

D2.1 Joint Final Report on activities, proposals and outcomes of the three Thematic Clusters and the Living Lab Coordination

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1. Introduction

1.1. Purpose of the Report

This report presents the activities, outputs and outcomes of the Arqus Living Lab implemented within Work Package 02 (WP02) of Arqus II during the 2022–2026 project period. It brings together the contributions of its three thematic clusters:

- Climate Change and Sustainable Development (CChSD),
- Artificial Intelligence and Digital Transformation (AIDT),
- European Identity and Heritage (EIH).

The report describes the development of the Living Lab, presents the main achievements and lessons learned within each cluster, and assesses their collective contribution to the objectives of WP02. It also reflects on the added value of cooperation across the three thematic areas and identifies elements that can support the future Academic Hubs.

The analysis is based on cluster activity reports, available participation data, generated materials and the results reported in the related WP02 deliverables. Quantitative data are complemented by qualitative evidence of community building, knowledge exchange, stakeholder engagement and follow-up collaboration.

Participant feedback was collected mainly through direct comments, follow-up correspondence and evidence of continued engagement. As no standardised satisfaction survey was applied across all WP02 activities, no aggregated satisfaction rate is reported.

1.2. The Arqus Living Lab Framework

The Arqus Living Lab was established as an umbrella framework for interdisciplinary and challenge-based cooperation addressing major societal challenges. It connected education, research, innovation and societal engagement and brought together students, academics, professional staff and external stakeholders from across the Alliance.

The Living Lab comprised three thematic clusters: CChSD, AIDT and EIH. Each cluster developed activities reflecting its thematic priorities and available expertise while contributing to the common objectives of WP02. This structure combined thematic specialisation with cooperation across disciplines, institutions and sectors.

WP02 was organised around four main tasks:

- **T02.1:** establishing the Arqus Living Lab and thematic clusters;
- **T02.2:** initiating transdisciplinary innovation activities;
- **T02.3:** developing joint challenge-based teaching initiatives;
- **T02.4:** generating inter- and transdisciplinary research and innovation collaborations.

The flexible framework allowed the clusters to develop educational, challenge-based, innovation and stakeholder engagement activities suited to the expertise and capacities of their communities. Over the project period, these activities supported interdisciplinary networks, joint educational formats, reusable resources and cooperation between universities and their wider ecosystems, providing a foundation for the transition towards the Academic Hub model.

2. Development of the Arqus Living Lab

2.1. Establishment of the Living Lab

The development of the Arqus Living Lab began with the launch of Arqus II in late 2022 and built on experience gained during the first phase of the Alliance. During the initial implementation period, the co-leads and thematic groups identified institutional representatives, mapped relevant expertise and developed preliminary plans for joint activities. This process also revealed the need to translate the broad Living Lab concept into feasible activities adapted to the expertise, available resources and institutional conditions of the participating universities.

The three clusters gradually became the principal operational structures of the Living Lab. Each developed its own thematic community and portfolio of activities while contributing to the shared objectives and deliverables of WP02. Greater operational autonomy enabled the clusters to respond to their specific thematic priorities while remaining connected through joint coordination and cross-cluster exchange.

A joint meeting held in Leipzig in January 2024 helped consolidate this model. Participants confirmed the value of retaining the Living Lab as a broad and flexible umbrella framework while allowing the clusters to develop different approaches and activity formats. The meeting also identified practical priorities, including regular coordination, clearer distribution of responsibilities, support for bottom-up initiatives, stakeholder engagement and systematic monitoring of WP02 activities and deliverables.

The Midterm Review formally confirmed the achievement of MS03, concerning the establishment of the Arqus Living Lab and its three initial clusters. It also recommended stronger evidence of cluster composition, stakeholder involvement, activities and measurable outcomes. In the second half of the project, WP02 therefore placed greater emphasis on implementation, documentation and demonstration of tangible results.

2.2. Community Building and Engagement

The Living Lab communities developed through open membership, regular interaction and collaboration around specific activities and societal challenges. The clusters identified participants with relevant disciplinary expertise and encouraged partner universities to involve more than one institutional representative where possible. This supported continuity and enabled new members to join activities according to their expertise and interests.

Regular online meetings were used to exchange information, develop activities, identify partners, discuss funding opportunities and monitor implementation. Shared folders, collaborative documents, mailing lists and activity-planning tools supported communication between meetings and enabled members to contribute asynchronously. Face-to-face meetings held in connection with the Arqus Annual Conferences complemented online cooperation and provided opportunities for more extensive planning and networking.

Community building was driven primarily by joint activities. Challenge-Based Learning programmes, Blended Intensive Programmes, spring, summer and winter schools, lecture and seminar series, workshops, thinkathons, hackathons, collaborative projects and stakeholder events created practical opportunities for students, academics, professional staff and external stakeholders to work together.

Students were involved not only as participants in educational activities but also as contributors to international teamwork, challenge-based projects, presentations and follow-up initiatives. The Living Lab also created opportunities for doctoral candidates and early-stage researchers to develop international contacts, engage with experts and participate in teaching, networking and collaborative activities.

External stakeholders were involved mainly through activities connected to clearly defined challenges or local contexts. Depending on the thematic area, these included public institutions, schools, cultural organisations, museums, botanical gardens, civil society organisations, NGOs, businesses, industry partners, local producers and community actors. Existing relationships between universities and their regional ecosystems were an important mechanism for identifying and involving these partners.

Following the Midterm Review, greater attention was given to documenting cluster membership, participant categories, institutional representation, stakeholder involvement, generated resources and follow-up outcomes.

2.3. Participation Overview

The Arqus Living Lab involved students, academic and research staff, professional and administrative staff, representatives of other higher education institutions and external stakeholders. Participation was generated through activities differing considerably in format, duration and intensity, from individual lectures and public events to multi-stage educational programmes and collaborative projects.

The figures below represent participation documented in the cluster datasets. Depending on the activity, they may refer to registrations, attendance instances or cumulative participation rather than unique individuals. The same participant may have taken part in more than one activity. Views of recorded resources are reported separately and are not included as direct participation.

Indicator	Climate Change and Sustainable Development	Artificial Intelligence and Digital Transformation	European Identity and Heritage
Activities reported	13	21	22
Arqus partner universities represented	9	9	7
Arqus students	815	475	1286[1]
Academic and research staff from Arqus universities	129	468	117
External stakeholders	58	53 from organisations; 55 external academics; 167 external students	36
Open and online educational resources	117	23	12

[1] This number comprises the number of viewers of the online lecture series “Critical heritage studies at Arqus” on the Arqus YouTube channel (869 viewers, last access 16 September 2026)

The data demonstrate substantial participation across the three thematic areas and engagement extending beyond the regular membership of the clusters. Online and hybrid formats increased the geographical reach of WP02 activities, while face-to-face components supported more intensive cooperation among participants.

Differences in data collection and categorisation prevent the calculation of a reliable Alliance-wide total of unique participants. The main methodological differences concerned repeated attendance in multi-session activities, the separation of Arqus and external participants, the treatment of online participation and the distinction between stakeholder representatives and stakeholder organisations. These limitations should be taken into account when interpreting the cluster-level figures and assessing progress against the WP02 indicators.

2.4. Coordination and Cross-Cluster Collaboration

The coordination model shifted from a centralised framework led by the University of Granada to a decentralised structure based on cluster autonomy, shared responsibility, and cross-cluster communication. The three co-lead teams managed their thematic communities while coordinating shared WP02 objectives and deliverables. This adapted coordination model turned out to be effective, enhancing the Lab's dynamic while reducing redundancies in communication and coordination.

During a meeting in January 2024 in Leipzig, the co-leads developed a practical model for sharing organisational responsibilities through rotation. Leipzig University coordinated the co-lead process in 2024, the University of Graz assumed a greater organisational role in 2025, and the University of Wrocław did so in 2026.

Coordination combined regular and needs-based interaction. The co-leads met online approximately every three months to exchange updates, monitor progress and discuss common implementation and reporting issues. Additional online exchanges were organised when necessary. Annual face-to-face meetings and sessions during the Arqus Annual Conferences enabled more extensive planning, joint reflection and interaction with other Work Packages, Alliance boards, Institutional Coordinators and the Coordination Team.

Cross-cluster collaboration was facilitated by the co-leads, who shared proposals, identified relevant expertise and connected participants from different thematic communities. Collaboration was most effective when organised around a clearly defined topic or activity. It ranged from information exchange and participation by experts from another cluster to initiatives designed from the outset to connect two or three thematic priorities. The Twin/Triplet Transition activities provide the most visible examples of this cooperation (D02.7).

The Arqus Innovation Fund supported the development of inter-university and cross-disciplinary initiatives, while cooperation with other Work Packages provided additional mechanisms for teaching, mobility, stakeholder engagement, digital support and community development. The Partnering Platform complemented these mechanisms by providing an environment for presenting expertise, projects and collaboration opportunities. During the testing phase, numerous user profiles were created, and the platform began to operate as intended. However, for security reasons and to support data consolidation with Arqus Plaza, the platform was subsequently transferred to its

final server environment. As the platform has been operational in this environment for only a few weeks, renewed communication and promotion are needed to rebuild its user base and encourage active use. These promotional activities have already begun, while systematic usage data are not yet available at the time of reporting.

Responsibility for coordinating the WP02 deliverables prepared during the final project phase was distributed among the cluster-leading universities:

Deliverable	Coordinating responsibility
D02.1 Joint Final Report on the Arqus Living Lab	Shared responsibility of the three cluster-leading universities
D02.2 Arqus Partnering Platform	University of Wrocław, in cooperation with WP12 Digital Arqus
D02.3 Joint Final Report on Transdisciplinary Innovation Activities	University of Graz
D02.4 Joint Final Report on the Promotion of Sustainable and Inclusive Policies	University of Wrocław
D02.5 Summary Report on Joint Teaching Activities	Leipzig University
D02.6 Jointly Developed Teaching Materials	Leipzig University
D02.7 Joint Final Report on Responsible Twin/Triplet Transition Initiatives	University of Graz
D02.8 Recommendations for the Interdisciplinary Arqus Virtual Lab Initiative	University of Graz

Overall, the coordination model combined thematic autonomy with regular communication, practical distribution of responsibilities and joint accountability for WP02 outputs. This enabled the clusters to develop activities suited to their communities while remaining connected within a common Living Lab framework.

3. Climate Change and Sustainable Development Cluster

3.1. Objectives and Scope

The **Climate Change and Sustainable Development Cluster** supported interdisciplinary cooperation among Arqus universities and their wider ecosystems in addressing complex environmental and sustainability challenges. It connected education, research, innovation and societal engagement, contributing to the broader objectives of WP02.

The Cluster addressed climate adaptation and mitigation, biodiversity and ecosystem conservation, environmental and planetary health, sustainable food systems, responsible resource use, critical raw materials, sustainable tourism, urban development, water management, climate education and environmental communication.

One Health formed an important integrative strand within this broader sustainability framework. By recognising the interdependence of human, animal and environmental health, it connected expertise from life sciences, environmental sciences and health-related disciplines. Related activities addressed infectious diseases, antimicrobial resistance, host-pathogen interactions, parasites, vectors and environmental drivers of disease emergence.

The Cluster pursued its thematic priorities through joint teaching, interdisciplinary scientific exchange, Innovation Fund projects and stakeholder engagement. Its activities, outputs and tangible outcomes are presented in the following sections.

3.2. Participation and Community Building

The CChSD Cluster developed an interdisciplinary community connecting Arqus universities and their wider ecosystems around climate change, sustainability and One Health. It brought together academics, students and professional staff with external stakeholders, including public institutions, schools, civil society organisations, botanical gardens, businesses, local producers and community actors.

Community building was supported through regular cluster meetings and the joint development of educational, scientific, innovation and public engagement activities. Members contributed as coordinators, organisers, teachers, trainers, expert speakers, facilitators, co-designers, mentors, reviewers and research or innovation contributors. This flexible approach enabled participants to become involved according to their expertise, institutional capacity and the requirements of individual activities.

Joint teaching, seminar series, workshops, scientific events and Innovation Fund projects provided practical settings for cooperation. Online, hybrid and face-to-face formats enabled participation across institutions, while intensive programmes and project-based activities supported closer interaction. Students contributed through international teamwork, challenge-based projects, fieldwork, research reports, presentations and student-led dissemination.

External stakeholders were involved primarily through activities addressing clearly defined environmental or societal challenges. Their participation connected academic knowledge with professional experience and local contexts in biodiversity conservation, climate education, sustainable food systems, tourism, spatial development, critical raw materials and environmental health. Their roles ranged from participation in public events to active contributions to workshops, fieldwork and project-based cooperation.

The Cluster's activities involved all nine Arqus partner universities, with Durham University participating as an associated partner during the final phase of the project. The participating

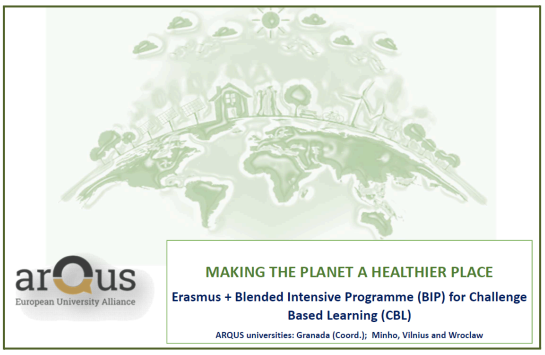
universities contributed through different combinations of coordination, teaching, mentoring, expert input, activity design and research or innovation cooperation.

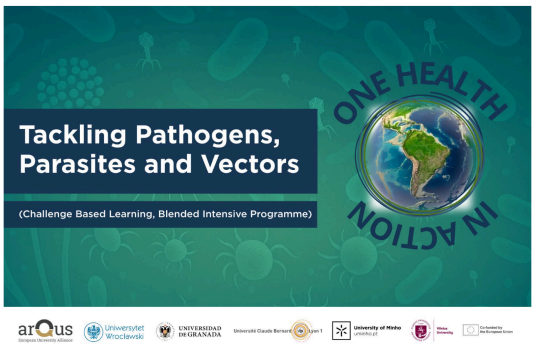
3.3. Activities Implemented

The CChSD Cluster implemented a diverse portfolio of joint teaching, scientific exchange, innovation and societal engagement activities. The initiatives combined online, hybrid and face-to-face formats and involved different configurations of Arqus universities, associated and external partners, students, academic and professional staff, and societal stakeholders. Activities were developed through Erasmus+ Blended Intensive Programmes, the Arqus Innovation Fund and other forms of inter-university cooperation.

Joint Teaching and Challenge-Based Learning

Joint teaching formed a major strand of the cluster's work. The implemented programmes combined research-based content with international teamwork, mobility, practical learning and interdisciplinary exchange.



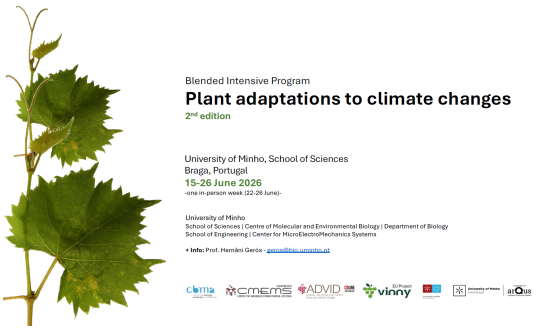


Two **Challenge-Based Learning Blended Intensive Programmes** connected students and academics around complex environmental and health-related challenges. **Making the Planet a Healthier Place**, coordinated by the University of Granada in 2025, addressed climate change, agriculture, sustainability and the use of digital technologies. The programme combined online learning with an on-site component in Granada and involved students, academic staff and external stakeholders. **One Health in Action: Tackling Pathogens, Parasites and Vectors**, coordinated by the University of Wrocław in 2026, focused on infectious diseases, antimicrobial resistance, parasites, vectors and environmental drivers of disease emergence. Its outputs included student projects and a Student-Led Forum.

Further Blended Intensive Programmes addressed complementary aspects of sustainability and One Health:

- **Plant Adaptation to Climate Changes**, coordinated by the University of Minho, focused on environmental stress and plant adaptation;
- **Mechanisms and Regulation of Cell Death and Autophagy**, implemented in two editions by the University of Minho, addressed cell biology and mechanisms of cellular responses;
- **One Health Approach to Host-Fungus Interactions and Virulence**, coordinated by the University of Minho, combined teaching, laboratory training and student research projects;

- **City and Water in Dialogue**: Shared Space in the Flow of Sustainable Development Ideas, coordinated by the University of Wrocław, addressed sustainable waterfront development through teaching, fieldwork and student project development.





These programmes demonstrated the value of combining online preparation with short-term mobility and collaborative work. They also enabled partner universities to integrate different areas of expertise into shared educational formats without requiring the establishment of permanent joint courses during the project period.

Interdisciplinary Scientific Exchange

The cluster supported scientific exchange through seminars, workshops and networking activities addressing climate change, sustainability, environmental health and One Health.

The Interdisciplinary Cycle of Seminars on Climate Change and Sustainable Development connected seven Arqus universities through online seminars and an on-site winter school in Lyon. The programme addressed topics including climate change, bioaerosols, antimicrobial resistance, food systems and water-related challenges. It created a recurring space for exchange between researchers from different disciplines and institutions and involved students, academic staff and professional staff.





The online **Scientific Symposium and Workshop "One Health and Pathogens, Parasites, and Vectors",** organised by the University of Wrocław in June 2025, brought together researchers, students and professional staff interested in antimicrobial resistance, pathogen biology, parasitology, vector-borne diseases and scientific collaboration. The symposium combined scientific presentations

with a workshop intended to identify shared research interests and potential areas for continued cooperation.

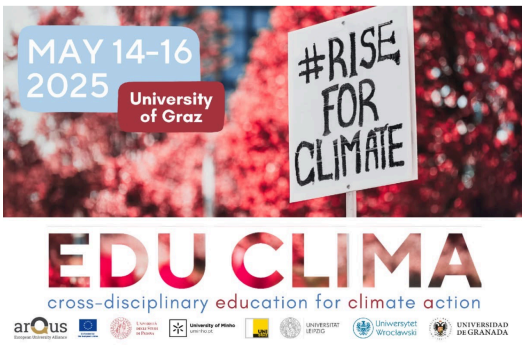
These activities complemented the formal teaching programmes by allowing researchers and early-stage academics to present their work, identify complementary expertise and develop contacts extending beyond individual events.

Innovation and Sustainability Initiatives

The Arqus Innovation Fund supported several collaborative initiatives linking environmental knowledge with education, cultural heritage, spatial development and regional challenges.

Arqus Verde: Connecting Botanical Gardens for Europe's Biodiversity and Cultural Heritage brought together botanical gardens and academic communities from the universities of Wrocław, Graz, Granada, Padua and Vilnius. Through seminars and workshops, the initiative addressed biodiversity conservation, the management of living collections, climate adaptation, education and the relationship between natural and cultural heritage.





Proximity Matters, involving the universities of Granada, Padua and Wrocław, examined relationships between food production, tourism and sustainable development. The initiative combined workshops with student research and engagement with external stakeholders. Because the activity remained ongoing in September 2026, its final participation figures and outputs were not yet complete at the reporting date.

Beyond the City: Sustainable Food and Spatial Strategies in Overtouristed Regions, developed by the universities of Padua and Wrocław, explored food production, overtourism, urban and spatial planning, and local sustainability strategies. Students participated in workshops and open lectures and prepared research reports and spatial development concepts with input from external stakeholders.

EDU-CLIMA: Cross-disciplinary Education for Climate Action connected six Arqus universities around climate education, climate communication and eco-storytelling. It included a seminar and webinar series, a conference and open educational activities involving students, academics, professional staff and wider audiences.

Together, these initiatives demonstrated how the cluster could use project-based cooperation to connect academic expertise with educational practice, local contexts and stakeholder knowledge.

Science and Society Engagement

The cluster also implemented public-facing activities intended to increase awareness of environmental challenges and strengthen interaction between universities and their wider ecosystems.

A major example was **CRM9: Connecting on Critical Raw Materials**, which involved the universities of Granada, Minho, Padua, Vilnius and Wrocław. The initiative consisted of open lectures, exhibitions and local public engagement activities addressing the environmental, economic and technological dimensions of critical raw materials. Its outreach-oriented format enabled participation by broad, non-specialist audiences across several partner locations.

Public engagement was also embedded in **CBL-BIPs, ERASMUS+ BIPs, EDU-CLIMA, Arqus Verde, Proximity Matters** and **Beyond the City**. Depending on the activity, societal participants included teachers, schools, botanical garden staff, public institutions, NGOs, businesses, producers, local communities and other professional or civic actors. Their roles ranged from attending open events and contributing specialist knowledge to participating in workshops, field-based activities and discussions of locally relevant challenges.

The strength of stakeholder involvement varied across initiatives. Some activities were primarily academic or educational, whereas others were designed around interaction with external actors. The cluster's portfolio should therefore be regarded as combining interdisciplinary academic activities with selected transdisciplinary formats in which societal partners contributed directly to knowledge exchange and problem exploration.

3.4. Outputs, Materials and Resources Generated

The activities implemented by the CChSD Cluster generated a broad range of **educational materials, Open Educational Resources, student outputs, recorded content** and **project-specific dissemination resources**. These outputs supported the implementation of individual activities and enabled the knowledge and materials developed within the cluster to be used beyond the original events.

Joint teaching activities produced **lecture and seminar materials**, **practical exercises**, **laboratory and fieldwork assignments**, **challenge-based tasks**, **student project guidelines** and **supporting digital content**. Materials were developed through CBL-BIPs, Erasmus+ BIPs, seminar cycles and workshops addressing climate change, sustainability and One Health.

The challenge-based and intensive educational programmes also generated tangible student outputs, including **research reports**, **project concepts, fieldwork analyses, spatial development proposals and presentations**. One Health in Action: Tackling Pathogens, Parasites and Vectors culminated in student projects and a **Student-Led Forum**, while City and Water in Dialogue generated **student project concepts and fieldwork analyses**. Beyond the City and Proximity Matters included student **research reports and analyses** related to sustainable food systems, tourism and spatial development.

Several projects produced resources intended for wider educational and public use. EDU-CLIMA generated a **webinar series and materials** supporting climate education, communication and eco-storytelling. Arqus Verde produced recorded **webinars and educational materials** concerning biodiversity, the management of living collections and the natural and cultural roles of botanical gardens.

The Interdisciplinary Cycle of Seminars on Climate Change and Sustainable Development generated **recorded presentations, seminar materials and documentation** from its online sessions and winter school, including a round-table discussion and report. The Scientific Symposium and Workshop One Health and Pathogens, Parasites, and Vectors generated **scientific presentations and workshop materials** supporting further exchange in antimicrobial resistance, pathogen biology, parasitology and vector-related research.

Public-facing initiatives produced additional dissemination resources. CRM9: Connecting on Critical Raw Materials generated materials associated with **open lectures, exhibitions and local engagement activities** addressing the environmental, economic and technological dimensions of critical raw materials. Other projects produced presentations, event documentation and communication materials disseminated through Arqus and institutional channels.

Based on the current CChSD dataset, the cluster reported **117 Open Educational Resources** developed during the project period. This value remained provisional as of 17 September 2026 because selected activities, particularly Proximity Matters, were still being completed and documented. The reported resources include recorded lectures and webinars, teaching materials, presentations, student-oriented resources and other digital outputs generated through cluster activities.

The outputs differed in their level of accessibility and readiness for reuse. Some, particularly recorded webinars and lectures, were designed for public dissemination. Others were developed for particular courses, workshops or project teams and may require further organisation, description or adaptation before wider use. Further information on jointly developed teaching materials, their accessibility and their inclusion in the designated repository will be consolidated through Deliverables D02.5 and D02.6.

3.5. Tangible Outcomes and Impact

The Climate Change and Sustainable Development Cluster generated tangible outcomes extending beyond the implementation of individual educational, scientific and stakeholder engagement activities. Through interdisciplinary and selected transdisciplinary formats, the cluster supported continued cooperation, knowledge exchange and the development of new educational, scientific and societal initiatives across the Arqus Alliance.

Sustainable International Teaching and Learning Networks

One of the cluster's main outcomes was the development of a practical foundation for continued joint international teaching in sustainability, climate change and One Health. The implementation of Challenge-Based Learning Blended Intensive Programmes and Erasmus+ Blended Intensive Programmes enabled academics from different Arqus universities to combine their expertise in shared educational formats and to engage students in international, interdisciplinary and practice-oriented learning.

The programmes connected online teaching with short-term mobility, group work, laboratory or field-based components and student-led dissemination. They strengthened cooperation among the participating academic teams, supported student mobility and generated experience that can inform future editions and other joint educational activities.

The implemented portfolio included two CBL-BIPs and several BIPs in areas such as climate change, One Health, host-fungus interactions, cell biology, plant adaptation, sustainable urban development and water management. Together, these activities demonstrated how existing Erasmus+ mechanisms could support joint Arqus teaching across different institutional and disciplinary contexts.

Strengthening One Health Research and Collaboration

Activities addressing One Health and environmental health developed interdisciplinary research connections among participants working on antimicrobial resistance, infectious diseases, host-pathogen interactions, parasitology, vector-borne diseases and environmental determinants of health.

The Scientific Symposium and Workshop One Health and Pathogens, Parasites, and Vectors brought together students, academic staff and professional staff and supported the formation of international thematic groups focused on antimicrobial resistance and vector-borne diseases. The initiative provided a basis for further scientific exchange and more focused bilateral and multilateral cooperation.

A particularly tangible outcome was the mentoring and research collaboration developed between the University of Wrocław and Université Claude Bernard Lyon 1. This cooperation led to a funded international research placement for an early-stage researcher, preparation of a joint scientific publication and transfer of research materials under a Material Transfer Agreement. The example demonstrates how an activity centred on networking and knowledge exchange could lead to concrete research-development opportunities beyond the original event.

Development of Long-Term Sustainability Networks

Several CChSD initiatives created collaborative networks that extended beyond their initial activity formats.

Arqus Verde: Connecting Botanical Gardens for Europe's Biodiversity and Cultural Heritage brought together botanical gardens and academic communities from the universities of Wrocław, Graz, Granada, Padua and Vilnius. The initiative supported the exchange of expertise concerning biodiversity conservation, living collections, climate adaptation, environmental education and natural and cultural heritage. It also generated recorded webinars, educational materials and a collaboration network among participating botanical gardens.

The cooperation initiated through Arqus Verde provided a basis for continued exchange and contributed to the preparation of a joint COST proposal involving botanical gardens and biodiversity researchers. This progression illustrates how a focused Innovation Fund initiative could create opportunities for broader European cooperation.

The Interdisciplinary Cycle of Seminars on Climate Change and Sustainable Development similarly connected researchers from several universities and disciplines. In addition to seminars and a winter school, the initiative supported new scientific contacts and contributed to the preparation of a joint review paper on bioaerosols. It also strengthened links with external partners and created opportunities for continued cooperation through the Weimar Initiative.

Bridging Universities and Regional Ecosystems

The cluster strengthened cooperation between Arqus universities and their regional ecosystems through activities involving schools, teachers, public institutions, botanical gardens, civil society organisations, businesses, local producers and community actors.

Proximity Matters and Beyond the City connected academic knowledge with challenges related to food production, tourism, overtourism and spatial development. Their student research reports, analyses and development concepts created a basis for dialogue with local and professional stakeholders. EDU-CLIMA connected climate science with education and communication, while CRM9 addressed the economic, technological and environmental dimensions of critical raw materials through open lectures, exhibitions and locally implemented public events.

These activities increased the practical relevance of cluster cooperation by connecting academic perspectives with local knowledge and real-world contexts. The depth of stakeholder participation varied across initiatives, but the strongest examples enabled external actors to contribute professional experience, contextual knowledge and perspectives that complemented academic expertise.

Contribution to the Arqus Living Lab Legacy

Beyond individual outputs and activities, the CChSD Cluster contributed to an Alliance-wide community connecting sustainability, climate resilience and One Health. The educational partnerships, interdisciplinary contacts, stakeholder relationships and collaborative practices developed during the project provide a foundation for continued cooperation within the future Academic Hub framework.

The cluster's main legacy lies not only in the number of completed activities, but also in the pathways created from teaching to continued educational cooperation, from scientific exchange to more focused research collaboration, and from project-based engagement to broader inter-institutional networks. Finally, its pioneering work in the field of One Health contributed to the emergence of a new Academic Hub for the long-term strategy of the alliance, while climate resilience and sustainable development remain flagship initiatives of Arqus.

3.6. Lessons Learned

The implementation of the Climate Change and Sustainable Development Cluster provided valuable insights into the development of interdisciplinary, challenge-based and stakeholder-oriented activities within a European university alliance. The experience confirmed that complex challenges such as climate change, biodiversity loss, environmental health and sustainable resource use require cooperation across disciplines, institutions and sectors. Initiatives combining complementary areas of expertise created broader opportunities for knowledge exchange and the development of educational and collaborative responses than activities confined to a single disciplinary perspective.

Challenge-based and project-oriented formats proved particularly useful for connecting education with practical environmental and societal issues. The CBL-BIPs and other intensive educational activities combined research-based knowledge with international teamwork, mobility, practical assignments and student-led outputs. Available qualitative feedback and continued participation indicated that students valued opportunities to collaborate internationally and apply knowledge to

defined challenges. However, future activities would benefit from a common and proportionate approach to collecting participant feedback and documenting learning outcomes.

The One Health approach provided an effective framework for connecting environmental, biological and health-related perspectives. It facilitated cooperation among participants working on infectious diseases, antimicrobial resistance, host-pathogen interactions, parasitology, vector-borne diseases and environmental determinants of health. At the same time, the cluster experience demonstrated that stakeholder involvement was most meaningful when external partners were connected to a clearly defined challenge and given an active role in the activity. Schools, public institutions, botanical gardens, civil society organisations, businesses, local producers and community actors contributed practical and contextual knowledge that complemented academic expertise.

Several activities developed into cooperation extending beyond their original scope, including continued teaching partnerships, mentoring and mobility opportunities, preparation of publications and project proposals, and emerging thematic networks. These examples demonstrate that relatively small-scale educational, networking and engagement initiatives can create pathways towards longer-term collaboration when they include recurring interaction, shared tasks and clear opportunities for follow-up. Maintaining these outcomes will require continued coordination, accessible funding mechanisms, institutional recognition and opportunities for participants to develop subsequent joint activities within the Academic Hub framework.

4. Artificial Intelligence and Digital Transformation Cluster

4.1. Objectives and Scope

The Artificial Intelligence and Digital Transformation cluster was established as one of the three thematic clusters under the overarching Arqus Living Lab. Its purpose was to bridge research and education to prepare young Europeans for existing and emerging grand societal challenges, to deepen cooperation between universities and their ecosystems, and to co-create actionable knowledge that contributes to regional and European innovation strategies. In the context of rapid digitalisation and the growing impact of artificial intelligence on all spheres of life, the cluster **connected cutting-edge research on AI and digital technologies with innovative teaching and learning formats**, equipping students, early-stage researchers, academics and professionals with the competences needed to navigate and shape these transformations in a responsible and informed manner.

Between 2022 and 2026, the cluster implemented a broad and coherent programme of activities, including **lecture series, thematic days, a challenge-based summer school, workshops, seminars, hackathons** and **thinkathons**. These formats were deliberately designed to foster interdisciplinary collaboration, enhance digital competences and promote active engagement with real-world challenges arising from AI and digitalisation.

The **thematic focus** of the cluster centred on **responsible AI, digital ethics, data science** and the **broader implications of digital transformation for education, work** and **democratic participation**, in line with the Arqus mission and vision. In the field of research and innovation, specific initiatives were launched to **co-create knowledge** and **support regional** and **European innovation strategies**. Hackathons and thinkathons provided collaborative settings in which participants from different

disciplines and sectors jointly addressed AI- and digitalisation-related challenges. Bottom-up project initiatives were encouraged, and Science and Society events linked AI and digital transformation research to public engagement and policy debates. Together, these activities strengthened cooperation within and beyond the alliance and fostered innovation that was both scientifically grounded and societally relevant.

Within the four years, the cluster effectively bridged research and education, deepened collaboration between universities and their ecosystems, and generated new actionable knowledge in the field of AI and digitalisation. In doing so, it advanced Arqus priorities related to digital transformation, responsible innovation, inclusion, participation and research collaboration, and supported the development of the Academic Hub Responsible Artificial Intelligence and Digital Transformation within the alliance.

4.2. Participation and Community Building

The Artificial Intelligence and Digital Transformation cluster was conceived as a participatory endeavour that would create a shared community across Arqus universities and their wider ecosystems. To this end, it brought together senior and junior academics, students, alumni and university professional staff from Arqus universities and other Higher Education Institutions across Europe with external stakeholders, such as businesses and industry partners, local and regional authorities, NGOs and other civil society organisations.

Within different initiatives and formats these actors jointly developed shared understanding of complex challenges posed by artificial intelligence and digital transformation and of their interrelations with sustainability and European identity.

Community building was further supported by contributing to the development of cross-cutting tools such the Arqus Partnering Platform and conceptual work towards an Interdisciplinary Virtual Lab, which aim to facilitate ongoing exchange across institutions and sectors in the future.

Through this combination of inclusive participation formats and sustained collaboration, the cluster strengthened the Arqus community around AI and digital transformation and helped the universities and the Alliance to act as role models in addressing societal challenges in this field.

4.3. Activities Implemented

As mentioned in the previous section, the cluster implemented a total of 21 initiatives. The following chapter provides a more detailed description of selected initiatives and activities.

Transdisciplinary Innovation Activities

Under the cluster, two challenge-based, innovative initiatives were implemented to promote interdisciplinary collaboration and community engagement around AI-related challenges: the **thinkathon "AI in the Hot Seat: Exploring (un)Trust, Transparency and Inclusivity"** (2023) and the Arqus Hackathon Series (2024).

The 2023 thinkathon at the University of Graz brought together around 20 participants from academia and professional domains to critically examine the trustworthiness, transparency and inclusivity of AI systems. Organised in collaboration with the Interdisciplinary Digital Lab (IDea_Lab), the event combined thought experiments on dystopian AI futures with thematic group discussions

on bias, fairness, ethics, human–AI collaboration and socioeconomic impact. The initiative resulted in the identification of key risks and mitigation strategies, recommendations for enhancing AI transparency and fairness, and strengthened interdisciplinary collaboration on ethical and socially responsible AI.

The **Arqus Hackathon Series (2024)** was a bottom-up initiative funded through the Arqus Innovation Fund. The format provided a structured, four-week, challenge-based environment for 26 participants from five Arqus universities to co-create practical solutions to institutional and societal issues related to AI literacy, digital transformation, sustainability and societal engagement. The hackathons followed a four-phase structure: kick-off and team formation, virtual development work, preparation of final solutions and presentations, and a closing event with jury evaluation and awards. Supported by digital platforms such as Moodle and SPOT Virtual/Makerspace, participants gained hands-on experience in virtual teamwork, creative problem-solving and interdisciplinary collaboration. The **winning project**, **"Human Library in a Virtual World"**, demonstrated the potential of digital storytelling and virtual environments for inclusivity and knowledge-sharing and successfully applied to the Arqus Innovation Fund 2025.





Left: co-leads Lea Pesec and Imme Petersen at the Thinkathon (2023); right: news on Arqus Hackathon winner project (2024)

Joint Teaching Activities

The cluster implemented a set of joint teaching activities to integrate frontier AI and digitalisation topics into interdisciplinary, international learning environments and to strengthen collaboration across Arqus partner universities.

A flagship initiative was the **Artificial Intelligence and Digital Transformation Challenge-Based Summer School**, hosted at the University of Graz from 7 to 13 July 2025. Following a joint call that attracted **92 applications** and 32 PhD students (34 were selected) from eight Arqus universities participated on-site, together with academic mentors from the universities Granada, Graz and Maynooth, external experts from IBM Research, Know-Center and AI-Driven Therapeutics and administrative staff. The summer school employed a challenge-based methodology, combining fundamentals lectures, thematic seminars, guest talks and interactive group work. Participants developed competencies in ethical and responsible AI, data analysis and visualisation with no-code tools, interdisciplinary problem-solving, and communication and dissemination through collaborative teamwork and poster presentations. The programme also included visits to the Graz Museum and the university's innovation hub Unicorn, linking academic learning with broader societal and innovation contexts. The activity contributed to building a network of early-career researchers and educators committed to responsible AI and laid the groundwork for future joint

teaching and research initiatives across the alliance. As part of the programme, the summer school included a student poster session, in which participants presented the results of their challenge-based group projects. This format enabled them to consolidate their learning, practise academic communication in an international setting and receive feedback from peers and mentors. The posters have been made available to the wider Arqus community, providing reusable teaching and dissemination materials and showcasing concrete examples of how responsible AI and digital transformation can be addressed through joint, interdisciplinary learning activities.

These efforts were complemented by **Arqus Thematic Days** embedded in existing international summer schools, which allowed Arqus and the Living Lab to reach wider and more diverse student communities. At the Graz International Summer School Seggau (GUSEGG), dedicated Arqus Days in 2025 and 2026 integrated AI and digital transformation topics into broader programmes on time, transition, risks and change. Lectures and discussions addressed digitalisation and AI as academic and societal challenges, strengthened dialogue between humanities, social sciences and technology-related disciplines, and enhanced AI literacy and critical thinking among over 60 participants in each edition. In parallel, an Arqus session at the "Data, Democracy & the New Social Fabric" Summer School (September 2025) focused on democracy as a complex system and on the digital public sphere. Through lectures combining theoretical and computational perspectives, hands-on Python tutorials and ethical reflection on data governance and algorithmic infrastructures, 26 PhD students and accompanying staff (35 people in total) gained analytical and ethical competencies related to data, democracy and AI.

These activities promoted interdisciplinary collaboration, advanced responsible AI and digital transformation education, and strengthened the visibility and sustainability of Arqus teaching networks across European and international higher education contexts.



Left: Arqus Challenge-based Summer School on AI and DT (2025); right: Arqus Thematic Day at GUSEGG (2025)

Science and Society Events

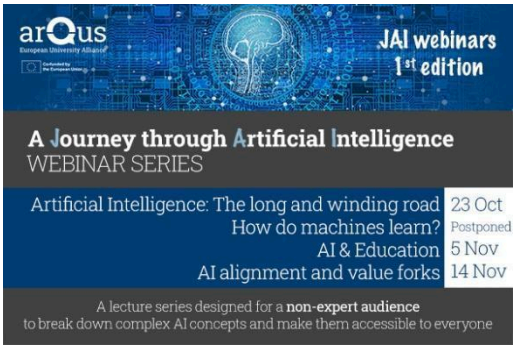
To promote AI literacy, stimulate public debate and support the responsible integration of AI into academic and societal contexts the cluster organised a series of science and society events.

A central pillar of these activities was the **JAI Lecture Series**, a hybrid webinar programme designed explicitly for a non-expert, general public audience. Across several editions from 2024 to 2026, the series attracted 763 registered participants and reached approximately **19,000 views on YouTube** (as of September 2026). Lectures were delivered by experts from Arqus partner universities

Granada, Graz, Leipzig, Lyon 1, Padua and Wrocław, covering a broad range of topics including the historical development of AI, machine learning fundamentals, AI in education, value alignment and ethics, explainable AI, AI and creativity in music, AI and cybersecurity, large language models and chatbots, responsible AI, and the mathematical foundations of generative AI in imaging. By breaking down complex technical and ethical issues into accessible formats, the JAI series helped build AI literacy among citizens, encouraged critical reflection about the societal implications of AI, and strengthened the visibility of Arqus as a key actor in public engagement on digital transformation.

In addition to this outreach-oriented format, the online event **"Exploring AI in Academia: Practical Applications and Best Practices"** targeted students, early-stage researchers, academics, professionals and external stakeholders, bringing together 219 participants in total. Through expert talks, interactive discussions and hands-on demonstrations, including the use of AI-powered tools for exam preparation, the event examined how AI is reshaping teaching, learning, research and professional practice in higher education. Contributions from researchers at four Arqus universities (Granada, Graz, Maynooth, Padua), experts from two companies and a medical university provided diverse disciplinary and sectoral perspectives on opportunities, risks and ethical challenges. The initiative fostered interdisciplinary collaboration, enhanced AI literacy in academic communities and offered concrete guidance on responsible and inclusive AI use in universities.

These formats contributed significantly to the Arqus Alliance's mission of linking science with society, advancing innovation and digital transformation while promoting ethical awareness and public engagement around artificial intelligence and its broader societal impact.





Left: news on first edition of the JAI Lecture Series (2024); right: news on the event Exploring AI in Academia (2026)

4.4. Outputs, Materials and Resources Generated

Across the 21 initiatives implemented under the Artificial Intelligence and Digital Transformation cluster, a **diverse set of outputs** was generated that will continue to **support network and community building**, **sustainable teaching and learning**, **scientific exchange** and **knowledge sharing** and **outreach** within and beyond the Arqus Alliance.

From the transdisciplinary innovation activities, such as the thinkathon and hackathon, the cluster produced **conceptual frameworks** and **recommendations** on AI trustworthiness, transparency, bias mitigation and responsible deployment, which are documented in internal reports and presentations and shared among participating partners. The hackathon project outputs, most notably the "Human Library in a Virtual World" concept, provide **concrete examples of inclusive and community-oriented uses of digital technologies** and have informed further collaboration through

an application to the Arqus Innovation Fund 2025. These materials not only support continued scientific discussion on ethical and socially responsible AI but also serve as catalysts for new networks among students, researchers and external stakeholders.

The joint teaching activities led to the development of a **challenge-based summer school curriculum** comprising lecture outlines, seminar materials and guest talk inputs and to the development of a **framework for thematic days** implemented in existing summer schools. These elements are reusable across Arqus institutions and thus contribute to sustainable teaching and learning offers in the field of AI and digital transformation. A set of **student posters** from the summer school group projects has been made available to the wider Arqus community; these posters function as tangible teaching resources and dissemination tools, showcasing how responsible AI can be addressed through joint, interdisciplinary learning. These multi-day events enabled intensive collaboration between students and academics from different disciplines and across universities. This created opportunities for scientific exchange and cooperation that extend beyond the events themselves and pave the way for long-term collaborations and knowledge-exchange.



Student posters by Iva-Nicole Mavrlja (left) and Maria Expósito Becerro (right)

The Science and Society events generated a substantial outreach-oriented resource base. The JAI Lecture Series produced an **extensive archive of recorded webinars**, publicly accessible on the Arqus YouTube channel and already **viewed** approximately **19.000 times**. This collection offers a long-term, scalable instrument for AI literacy, reaching international audiences and supporting Arqus' role in engaging citizens in debates on digital transformation. The online event "Exploring AI in Academia: Practical Applications and Best Practices" added practical guidance, best-practice examples and tool demonstrations on the use of AI in higher education, documented and shared within the alliance as reference material for institutional strategies, staff training and policy development.

4.5. Tangible Outcomes and Impact

Strategic Contribution and Overall Impact

The initiatives implemented within the Cluster Artificial Intelligence and Digital Transformation have led to a range of tangible outcomes that substantially advance the objectives of the Living Lab. By creating spaces for open, interdisciplinary and international exchange on key issues in artificial intelligence and digital transformation, the formats have strengthened core values such as democracy, diversity, academic freedom and the responsible production and dissemination of knowledge. Overall, the cluster has translated the Living Lab's strategic goals into concrete outputs – tools, networks, formats and knowledge resources – that will continue to support responsible, inclusive and innovative approaches to AI and digital transformation within the Arqus Alliance and beyond.

Knowledge Creation and Innovation

New formats such as transdisciplinary thinkathons and hackathons have produced concrete solution concepts and recommendations on responsible AI, while at the same time creating platforms for collaboration between students, researchers, staff and external stakeholders. Across the cluster, innovative practices and pilot formats were developed that can be adapted, further developed or scaled up, thereby offering transferable models for future collaboration between universities and external partners. The formats provided accessible platforms for critical reflection, collaborative learning and co-creation of knowledge, aligning with the Living Lab's vision of higher education as a public good and a driver of sustainable societal progress. This has supported the emergence of research-driven, innovative approaches to societal challenges.

Sustainable Teaching, Learning and Open Resources

Joint teaching activities, including challenge-based summer schools and thematic days embedded in existing programmes, have resulted in reusable curricula, teaching resources and open educational materials that can be adapted and scaled across Arqus universities. The science and society events have expanded the Living Lab's reach beyond the academic community, building AI literacy among diverse audiences and positioning Arqus as a visible actor in public debates on digital transformation. The recorded lectures and best-practice examples generated through these activities provide a growing pool of accessible resources that underpin lifelong learning and evidence-based institutional development. By making many of these resources and outcomes openly accessible, the cluster has extended its impact beyond the immediate academic context and fostered public engagement.

Community Building and Networking

A key achievement lies in the sustained networking effect: the initiatives brought together participants from different disciplines, institutions and countries, reinforcing interdisciplinary and cross-sector cooperation and enabling closer, more durable communities of practice. These multi-day, international formats have enabled intensive collaboration across disciplines and institutions, laying the groundwork for long-term partnerships and joint projects. This has promoted intercultural competence and global understanding and encouraged barrier-free cooperation in addressing complex issues at the intersection of technology and society.

Exemplary Impact: From Hackathon to "Human Chapters"

A particularly illustrative example of impact is the Arqus Hackathon Series and the follow-up project "Human Chapters". In the hackathon, interdisciplinary teams from five Arqus universities co-developed practical solutions to real-world challenges at the intersection of AI, digital transformation and societal engagement. The winning idea, initially conceived as "Human Library in a Virtual World", has since evolved into "Human Chapters", a series of online events on diversity in higher education funded by the Arqus Innovation Fund. This trajectory from a time-limited hackathon to a funded, ongoing inter-university initiative shows how challenge-based formats in Arqus can generate sustainable outcomes: they stimulate creativity and collaboration in the short term and lead to enduring, student-led projects that promote inclusion, cross-cultural dialogue and community building across the alliance.

4.6. Lessons Learned

Challenge-based and Transdisciplinary Formats Generate Sustainable Impact and Engagement

Challenge-based formats such as thinkathons, hackathons, summer schools and thematic days proved particularly effective in creating practically relevant solutions and triggering long-term initiatives. Moreover, as already highlighted in the section on Climate Change and Sustainable Development, challenge-based formats not only enhance sustainable impact but also increase student engagement. The pathway from the hackathon concept to the funded, student-led follow-up project "Human Chapters" exemplifies both dimensions: it shows how strongly students can be motivated and empowered to take ownership of ideas, and how time-limited activities can evolve into sustained, inter-university collaborations when clear follow-up opportunities are in place. In this process, interdisciplinary, multi-role teams substantially increased the innovation potential and the likelihood of continuation.

Network and Community Building Are Central Drivers of Impact

Multi-day, international formats created strong and lasting networks, bringing together participants from different disciplines, institutions and countries and fostering communities of practice. These networks supported long-term collaboration, including joint projects and cross-sector partnerships, and proved to be a core outcome in their own right rather than a by-product of the activities.

Open and Reusable Resources Amplify Reach and Sustainability

Many activities generated reusable outputs such as lecture recordings, teaching materials, posters and best-practice documents, often made available as open educational resources. These materials extended the impact well beyond the immediate events by enabling adaptation and scaling across Arqus universities, supporting lifelong learning and providing assets for institutional development.

Science–Society Formats Are Powerful Levers for AI Literacy and Visibility

Science and society activities, notably the JAI Lecture Series, demonstrated that accessible, well-designed formats can significantly enhance AI literacy among diverse audiences and raise the public profile of the alliance. By addressing ethical and societal dimensions of AI in an

understandable way, these activities strengthened Arqus' position as a visible and credible actor in debates on digital transformation.

Interdisciplinarity and Diversity Are Key Innovation Drivers

The formats showed that interdisciplinarity and diversity are essential drivers of innovation in the field of AI and digital transformation. Combining different disciplinary and cultural perspectives led to more reflective and responsible solutions, while initiatives focused on diversity in higher education highlighted the importance of embedding diversity not only as a topic but also as a design principle of the activities themselves.

Stronger Integration of Practice Partners

The activities suggest that more systematic involvement of practice partners (such as companies, NGOs and public administrations) can significantly enhance the real-world relevance and societal transfer of outcomes. Practice partners bring concrete challenges, contextual expertise and implementation capacity that complement academic perspectives and help translate results into practice. Designing formats with clear, long-term roles for these actors—beyond ad hoc participation—would strengthen application orientation, deepen societal impact and create mutual benefit for all stakeholders involved.

5. European Identity and Heritage Cluster

5.1. Objectives and Scope

The European Identity and Heritage (EIH) Cluster addressed how Europe's cultural, political and social transformations shape contemporary understandings of identity, belonging and heritage across the continent and inform its position in a highly dynamic, globalizing world. It brought together expertise from the fields of history, cultural studies, anthropology, heritage studies, political science, sociology and European Studies. The cluster's thematic scope on heritage and identity this included broader humanities and social sciences perspectives on European societies.

The cluster pursued three complementary aims:

1. to explore European heritage and memory as dynamic, contested and socially embedded fields, and
2. to strengthen the study of Europe as an interdisciplinary field connecting culture, politics, society and values.
3. to provide formats for education and stakeholder engagement fostering the communication between science and society and training experts in translating insights from academic research to the application of societal challenges and vice versa.

This focus enabled the cluster to link heritage debates with broader questions of European integration, democratic resilience, skills needs and societal change.

5.2. Participation and Community Building

The cluster developed an interdisciplinary community across all Arqus universities. Academics, students and external stakeholders—including museums, cultural institutions, NGOs, employers and public authorities—participated in joint teaching activities, lecture series, challenge-based programmes and innovation events.

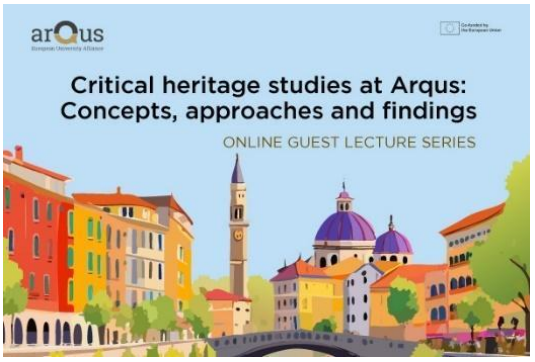
Community building was driven by activities that combined heritage analysis, European Studies perspectives, and stakeholder engagement. Programmes such as Dissonant Heritage, the Critical Heritage Studies lecture series, and the European Studies in a World in Flux thinaktons created recurring spaces for exchange between academic disciplines and societal actors.

5.3. Activities Implemented

The EIH Cluster implemented a diverse portfolio of educational, scientific and innovation activities. These included challenge-based learning programmes, lecture series, stakeholder dialogues, and joint teaching initiatives.

As a key activity the **Challenge-Based Learning Programme "Dissonant Heritage"** combined as a transdisciplinary programme online preparation, fieldwork, stakeholder engagement and student-led project work. Students analysed contested heritage sites and produced evidence-based proposals for responsible heritage interpretation. Hence, it served as innovation labs where students co-created knowledge with local communities, museums and cultural organisations. As a crucial component the Joint **Lecture Series "Critical Heritage Studies at Arqus"** addressed dissonant heritage, digitalisation of cultural heritage, tourism pressure, Jewish heritage, fascist architecture and ethics of humiliation. Its recordings were published as OERs.





As dynamic stakeholder-oriented events, the **thinkatons "European Studies in a World in Flux" and "What Skills Do Students Need in a Fast-Changing World?"** connected students with employers, cultural institutions and societal actors. These formats addressed skills needs, labour-market expectations and the evolving role of humanities and social sciences in European societies in fast changing global contexts.






Left: Participants of thinkaton in 2024; middle: announcement of thinkaton 2025, right: roundtable discussion during thinkaton 2025

Outputs, Materials and Resources Generated

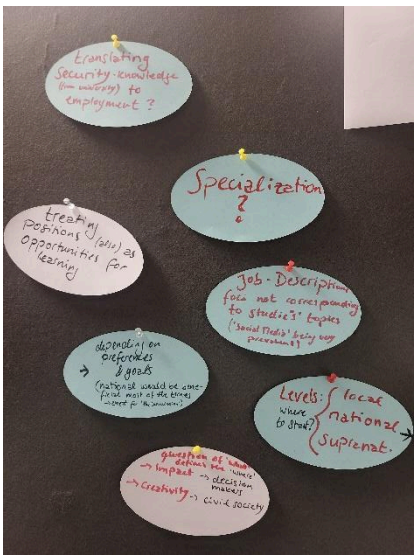
The cluster generated a wide range of teaching materials, including syllabi, reading collections, maps, case studies, digital exhibitions and recorded lecture series.

The cluster produced:

- digital teaching kits for CBL programmes (fieldwork guidelines, case study templates);
- joint syllabi aligning learning outcomes across universities in heritage and European Studies;
- digital exhibitions (e.g., Palazzo Liviano: Art, Memory and Critical Responsibility);
- Open Educational Resources (OERs) e.g. through the Critical Heritage Studies lecture series;
- Student-oriented materials such as maps, video clips and methodological guides for critical heritage and European studies.

These materials were stored either in Moodle environments or openly in the Arqus Repository, ensuring long-term accessibility and reuse across the Alliance.





Left: Announcement to online lecture series and stream (2025/2026); right: Brainstorming matrial during thinkaton 2025 which was basis for the creation of student information guides.

5.4. Tangible Outcomes and Impact

The EIH Cluster contributed to strengthening interdisciplinary Critical heritage studies, developing innovative teaching formats and connecting universities with cultural institutions and societal actors. It also advanced social sciences and humanities concerned with Europe as an interdisciplinary and international field by linking academic knowledge with labour-market needs and societal debates.

Key impacts include:

- **Sustainable teaching formats:** The CBL programme "Dissonant Heritage" established a replicable model for challenge-based Critical Heritage Studies and European Studies education.
- **Strengthened networks:** Collaboration with museums, cultural organisations, national and international political organizations, employers and public authorities expanded the cluster's societal reach.
- **Enhanced digital literacy in the social sciences and humanities:** Through digital exhibitions, lecture recordings and methodological toolkits, the cluster advanced digital competences for students and academics alike.
- **Labour-market relevance:** Stakeholder dialogues clarified skills needed in fields such as cultural management, public administration, NGOs, journalism and European institutions.
- **Research innovation:** Activities stimulated new research collaborations on contested heritage, memory politics, European values, democratic resilience and digital heritage practices.

5.5. Lessons Learned

The cluster identified several lessons relevant for future Academic Hubs:

- **Challenge-based learning is highly effective** for social sciences and humanities programmes concerned with Europe, enabling students to engage with real societal debates.
- **Interdisciplinarity is essential**, as Heritage and European identity questions always intersect with politics, history, sociology, cultural studies or digital humanities.
- **Academic cooperation is the basis for setting innovative and effective thematic priorities.** This, in turn, requires reliable communication, sustainable community building over time and will lead to follow-up initiatives inteaching and research.
- **Stakeholder involvement increases relevance and can help foster innovation**, particularly when addressing contested heritage issues, global challenges or labour-market expectations.
- **Digital formats expand reach and accessibility**, especially for lecture series and joint courses. Hybrid formats can effectively combine broad accessibility with focused community building and in-depth engagement, but need to be carefully moderated and prepared.
- **Joint teaching materials require clear coordination**, shared standards and continuous refinement.

6. Cross-Cluster Insights and Strategic Outcomes

The implementation of the Arqus Living Lab generated added value beyond the activities and outcomes of its individual thematic clusters. The Living Lab provided a common framework for connecting interdisciplinary communities, testing collaborative educational and innovation formats, involving external stakeholders and developing cooperation across institutional and thematic boundaries.

The CChSD, AIDT and EIH Clusters differed in their thematic scope, participating communities and activity formats, but followed several common implementation principles. They combined bottom-up initiative development with Alliance-level coordination, used interdisciplinary and challenge-based approaches, connected online cooperation with face-to-face activities and created opportunities for students, academics, professional staff and external stakeholders to contribute to different roles.

Across the three thematic areas, the Living Lab progressed from the establishment of structures and communities towards the implementation of joint activities, generation of educational and dissemination resources, and development of cooperation extending beyond individual events. This progression addressed the need to demonstrate more clearly the composition of the Living Lab, stakeholder participation, concrete outputs and measurable outcomes.

6.1. Building Interdisciplinary Communities Across Arqus

Community building was a central outcome of the Living Lab. Rather than operating through fixed membership structures, the clusters developed evolving communities in which participants became involved according to their expertise, interests and institutional capacity. Regular meetings, shared planning processes, educational activities, scientific events, public engagement initiatives and projects funded by the Arqus Innovation Fund provided recurring opportunities for interaction and cooperation.

The Living Lab engaged participants at different academic and professional stages. Students contributed through courses, intensive programmes, international teams, fieldwork, challenge-based projects, student forums and dissemination activities. Doctoral candidates and early-stage researchers gained opportunities for networking, mobility, mentoring and interaction with experts from other institutions. Academic staff participated as coordinators, teachers, mentors, speakers, facilitators, co-designers and research or innovation contributors. Professional staff supported coordination, organisation, communication and programme implementation.

Community building and academic cooperation in all three clusters was fostered through joint teaching, interdisciplinary events, and challenge-based activities such as seminar cycles, lecture series, thematic days, thinkathons and seasonal schools. These formats connected students, academics, researchers and external stakeholders across Arqus universities and supported international, interdisciplinary exchange.

CChSD activities centred on climate resilience, biodiversity, environmental health, sustainable food systems and other environmental and societal challenges. One Health initiatives, sustainability projects and scientific exchange inspired new communities or teaching, research and stakeholder engagement. AIDT created interdisciplinary communities around responsible AI, digital transformation, ethics and education through public events, hackathons, thinkathons, thematic days, online lectures and the Challenge-Based Summer School, combining intensive cooperation with formats accessible to broad audiences. EIH brought together lecturers, students, researchers and stakeholders around European identity, cultural heritage and contested histories through

seasonal schools, thematic days and thinkatons, conferences and challenge-based formats, strengthening international and interdisciplinary collaboration across several Arqus universities.

External stakeholder engagement reflected the thematic profile of each cluster. CChSD collaborated with public institutions, schools, botanical gardens, civil society organisations, businesses, local producers and community actors. AIDT involved representatives of business, industry, public administration, higher education and civil society. EIH engaged cultural institutions, national and international political organisations, EU institutions, heritage professionals and other actors concerned with representing, moderating and transmitting European histories, identities, and cultures as well as social and political projects of Europe's global positionality. In all three clusters, external participation was most meaningful when linked to a defined challenge, practical activity or specific local and institutional context.

Online and hybrid formats increased the geographical reach of the Living Lab and allowed participants from several institutions to contribute without continuous physical mobility. Face-to-face components, including intensive programmes, workshops, schools and Annual Conference meetings, supported closer interaction and more sustained cooperation. The combination of these formats became an important feature of Alliance-wide community building.

6.2. Cross-Cluster Collaboration and Added Value

Cross-cluster collaboration developed through information exchange, participation by experts from different thematic communities and activities connecting two or more thematic priorities. The co-leads supported this process by sharing proposals, identifying relevant expertise and connecting potential partners.

The strongest collaborations developed around clearly defined themes and projects, driven by strategic and academic interests by the members of the Lab rather than general invitations to cooperate. Connections between CChSD and AIDT were visible in activities combining sustainability challenges with digital transformation, artificial intelligence, climate education or responsible innovation. For example, the BIP "Making the Planet a Healthier Place" connected climate change, agriculture, sustainability and digital technologies.

Cooperation between AIDT and EIH developed around the impacts of digital transformation on democracy, culture, participation and the interpretation of heritage. Digital humanities, ethical uses of artificial intelligence, the digital public sphere and the social consequences of new technologies created natural areas of overlap between these clusters. This was e.g. reflected and worked upon in the thinkathons, the Hackathon series and the thematic days, given the highly dynamic nature of the field.

Connections between CChSD and EIH concerned the relationships between sustainability, cultural landscapes, natural and cultural heritage, local communities and European identity. The project "Arqus Verde: Connecting Botanical Gardens for Europe's Biodiversity and Cultural Heritage" is a clear example of an initiative linking biodiversity conservation and climate adaptation with the cultural and educational roles of botanical gardens.

Some activities incorporated all three thematic perspectives by connecting environmental or technological change with social responsibility, inclusion, democratic participation and European

values. The Twin/Triplet Transition approach provided a mechanism for identifying such activities and recognising initiatives that crossed the original cluster boundaries.

The degree of integration varied. Some activities were designed from the outset around two or three thematic priorities of the respective clusters. Others remained primarily associated with one cluster but incorporated speakers, participants, methods or perspectives from another. Cross-cluster cooperation should therefore be understood as a continuum ranging from information exchange and mutual participation to jointly designed activities and outputs.

The added value of this cooperation lay in broadening the expertise available to individual initiatives and connecting societal challenges that could not be addressed adequately within a single thematic area. It also provided practical experience for future cooperation among the Academic Hubs.

A crucial role played the regular exchange between the cluster co-leads to identify potentials for cross-cluster cooperation and dissemination across the disciplinary communities.

6.3. Contribution to WP02 Objectives

The activities and outcomes of the three clusters contributed to the overarching objectives of bridging research and education, strengthening cooperation between universities and their ecosystems, and co-creating actionable knowledge relevant to societal challenges and innovation.

6.3.1. Bridging Research and Education

All three clusters translated academic knowledge and current research perspectives into educational formats involving international and interdisciplinary participation.

CChSD implemented CBL-BIPs, Erasmus+ BIPs, seminar cycles, workshops and student-led activities in climate change, sustainability and One Health. AIDT and EIH implemented Challenge-Based Summer Schools, thematic days, lecture series, hackathons and other activities connecting research with education and public contemporary debates on AI, identity, heritage, memory and the dealing with contested histories across Europe.

These formats enabled students to engage with current scientific, cultural and societal questions, work in interdisciplinary and international teams, and generate outputs such as reports, project concepts, fieldwork analyses, posters, presentations and public-facing materials. Academic staff gained experience in jointly developing and delivering teaching across institutional and disciplinary boundaries.

The Living Lab therefore bridged research and education by incorporating current knowledge, research methods and specialist expertise into shared educational and challenge-based environments.

6.3.2. Strengthening Cooperation Between Universities and Their Ecosystems

The three clusters involved external actors whose expertise complemented university-based knowledge.

CChSD involved schools, public institutions, botanical gardens, NGOs, businesses, producers and local communities. AIDT engaged companies, industry partners, public administration, higher education institutions, civil society organisations and professionals in the field of artificial

intelligence and digital transformation. EIH developed connections with cultural and heritage organisations, national and international political organizations including EU agencies, practitioners and public audiences concerned with European identity, memory and cultural heritage.

Stakeholder participation ranged from attendance at public events to contributions as speakers, mentors, workshop participants, professional experts and partners in challenge-based activities. The strongest examples involved clearly defined contexts in which external actors could contribute specialist, professional or locally grounded knowledge.

The clusters frequently built on relationships already established by the partner universities within their regional ecosystems. This allowed Arqus activities to connect with existing communities and institutional partnerships rather than creating separate stakeholder structures for each initiative. On the other hand, the expansion of international networks and stakeholder engagement as driven by the Living Lab fostered local initiatives and spurred academic and institutional innovation.

6.3.3. Co-Creating Actionable Knowledge and Supporting Innovation

Challenge-based activities, bottom-up projects, thinkathons, hackathons, seasonal schools and interdisciplinary workshops created opportunities to develop knowledge, concepts and responses addressing defined challenges.

In CChSD, outputs included student research reports, spatial development concepts, climate education materials, biodiversity resources and collaborative approaches to food systems, tourism, water management and critical raw materials. Scientific exchange also led to mentoring, mobility, publication preparation and further project development.

In AIDT, activities generated recommendations and solution concepts concerning responsible AI, transparency, inclusivity and digital participation. The progression from the Hackathon Series to the funded Human Chapters initiative demonstrates how a time-limited activity could lead to a continuing inter-university project. Moreover, the recordings of the JAI Lecture Series have created accessible sources of information on AIDT for a broad public audience, introducing the topic in an approachable way to people without specialist knowledge.

In EIH, challenge-based and teaching activities explored the interpretation and communication of European heritage, including difficult and contested dimensions of the past. Lecture series, seasonal schools and collaborative formats supported critical reflection and produced educational, conceptual and dissemination outputs for academic and wider audiences.

Across WP02, actionable knowledge included not only formal publications or technological products, but also educational resources, practical concepts, collaborative methodologies, recommendations, student outputs and new pathways for inter-institutional cooperation.

6.4. From Activities to Deliverables

The WP02 deliverables reflected interconnected strands of Living Lab activity. Individual initiatives frequently contributed to more than one deliverable by combining teaching, innovation, stakeholder engagement, sustainability, inclusion and cross-cluster cooperation.

D02.2, the Arqus Partnering Platform, provided digital infrastructure intended to support the visibility of expertise, projects and collaboration opportunities. The platform became operational and publicly accessible, although systematic usage data were not available at the time of reporting.

D02.3, the Joint Final Report on Transdisciplinary Innovation Activities, brought together activities in which interdisciplinary and selected transdisciplinary approaches were used to address societal and institutional challenges. Examples included thinkathons, hackathons, bottom-up initiatives funded by the Arqus Innovation Fund, project-based workshops and activities involving societal actors.

D02.4, the Joint Final Report on the Promotion of Sustainable and Inclusive Policies, drew on evidence from all three clusters concerning environmental sustainability, responsible AI, inclusion, participation, democratic values, heritage and engagement with external stakeholders.

D02.5, the Summary Report on Joint Teaching Activities, consolidated evidence from CBL-BIPs, Erasmus+ BIPs, seasonal schools, thematic days, lecture series, seminars and other shared educational formats developed across the three clusters.

D02.6, Jointly Developed Teaching Materials, documented educational resources produced through these activities, including teaching materials, recorded lectures, student outputs, assignments, presentations and other reusable resources.

D02.7, the Joint Final Report on Responsible Twin/Triplet Transition Initiatives, identified activities connecting at least two thematic priorities. It demonstrated how cross-cluster cooperation emerged through both structured WP02 processes and bottom-up initiatives.

D02.8, Recommendations for the Interdisciplinary Arqus Virtual Lab Initiative, provided conceptual recommendations for digital and interdisciplinary cooperation based on experience gained through the Living Lab and other Arqus structures.

The relationship between activities and deliverables was not linear. One activity could contribute evidence to several deliverables. A challenge-based programme, for example, could simultaneously support joint teaching, generate educational materials, involve external stakeholders, promote inclusive participation and connect more than one thematic priority.

The deliverables should therefore be read as complementary perspectives on the implementation of WP02 rather than as separate portfolios of unrelated activities.

6.5. Main Cross-Cluster Lessons Learned

The experience of the three clusters indicates that interdisciplinary cooperation is most effective when organised around a clearly defined challenge, activity or expected output. Broad thematic networks are valuable for identifying expertise, but sustained cooperation generally requires a concrete incentive for participants to work together, which included opportunities for scholarly innovation, the strengthening and expansion of international and stakeholder networks, for sustainable and strategic institutionalization and the availability of appropriate funding for the additional workload.

Challenge-based formats were useful for connecting education with societal, environmental, technological and cultural issues. They enabled students to participate actively, supported

teamwork across disciplines and institutions, and generated outputs that could be communicated or developed further. Their longer-term value was greatest when activities included opportunities for continuation through further teaching, funding, mobility, mentoring or project development.

Interdisciplinary and transdisciplinary activities should be distinguished. Many initiatives successfully connected several academic disciplines, but not all involved external stakeholders in defining challenges or co-creating responses. The strongest transdisciplinary activities assigned substantive roles to external actors and incorporated their professional, cultural or contextual knowledge into the activity.

Community building required continuity. Regular meetings, accessible shared documentation, face-to-face interaction, practical coordination support and funding opportunities helped maintain participation across institutions. Differences in institutional procedures, staff capacity, academic calendars and access to mobility funding could limit participation and the continuation of activities.

The clusters also demonstrated the value of combining online reach with more intensive interactive formats. Public lectures and recorded resources increased accessibility and visibility, while workshops, schools, hackathons, fieldwork and project-based activities enabled deeper engagement and collaborative work. Hybrid formats proved to be challenging, but with sufficient technical and communicative care they could help to expand fair access, while allowing for intensive engagement in smaller online or on-site groups when necessary.

The implementation experience highlighted the need to distinguish activities, outputs and outcomes. Organising an event is an activity, producing a report, teaching resource or project concept is an output, and continued cooperation, further use of a resource or development of a subsequent initiative represents an outcome.

Finally, monitoring procedures should be established before activities begin. Differences in participant categories, treatment of registrations and attendance, identification of stakeholder organisations and recording of follow-up outcomes limited comparability across the clusters. Future initiatives would benefit from a shared but proportionate approach to participation data, qualitative feedback, outputs and evidence of continued cooperation.

6.6. Contribution to the Future Academic Hubs

The Living Lab provided practical experience for the transition towards the Academic Hub model. It demonstrated how broad thematic communities can combine bottom-up initiative development with Alliance-level coordination and how educational, scientific, innovation and societal engagement activities can operate within a shared framework.

The CChSD Cluster provides a foundation for continued cooperation in climate resilience and sustainable development. Its activities established educational partnerships, interdisciplinary contacts and stakeholder relationships in climate education, biodiversity, sustainable resource use, environmental health and One Health. The vibrant community in Arqus around this latter thematic field is reflected in the establishment of a new Academic Hub focussing on health and expanding the international and interdisciplinary cooperation around this key challenge.

The AIDT Cluster provides a foundation for continued cooperation in responsible artificial intelligence and digital transformation. Its educational, innovation and Science and Society activities generated collaborative formats, public resources and networks addressing AI literacy, ethics,

transparency, inclusion and the societal implications of digital technologies. Its insights have demonstrated, how necessary the focus on "responsible" AI is, which is now reflected in the adjusted focus of the respective Academic Hub.

The EIH Cluster provides a foundation for future cooperation in Arqus concerning Europe's identity, heritage, and culture as well as its role in addressing contemporary global challenges. Simultaneously, it revealed the relevance of interdisciplinary cooperation across the social sciences and humanities concerned with Europe in Arqus more broadly. Its seasonal schools, lecture series, forums and challenge-based activities created educational experience and networks relevant to cultural heritage, critical reflection on European history, democratic participation and engagement with cultural and societal actors. These insights are reflected in the thematic adjustment of the Academic Hub "Europe as a Global Actor".

The experience of the three clusters also points to the importance of cooperation between future Academic Hubs. One Health connects climate resilience, environmental change and sustainable health. Artificial intelligence and digital tools are relevant to climate research, cultural heritage, education, public participation and responsible innovation. Sustainability relates to governance, identity, cultural landscapes and Europe's global role. Heritage and identity provide essential cultural and societal perspectives for understanding environmental and technological transitions.

The Living Lab experience suggests that the future Academic Hubs should preserve:

- thematic autonomy to develop relevant communities and activities;
- regular communication among Hub Co-Leads as mechanisms for identifying cross-Hub topics and partners;
- support for bottom-up educational and innovation initiatives;
- opportunities for students and early-stage researchers to participate actively;
- purposeful engagement of external stakeholders;
- shared procedures for monitoring participation, outputs and outcomes;
- accessible mechanisms for preserving and disseminating generated resources towards sustainable institutional effects.

The transition towards the Academic Hubs must build on the communities, successfully established formats and collaborative relationships developed within WP02 rather than treating the completion of the Living Lab as the end of these networks. At the same time, the new structure offers an opportunity to strengthen continuity, monitoring, stakeholder participation and connections between educational activities and longer-term institutional priorities.

7. Overall Evaluation and Recommendations

The Arqus Living Lab achieved its general objective of establishing an Alliance-wide framework for interdisciplinary and challenge-based cooperation in the three thematic areas of CChSD, AIDT and EIH. Over the project period, the three clusters developed distinct thematic communities, implemented educational, innovation and societal engagement activities, and generated resources and collaborative relationships that extended beyond individual events.

The Midterm Review confirmed that the Living Lab and its three initial clusters had been established, while identifying the need for clearer evidence of participation, stakeholder involvement, measurable outcomes and links between activities and support mechanisms. During the second half of the project,

greater attention was therefore given to completing planned activities, documenting participation and outputs, identifying follow-up outcomes and coordinating the preparation of the final deliverables. This turned out to be highly productive, while it had to necessarily built on the experience and practices gathered and established in the first half of the project period.

The final experience demonstrates that the Living Lab was most effective as a flexible umbrella framework. The thematic autonomy of the clusters allowed them to develop activities suited to their communities and areas of expertise, while co-lead coordination and cross-cluster cooperation maintained their connection to the common objectives of WP02.

7.1. Main Achievements

A first major achievement was the establishment of three interdisciplinary communities connecting participants from across the Arqus Alliance. The clusters involved students, academic and research staff, professional staff and external stakeholders in different roles, including coordinators, educators, mentors, expert contributors, facilitators, co-designers and participants. Online, hybrid and face-to-face formats enabled both broad participation and more intensive collaboration.

A second achievement was the development and implementation of joint educational formats. CBL-BIPs, Erasmus+ BIPs, seasonal schools, thematic days, lecture and seminar series, workshops and student-led activities connected current academic knowledge with international teamwork, mobility and challenge-based learning. These activities generated teaching materials, student projects, reports, presentations, recorded lectures and other resources that can support future educational cooperation.

A third achievement was the implementation of interdisciplinary innovation and engagement activities. Thinkathons, hackathons, Innovation Fund projects, workshops and public-facing initiatives created spaces in which participants could explore environmental, technological, cultural and societal challenges. Selected activities also involved external stakeholders whose professional or contextual knowledge complemented university-based expertise.

The Living Lab also generated tangible follow-up outcomes. In CChSD, these included continued teaching cooperation, thematic scientific groups, mentoring and mobility, preparation of a joint publication, transfer of research materials under a Material Transfer Agreement, cooperation among botanical gardens and development of further project proposals. In AIDT, the progression from the Hackathon Series to the funded Human Chapters initiative demonstrated how a time-limited activity could develop into a continuing student-led project. In EIH the CBLs, micro-credentials and initiatives in Joint M.A. programmes resulted in a sustainable academic and administrative cooperation as the foundation for further institutionalization in further joint modules, M.A. and PhD programmes.

Another achievement was the production of reusable educational and dissemination resources. Recorded lectures and webinars extended the reach of the clusters beyond direct participants, while teaching materials, student outputs, project documentation and public engagement resources created a basis for adaptation and further use.

Finally, the practical coordination model developed by the co-leads enabled the clusters to combine thematic autonomy with shared responsibility. Regular communication, joint meetings, distributed coordination of deliverables and collaboration with other Arqus structures supported implementation and final reporting.

7.2. Challenges and Areas for Improvement

The broad and flexible character of the Living Lab was valuable, but it also created challenges. During the initial implementation phase, the relationship between the overarching Living Lab and its three thematic clusters required clarification. Greater cluster autonomy improved implementation, although it also increased the need for regular communication and coordination across the thematic areas.

Participation and engagement varied among institutions and activities. Differences in staff capacity, academic calendars, internal procedures, access to mobility funding and availability of participants affected the continuity and scale of cooperation. Dependence on individual coordinators or highly engaged members also created risks for the continuation of some activities.

External stakeholder involvement was uneven. Some initiatives actively involved societal actors in workshops, fieldwork, public events or challenge-based activities, while others remained primarily academic. This, however, turned out to be also a helpful differentiation to allow for effective communication in clearly defined communities. In future activities stakeholder roles should be defined clearly at the planning stage and distinguish between attendance, expert contribution, consultation and active participation in co-design or co-creation.

The monitoring of participation and outcomes was another limitation, as it consumed additional resources. Reporting methods evolved during the project and were not applied uniformly from the beginning. Depending on the activity, figures could represent registrations, attendance instances or cumulative participation rather than unique individuals. The distinction between stakeholder representatives and stakeholder organisations was not always recorded consistently, and alumni participation was not systematically monitored.

Participant experience was documented mainly through direct comments, follow-up correspondence and evidence of continued engagement. Because a common satisfaction survey was not implemented across WP02, no aggregated satisfaction rate or systematic comparison between clusters could be produced.

The accessibility and status of generated resources also varied. Some recorded lectures and webinars were publicly available, while other teaching or project materials remained in internal working spaces or required further description and organisation before wider reuse. This distinction is, however, useful when clearly defined, allowing for innovation in emerging fields and spill-over effects at later stages.

Cross-cluster cooperation developed, but its intensity naturally differed among activities. Not only were the clusters themselves interdisciplinary, but cross-cluster cooperation increased the degree of interdisciplinarity even more. Hence, general invitations to collaborate were less effective than proposals based on a defined topic, challenge or expected output that could be clearly translated into the respective communities. Therefore, cross-cluster activities also required active facilitation, sufficient preparation time and appropriate funding or administrative support.

Finally, the sustainability of the established communities cannot depend exclusively on informal relationships or temporary project funding. Continued cooperation will require institutional recognition, coordination support, accessible funding mechanisms and opportunities to integrate successful formats into the future Academic Hubs.

7.3. Recommendations for Future Development

Based on the implementation experience, the following recommendations are proposed for the future Academic Hubs and related Alliance activities:

- **Preserve thematic autonomy within a shared coordination framework:** Each Academic Hub should be able to develop activities responding to its thematic priorities and academic community needs. Regular coordination among Hub leaders is nevertheless to be maintained to identify shared challenges, avoid fragmentation and support cross-Hub initiatives.
- **Organise interdisciplinary cooperation around clearly defined challenges and outputs:** Calls and invitations should specify the topic, intended participants, expected contribution and potential outcome that are developed in the Hubs and clearly defined and communicated as strategic priorities across the Alliance. Concrete proposals are more likely to generate active cooperation than general requests for interdisciplinary involvement.
- **Strengthen pathways from individual activities to sustainable cooperation:** Educational programmes, workshops, schools, hackathons and networking events etc. should include opportunities for follow-up, such as subsequent teaching editions, mobility, mentoring, small-scale funding, project development or integration into existing thematic networks. They should be prioritised depending on their institutional and strategic effectiveness, enhancing the profile of the Alliance.
- **Involve external stakeholders from the planning stage:** Stakeholder engagement should extend beyond event attendance wherever appropriate. External actors should be given clearly defined roles as challenge contributors, co-designers, mentors, facilitators, experts, users of outputs or partners in follow-up activities.
- **Maintain active roles for students and early-stage researchers:** Students and early-stage researchers should continue to contribute through international teamwork, challenge-based projects, forums, presentations, mentoring, mobility and student-led initiatives. Appropriate recognition and support should accompany these roles.
- **Use proportionate feedback mechanisms:** A short common set of evaluation questions should be available for educational, innovation and public engagement activities. The mechanism should be sufficiently flexible to match the format and scale of each initiative while enabling basic comparison and identification of areas for improvement.
- **Improve the organisation and accessibility of generated resources:** Materials intended for wider use should be deposited in a designated repository with appropriate titles, descriptions, authorship information, licensing and thematic metadata. Public OERs should be distinguished from internal teaching and project materials, while the latter remain a crucial achievement of the Lab's work and can result in OER expansion where academically and institutionally appropriate.
- **Provide practical support for cross-Hub and cross-Work Package cooperation:** Cooperation should be supported through shared calls, matchmaking mechanisms, small-scale funding, mobility instruments, administrative guidance and dedicated coordination time.
- **Monitor the uptake of digital cooperation tools:** The Partnering Platform and other shared digital environments should be supported by clear ownership, communication, regularly updated content and appropriate usage indicators. Their value should be assessed through actual use and resulting collaborations rather than technical availability alone.
- **Embed sustainability within institutional structures:** Successful activities should be linked, where feasible, to existing courses and programmes, mobility schemes, staff development,

research networks or institutional partnerships. Such integration can reduce dependence on individual coordinators and short-term funding.

7.4. Final Reflection

The Arqus Living Lab demonstrated the value of a flexible Alliance-wide framework for bringing together interdisciplinary communities around complex environmental, technological, cultural, political and societal challenges. Its principal contribution was not limited to the number of activities implemented. It created opportunities for participants from different universities, disciplines and sectors to develop shared educational formats and academic profile, generate resources, test collaborative approaches and establish relationships that could continue beyond individual events.

The implementation experience also showed that such cooperation requires sustained facilitation. Thematic communities need regular interaction, clearly defined opportunities, appropriate administrative and financial support, and mechanisms for preserving knowledge and maintaining participation. Flexible bottom-up development can generate relevant and innovative initiatives, but it must be accompanied by coordination, monitoring and pathways for continuation.

The transition towards the Academic Hubs provides an opportunity to consolidate the strongest elements of the Living Lab while addressing its limitations. The thematic communities, educational formats, stakeholder relationships and cross-cluster connections established within the work package offer a practical foundation for this next phase. Their continuation will depend on integrating successful practices into the longer-term structures and priorities of the Arqus Alliance.

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