report to the Director General.

- 4) In-Time Adjustments: National Nodes and platform coordinators access survey data to make necessary real-time adjustments to their services.
- 5) Annual Review: The Director General sends an annual report to the Scientific Advisory Board for review.
- 6) Recommendations: The Scientific Advisory Board uses the data to make recommendations, which are then sent to the Director General and the E-RIHS General Assembly.

This systematic approach ensures continuous improvement, maintaining high service standards and supporting cutting-edge research.

4.4 E-RIHS User Strategy in a Nutshell

The following wiring diagram illustrates the various engagement and information gathering and decision-making pathways outlined in the User Strategy:

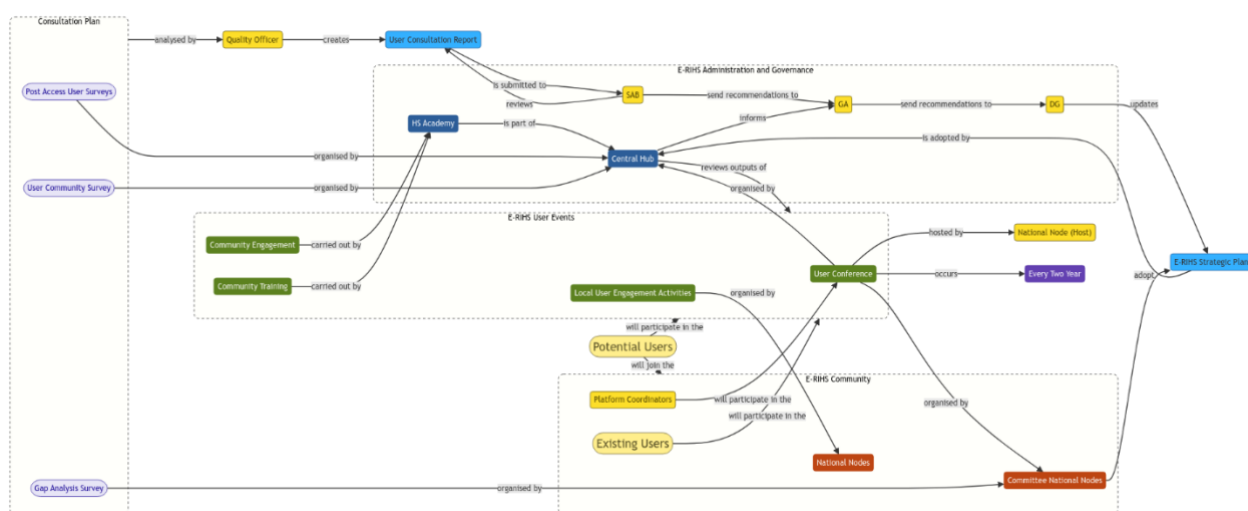


Figure 4: E-RIHS User Strategy Overview

APPENDIX

Definitions

ARCHLAB, MOLAB, FIXLAB, and DIGILAB

The physical platforms ARCHLAB, FIXLAB and MOLAB encompass facilities, resources and services, as well as the expertise and experience of the E-RIHS teams operating the facilities, summarised as follows:

- ARCHLAB: access to physical and local digital collections that constitute valuable research resources, such as objects, technical images, samples and reference materials, analytical data and conservation documents, as stored in museums, galleries, conservation and research institutions;
- FIXLAB: access to large scale facilities established in a fixed location, e.g., particle accelerators, neutron and laser-based laboratories for in dept studies of micro samples or movable objects;
- MOLAB: access to mobile instrumentation for non-invasive measurements and documentation on objects, buildings, and sites, allowing in situ investigation in the frame of multi-technique diagnostic projects, including the associated unique skills and expertise of the staff in the application of these techniques.

Since the creation of a unified catalogue of services and dashboard within IPERION HS in 2020, users have enjoyed an integrated single-entry point to all platforms and can follow their projects from the proposal to the exploitation phase on the same website.

In the future a fourth virtual platform, DIGILAB, will be established:

- DIGILAB: access to scientific data (principally from ARCHLAB, FIXLAB, and MOLAB), along with tools for data interrogation, processing, analysis, and interpretation, and digital services.

In this way, E-RIHS will enlarge its services to users, offering a Virtual Research Environment and advanced research services, adhering to FAIR, Open Access, and EOSC principles.

HS Academy

The Heritage Science Academy is a platform for engagement with users particularly through training and dissemination activities, both in-person and remotely. It is aimed at users, access providers and infrastructure managers. The Academy offers:

- Individual webinars and lectures
- Focussed courses, including training camps and doctoral summer schools
- User meetings.

E-RIHS User Statistics

The following information concerning the number, the disciplinary and geographic background, and the gender identity of E-RIHS users is drawn from statistics gathered during the IPERION HS project for TNA and HS Academy services.

Annual user numbers

In the period 2021-23, over 600 user requests were made to the opens calls for TNA, with an average of 340 requests per year across all platforms (FIXLAB, MOLAB and ARCHLAB), of which 70 single and multi-facility projects were granted annually (see figure 1). Meanwhile, the annual attendance in HS Academy activities (courses, individual webinars and lectures, and user meetings) averaged 1000 participants for the period 2021-2024.

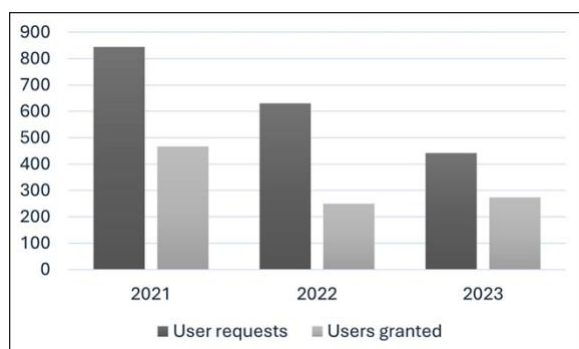


Figure 1: Number of TNA user requests made and granted (2021-2024). NB: number of competitive calls for access = 3 calls in 2021; 2 calls in 2022 and 2023.

Academic background

Around 75% of user group leaders applying for TNA services have a main academic background in the humanities, material science, chemistry, earth science and environment. The remainder have backgrounds in disciplines such as physics, social sciences, life sciences and engineering (figure 2a). Within the IPERION HS project efforts were made to reach out to further communities in the HS field, such as built heritage, palaeontology, and archaeology amongst others. Through these efforts, the field of archaeology is increasingly represented in TNA user statistics, with a smaller but emerging number of requests from built heritage and palaeontology (figure 2b).

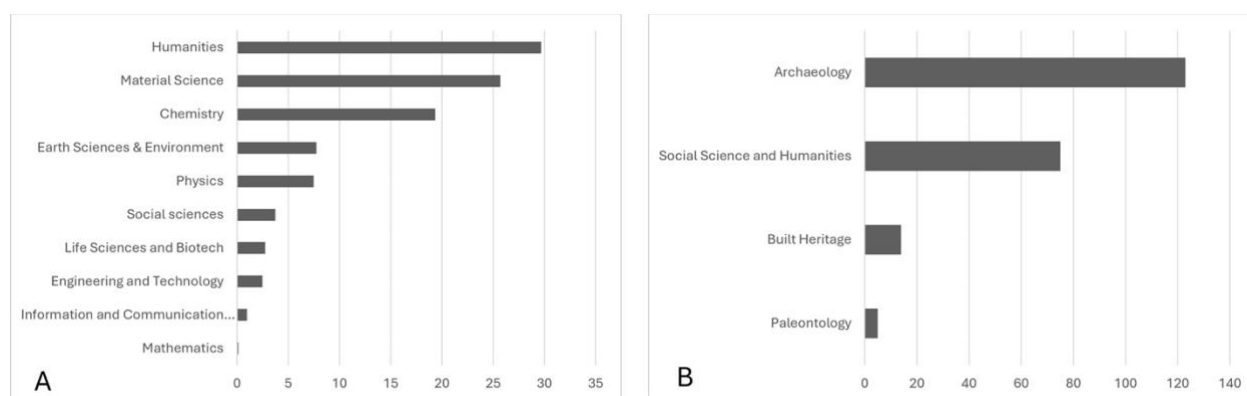


Figure 2: a) User group leader disciplines (% of total) b) Requests from new communities (2021-2024)

Geographic distribution

User requests for TNA access have come from researchers widely distributed across Europe and associated countries, with the highest numbers of user group members based in Italy, France, Belgium and Spain respectively. Access for user groups in which the majority were not working in an EU or associated country was limited according to the rules and budget conditions for TNA in IPERION HS. Nevertheless, researchers from beyond Europe have included those from USA, South Africa, Tunisia and Iceland.

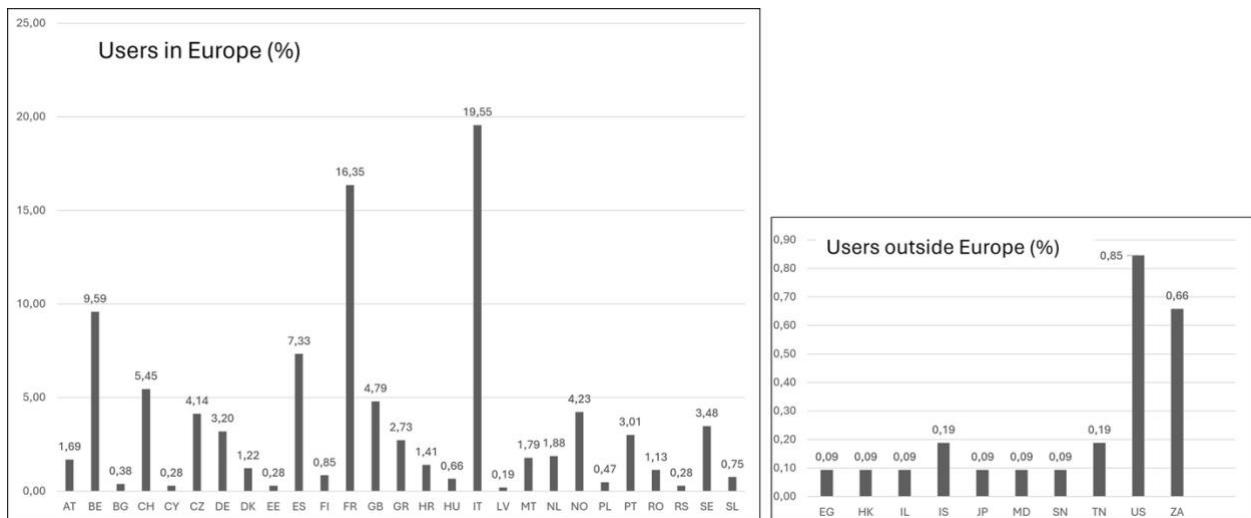


Figure 3: Geographic distribution of Users from Europe and beyond, % per country (2021-2024)

Gender

Around 60% of users submitting requests to TNA services identify as being female, 40% as being male and roughly 0,5% identify as other.