Project Acronym:	COPILOT
Project Title:	Co-creating the next generation platform of PILOT and demo infrastructures, unlocking faster innovations and EU bioeconomy growth
Project Number:	101157279
Topic:	HORIZON-JU-CBE-2023-S-01
Type of Action:	HORIZON-JU-CSA

Deliverable 1.3:

REPORT ON RIS, NETWORKS AND RELATED INITIATIVES

This project is supported by the Circular Bio-based Europe Joint Undertaking and its members.

Funded by the European Union. Views and opinions expressed are however those of the author(s) and do not necessarily reflect those of the European Union or CBE JU. Neither the European Union nor the CBE JU can be held responsible for them.

Deliverable:	D1.3
Work Package:	WP1
Due Date:	28/02/2025
Submission Date:	25/02/2025
Start Date of Project:	01/06/2024
Duration of Project:	30 months
Organisation Responsible of Deliverable:	SPRING
Version:	V1.2
Status:	Final
Author name(s):	Giulia Longhi, Leonardo Gaiani
Reviewer(s):	Pauliina Tukiainen, Mateusz Kowacki, Ana Barbosa de Melo, Olga De Blas, Yang Zou
Type:	R – Report
Dissemination level:	PU – Public

Revision History

Version	Author	Date	Comments
1.0	SPRING	07/02/2025	First Draft
1.1	SPRING	19/02/2025	Integration of suggestions from reviewers
1.2	SPRING	25/02/2025	Integration of suggestions from reviewers

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Abbreviations and Acronyms

Abbreviation / Acronym	Description
COPILOT	CO-creating the next generation platform of PILOT and demo infrastructures, unlocking faster innovation and EU bioeconomy growth
PDIs	Pilot and Demo Infrastructures
BIs	BioInnovators
RIs	Research Infrastructures
TRL	Technology Readiness Levels
SMEs	Small and Medium-sized Enterprises
OITBs	Open Innovation Test Beds
ESFRI	European Strategy Forum on Research Infrastructures
SWOT	Strengths, Weaknesses, Opportunities and Threats
EDIC	European Digital Infrastructure Consortium
TA	Technical Assistance
LCA	Lyfe Cycle Assessment
IP	Intellectual Property
TEA	Technology Evaluation Assessments
POC	Proof of Concept
CMO	Contract Manufacturing Organization
CBE-JU	Circular Bio-based Europe Joint Undertaking
SRIA	Strategic Research and Innovation Agenda
EU	European Union
EC	European Commission

Executive summary

This report presents the findings from a survey conducted with Research Infrastructures (RIs) for the bioeconomy across Europe, aimed at assessing their current services, technology areas of research, and willingness to cooperate at higher TRLs with Pilot and Demo Infrastructures (PDIs), startups and SMEs. It also shows the results of a workshop conducted together with PDIs to determine needs and means to cooperate with each other, as well as how they would support the growth of the bioeconomy sector, sharing common practices and success stories.

The survey found that material technologies, fermentation and digestion and separation technologies are the most technology used by the mapped European RIs, and that they have PDIs and BioInnovators (BIs) as main targets for collaboration, which are also the main actors of the COPILOT network.

The diversity in technological expertise across RIs ensures that a broad spectrum of bioeconomy innovations can be effectively supported, while fruitful connections can be achieved through the new COPILOT database.

The workshop identified some challenges to cooperation. First, competition limits efficiency in the distribution of funds and prevent some RIs and PDIs to fully utilize their potential. Moreover, there is slowness and limited flexibility in adapting to changing circumstances in the projects. Finally, issues related to confidentiality Intellectual Property protection can also hinder collaboration.

To address these challenges, workshop participants emphasize the need for improved coordination and collaboration among RIs and PDIs to optimize resource utilization across Europe: screening scalable ideas/projects to join forces would avoid competition as well as to duplicate investments and expertise, together with training programmes.

Enhancing and developing the next-generation Pilots4U platform, which connects RIs, PDIs and BIs, is also crucial to ensure better visibility and access to up-to-date information about available facilities and their capacities.

The insights from this report will provide solid input for the development of the next-generation Pilots4U database, which will create a more interconnected and efficient network of PDIs, that will also be equipped with links to RIs available for cooperation. By maintaining accurate and updated infrastructure and service information, by strengthening collaboration and by enhancing scale-up funding access, the European bioeconomy can grow.

1 Introduction

The European bioeconomy is experiencing rapid growth, driven by the need for sustainable processes and innovative technologies that can replace fossil-based resources. Central to this growth are Pilot and Demo Infrastructures (PDIs), which serve as crucial intermediaries between laboratory-scale research and full-scale industrial production. PDIs provide the facilities, expertise, and support necessary for BioInnovators (BIs) to scale up their technologies, validate processes, and accelerate the commercialization of bio-based products. In recognition of the vital role that PDIs play in advancing the bioeconomy, the COPILOT project has been initiated to enhance collaboration and resource sharing among these infrastructures.

COPILOT aims to create a more interconnected network of PDIs to facilitate access to state-of-the-art facilities and foster innovation across Europe. As part of the COPILOT initiative, the Pilots4U project [1] was established to map and connect existing PDIs through a comprehensive database and communication platform. Pilots4U serves as a centralized resource where BIs can identify and access the facilities best suited to their scaling needs. By providing detailed information on PDIs' capabilities, capacities, and services, Pilots4U enhances transparency and encourages collaboration within the bio-based industry.

The aim is to interlink and map relevant European Strategy Forum on Research Infrastructures (ESFRI) Research Infrastructures (RIs) that are within the scope of relevant bioeconomy related technologies, aligned with the Circular Bio-based Europe Joint Undertaking (CBE-JU) Strategic Research and Innovation Agenda (SRIA) and Pilots4U database. This would allow the COPILOT database design and to enhance collaboration between RIs and PDIs. In addition, feedback about needs and means to stimulate the collaboration between RIs and PDIs and develop an efficient ecosystem to integrate RI-PDIs services will be collected to be further processed in task 1.4 Capacity and Synergy Assessment: integration access from lab to pilot.

This report details the findings from a recent survey conducted among RIs and co-creation workshop organised for RIs and PDIs. The primary objective of the survey was to map relevant RIs and initiatives at the European level, that could be part of the COPILOT platform and could cooperate with PDIs, developing an efficient ecosystem that integrates RI-PDI services.

2 Mapping of Research Infrastructures and Networks

2.1 Definitions

First, a definition of RIs was given to define the perimeter of the analysis.

[1] https://www.cbe.europa.eu/projects/pilots4u

According to the European Commission (EC) [2], RIs are facilities or (virtual) platforms that provides the scientific community with resources and services to conduct research in their respective field. These include:

- major equipment or sets of instruments;
- knowledge-related facilities such as collections;
- archives or scientific data infrastructures;
- computing systems;
- communication networks.

A RI can be further classified[3] as:

- Distributed: an organization that enables the research community to use specific facilities, resources and services that are geographically scattered;
- Single-sited: an organization that enables the research community to use specific facilities, services and resources that are geographically localized in a single site (or a few complementary sites), even though its governance may include several countries;
- Virtual: an organization that works as an e-infrastructure, providing electronic services, networks, archives, databases and databanks

Moreover, since the T1.2 required a focus on under-represented countries, a definition of those countries was given according to the definition in the "Widening Strategy" by the CBE-JU[4], leading to the following list: Bulgaria, Croatia, Cyprus, Czechia, Estonia, Greece, Hungary, Latvia, Lithuania, Malta, Poland, Portugal, Romania, Slovakia and Slovenia.

2.2 Methodology

The goal of the mapping process was to select the most relevant RIs and initiatives both at the European and national level, to be part of the COPILOT platform to cooperate with PDIs.

The ESFRI RI portfolio[5] and Open Innovation Test Beds (OITBs)[6] were considered as starting point. According to the EC, "the **European Strategy Forum on Research Infrastructures (ESFRI)** plays a key role in policymaking on Research Infrastructures in Europe. It is composed of national delegates nominated by research ministers of European Union (EU) countries and countries associated with Horizon 2020. It also includes a Commission representative. ESFRI is a self-regulated body, operating on a consensus basis and typically meets 4 times a year."[7]

First, T1.2 leader (SPRING), carried out a selection of the ones within the scope of bioeconomy related technologies, aligned with the CBE-JU SRIA and Pilots4U database. OITBs were selected through the CORDIS platform[8], using "OITB" as key word for filtering. A double check was required to task partners. Then, information on the coordinating country and technology scope of each ESFRI RI and OITBs were

[2] https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe/research-infrastructures_en
[3] https://ri-vis.eu/network/rivis/about-european-research-infrastructures
[4] https://www.cbe.europa.eu/system/files?file=2023-09/CBE-JU-widening-strategy.pdf
[5] https://ri-portfolio.esfri.eu/ri-portfolio/
[6] https://cordis.europa.eu/article/id/436434-open-innovation-test-beds-to-accelerate-european-innovation
[7] https://research-and-innovation.ec.europa.eu/strategy/strategy-research-and-innovation/our-digital-future/european-research-infrastructures/esfri_en
[8] https://cordis.europa.eu/search

added in main working tool, i.e. a spreadsheet on the project's SharePoint that all the partners have access to.

Project partners were also asked to add RIs in the framework of national roadmaps according to a distribution of work agreed as follows in Table 1.

Table 1 Distribution of work among partners for mapping Research Infrastructures

Partner	***Countries***
B4C	Austria, France, Germany, Luxemburg, Netherlands, Switzerland
VTT	Finland, Norway, Sweden, Estonia, Iceland, Latvia, Lithuania
BIOEAST	Bulgaria, Czech Republic, Hungary, Poland, Romania, Slovakia
SGZ	Slovenia, Croatia
SPRING	Italy, Portugal, Cyprus, Malta, Greece
IBF	United Kingdom, Ireland
BBEPP	Belgium
KHZ	Denmark
F+i	Spain

2.3 Creation of the recipient list for Survey

All the ESFRI RIs and OITBs previously selected by SPRING and partners were deemed relevant recipients.

Then, T1.2 leader selected the most appropriate RIs in the national roadmap to create a recipient list for the Research Infrastructure survey (Milestone No.15).

The first selection was made according to the relevance of the technology, as provided by the partners.

This step is crucial to then have a consistent recipient list that could cooperate properly with PDIs.

The second aim was reaching those RIs based in countries that were not already coordinating ESFRI RIs, with a specific focus on under-represented countries.

3 The Survey

3.1 Design

The survey, sent to the recipients list, was designed to collect information on the RIs technology areas, services and types of collaboration sought, with the aim of inviting them to be added to the new COPILOT database. It also gave visibility to the COPILOT project.

For consistency reasons, the selection of the technology areas in the survey has been made according to the one prepared for PDIs mapping in T1.1. , i.e., industrial biotechnology, mechanical separations, physicochemical, separations, chemical processing, pre-treatment, thermochemical conversion, algae cultivation and harvesting, material technologies, anaerobic digestion and pulping.

The type of collaborations proposed in the survey were mainly related to the entities that RIs could find in the COPILOT ecosystem, with the option to add more.

A Google form (https://forms.gle/kVq4QWEZAjZo8N5PA) was used to share the questionnaire and SPRING legal consultants prepared a tailor-made privacy policy for the specific information asked: participants to the survey were required to read it carefully and send it back compiled and signed to SPRING. Annex I shows the full content of the survey.

After the end of this task (M9) data will be transferred to the project coordinator (BBEPP), that will manage them from that moment onwards.

3.2 Results

The KPI of reaching 10 links from ESFRI/RIs to be included in the COPILOT platform has been met.

The entries received from the survey were 16, but we considered only 14 of them due to the following reasons:

- One RI replied twice, SPRING contacted it to ask which information to consider and the RI replied to consider the second most recent input;
- One RI asked later not to be considered anymore since bioeconomy is out of its scope nowadays, and, consequently, the possibility of contributing meaningfully would be very limited.

This is the list of Infrastructures that participated:

1. EU - OPENSCREEN[9];
2. ECCSEL ERIC[10];
3. INNPRESS-ME[11];
4. BIOMAT[12];
5. CERIC ERIC[13];
6. CircBio[14];
7. ELIXIR[15];
8. EMBRC ERIC[16];
9. ESNA[17];
10. IBISBA[18];
11. InBio[19];
12. MIRRI[20];
13. UCLouvain[21];
14. ECAC[22].

[9] https://www.eu-openscreen.eu/
[10] https://www.eccsel.org/
[11] https://www.inn-pressme.eu/
[12] https://biomat-testbed.eu/
[13] https://www.ceric-eric.eu/
[14] https://circbio.ie/
[15] https://elixir-europe.org/
[16] https://www.embrc.eu/
[17] https://esna-assoc.eu/
[18] https://ibisba.eu/
[19] https://inbio.be/
[20] https://www.mirri.org/
[21] https://www.uclouvain.be/fr
[22] https://akki.ut.ee/en/

The results of the survey offer valuable insights into the structure and focus areas of the RIs. Among the surveyed entities, the majority—12 out of 14—are distributed across multiple locations or countries, facilitating broader international collaboration. Only 2 of the RIs are single-sited, meaning they are centralized at one location. This distribution suggests a strong trend toward decentralized networks in the research community, emphasizing the importance of international collaboration and resource-sharing.

Figure 1 highlights the coordinating countries of these RIs, with 21% of them coming from underrepresented regions. This indicates a conscious effort to promote global participation and inclusivity in research collaborations, ensuring that countries from diverse backgrounds are well-represented in the scientific community.

Regarding legal status, the survey reveals a range of organizational forms. The most common legal status among the RIs is ERIC (European Research Infrastructure Consortium), which applies to four of the infrastructures. This structure is favored for its support by the EU and its facilitation of cross-border research activities. Other legal statuses include Pre-ERIC entities, non-profit associations (by French law), consortiums, and various public and international legal bodies. This diversity of legal frameworks reflects the need for different types of organizational structures to address specific operational, financial, and legal requirements in various regions.

Figure 2 represents the technology areas: the RIs predominantly engage in material technologies (7 RIs), fermentation and digestion processes (5 RIs), and separation technologies (5 RIs). These are identified as the most widely used areas, underscoring their importance in advancing research in sectors like sustainable materials, bioengineering, and chemical processes. Also, on PDIs' side (D1.2) physicochemical separations emerged as the most common technology, together with Industrial biotechnology and mechanical separations that were also well-represented, and material technologies and thermochemical conversions, algae cultivation and harvesting, pulping, and anaerobic digestion.

This shows a possible ground for collaboration between PDIs and RIs in the above fields, where they already have developed expertise.

Figure 3 illustrates the types of collaboration that RIs are seeking, specifically targeting PDIs and BIs. These entities are also identified as the main actors within the COPILOT network. This result suggests that the newly developed COPILOT database will play a significant role in facilitating productive and impactful collaborations. By connecting RIs with PDIs and BIs, the database is poised to enhance the potential for knowledge exchange, innovation, and joint research efforts, ultimately strengthening the network's collaborative capacity.

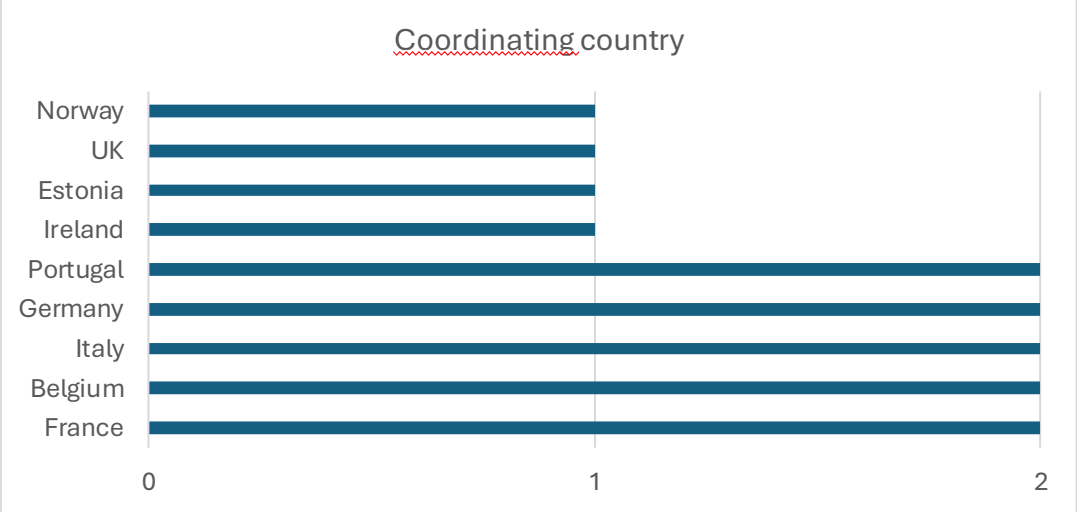


Figure 1 Distribution of coordinating countries of RIs

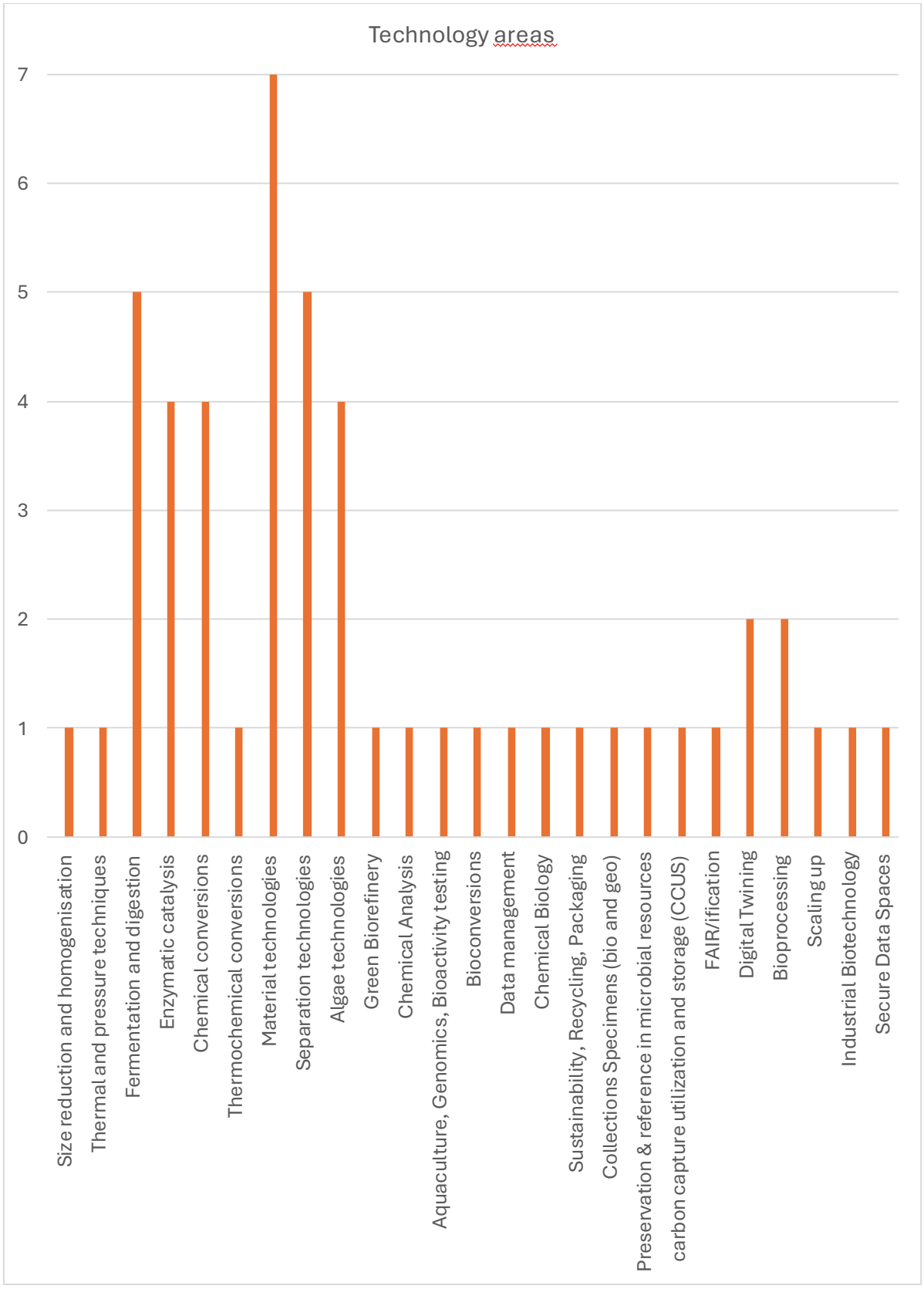


Figure 2 Distribution of technology areas according to the replies to the survey

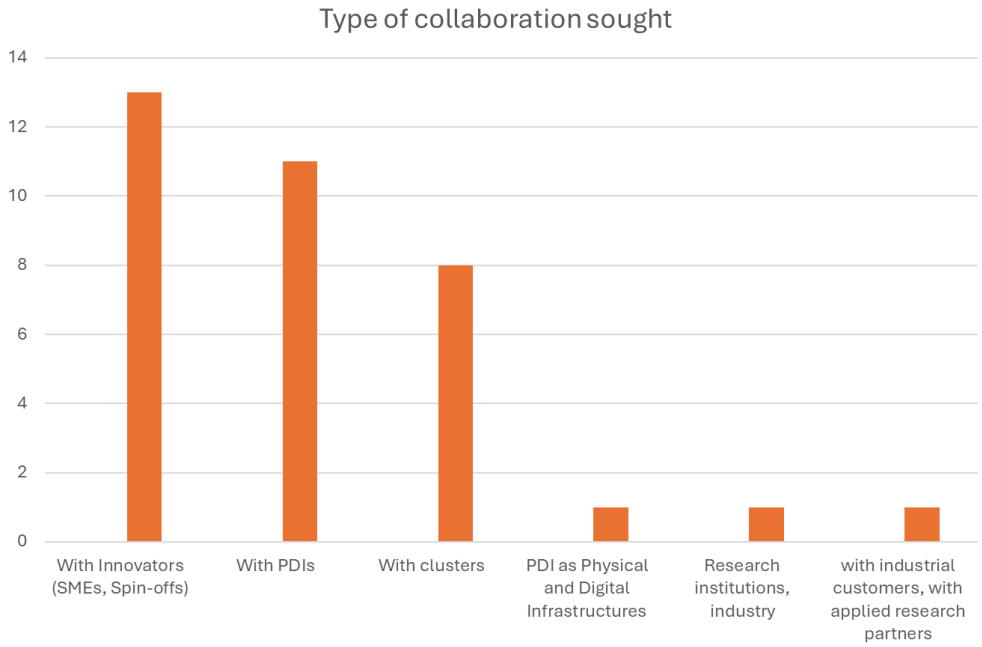


Figure 3 Distribution of the type of collaboration sought by RIs according to the replies to the survey

4 Workshop organised with research and pilot/demo infrastructure networks

In the framework of Task 1.2, feedback about needs and means to stimulate the collaboration between RIs and PDIs and develop an efficient ecosystem to integrate RI-PDIs services have been collected during a COPILOT workshop (Milestone No.2 of the Project): "From lab to pilot: co-creating efficient RIs-PDIs collaboration", organized by SPRING in collaboration with the project coordinator (BBEPP) and WP1 leader (VTT). VTT's collaboration and participation during the workshop was relevant to gather data as input for the capacity and synergy assessment carried out in Task 1.4.

4.1 Agenda and organization

The Workshop took place online on January 31st, 2025, from 2-4 pm.

The agenda, shown in Annex II, was shared with the RIs and PDIs invited to the workshop (Annex III) via email: all the RIs that replied to the survey were included in the invitation list and a selection of PDIs - Open Call 1 [23] (OC1) participants - was made in consultation with BBEPP.

The workshop was organized through co-creation methods to make it interactive, appealing and fruitful for the scope. After the first introduction of COPILOT Project by BBEPP, VTT underlined the importance of PDIs-RIs collaboration, whereas SPRING introduced the activities designed for the co-creation

[23] https://copilot-project.eu/open-calls/

session. The interactive work with the stakeholders was carried out using a Miro[24] board for both sessions. In the first session, participants were split into two breakout rooms: RIs and PDIs worked separately on Strengths, Weaknesses, Opportunities and Threats (SWOT) analyses about their activities. Input from this first session was channeled into the second session's brainstorming.

4.2 Participants

A total of 35 people attended the workshop.

Table 2 shows the list of infrastructures present to the workshop. The following COPILOT partners were also present: SPRING, represented by two people; BBEPP also with two representatives who not only serve as COPILOT partners but also represent a PDI; VTT, another COPILOT partner, represented by three people, fulfilling a dual role as both COPILOT partners and PDI representatives as well. Other partners in the project that were present include Irish Bioeconomy Foundation (IBF), Bioeconomy For Change (B4C), and BIOEAST HUB.

Table 2 List of Participants to the Workshop

RIs present	PDIs present
BIOMAT (2 people present)	A4F – Algae for future
ECCSEL ERIC	Acies Bio d.o.o
ELIXIR Europe (2 people present)	BEST – Bioenergy and Sustainable Technologies
EMBRC ERIC	BIO2CHP
Convert2Green OITB SEP: KETMarket GmbH (same contact as ESNA)	CPI (2 people present)
IBISBA (2 people present)	DTI – Danish Technological Institute
INN-PRESSME OITB	FHNW - School of Life Science
MIRRI-ERIC	IBIOIC – Industrial Biotechnology Innovation Center
	ILVO - Instituut voor Landbouw-, Visserij- en Voedingsonderzoek
	LIST - Luxembourg Institute of Science and Technology
	NIZO - Food Research (2 people present)
	TECNALIA

[24] https://www.miro.com

4.3 Outcomes: needs and means to stimulate the collaboration between RIs and PDIs and develop an efficient ecosystem to integrate RI-PDIs services

In the first breakout session RIs and PDIs were asked to carry out a SWOT analysis of their activities, with some guidance provided in the corresponding section.

To identify **strengths** participants in both rooms focused on their:

1. Added value / initiatives;
2. Unique services;
3. Success stories (why were your users satisfied?).

When looking at **weaknesses**, participants were required to think about their:

1. Areas of improvement;
2. Areas where help is needed (e.g., Funds);
3. Failure stories (what went wrong?).

Regarding **opportunities**, participants focused on their:

1. synergies with other RIs / PDIs;
2. potential collaboration with PDIs in carrying out OC1 activities;
3. future - proof collaboration with both RIs and PDIs.

On **threats**, participants focused on:

1. barriers to cooperation (with PDIs and RIs);
2. what can go wrong?
3. do opportunities seem realistic?

In the second session, RIs and PDIs brainstormed together on practical means to enhance collaboration and enable identified strengths and opportunities in framework of COPILOT network.

4.3.1 RIs-PDIs collaboration – SWOT analysis results

The inputs gathered in the SWOT analysis co-creation session have been analyzed as follows.

Table 3 shows the main **strengths** summarized from both RIs and PDIs.

Table 3 Main Strengths emerged from the workshop – raw data elaboration

RIs	PDIs
• Open access resources and services (catalogues) • Funding programs for TA • Research phases optimization • Assistance in experimental design and analysis • Dedicated funding for ERICs	• Complementary Expertise for RIs (TRL 4-7) • Testing ground for scaling up • Risk reduction for scaling up • Integration of RI-PDI operation (thesis)

RIs play a pivotal role in addressing the evolving demands of economic and industrial sectors, offering extensive, open access and diverse catalogue of resources and innovative services tailored to these needs (some of them in the form of one-stop-shop). This openness is further supported by dedicated funding programs that specifically focus on providing technical assistance (TA) to facilitate access to these resources and expertise, thus ensuring that even small entities can benefit from state-of-the-art research infrastructure.

The main aim of RIs is to promote scientific excellence and lower Technology Readiness Level (TRL) results that enable renewal of industry / novel products and processes. They have also highlighted abilities in optimizing the research phases (e.g., how to produce specific production strains with some typical raw materials), which are vital for enhancing the efficiency and sustainability of industrial processes, particularly in sectors that depend heavily on resource optimization and the development of sustainable production methods.

Beside unique competence and RIs access that enable high quality scientific results, RIs support the practical application of this knowledge, providing comprehensive assistance in experimental design and result analysis. This ensures that industries can achieve reliable, scientifically sound outcomes from their research initiatives, helping them make informed decisions based on solid evidence and cutting-edge methodologies.

RIs that have the legal structure of the ERIC are formally recognized by both the EC and individual Member States, enjoying robust commitment from them. This guarantees that they operate within a framework supported by stable and dedicated funding opportunities, giving a robust foundation in terms of governance, responsibility, and collaboration across borders.

Lastly, a shared regulatory and political framework across member states creates a unified environment for collaboration, ensuring consistency in the application of policies and standards, making it easier for industries and researchers to work together across borders.

On their side, PDIs can offer complementary expertise for RIs tackling different challenges: access to TRL 4-7 offers a testing ground for the validation of new technologies and processes, particularly beneficial for companies looking to refine their innovations before scaling them up to full production. PDIs play a crucial role in reducing risks associated with scaling up industrial processes, ultimately contributing to the successful commercialization and scaling of innovative solutions. Some participants integrate RI and PDI operations— including PhD and master's thesis projects. Moreover, PDIs that are equipped with certified food-grade facilities ensure that industrial applications meet the necessary safety and regulatory standards.

PDIs that are positioned strongly within national and international ecosystems also help collaboration across borders, allowing to build a network of research-driven innovation.

Table 4 shows the main **weaknesses** elaborated from the input from both RIs and PDIs.

Table 4 Main Weaknesses emerged from the workshop – raw data elaboration

RIs	PDIs
• Slowness (bureaucracy) • Limited flexibility (project adjustments and IP) • Lack of alignment with industry • Extended timelines for pilot deployment	• Slowness (safety procedures) • Competition at national and EU level • Different approaches to work (RIs and industry) • Extended timelines for pilot deployment • Uncertainty about IP • Lack of funding for SMEs to access PDIs

On RIs' side, the main significant issues raised are the slowness of decision-making processes within universities due to bureaucratic hurdles, the limited flexibility in adapting funded projects to meet evolving needs and in discussions around intellectual property (IP), which can slow down the process of innovation and responsiveness to emerging opportunities or industry demands.

Industry collaboration can also be difficult, with organizations sometimes facing barriers to engage with RIs due to a lack of alignment between academic and industrial objectives. There is sometimes a lack of clear criteria for defining and harmonizing data parameters, especially when working across different scales, such as small-scale experiments versus large-scale industrial applications. The extended timelines for pilot deployment pose another challenge, complicating data integration and comparison and slowing progress in research and commercialization.

Looking at PDIs' side, we also find IP issues, slowness and inconsistencies among their weaknesses: RIs and industry partners often struggle to navigate IP rights and ownership, which can lead to delays in commercialization or reluctance to share knowledge.

Different approaches to work both from RIs and Industry side can also lead to disappointment: processes developed at RIs often aren't easily scalable to meet industry needs, particularly at the commercial scale, and, while RIs can typically implement changes quickly, PDIs often need to re-evaluate safety procedures or other regulatory requirements before adjusting, which can slow down progress. This disconnection can prevent effective technology transfer, during which critical information can also be lost from RIs to industry partners, particularly when it comes to practical aspects that are essential for industrial applications. It is also difficult to communicate the price-to-

value ratio of the services to users, whose expectations are difficult to manage, particularly if pilot services don't meet performance goals.

OITBs are still relatively unknown to potential customers and therefore require better marketing efforts to raise awareness and increase demand for their services.

Then, the lack of co-financing mechanisms for small and medium-sized enterprises (SMEs) creates a barrier for these companies to access PDIs and shifts in national priorities can result in decreased funding or the blocking of grants, leaving critical projects at risk of stagnation.

Finally, there is intense competition both at the national and EU levels in building similar infrastructures, but also with academia and industry.

Table 5 discloses **opportunities**.

Table 5 Main Opportunities emerged from the workshop – raw data elaboration

RIs	PDIs
• Collaborative Projects (with PDIs and SMEs) • Screening of ideas/projects • Training programs • Development of advanced measurement technologies	• Bridge the gap academia-commercialization • Roadmaps for innovators across several pilots • Anticipation of future needs (after TRL 3) • Eu projects as catalysts for coordination • Referral systems

On RIs' side, collaborative projects at higher TRLs were brought to the attention, involving multiple RIs and SMEs, thus creating valuable synergies that foster innovation and drive progress across industries, but also PDIs, allowing for more advanced testing and development of innovative technologies that are closer to commercialization. RIs can also provide screening of scalable and marketable ideas/projects, and the complementarity of skillsets helps avoid duplicate investments, ensuring that each partner contributes unique expertise to the project, leading to more efficient use of resources.

Training programs and the development of advanced measurement technologies play a critical role in fostering the necessary expertise for scaling experiments, so that users are equipped with the knowledge and skills to transition from lab-scale to larger industrial applications and that experimental data is accurate and reliable for real-world applications.

While RIs typically operate with basic funding, which can limit their capacity to engage directly with industry, PDIs can facilitate a seamless flow between research and practical application, bridging the

gap to commercialization, and ensuring that research outcomes are effectively translated into commercial products or services.

Raising awareness of the complementary capabilities and services provided by RIs and PDIs is crucial in attracting more collaborators. By showcasing the unique strengths and services of each entity, potential users can see how they fit into the broader innovative ecosystem. This makes collaboration more appealing and ensures research can be applied across a wider array of industries, reducing the risk of overlapping investments, fostering a more efficient research environment, and increasing the likelihood of project success. EU projects are instrumental in fostering this coordination, serving as catalysts for deeper collaboration among diverse stakeholders across Europe.

Networks also facilitate the exchange of scientific knowledge, methods, and business strategies, enabling both RIs and PDIs to learn from one another and apply best practices across the board. This holistic approach creates a more integrated and effective research and development ecosystem, driving greater innovation and commercial success.

Moreover, another opportunity would reside in the ability to anticipate future PDIs' needs—such as ensuring technologies at TRL 3 will eventually receive suitable PDIs for further development. This would strengthen the reputation of both RIs and PDIs and make them more attractive to potential customers.

Improving referral systems and streamlining collaboration processes based on scale, expertise, and budget further enhances the efficiency of partnerships, ensuring that expectations are clear, and collaborations are structured effectively.

To enhance the innovation process, PDIs could also help develop roadmaps for innovators across several pilots, crucial for guiding them through the entire pipeline, from production to formulation, making it easier for both small and large-scale innovators to navigate complex Research and Development processes.

Table 6 summarizes **threats**.

Table 6 Main Threats emerged from the workshop – raw data elaboration

RIs	PDIs
• Competition for funding and between ERIC-EDIC • Inconsistent quality services across RIs • Changes in strategies or governance structures • Communication barriers	• Competition with RIs for funding • Inefficiencies due to lack of coordination • IP buyouts • Missing public support

RIs highlight that one of the primary challenges in research collaborations is the increasing competition for limited funding. There is also competition between ERICs and European Digital Infrastructure Consortia (EDICs), which can cause fragmentation, as both types of consortia often pursue similar goals but differ in their approaches, priorities, or areas of focus. This competition can dilute the impact of collective efforts, as resources and attention are divided between competing initiatives which are further complicated by concerns over confidentiality and IP protection. Moreover, there is a lack of direct Capital Expenditure support mechanism for large investment in RIs.

Another challenge lies in the potential conflicts that can arise from differing goals and priorities between stakeholders.

Additionally, managing project timelines can be difficult, impacting project efficiency and stakeholder satisfaction. Inconsistent service quality across different RIs adds another layer of complexity to collaboration, as users may struggle to rely on services that do not meet expected standards. Also, changes in partner strategies or governance structures over time can disrupt the continuity of collaboration, leading to uncertainty regarding roles and responsibilities within the partnership.

Communication barriers also pose a significant challenge, particularly when working with a wide range of stakeholders from diverse backgrounds, often resulting in misunderstandings or inefficiencies.

Also on PDIs' side, competition, disagreements over confidentiality and IP issues can prevent collaboration; moreover, universities and companies often prefer building their own facilities over utilizing existing RIs and PDIs, leading to inefficiencies and underuse of available resources. This results in duplicated efforts and reduces the overall effectiveness of research infrastructure. At the same time, there are threats coming from IP buyouts that can block technological access.

Finally, non-coordinated public support for investments in RIs and PDIs contributes to an unstable funding environment, complicating long-term planning and undermining sustained support for initiatives, while changes in funding mechanisms or policies can disrupt ongoing projects, especially those requiring long-term investment.

4.3.2 Practical means to enhance collaboration and enable identified strengths and opportunities in framework of COPILOT network

Having identified all the above points, participants were asked to provide some thoughts about practical means to enhance interaction between RIs and PDIs.

The participants' responses suggest a comprehensive approach on how the Pilots4U platform could be further developed to maximize its utility for stakeholders, policy makers, funding agencies, and the broader research community. A key feature of the platform would be an integration where funding calls are linked allowing users to search for opportunities directly via the platform, also dedicating a section

or user profile for policy stakeholders and funding agencies, enabling them to post updates, news, and funding opportunities directly to the community. This would serve as a direct communication channel between policymakers, funding bodies, and researchers, ensuring that key stakeholders can easily share announcements and engage with the research community.

Moreover, the platform could host regular networking events such as pitching events where researchers and startups can present their ideas to potential investors, industry partners, or academic collaborators. This could be facilitated through virtual or physical events and could also include tools for matching potential cooperation partners based on shared research goals or needs. Additionally, investors could be directly engaged with emerging technologies or research proposals, accelerating the development of innovative solutions.

Also, researchers could easily browse this database to find infrastructures that match their project specifications thanks to direct links to relevant RIs with physical or digital resources, equipment, or expertise. To support this research journey, the platform could offer detailed profiles of equipment, lab spaces, and other essential facilities available across both PDIs and RIs. Additionally, the database could provide information on certifications or accreditations held by the equipment or facility, ensuring that researchers understand the quality standards and compliance requirements. Beyond just listing equipment and facilities, the platform could offer additional details that highlight operational nuances including IP considerations, subcontracting options and policies, scalability of equipment or services.

Finally, the platform could emphasize the complementarity among different PDIs and RIs, showcasing how various infrastructures can work together to support diverse research projects.

By implementing these features, COPILOT could transform into a truly collaborative platform where stakeholders at all levels—researchers, funding agencies, policymakers, and infrastructure providers—can interact, share resources, and co-create solutions.

One of the proposed initiatives to be carried out through the COPILOT network could be organizing a "monthly network connection lottery". This would allow RIs and PDIs to apply to a random selection each month. After a meeting devoted to an exchange of ideas, the "winners" could then apply for joint projects. Additionally, a deep-dive evaluation of RIs/PDIs capabilities could help identify synergies, and promoting understanding of how RIs and PDIs can support each other could foster stronger collaboration.

One way ESFRI networks can support PDIs is by providing estimates of future PDI needs to assist with planning. ESFRI networks can also influence policymakers to align strategies with the long-term needs of PDIs. RIs can offer various forms of support, including modeling, analytical services, sensory analyses,

and culture collection services. Joint activities such as contributing to EU biotech and manufacturing hubs can further align PDIs and RIs with common objectives.

Every PDI could then list connected RIs to facilitate background checks and offer basic research support. Furthermore, Pilots4U platform can provide RIs visibility, showcasing how their services can support PDIs and expanding their reach: RIs can offer several complementary capabilities to piloting and scale-up processes, such as easy access to cross-cutting topics. They can provide analytical and characterization support and contribute services like life cycle assessment (LCA) and recyclability analysis, further bolstering the effectiveness of scale-up efforts.

On the other hand, PDIs can validate proof-of-concept (POC) and lower TRL experiments, assess scalability, and evaluate the marketability of research. PDIs also support the creation of roadmaps, ensuring that the overall development is focused and aligned with industry needs: PDIs offer insights into stakeholders' needs and expectations at higher TRLs such as what contract manufacturing organizations (CMOs) and engineering companies require to move research from the lab to industrial-scale challenges, helping to refine research for real-world applications.

5 Conclusion

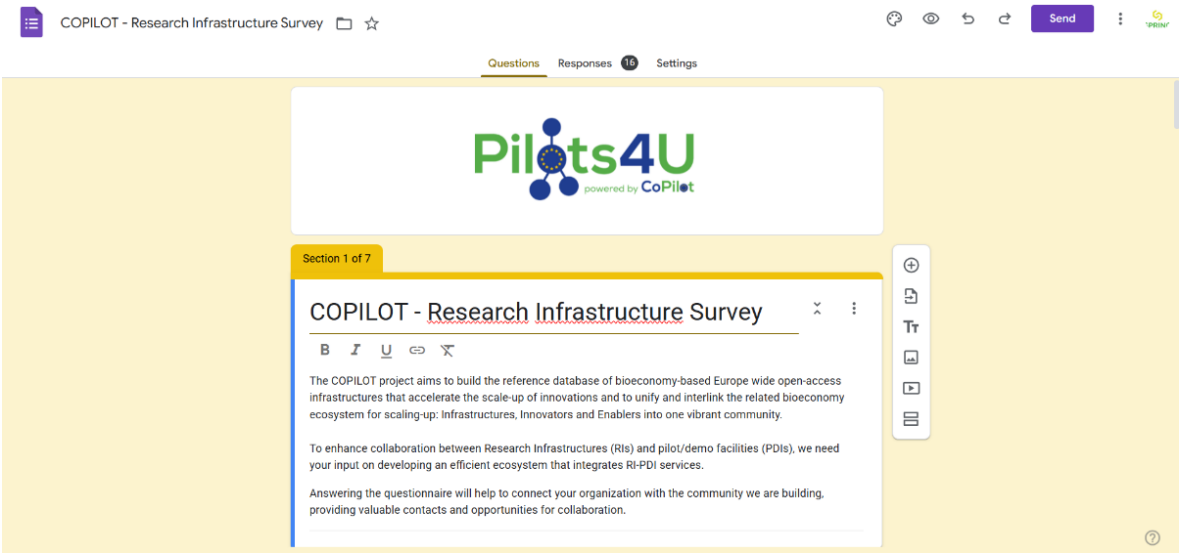
This report started with a survey that was intended to engage RIs to the COPILOT project, as well as to collect information from them as input for the new Pilots4U powered by COPILOT platform, providing a comprehensive overview of their technology areas.

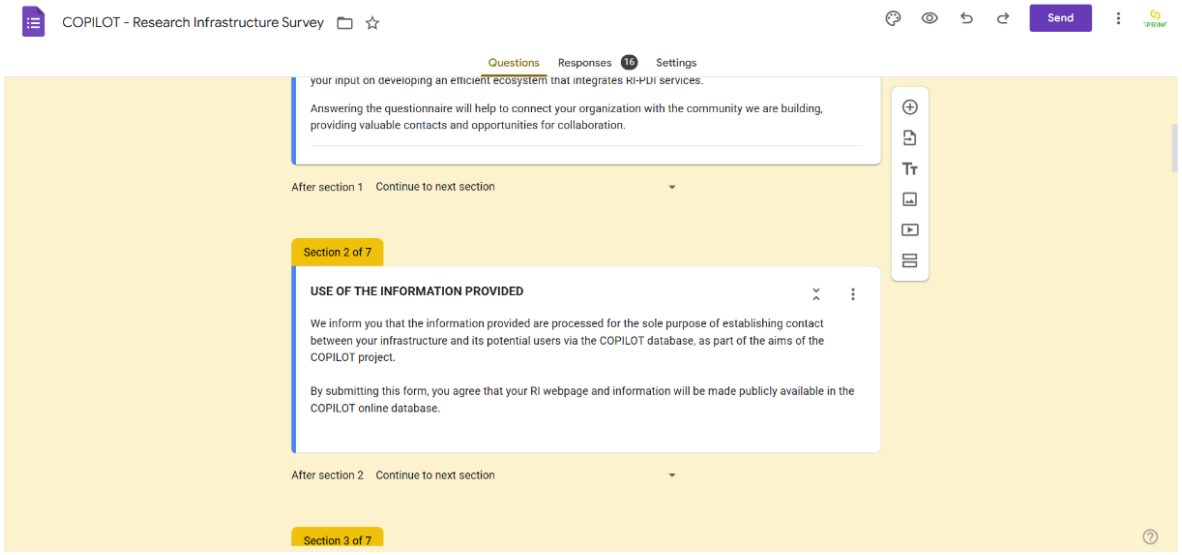
The workshop aimed at enhancing collaboration between the same RIs and PDIs in the Project network, showing their strengths and needs.

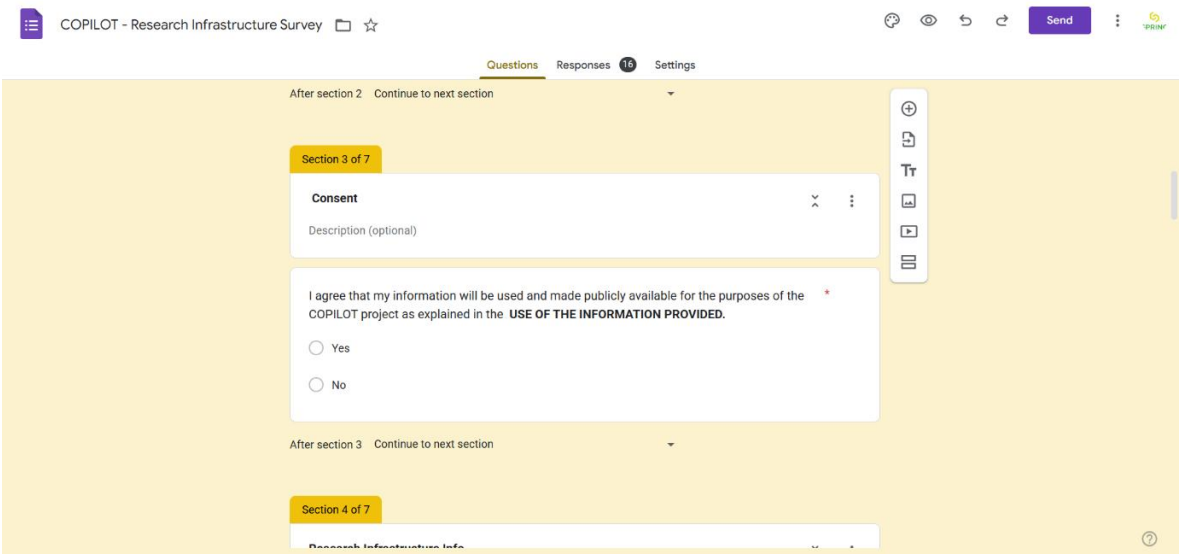
Addressing these needs is central to the development of the next-generation Pilots4U platform, that could enhance interaction between RIs and PDIs by linking funding calls to relevant infrastructures, allowing users to directly find opportunities. A dedicated section for policy stakeholders and funding agencies would enable them to post updates and opportunities, fostering communication. The platform could also host networking events like pitching sessions to connect researchers, startups, investors, and collaborators. A comprehensive database for RIs and PDIs, including equipment, facilities, certifications, and operational details, would support researchers, emphasizing complementarity between RIs and PDIs, and integrating ESFRI network support.

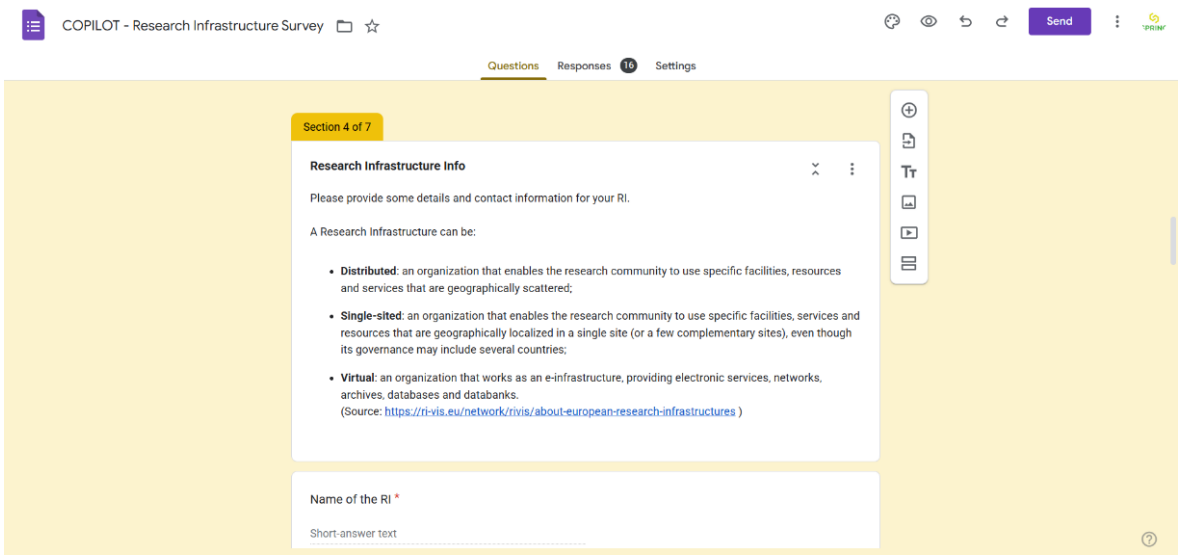
Data from this report will be analyzed and contribute to the realization of a COPILOT capacity and synergy assessment and improvements to the Pilots4U platform that will include also links to the RIs, networks and related initiatives, and that will contribute to creating a more interconnected and responsive community.

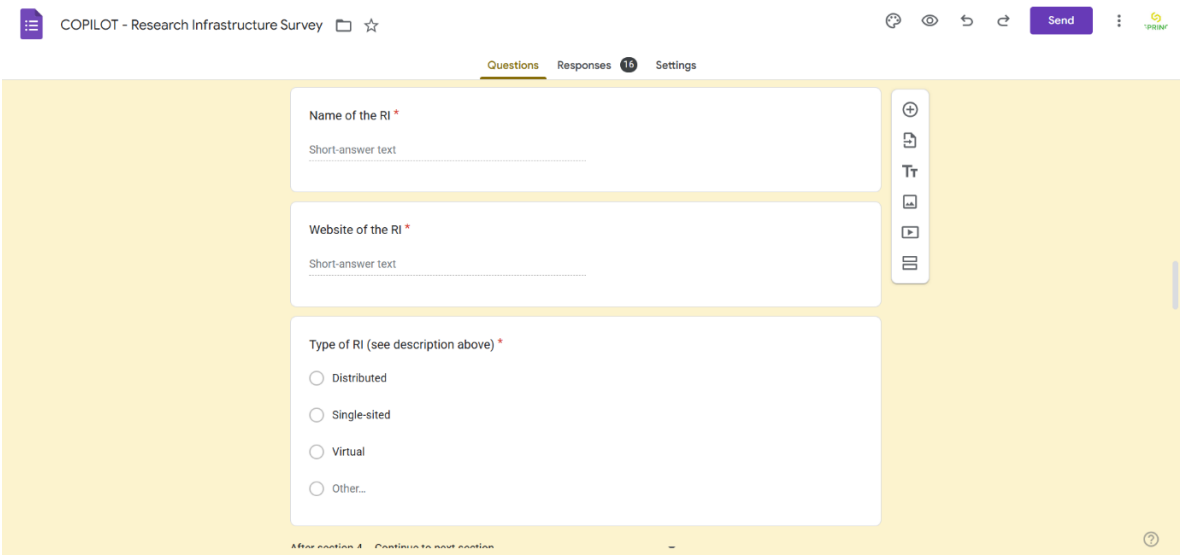
ANNEX I: COPILOT- Research Infrastructure Survey

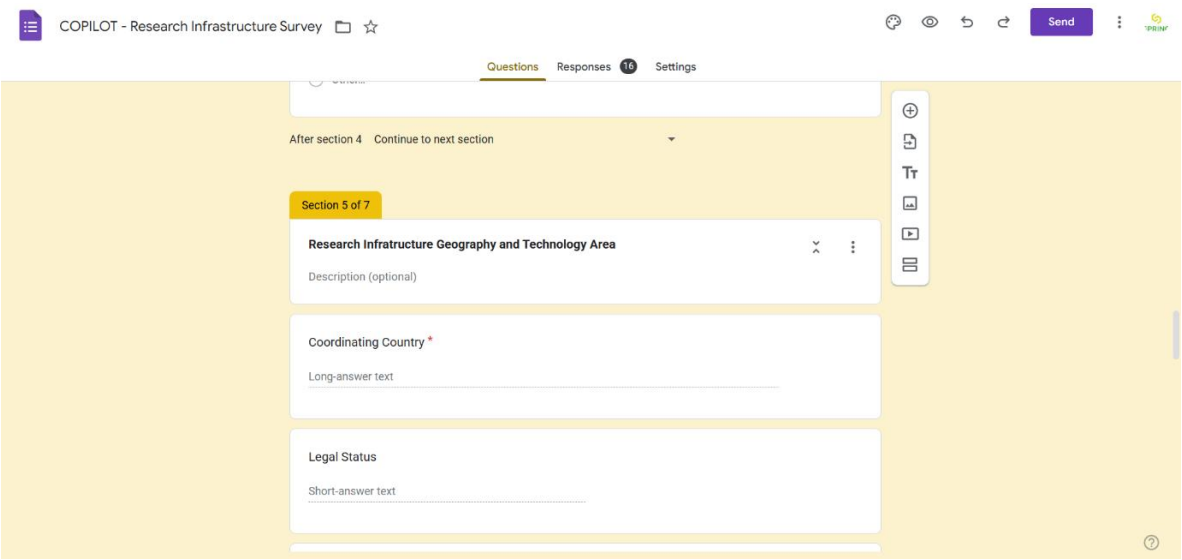


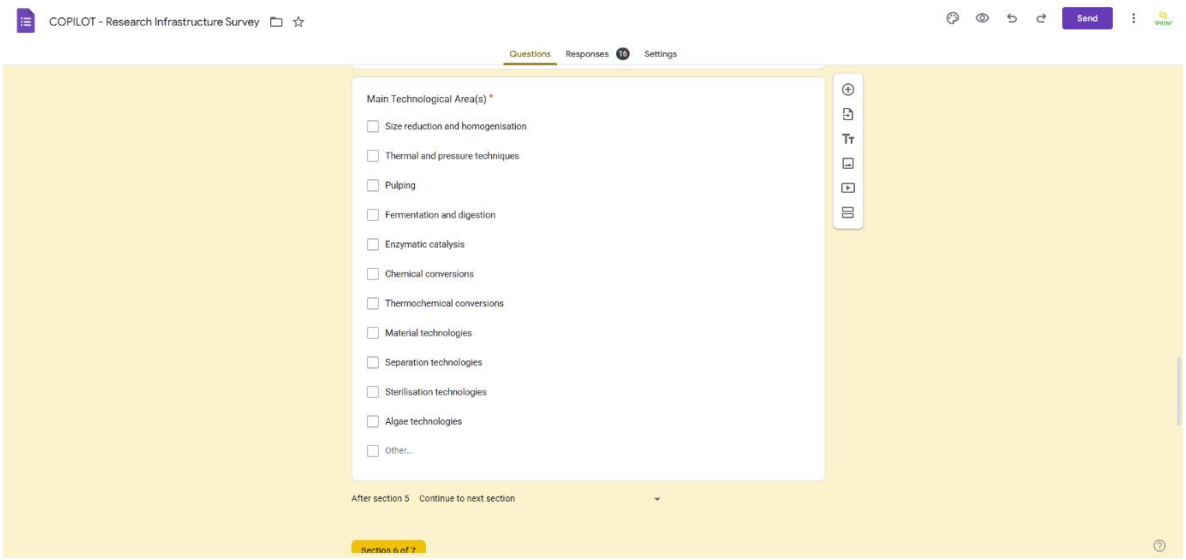


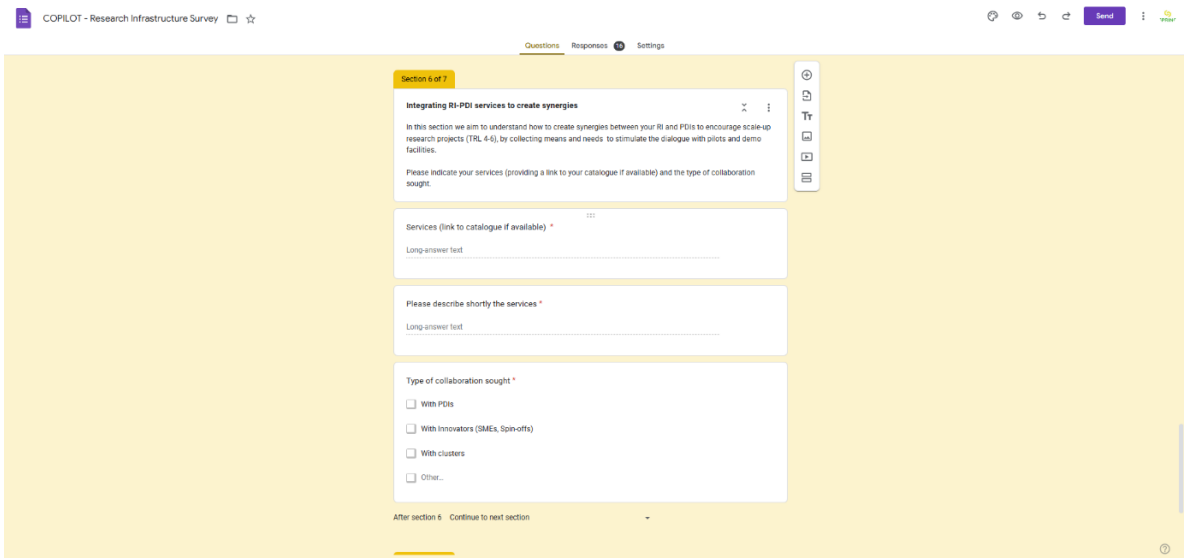


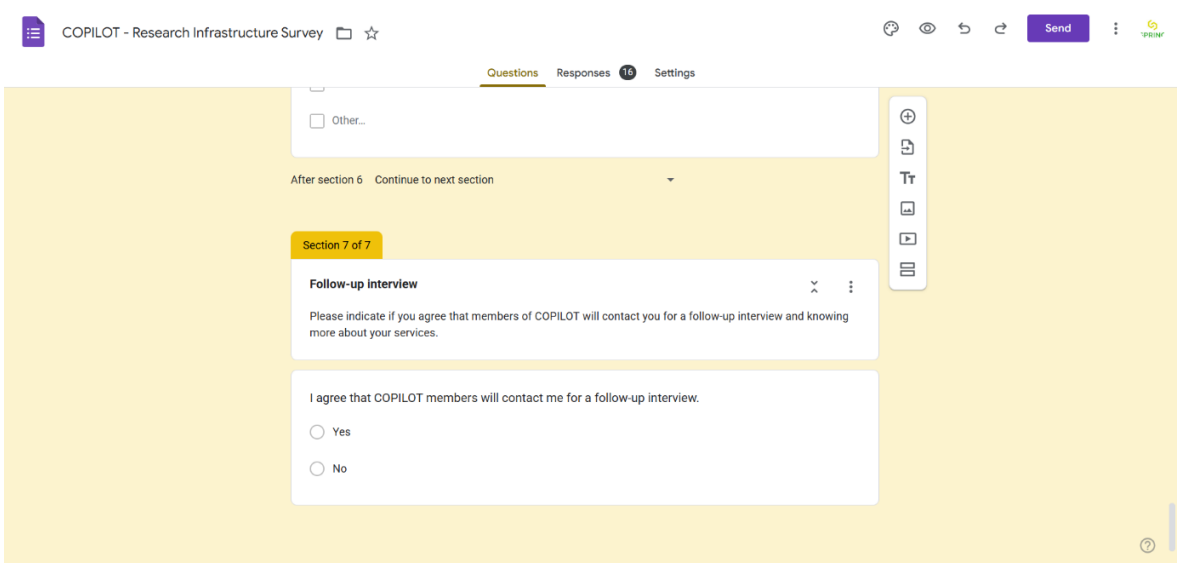

COPILOT - Research Infrastructure Survey
Send
Questions
Responses 16
Settings
Section 4 of 7
Research Infrastructure Info
Please provide some details and contact information for your RI.
A Research Infrastructure can be:
Distributed: an organization that enables the research community to use specific facilities, resources and services that are geographically scattered;
Single-sited: an organization that enables the research community to use specific facilities, services and resources that are geographically localized in a single site (or a few complementary sites), even though its governance may include several countries;
Virtual: an organization that works as an e-infrastructure, providing electronic services, networks, archives, databases and databanks.
(Source: https://ri-vis.eu/network/rivis/about-european-research-infrastructures)
Name of the RI *
Short-answer text


COPILOT - Research Infrastructure Survey
Send
Questions
Responses 16
Settings
Name of the RI *
Short-answer text
Website of the RI *
Short-answer text
Type of RI (see description above) *
Distributed
Single-sited
Virtual
Other...


COPILOT - Research Infrastructure Survey
Send
Questions
Responses 16
Settings
After section 4 Continue to next section
Section 5 of 7
Research Infratructure Geography and Technology Area
Description (optional)
Coordinating Country *
Long-answer text
Legal Status
Short-answer text


COPILOT - Research Infrastructure Survey
Send
Questions
Responses 16
Settings
Main Technological Area(s) *
Size reduction and homogenisation
Thermal and pressure techniques
Pulping
Fermentation and digestion
Enzymatic catalysis
Chemical conversions
Thermochemical conversions
Material technologies
Separation technologies
Sterilisation technologies
Algae technologies
Other...
After section 5 Continue to next section
Section 6 of 7


COPILOT - Research Infrastructure Survey
Send
Questions
Responses 16
Settings
Section 6 of 7
Integrating RI-PDI services to create synergies
In this section we aim to understand how to create synergies between your RI and PDIs to encourage scale-up research projects (TRL 4-6), by collecting means and needs to stimulate the dialogue with pilots and demo facilities.
Please indicate your services (providing a link to your catalogue if available) and the type of collaboration sought.
Services (link to catalogue if available) *
Long-answer text
Please describe shortly the services *
Long-answer text
Type of collaboration sought *
With PDIs
With innovators (SMEs, Spin-offs)
With clusters
Other...
After section 6 Continue to next section


COPILOT - Research Infrastructure Survey
Send
Questions
Responses 16
Settings
Other...
After section 6 Continue to next section
Section 7 of 7
Follow-up interview
Please indicate if you agree that members of COPILOT will contact you for a follow-up interview and knowing more about your services.
I agree that COPILOT members will contact me for a follow-up interview.
Yes
No

Annex II: COPILOT Workshop Agenda - 31.01.2025

	Agenda
2:00-2:20	Introduction to COPILOT and PDIs-RIs collaboration (BBEPP and VTT)
2:20-2:30	Introduction to group works (SPRING)
2:30-2:50	Breakout session #1– RIs - PDIs collaboration: a SWOT analysis.
2:50-3:05	Presentation and discussion of the outcomes.
3:05-3:35	Session #2 – How to cooperate? Let's brainstorm!
3:35-3:50	Presentation and discussion of the outcomes.
3:50-4:00	Wrap - up and conclusion (SPRING)

Annex III: COPILOT Workshop Invited Infrastructures

Pilot and Demo Infrastructures (PDIs)	Research Infrastructures (RIs)
A4F – Algae for Future	Benchtop bioreactor systems
Acies Bio d.o.o.	BIOMAT OITB
ARD-CEBB	CERIC ERIC
BEST – Bioenergy and Sustainable Technology	ECCSEL ERIC
BIO2CHP	ELIXIR Europe
Biosphere	EMBRC ERIC
CPI	Estonian Center of Analytical Chemistry
DTI – Danish Technological Institute	EU-OPENSCREEN
FHNW – School of Life Science	FlexFunction2Sustain (now ESNA)
FOOD PILOT	IBISBA
FRAUNHOFER	INN-PRESSME OITB
IBIOIC - Industrial Biotechnology Innovation Center	MIRRI-ERIC
ILVO - Instituut voor Landbouw-, Visserij- en Voedingsonderzoek	Munster Technological University (CircBio)
LIST - Luxembourg Institute of Science and Technology	UCLouvain
NIZO – Food Research	
RISE – Research Institute of Sweden	
TECNALIA	
TNO	