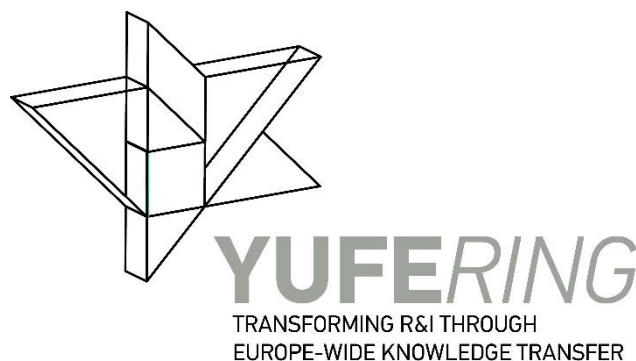# YUFERING Project
YUFE TRANSFORMING R&I THROUGH EUROPE-WIDE KNOWLEDGE TRANSFER

Call: H2020-IBA-SwafS-Support-1-2020
Topic: IBA-SwafS-Support-1-2020
Funding type: Coordination and Support Action Lump Sum
Grant agreement No. 101016967

D 2.5: Report & Action Plan for YUFERING Infrastructures

February 2024

Deliverable number	D2.5
Deliverable name:	Report and Action Plan for YUFERING Infrastructures
WP number:	WP2
Version	02
Delivery due date:	Project month 36 (29/02/2024)
Actual date of submission:	27/02/2024
Dissemination level:	Public
Number of pages:	47
Lead beneficiary:	University of Cyprus
Deliverable leader:	Marios Demetriades (UCY)
Authors:	Elena Christodoulou (UCY) Marios Demetriades (UCY)
Contributor(s):	Tatiana-Ioanna Gialama (UCY)
Reviewer(s)	Nataša Jakominić Marot (UNIRI)

Disclaimer:

The content of this report is the sole responsibility of the authors and does not necessarily reflect the opinions of the European Commission. The European Commission is not responsible for any use that may be made of the information contained therein.

Table of Contents

List of Figures

List of Tables

List of Abbreviations

APIs	Application Programming Interfaces
BMBF	Federal Ministry of Education and Research
CAI	Research Support Centre of UC3M
CERI	Community-Engaged Research and Innovation
CERN	Conseil Européen pour la Recherche Nucléaire
DG RTD	Directorate General for Research and Innovation
EC	European Commission
ELSI	Ethical, Legal, and Social Implications
EOSC	European Open Science Cloud
EPSRC	Engineering and Physical Sciences Research Council
ERA	European Research Area
ERF-AISBL	The Association of European-Level Research Infrastructures Facilities
ERIC	European Research Infrastructure Consortium
ESFRIs	European Strategy Forum on Research Infrastructures
EU	European Union
FIRI	Funding Instrument for Research Infrastructures
FWO	Research Foundation Flanders
GRF	German Research Foundation
HE	Horizon Europe
HPC	High Performance Computing
ICT	Information and Communication Technologies
IRI	International Research Infrastructures
LLM	Larger Language Model
NCU	The Nicolaus Copernicus University in Toruń
NLP	Natural Language Processing
NWO	Dutch Research Council
OA	Open Access
OCW	Dutch Ministry of Education, Culture and Science
OS	Open Science
PI	Principal Investigator
PNIR	Piano Nazionale Infrastrutture di Rica
PNRR	National Recovery and Resilience Plan
R&I	Research and Innovation
RCF	Research Council of Finland
RI	Research Infrastructure

RIF	Research and Innovation Foundation
RISIS	Research Infrastructure for Science and Innovation policy Studies
RISS	Research and Innovation Support Service
SIPER	Science and Innovation Policy Evaluations Repository
STFC	Science and Technology Facilities Council
TINK	Finnish Research Infrastructure Committee
UANT	University of Antwerp
UBREMEN	University of Bremen
UC3M	Universidad Carlos III de Madrid
UCY	University of Cyprus
UEF	University of Eastern Finland
UESSEX	University of Essex
UK	United Kingdom
UKRI	UK Research and Innovation
UM	Maastricht University
UNIRI	University of Rijeka
UNITOV	University of Rome Tor Vergata
YERUN	Young European Universities for the Future of Europe
YUFE	Young Universities for the Future of Europe

REPORT & ACTION PLAN FOR YUFERING INFRASTRUCTURES

Executive Summary

The purpose of this deliverable was firstly to a) record the existing research infrastructures/entities/laboratories/units (RIs so forth) of each Young Universities for the Future of Europe (YUFE) partner, b) to carry out a detailed mapping of YUFE-related participation in RI projects, European Strategy Forum on Research Infrastructures (ESFRIs) and European Research Infrastructure Consortiums (ERICs) and identify potential funding opportunities for RIs and in particular for upgrading or creating new RIs, exploiting existing European RIs, joining existing consortia of ESFRI projects and landmarks and finally exploring the possibilities of creating such a YUFE RI from scratch, c) to find matching RIs from a number of YUFE partners in a direct or cross-cutting manner and d) to develop an Action Plan to lead to a future strategy for how to make the best out of the collaboration of YUFE RIs.

This report is based on WP2, Task 2.6 titled 'Development of a joint strategy towards a common YUFE RI agenda' led by the University of Cyprus (UCY). It represents a first systematic effort undertaken to identify, map, and link the RIs of the ten YUFE alliance academic institutions. The document is foundational in developing a cohesive YUFE RI strategy in the future, aiming to lay out potential collaborative avenues within the framework of the ESFRI and similar consortia.

The methodology for the study was multifaceted, employing desk research, analysis of the Horizon Dashboard and Web of Science data, and interviews with institutional representatives. This mixed approach, combining quantitative and qualitative insights, facilitated a nuanced understanding of the Open Access (OA) landscape, funding sources, and the identification of RIs for potential synergies.

Significant findings include varied definitions and perceptions of RIs among interviewees, disparities in funding, particularly noted between advanced and widening partners, and the correlation between OA publication percentages and institutional openness to RIs. A number of pilots and a follow-up action were described and analysed including a Python algorithm that was devised to facilitate the clustering of RIs based on thematic and cross-cutting research areas, hinting at a future digital collaboration platform that can accommodate this type of matching.

The deliverable emphasises the YUFE alliance's commitment to developing RIs that can be of joint use, secure OA and knowledge sharing, advocating for a culture that supports community-engaged research and innovation (CERI). The deliverable outlines the need for strategic planning and the possibility of establishing a central unit to guide and promote the sharing and utilisation of RIs, further leveraging the YERUN network's digital research collaboration tools.

The Action Plan for the immediate future includes inter alia the following steps:

- Circulate the final/updated RIs list to all YUFERING partners.
- Utilise and extend the competent RI personnel in each YUFE partner to create a common group to discuss issues and uptake any solutions that will stem from this deliverable.
- Focus on the YUFE2030 project (WP5, Task 5.3) on developing further pilots for submitting joint proposals to further develop and utilise RIs.
- Test the YERUN digital collaboration platform and identify ways and tools to incorporate the RIs for joint use and to that end, resubmit the TRIP2EXCELLENCE proposal under the WIDERA/EEI call in 2025 in order to invest in digitalisation of RIs through the upgrade of the YERUN platform.
- Advance further the algorithm created through Large Language Model (LLM) training in order to identify relevant research areas both vertically and in a multidisciplinary manner.
- Develop further the CERI approach of RIs to engage the stakeholders and the public.

In conclusion, the report provides an action plan with recommendations for fostering joint research endeavours, encouraging a blend of top-down and bottom-up approaches to RI collaboration. This plan includes potential scenarios for sharing RIs within the YUFE alliance, signifying a move towards more integrated and community-engaged RIs across the alliance.

1. Introduction

RIs are fundamental to the European Union's (EU) strategy for scientific excellence and innovation. They serve as the bedrock upon which the European Research Area (ERA) stands, catalysing the cross-border and interdisciplinary collaboration essential for addressing the grand challenges facing society. The European Commission's (EC) commitment to these infrastructures is evident in its allocation of substantial funding and in policies that underscore their significance in driving high-impact research that transcends national boundaries.

The integration of RIs with the broader goals of Open Science (OS) reflects the EU's dedication to making scientific processes more transparent and accessible. OS principles are key to enhancing scientific collaboration and sharing, ensuring that research outputs are more widely disseminated and that the fruits of research can be leveraged by various societal actors. The European Open Science Cloud (EOSC) exemplifies this approach, aiming to provide European researchers with seamless access to data across disciplines and borders, underpinning the EU's vision for a digital single market for research.

Moreover, the EU's funding landscape for RIs extends beyond Horizon 2020 and Horizon Europe (HE). It encompasses a variety of financial instruments designed to nurture innovation and bolster the capacity of RIs to meet emerging scientific and technological demands. These funding mechanisms are instrumental in ensuring that European RIs remain at the cutting edge and continue to offer state-of-the-art services to researchers from academia, industry, and beyond.

In the spirit of inclusive innovation, the EU's policy framework actively encourages the opening up of RIs to a wider community. This policy is manifest in funding criteria that incentivise collaboration with the private sector, fostering a symbiotic relationship between academia and industry. By doing so, the EC not only enhances the innovation potential of RIs but also ensures their alignment with market needs and societal challenges.

This strategic orientation towards inclusivity and excellence in RI policy not only reinforces the EU's position as a global leader in research and innovation (R&I) but also ensures that European RIs continue to be a lynchpin in the global scientific community.

Based on the above, RIs play a key enabling role for the advancement of knowledge and technology and have become a priority at the EU-level. The ESFRI established in 2002 publishes a Roadmap to provide medium and long-term visions for RIs. The Roadmap is updated periodically as mandated by the EU's Competitiveness Council and outlines the results of the research projects that were selected as ESFRI projects.

According to the EC (2020)[1],

---

1 European Commission, Directorate-General for Research and Innovation, (2020) Supporting the transformative impact of research infrastructures on European research: report of the High-Level Expert Group to assess the progress

"[the term 'Research Infrastructure' refers to facilities, resources or services of a unique nature that have been identified by European research communities to conduct top-level activities in all fields of science. This definition includes the associated human resources, covers major equipment or sets of instruments and knowledge-containing resources such as collections, archives and data banks. RI may be located at a single site (for example, large telescopes or synchrotron light sources) or can be distributed across a large number of sites working jointly (for example, biobanks, archives or marine stations). (p. 10).

National and EU-level funding is being distributed each year for RIs. Funding that can be utilised for RIs is provided mainly through the HE programmes (RIs, ERC programme etc.) but also through other finance means such as the InnovFin Fund-of-Funds (InnovFin) the European Structural and Investment Funds (ESIF), the Recovery and Resilience Funds (RRF), and the European Fund for Strategic Investments (EFSI).

HE (successor programme to Horizon 2020) acts as the flagship EU funding programme for Research and Innovation, dedicating over €200 Million per year in project financing for RIs. According to the EC's Directorate General for Research and Innovation[234] (DG RTD), the estimated total budget (rounded to two decimal places) for RIs for the period 2018-2023 was:

- 2018: €387.15 Million
- 2019: €416.20 Million
- 2020: €370.77 Million
- 2021: €289.24 Million
- 2022: €318.50 Million
- 2023: €320.26 Million

The EU has also placed emphasis to opening up RIs to the community, whether that concerns industry, other research organisations, or civil society. This priority is reflected in ERA Priority 1 and ERA Action 8 "Strengthen Sustainability, Accessibility and Resilience of RIs in the ERA" as well as EU funding evaluation criteria which include collaboration with enterprises and citizens.

For YUFE, formulating a cohesive Action Plan for sharing RIs is paramount to leverage the collective strengths of its members and enhance their research impact. This strategic approach enables YUFE to tap into EU funding mechanisms effectively, fostering innovation and facilitating cutting-edge research collaborations across borders.

---

of ESFRI and other world class research infrastructures towards implementation and long-term sustainability. Publications Office of the European Union. https://data.europa.eu/doi/10.2777/3423

[2] European Commission, DG RTD, March 2017, Implementation of H2020 RI Work Programmes 2014-2015 and 2016-2017

[3] European Commission, DG RTD (2022). Horizon Europe Work Programme 2021-2022 – Research Infrastructures. Available at: https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/wp-call/2021-2022/wp-3-research-infrastructures_horizon-2021-2022_en.pdf

[4] European Commission, DG RTD, March 2023. Horizon Europe Work Programme 2023-2024 – Research Infrastructures. Available at: https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/wp-call/2023-2024/wp-3-research-infrastructures_horizon-2023-2024_en.pdf

Mapping the current RIs and understanding the context for each YUFE partner is crucial. It identifies existing strengths, gaps, and opportunities for collaboration, ensuring efficient use of resources and avoiding duplication. This process facilitates the strategic alignment of RIs, promoting shared access and the joint development of new facilities, thereby enhancing the alliance's collective research capabilities and fostering innovation.

Developing the present report and Action Plan aligns with the EU's emphasis on interconnected research ecosystems, ensuring YUFE remains competitive and at the forefront of scientific advancements. Utilising EU resources and tools will empower YUFE to build a robust RI network, crucial for addressing complex global challenges and contributing to societal progress.

2. Objectives and Methodology

Aim and Objectives

This report is the result of a task focused on developing an Action Plan that will lead to a joint strategy towards a common YUFE RI agenda. This report also investigates the potential avenues for collaboration of the YUFE alliance academic institutions within the framework of the ESFRI consortia, the ERICs or other current European RIs consortia or projects that may evolve to become either ERICs or ESFRI projects in the future.

More specifically, the purpose of this deliverable was firstly to a) record the existing research entities/laboratories/units (RIs so forth) of each YUFE partner, b) to carry out a detailed mapping of YUFE-related participation in RI projects, ESFRIs and ERICs and identify potential funding opportunities for RIs and in particular for upgrading or creating new RIs, exploiting existing European RIs, joining existing consortia of ESFRI projects and landmarks and finally exploring the possibilities of creating such a YUFE RI from scratch, c) to find matching RIs from a number of YUFE partners in a direct or cross-cutting manner and d) to develop a strategy for how to make the best out of the collaboration of YUFE RIs.

However, this deliverable was never meant to replace the institutional policies of each YUFE partner nor to form a rigid strategy document for the alliance to follow blindly. Its purpose was to analyse the situation, find optimal patterns for research collaboration of RIs and ideally to become a guide to YUFE partners and other interested institutions as to how to identify opportunities for RI collaboration, taking into account the specifics of each partner, country and research area.

Methodology

A variety of methods were deployed in order to extract the data to be analysed. These methods included both quantitative and qualitative means. Desk research took place initially to identify the sources of data and to prepare the ground for the collection of complementary primary data.

The Horizon Dashboard and the Web of Science we used as sources for the desk research and the quantitative part of the analysis. We found all H2020/HE funded RI

projects from the Horizon Dashboard for all YUFE partners and analysed the aggregates in subsequent sections of this report and listed the projects as Annex to this report. We also found publications and analysed the contribution of different funding sources, while analysing the OA percentage and tendency which could work as a proxy of how open the RIs of the participating institutions are.

The results of the quantitative study were cross-checked and complemented with interviews. An interview guide was prepared and shared with informants before the interviews. The informants had the choice to provide all the information during the interview, or answer few questions in written form and other questions verbally.

The individuals interviewed were administrative staff from R&I offices, research support staff, and other individuals with the institutional mandate, extensive experience and knowledge regarding the RIs of their institution. One interview per university was carried out with one or more competent individuals from each institution. Any missing information that could not be gathered neither from the quantitative data collection and analysis nor the interviews was subsequently gathered via email from the interviewees who contacted other departments or internal entities at their institution.

The broad definition and the various definitions available of what a RI is, was at times challenging causing uncertainty to the interviewees as to which RIs to highlight as successful RIs at their institution. The definition of RIs also varied across interviewees and to that end the responsible team tried to provide a uniform definition for RIs, albeit broad but suitable for all scientific disciplines. Few interviewees were much more focused on large-scale infrastructures, particularly physical ones, while others were highlighting large-scale infrastructures as equally important RIs such as community-engaged initiatives and research or grant support services.

The question of "what counts as a good example of a successful RI" does not have a straightforward answer. Interviewees mentioned and assessed them based on political (e.g. priorities of the institution), economical (depending on the amount of funding the RI attracts), expertise (e.g. famous research group within the institution), and whether the RI is a large-scale and core facility for the institution. The interviewing team explained to the interviewees that all these attributes matter for this classification, however, the external objectivity signalled by external funding, ESFRI inclusion, scientific excellence through high quality research output and societal/economic impact would be more catalytic factors for classifying RIs.

Recurrent funding (funding that comes on set intervals to sustain RIs either from the institution, national or EU bodies) does not seem to be the norm when it comes to RIs. Funding to sustain RIs is based on calls (e.g. national/institutional calls) or project-based (e.g. H2020 project funding). This was identified as a major problem since in several cases there is no funding to maintain the RIs, let alone upgrade them. This reality poses much more weight to the exercise of the deliverable since the match-making of RIs for asserting joint external funding and the facility to jointly utilise the YUFE alliance RIs could sometimes be critical for the survival of RIs or RI-oriented research groups.

Based on the quantitative results gathered, a word cloud was generated showcasing the disciplines and research topics that attract the most funding. This word cloud was shared with the interviewees and discussed to confirm and gain additional insights and generate further discussion.

Also, based on the outcomes of the interviews an algorithm in Python was created which would break down specific disciplines into subdisciplines and look up for clustering of different RIs of YUFE partners based on matches and distance minimisation of resulting vectors of research areas and keywords.

Finally, a pilot case of finding common areas of collaboration through RIs coupled with a success story of securing HE funding for utilising European RIs is presented, alongside a similar attempt to move things forward with YUFE RIs with the creation of a digital platform for collaboration in listing, booking and using RIs for research collaboration.

This combination of methods will set the bases for identifying collaboration potential for RIs of the YUFE alliance in all such activities and exploit these findings to further upscale on existing research potential.

Limitations

This study was based on publicly available publications, funding figures, and information, and was complemented with insights from individuals who are located at research support services and/or other competent internal entities of the partners. Therefore, this report did not include the insights of the research groups or particular individuals handling specific RIs. A future study would benefit from a large-scale survey gathering further information regarding the RIs identified in this report, along with gathering interest on potential pilots. Focus group discussions with interested research groups would also be beneficial to design and plan future pilots.

3. Findings

In what follows the findings are presented starting from quantitative data which were corroborated by the interviewees. First, the OA to RIs is discussed through the openness of the publications and the responses of the interviewees. Then the different sources of funding are analysed for each partner followed by the H2020/HE funding analysis of RI-related projects. Next the selected RIs from each institution are discussed, elaborating on the ESFRI projects and outlining the sustainability and strategic direction for RIs through national funding opportunities. Finally, the research support units and the CERI-oriented RIs are identified and discussed.
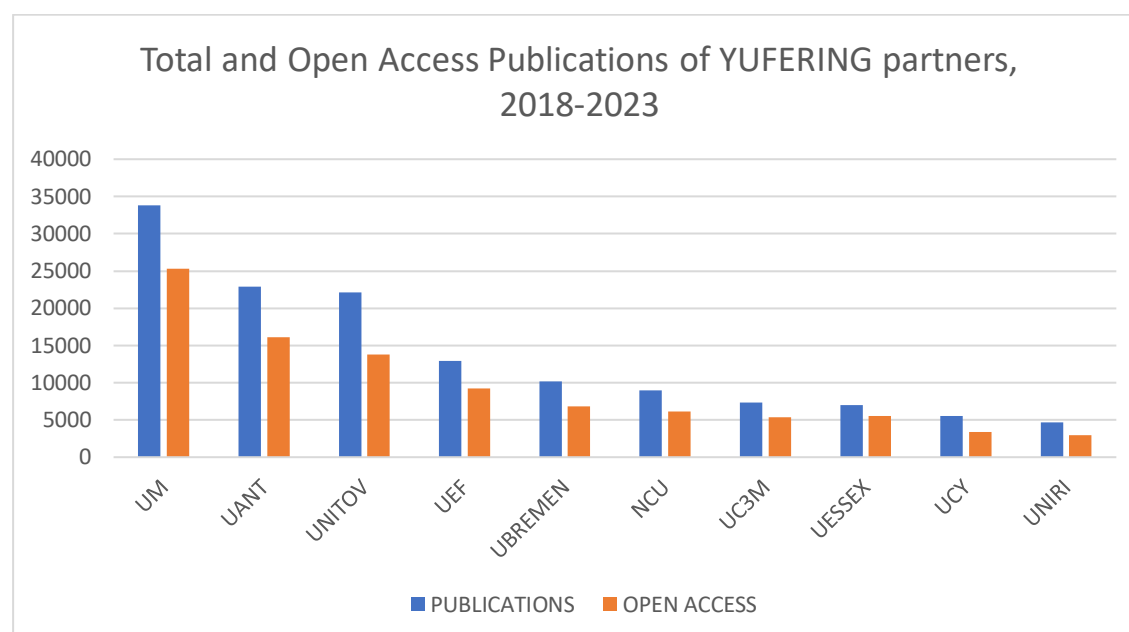
Open Access

The data below were collected for the period 2018-2023, which covers the past five years as of writing this report.

Figure 1 reveals an interesting pattern which we found to be a representative proxy for how open the RIs of the YUFE partners to outside users are including enterprises. The pattern is related to how OA to publications is also representative to how open the RIs

are to external users and especially enterprises. This was corroborated by the desk research and the responses from interviews.

Source: Web of Science, 2018-2023

Figure 1 Total and Open Access Publications of YUFERING partners (2018-2023)

The statistics provided for the ten YUFERING partners reveal a significant commitment to OA publication across these institutions. Maastricht University (UM) and University of Antwerp (UANT) have respectively the first and second highest number of OA publications whereas according to the following Table, University of Essex (UESSEX) leads with the highest percentage of OA publications at 79%, indicating a strong inclination towards enhancing the visibility and accessibility of their research output. This is followed by UM with 75%, UC3M with 73% and then equally UANT and University of Eastern Finland (UEF) with 71%. These figures suggest that the YUFE universities are not only productive in terms of research output but also prioritise OA as a means of dissemination.

Table 1 Percentage of Open Access to the Total of Publications

YUFE PARTNER	UM	UANT	UNITOV	UEF	UBREMEN	NCU	UC3M	UESSEX	UCY	UNIRI
OPEN ACCESS %	75%	71%	63%	71%	67%	68%	73%	79%	61%	64%

On the other end, UCY and University of Rijeka (UNIRI) have the lowest OA percentages, 61% and 64% respectively, although they still maintain a majority of their publications in OA format. This is yet another pattern that reveals the difference between advanced and widening partners. However, this analysis reflects a general trend across the alliance towards OA, which is critical for fostering a more inclusive and accessible R&I environment. Based on the interviews carried out within

YUFERING, it also seems to indicate varying levels of resources dedicated to supporting OA or differences in institutional policies and mandates regarding publication.

The propensity to publish in OA formats reflects a broader philosophy of openness that extends to RIs. OA publications can be seen as a facet of this approach, which includes the sharing of RIs within a CERI framework, such as with citizens and enterprises. Such openness is not only about transparency but also about breaking down barriers to innovation and knowledge valorisation. Open RIs enable external users to engage with the university's resources, promoting collaborative projects that can drive economic development, social advancement, and educational opportunities.

By embracing OA, the YUFE partners are signalling their willingness to participate in a larger dialogue beyond academia, fostering relationships that can lead to impactful research collaborations. It is anything but random that almost all YUFE partners are signatories to the Coalition of Advancing Research Assessment (CoARA), of which the foundations are strongly built on OS. This approach aligns with current trends towards open science, where research data, materials, and processes are made available to all levels of an inquiring society. The correlation between OA publishing and the use of open RIs underlines a strategic commitment to knowledge valorisation, inclusivity and the democratisation of knowledge, benefiting a wide range of stakeholders including the industry, policymakers, and the public at large.

Funding Sources for Research

Another task in this study was to identify the sources of funding used by the YUFE alliance academic institutions with specific reference to RIs and find additional or complementary calls where the YUFE alliance as a whole or few of the institutions of the alliance could apply. To that end, desk research of all the publications of each institution was carried out and the funding behind the articles for each institution was identified. The funders behind the journal articles are included in Table 2 in decreasing order (from highest number of publications funded per funder to the lowest).

Table 2 Funding Sources of Research Articles for YUFE partners

Maastricht University	University of Eastern Finland
- European Commission - Netherlands Organization for Scientific Research Now - Spanish Government - United States Department of Health Human Services - National Institutes of Health NIH USA - Netherlands Organization for Health Research and Development - UK Research Innovation UKRI - German Research Foundation - Medical Research Council UK MRC - Netherlands Government	- Academy of Finland - Finnish Funding Agency for Technology Innovation Tekes - European Commission - Finnish Cultural Foundation - Sigrid Juselius Foundation - Finnish It Centre for Science - United States Department of Health Human Services - National Institutes of Health NIH USA - University of Eastern Finland - UK Research Innovation - Medical Research Council UK MRC

	• Kuopio University Hospital • Emil Aaltonen Foundation
Universidad Carlos III de Madid (UC3M) • Spanish Government • European Commission • Comunidad De Madrid • Instituto De Salud Carlos III • Universidad Carlos Iii De Madrid • UK Research Innovation • Euratom Research and Training Programme • National Science Foundation NSF • Madrid Government Comunidad De Madrid Spain	**University of Essex** • UK Research Innovation • Economic Social Research Council (ESRC) • National Natural Science Foundation of China • European Commission • Engineering Physical Sciences Research Council EPSRC • Biotechnology and Biological Sciences Research Council BBSRC • Medical Research Council UK MRC • Natural Environment Research Council N • Spanish Government
University of Antwerp • Flanders Research Foundation (FWO) • European Commission • Spanish Government • UK Research Innovation • National Natural Science Foundation of China • German Research Foundation • National Science Foundation NSF • Fonds De La Rechhe Scientifique FNRS • Federal Ministry of Education Research BBMF	**University of Nicolaus Copernicus in Torun** • National Science Centre Poland • Polish National Science Centre • Ministry of Science and Higher Education Poland • European Union • German Research Foundation • UK Research Innovation • National Science Foundation Nsf • Polish National Science Centre • Spanish Government • Ministry of Education Culture Sports Science and Technology Japan Mext • Nicolaus Copernicus University
University of Bremen • German Research Foundation • Federal Ministry of Education Research Bmbf • European Commission • National Science Foundation NSF • UK Research Innovation • National Natural Science Foundation of China • Spanish Government • European Research Council • Natural Environment Research Council N	**University of Rijeka** • University of Rijeka • Croatian Science Foundation • European Commission • Ministry of Science Education and Sports Republic of Croatia • German Research Foundation • German Research Foundation • Spanish Government • Slovenian Research Agency • Ministry of Education Culture Sports Science and Technology Japan Mext • Japan Society for The Promotion of Science • Federal Ministry of Education Research

University of Cyprus	University of Rome 'Tor Vergata'
- European Union - Research and Innovation Foundation of Cyprus - University of Cyprus - UK Research Innovation - - Spanish Government - United States Department of Health Human Services - German Research Foundation - - National Institutes of Health -NIH USA - National Science Foundation -NSF - National Natural Science Foundation of China -	- Ministry of Education Universities and Research MIUR - Spanish Government - UK Research Innovation - European Commission - National Science Foundation NSF - Science Technology Facilities Council STFC - National Natural Science Foundation of China - German Research Foundation - Instituto Nazionale Di Fisica Nucleare INFN

Table 3 EU R&I Project Funding for Research Infrastructures 2014-2023

YUFE PARTNER	H2020/HE FUNDING FOR RIs (in €)	No of project participations
UANT	5.584.501	18
UBREMEN	3.535.700	16
UESSEX	2.827.032	16
UEF	1.516.010	9
UC3M	1.414.480	8
UM	1.259.793	6
UNITOV	1.052.719	9
UCY	833.685	8
NCU	819.400	7
Total	**18.843.320**	**97**

The table of funding secured and project participations from Horizon 2020 and HE for RIs among the YUFE partners provides a snapshot of the engagement and success of these universities in securing competitive European funding. The UANT stands out with the highest amount of funding at €5,584,501 and the most project participations, with 18. This indicates not only a strong capacity for developing RI projects that meet the criteria of European funding programs but also suggests a proactive approach in engaging with these funding opportunities.

The University of Bremen (UBREMEN) and the UESSEX follow with €3,535,700 and €2,827,032 respectively, each with 16 project participations. These figures are reflective of a significant level of involvement in RIs development, which is essential for advancing scientific discovery and innovation. While UEF, Universidad Carlos III de Madrid (UC3M), and UM have secured lower funding amounts, their participation in 9,

8, and 6 projects respectively indicates a consistent engagement with European research initiatives.

Notably, the three widening partners UCY, Nicolaus Copernicus University in Torun (NCU) and UNIRI are far behind in terms of funding secured for RIs. This reflects also the level of advancement of their national R&I systems which are not yet in a position to absorb much funding for this purpose given that the national funding provided for setting up large scale RIs is limited compared to countries such as Germany, Belgium, UK, etc. The overall total of €18,843,320 and 97 project participations across the alliance reflects a commendable level of activity and success in securing funding for RI projects, which are critical for fostering innovative research and collaboration within and beyond the academic community. This collective effort not only enhances the research capabilities of the individual institutions but also contributes to the ERA as a whole.

The following Figure also shows the distribution of the secured funds amongst H2020 and HE. Since HE has completed its first three years while H2020 has concluded in 2020 its full 7 years, it is as expected that nearly €15 million of RI funding come from H2020 and only €4 million from HE.
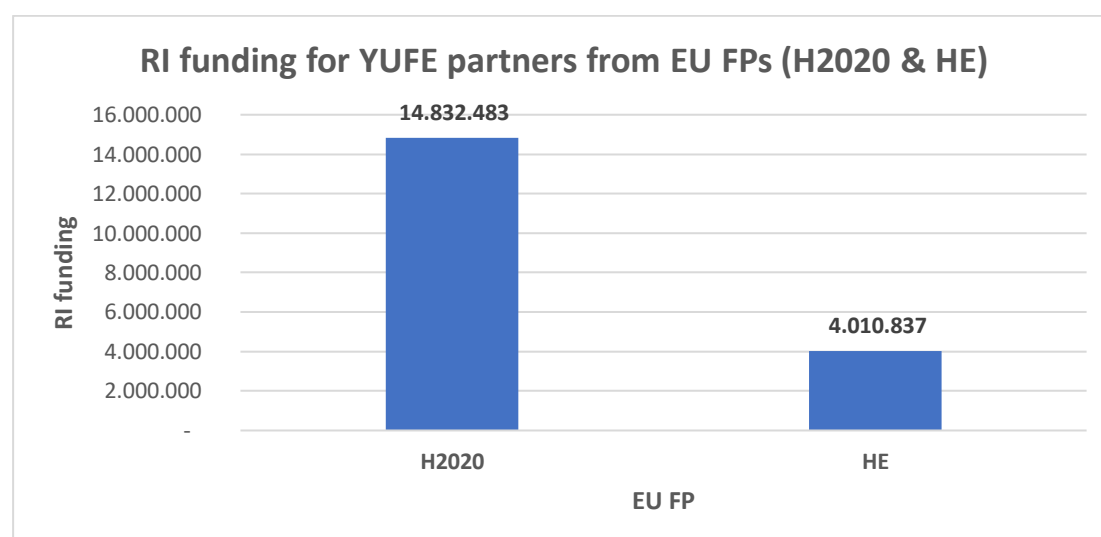
Figure 2 RI funding for YUFE partners from H2020 & Horizon Europe

Selected Research Infrastructures

At the initial phase of the study, a list of RIs was compiled for all YUFE academic institutions, along with funding calls. During the interviews, specific RIs were discussed and the ones mostly highlighted are described below. This selection was carried out by the writing team of the deliverable weighing on both desk research outcomes and the inputs of the interviewees.

Maastricht University

The MU has listed the following RIs: 1. Metabolic Research Unit Maastricht (MRUM), 2. ETPathFinder, 3. Scannexus (not led by UM but highly involved) which provides Ultra-High-Field MRI data , 4. M4I Maastricht Multimodal Molecular Imaging Institute, 5. The Maastricht Study, 6. Gravitational Waves and Fundamental Physics.

Universidad Carlos III de Madrid

The UC3M highlighted RIs that are owned by the research support unit because they provide general services, the technicians are part of the university staff and they have an established access for external actors who require services. The RIs are as follows: 1. Scanning Electron Microscopy Laboratory, 2. RX Diffraction Laboratory, 3. Bioengineering Cleanroom Facility, 4. Electronics Workshop, 5. Mechanical Workshop.

University of Antwerp

The UANT selected the following Core Facilities that have a cross-cutting character: 1. Antwerp Centre for Advanced Microscopy (ACAM), 2. Antwerp Text Mining Centre (TEXTUA), 3. Biobank, 4. Biomina, 5. CalcUA, 6. Centre for Proteomics (CfP), 7. Molecular Imaging Centre Antwerp - Bio-Imaging Lab (MICA-BIL), 8. Neuromics Support Facility (NSF), 9. The Antwerp Social Lab(tASL)

A core facility has a service function and brings together complementary scientific RI and/or expertise in an overarching unit, generating greater capacity and impact. Since they make state-of-the-art infrastructure and/or highly specialised expertise available to other researchers, preferably at an international level, core facilities are levers for scientific research. Through their professional service they help UANT researchers to conduct excellent academic research. The core facilities have a broad and international network and ensure visibility of their expertise and infrastructure, so that also third parties can make frequent use of it.

UANT finances the core facilities with an annual basic funding to support and recognize their important service function. Core facilities are selected via a competitive internal call which prioritizes excellence. The selection of the aforementioned RIs is based on research excellence and international standing/reputation of the involved Principal Investigators (PIs) and their groups at our university (required for participation in RI consortia in H2020 and HE), coupled with extensive national and European networks, to academia and beyond (government, civil society, private sector). Funding by the Flemish government/FWO to connect Flemish academic RIs with ESFRI and other international RIs also played an important role in this. During H2020, FWO had the ESFRI and Big Science funding programs, which were merged into the current FWO-IRI funding in the last years of H2020.

University of Bremen

The following five RIs were selected as they are part of the university's High-Profile Areas, while MARUM is a cluster of excellence.

1. Marine, Polar and Climate Research: MARUM

- *MARUM GeoB Core Repository:* marine samples, sediment cores;
- IODP Bremen Core Repository: (DSDP) cores from the Atlantic Ocean, Mediterranean, Black and Baltic Seas and Arctic Ocean; it is operated at University of Bremen within the framework of the German participation in IODP

2. Research Data Repositories and Projects at the UBREMEN

- *PANGAEA® - Data Publisher for Earth & Environmental Science*: Services supplied by the long-term archive and data library PANGAEA include long-term archiving of data, data publication and dissemination as well as scientific data management;
- *Qualiservice*: data service center for qualitative social science research data; Storing, documenting, and providing qualitative interview data in three dimensions;
- *ParlGov*: contains data on elections and governments for all EU and most OECD members for the entire post-war period. The database combines parties, elections with election results, and governing parties;
- *openEASE*: a web-based knowledge service providing robot and human activity data. Comprehensive data about episodes, in which humans and robots perform complex manipulation tasks, is logged into a big data database;

3. *ZARM Test Centre:* Part of the Centre of Applied Space Technology and Microgravity (ZARM). The Test Centre combines a variety of test labs for small- and large-sized aerospace components. Provides test possibilities for products in vacuum, in extreme and variable thermal environments, under vibration, as well as in hyper- and microgravity;

4. *IMSAS* (Institute for Microsensors, -actuators and –systems): Clean Rooms

5. *MAPEX Core Facility for Material Analysis*: part of the MAPEX Centre For Materials and Processes of the University of Bremen. Instrument Database available here.

University of Cyprus

The UCY has established several key RIs that are at the forefront of innovation and scientific advancement. The KIOS Research and Innovation Centre of Excellence (KIOS CoE) is one such entity, which is the largest R&I centre in Cyprus, focusing on Information and Communication Technologies (ICT). The Centre is particularly involved in monitoring, control, management, and security of critical infrastructures, including electric power systems, water distribution networks, telecommunication networks, and transportation systems.

The UCY hosts a significant High Performance Computing (HPC) facility that is centralised at the Learning Resources Centre on the new University Campus. This facility is equipped with 258 nodes and offers substantial computing power and memory resources to its users. It plays a pivotal role in enabling advanced research that requires extensive computational capabilities. The HPC cluster is designed to support a wide range of research activities, facilitating complex computations and analyses across various fields. It's an essential tool for researchers working on projects

that require the processing of large data sets or the execution of computationally intensive simulations.

The CY-BIOBANK is a Centre of Excellence in Biobanking and Biomedical Research at UCY. This centre is at the forefront of molecular medicine and focuses on human genetic diseases. It's a key piece of the university's RI and a reflection of its commitment to advancing the frontiers of biomedical research. Biobank.cy is structured around several pillars including education, a diagnostics laboratory, and an innovation hub. It has a strong emphasis on ethical, legal, and social implications (ELSI) to ensure compliance with the highest standards. The centre has been funded and supported by the EU, the Cypriot Government, and the UCY under a Horizon 2020 – Widening Teaming Action, and it was initiated in 2019.

University of Eastern Finland

The RIs at the UEF are divided into eight thematic areas. Selected RIs include: 1. Biocenter Kuopio (Faculty of Health Sciences), 2. Infrastructure for materials research and photonics (Department of Physics and Mathematics, Department of Chemistry, Department of Applied Physics, Department of Environmental and Biological Sciences, and SIB Labs), 3. Climate Change RI (Department of Applied Physics, Department of Environmental and Biological Sciences, School of Forest Sciences), 4. Natural Resources RI (School of Forest Sciences, Department of Environmental and Biological Sciences, Department of Geographical and Historical Studies), and 5. Datasets and RI for humanities (Philosophical Faculty and Faculty of Social Sciences and Business Studies).

University of Essex

Selected RIs include: 1. UK Data Archive (infrastructure focused not only on UESSEX but the whole of UK), 2. Research and Enterprise Office, 3. Institute for Public Health and Wellbeing, 4. Centre for Coastal Communities (currently being established and focused on economically deprived areas), 5. Centre for Human Rights (known as world-leading and it is multidisciplinary and practical).

These RIs are highlighted due to the importance of interdisciplinary research, community partnerships or generating solutions for local communities, and addressing global challenges in their work.

University of Nicolaus Copernicus in Torun

The first three RIs selected were launched by strong research teams that produced many publications. The 4th RI was chosen as cultural heritage is of high international level and, in general, conservation is at top international level at NCU. The 5th was chosen as it is from the Medical Faculty and it was a strong infrastructure project for their policy makers. The 4th and 5th RIs concern research areas that are on ESFRI.

The selected RIs are: 1. Centre for Modern Interdisciplinary Technologies, 2. Centre for Quantum Optics, 3. National Laboratory for Photonics and Quantum Technologies - The main goal of the project is the development of modern infrastructure in the fields of photonics and quantum technologies, with particular attention paid to the needs of

industry, 4.Centre for Research and Conservation of Cultural Heritage (Faculty of Fine Arts, NCU), 5.Laboratory of Microextraction Methods and Mass Spectrometry (Department of Pharmacodynamics and Molecular Pharmacology).

University of Rijeka

In 2015, UNIRI has received its largest RI project from the Structural funds. This project was €24 million for scientific equipment in different fields of science. A highlighted RI is the high-performance computing facility. Other RIs are not as large per se, however, when added together they create the preconditions for rising the scientific capacities at a higher level. Other highlighted RIs include the collaborations on large telescopes of the Physics Department, and the Immunology and virology research group infrastructures.

University of Rome 'Tor Vergata'

Interviewees did not select their five core RIs and the writing team could not corroborate the information collected from desk research and quantitative analysis. Therefore, the key RIs are described in the Table below and the Table of funded RI projects in Annex 2.

Research Infrastructures on ESFRI

An initial mapping of the infrastructures that have been on ESFRI or will soon be on ESFRI was conducted. Based on the information gathered, a recommendation would be for few YUFE academic institutions to join already existing ESFRI. It is noted that in the following Table all ESFRI related RIs were included, such as ESFRI landmarks, projects and prospective projects.

Out of the 10 YUFE academic institutions, 8 have RIs on ESFRI.

Table 4 Research Infrastructures of YUFE partners in established and prospective ESFRI consortia

Academic Institution	ESFRI
UM	• ET-Einstein Telescope (included in the ESFRI Roadmap 2021) • E-Brains (Not physically located or led by UM but it is one in which UM is engaged/collaborating)
UC3M	• SLICES: Scientific Large-scale Infrastructure for Computing/Communication Experimental Studies
UANT	• ET - Einstein Telescope. (included in the ESFRI Roadmap 2021)
UBREMEN	• No participation on ESFRI identified.
UCY	• ELIXIR • PRACE • ESS ERIC • KM3NeT 2.0

	- **BBMRI** ERIC: Biobanking and BioMolecular Resources RI
UEF	- **ACTRIS**: Aerosol, Clouds and Trace Gases RI - **AnaEE**: Infrastructure for Analysis and Experimentation on Ecosystems - **BBMRI** ERIC: Biobanking and BioMolecular Resources RI - **EATRIS** ERIC: European Advanced Translational RI in Medicine - **Euro-BioImaging**: European RI for Imaging Technologies in Biological and Biomedical Sciences - **ICOS** ERIC: Integrated Carbon Observation System - **INSTRUCT** ERIC: Integrated Structural Biology Infrastructure - **CLARIN** ERIC
UESSEX	- **ESS** ERIC
NCU	- **IPERION CH** (completed) and **IPERION HS**: Focused on cultural heritage, providing background for E-RIHS. IPERION HS is a RIs funded project. - **E-RIHS**: European RI for Heritage Science
UNIRI	- Not currently on any ESFRI. UNIRI is associated to the Croatian network involved in CERN and also associated with the Central European CERN based in Trieste (Italy) which also has a Croatian branch.
UNITOV	- **ET - Einstein Telescope**. The Solar Telescope is a RI that will soon be on ESFRI. The University of Rome 'Tor Vergata' contributed to creating this through European Projects. - **EuPRAXIA**: UNITOV is an associated partner to the RI titled European Plasma Research Accelerator with Excellence in Applications

Sustainability and Strategic Direction for Research Infrastructures

To assess the feasibility of sharing infrastructures, we assessed the main challenges faced in sustaining the operations of the RIs and the strategic direction for creating and sustaining them at institutional and national level.

Based on information gathered from the UBREMEN, two initiatives in Germany are worth mentioning: 1. Excellenz Cluster (it only includes infrastructure, but is not specifically for it), and 2. European Excellence Strategy.

Based on information gathered from the UANT, maintenance and upgrade costs are often partially borne by research groups, who do not (yet) always sufficiently plan ahead for this. Economic valorisation of RI's is encouraged/incentivised in order to foster financial sustainability. The Research Foundation Flanders receives funding from the Flemish government to organise a call for International Research Infrastructures (IRI) every two years. Current funding, for the whole of Flanders, stands at ca. 30-35 million euro per call. This funding channel is explicitly aimed at the participation of Flemish RI's in ESFRI and other international RI's (e.g. the experiments at Conseil Européen pour la Recherche Nucléaire (CERN) and other large-scale facilities).

There is currently no Belgian ESFRI roadmap. At the Flemish level, EWI published the Flemish participation in international RIs in 2020[5]. The publication provides a comprehensive overview of existing and new international RIs in Flanders. This guide includes the large-scale RIs in which the Flemish government has been investing since 2011, and was realized by the Department of Economy, Science and Innovation in collaboration with Research Foundation Flanders (FWO). The next step is to work on a landscape analysis of institutional, regional and international RIs to arrive at the first Flemish Roadmap for RIs. To the best of our knowledge, no news has been published by EWI since 2020.

Recurrent funding is not the case for most YUFE alliance members, and infrastructure funding is mostly EU project-based funding. For example, NCU mostly uses European Structural Funds and only around 30% of funding comes from national or local funding.

At the UEF bi-annual calls for RIs take place which help in sustaining RIs. UEF has also shown to be successful in securing EU RIs funding and has various RIs on ESFRI.

UC3M has calls for RIs but these calls are dedicated only to creating RIs. Sustaining RIs is assumed to be supported by the university budget and from revenue generated by services of those RIs.

National Funding for Research Infrastructures

The funding options for RIs were identified and analysed in the previous sections of this report. However, various funding options and priorities take place on a national level that can affect the RIs at each YUFE academic institution. Table [X Number] below outlines the various funding options that were available on a national level for sustaining or creating RIs.

---

[5] Available at: https://www.esfri.eu/latest-esfri-news/flemish-participation-international-research-infrastructures

Table 5 National Funding Opportunities for RIs for the YUFE Academic Institutions

Institution and Country	National Level Funding Opportunities
Maastricht University – Netherlands	The Dutch Research Council (NWO) is the main funding agency for science in the Netherlands. It is an independent administrative body under the auspices of the Dutch Ministry of Education, Culture and Science (OCW). NWO's mission is to stimulate and promote top-quality scientific research in the Netherlands, with a focus on curiosity-driven research, research related to societal challenges, and research that has the potential for high impact. NWO provides funding for a wide range of research activities, including RI projects. NWO funds research through a variety of mechanisms, including: • Open calls for proposals that are open to researchers from all over the world • Strategic initiatives that are designed to address specific societal challenges • Individual fellowships for outstanding researchers • RI grants for the development and operation of large-scale research facilities More info here.
Universidad Carlos III de Madrid – Spain	Most funding for UC3M comes from European-funded projects. National funding is also available but only parties that have been successful in receiving EU-funding can apply. This funding comes mainly from the State Programme to Promote Scientific-Technical Research and its Transfer. It addresses the specific objectives OE4, OE5, OE6, and OE7 with actions aimed at: • Increasing and enhancing the necessary resources to produce quality science and technology. • Fostering an environment that encourages the development of scientific results towards advanced levels of technological maturity through transfer channels between scientific research, technological development, and business innovation. • Institutionally strengthening research units and centres to be in a position to achieve international leadership. • Improving scientific-technical facilities, including unique scientific-technical infrastructures (ICTS) and the national nodes of international research infrastructures, and scientific-technical equipment to provide researchers with the necessary tools to be internationally competitive. These action lines are structured around four sub-programmes: • State sub-programme for Knowledge Generation • State sub-programme for Knowledge Transfer

	• State sub-programme for Institutional Strengthening • State sub-programme for Infrastructures and Scientific-Technical Equipment More info [here.](#)
University of Antwerp - Belgium	Through the Research Foundation Flanders (FWO), the Flemish government invests in three types of (academic) RI's: medium-scale (150K-1M euro per project); Large scale (+1M euro) and International RI's (no budget limit). On a two-yearly basis, funds invested in such funding amount to: • medium-scale: ca. 2,5 M euro (two-yearly budget reserved for UANT) • Large-scale: 10-15 M euro (for the whole of Flanders, distributed on a competitive basis) IRI: 30-35M euro (for the whole of Flanders, distributed on a competitive basis)
University of Bremen - Germany	German Research Foundation (GRF): "Major Research Instrumentation" funding programme (according to Art. 91b of the Basic Law). GRF has an information portal for RIs (RIsources). The nine RIs registered on this portal for the UBREMEN are: • Centre of Applied Space Technology and Microgravity (ZARM) • GFBio Service Portal for Biological Data (GFBio_Portal) • Helium Isotope Lab (Helis) • Institute of Solid State Physics, Section Electron Microscopy (IFP-Elektronenmikroskopie) • MAPEX Core Facility for Materials Analytics (MAPEX-CF) • PANGAEA - Data Publisher for Earth & Environmental Science • Research Data Centre Qualiservice • SILVA: The European database for ribosomal RNA sequences • Subject Information Service Social and Cultural Anthropology (FID SKA) More information available [here](#). Federal Ministry of Education and Research (BMBF): Research buildings and major research instrumentation Since 2007, the Federal Government has been funding research buildings at universities with currently €200.5 million per year; large-scale equipment at universities is currently funded with €85 million per year. The federal state that plans and carries out the research building or large-scale equipment participates in the funding to the same extent as the federal government. More information available [here](#). Funding from the State of Bremen is also available.

University of Cyprus – Cyprus	Research and Innovation Foundation (RIF)
	The Cyprus RIF has a dedicated programme for RIs which however publishes calls for proposals in non-frequent time intervals. It opened the last call in 2023 and before that in 2016 and 2011. It has two lots: one for Strategic Infrastructures and another one for Small Scale RIs. Foreign Research Organisations are allowed to participate but only as direct research subcontractors of Cypriot research institutions. More information available here
University of Eastern Finland – Finland	Research Council of Finland (RCF) Funding Instrument for Research Infrastructures (FIRI): This call is open to proposals for the development, acquisition, establishment, strengthening, and upgrading of nationally significant RIs. The deadline for this call is 31 January 2024. More information, available here.
	Finnish Research Infrastructure Committee (TINK): This committee is responsible for coordinating and promoting the development of national RIs in Finland. TINK also publishes a roadmap for Finnish RIs, which outlines the priorities for funding and development in the coming years. More information here.
University of Essex – U.K.	There are several calls for proposals that fund RIs in the United Kingdom (UK). These calls are typically open to researchers from all over the world, but they may also have specific requirements for participation from UK researchers. Here are a few examples of recent calls for proposals that are open to researchers from the UK:
	Science and Technology Facilities Council (STFC): STFC is responsible for funding and operating the UK's national RI in the fields of particle physics, nuclear physics, astronomy, and astrophysics.
	Engineering and Physical Sciences Research Council (EPSRC): EPSRC provides funding for the development and operation of RIs. The EPSRC website has a dedicated page for RI funding opportunities. More info here.
	UK Research and Innovation (UKRI): UKRI is the UK's national science funding agency, and it provides funding for a wide range of research activities, including the development and operation of RIs. The UKRI website has analytical information for all calls for proposals. More info here.
University of Nicolaus Copernicus University in Torun – Poland	Most funding for RIs at NCU comes from European Structural Funds. Around 30% of funding comes from national or local funding.
	The main instrument through which RIs can be funded is the Strategic programmes. Strategic research and development programmes are high-budget initiatives resulting from the state's

	scientific and innovation policy, serving the social and economic development of Poland. More info here.
University of Rijeka – Croatia	There are funding opportunities through the Croatian Science Foundation but not a specific call for RIs. The Programme "Research Projects" funds fundamental research whose goal is creating new and enhancing existing knowledge about a specific area and that is directed at better understanding of the research topic, as well as applied research that is conducted with clear technological, economic or social aims in mind. Projects are funded for a period of 4 years and perhaps there is an opportunity to acquire small scale research equipment.

Between 2013 and now, seven calls have been published within this Programme (IP-2013-11, IP-2014-09, IP-2016-06, IP-2018-01, IP-2019-04, IP-2020-02, IP-2022-10) through which more than 800 projects were funded. More info here. |
| University of Rome 'Tor Vergata' - Italy | The Piano Nazionale Infrastrutture di Rica (PNIR) 2021 – 2027 is a programme completely in line with the European Policy on infrastructures (ERA, ESFRI etc.).
Next Generation Italy 2022-2026 (or Recovery fund; PNRR in Italian), is the plan which manages the funds given to Italy after the COVID-19 pandemic. It provides 191,5 billion € + 50 billion € from the Italian Government. This Programme has 4 typologies of actions. One of them is called IR (RIs) or II (Innovation Infrastructures). This action is completely dedicated to research and innovation Infrastructures. |

The priority placed on RIs at a national level differs among the countries of the YUFE academic institutions. For example, the development of RIs in Italy is an R&I priority. There is alignment between the national plan of the Italian government dedicated to the RIs and the European Funds coming from the Next Generation EU and the Recovery Fund, and the national plan for RIs covers the period 2021-2027.

Interviewees were also asked if any recurrent funding for RIs was available. At the UANT, IRI funding of FWO is intended to give mid- to long-term financial support to Flemish participation in ESFRI projects, although the actual RI's involved are funded from other sources. The government funds the institutions that have some freedom in spending themselves, including for the maintenance of RIs. On an institutional level, the UANT has maintenance funds. Another funding stream is the Special Research Fund (Bijzonder Onderzoeksfonds-BOF) basic infrastructure of the Flemish Government, which has to do with basic RI. This funding can perhaps also be partly included under 'Sustainment' (max. 150K euro per project; call every two years). Core facilities also provide subsidisation as a form of 'sustainment'.

Research Support Units

Few interviewees have highlighted research support units as RIs or RIs under research units, since they play a key supporting role to other infrastructures.

The selected RIs by UC3M mentioned in the report section 'Selected Research Infrastructures' are placed under the Research Unit of the institution. Up to 2020, funding at UC3M was streamlined to research groups directly. From 2020 onwards, the conditions changed and large-scale infrastructures should be provided for the whole community and that is also the reason why they also provide support for researchers.

UC3M now has an umbrella of infrastructures that earlier belonged to the research groups, which are now more accessible to external users. A challenge for UC3M is the risk of losing knowledge, and a way the institutions is preventing this is by having RIs under the research facility, having permanent positions to keep knowledge in-house and have provision of maintenance for the facilities by having charges for the those that are open to externals. More information about the Research Support Centre (CAI) of the UC3M is available [here](#).

The **UESSEX** has a research support unit and the nature of its support makes it a RI itself. The research and enterprise office provides support such as research development, knowledge exchange, research impact, and administrative support.

UCY has a Research and Innovation Support Unit (RISS) which is a central administration unit dedicated to support academics in submitting proposals in competitive calls, support the financial management of projects, manage the innovation generated through its research activities, as well design and implement internal R&I policies. There is no dedicated unit for RIs and the UCY RISS plays this role centrally whenever needed but the norm is that RIs are managed in a decentralised manner by the faculties and academic departments of the university.

At **UNITOV**, the grants office promotes a 'grants culture'. Although the institution provides support to researchers across various levels and ranks, they encourage them from an early stage of their research career to apply for grants. The reason for this approach is that researchers gain experience, and they also ensure that researchers can move to the next level (e.g. from student to PhD, from PhD to experienced researcher, etc.).

Community-Engaged Research Infrastructures and Access

CERI is one of the main working areas of the YUFERING project, but it is also used in a horizontal way across other working areas. One of the ways to convene and share successful community-engaged R&I practices in the YUFE alliance is through sharing RIs.

A first step is to identify which RIs have a community-engaged character at the YUFE academic institutions. **UM** has four campuses, with Brightlands Campus being one of them. Brightlands Campus is where the concentration of all research translation taking place (translating research to real-world impact). The campus provides location for co-creation, education such as research internships, and spaces for startups and other companies to collaborate with universities on specific questions they have.

Two RIs of **UC3M** that are particularly successful in being open to externals are the bioengineering cleanroom facility and the Scanning Electron Microscopy, which are

open to other researchers but also other universities, institutions and some private companies.

When it comes to community-engaged RI, they have co-working spaces in the centre of Leganes. The infrastructures are shared or even integrated with the community in Leganes (e.g. community use of UC3M's tennis courts, cafés etc.) They also have a specific facility-building in one of the industrial areas of Leganes that hosts spin-off companies. An event sponsored by the Community of Madrid titled 'community for science' is open to the general public and it is targeting students that are not university-level students yet as a way to inform them of possible studies. These activities include visits to RIs and activities at the maker space. UC3M has a makerspace that is open for the public and holds activities for high schools, but it is used mostly for educational purposes rather than research purposes.

RIs can be the object of economic valorisation, whereby external users, academic and non-academic, pay on a fee-for-service basis. For example, **UANT's** Core Facilities, but also many other RI's and their relevant expertise, are available to companies. The UANT also holds open days for labs. A specific example of community-engagement is BlueApp. BlueApp collaborates with 'community' of companies as potential partners in sustainable chemistry and materials. They provide science labs and testing environments.[6] They provide ready-to-use halls, pilot labs, and flex desks for researchers and companies.

The core facilities at the UANT often combine expertise from various domains. A core facility has a service function and brings together complementary scientific RIs and/or expertise in an overarching unit, generating greater capacity and impact. Since they make state-of-the-art infrastructure and/or highly specialized expertise available to other researchers, preferably at an international level, core facilities are levers for scientific research. Through their professional service they help UANT researchers to conduct excellent academic research. The core facilities have a broad and international network and ensure visibility of their expertise and infrastructure, so that also third parties can make frequent use of it. UANT finances the core facilities with an annual basic funding to support and recognize their important service function.

The **UBREMEN** does not use the term of CERI and mostly uses the term 'Transfer' and different institutes have transfer managers. Numerous research institutes in the Technology Park offer a wide range of services in the field of knowledge transfer for children, young people and teachers ('future day' at schools, kindergarten, workshops for juniors, Internships for pupils). More information is available here. Other community-engaged initiatives include: Citizen Science Projekt GINGER, Science in bars and pubs, Open Campus, and 'Book a Scientist'.

State aid for RIs in Cyprus has particular restrictions, which makes it more challenging for the **UCY** to make RIs openly accessible to externals. However, even amid these restrictions, UCY has a number of CERI-related RIs that favour participatory citizen science, such as the BIOBANK research centre, which has created the Cyprus

---

[6] https://www.blueapp.eu/en/services/science-labs-testing-enviroments

biobank. In turn for their participation the Cyprus biobank can help any citizen needing information for genetic diseases. At the same level, other RIs utilise the participation of citizens such as the experiments of the Centre of applied Neuroscience and the Psychology Department.

The **UESSEX** has 'Challenger Labs' where external stakeholders pitch their problems and researchers work with them to develop solutions. UESSEX also has an innovation centre and office spaces on campus where they collaborate with local organizations and businesses.

The **NCU** has regulation internally in Polish on opening RIs, giving the opportunity to faculty to open infrastructures for external use and gain benefits by leasing infrastructures or equipment. The infrastructures have a 'researchers first' approach, and if they are not utilized then they are opened for other purposes. The regulation applies to all faculties but faculties have autonomy when it comes to the openness of their RIs. Depending also on previous international collaboration, few faculties might be more eager to make their RIs open as they have frequently done this in the past.

NCU also has community-engaged RIs. For example, a long-term activity is 'Medical Wednesdays' which has been going on for many years and the doctors and nurses discuss the newest achievements of medicine with the society. Other times, well-known doctors are also invited from abroad to talk about their research. Another activity is the Festival of Science and Arts where researchers show what they are doing. Radio telescope has been community engaged, being opened to the public, influencing society and allowing society to contribute. Another activity is 'White Sunday' which allows anyone to get their sunburns tested for melanoma.

At the **UNIRI**, there are no structurally-designed CERI infrastructures, however, a number of RIs have become CERI-oriented by circumstance. No provisions for community engagement exist, but during the pandemic many RIs became community-engaged, such as the immunology RI due to sequencing and analysing coronavirus peculiarities, as well as the 3D printing facility used for medical reasons. The university also opens its facilities to everyone every year for a week, with science outreach events, public lectures, roundtables, and most laboratories are open for visits by the general public. There is also a Renaissance palace on the island of Cres, which opens for summer schools and science outreach activities. Moreover, UNIRI provided a senior citizens life-long learning programme, which is directly focused on people who are retired and each year various events and lectures take place and are dedicated to senior citizens.

4. RI Pilots & Actions

TWIN4MERIT Pilot

A successful pilot of how to find common grounds with respect to RIs has taken place through the TWIN4MERIT project, which is a spin-off project of the YUFERING project funded by the Horizon Europe programme and more specifically the WIDERA-Twinning Action. The initiative started from UCY with direct communication of the

involved research teams. The consortium includes 3 out of the 10 YUFE academic institutions and offered the opportunity to pilot how to share RIs with a smaller group of YUFE alliance academic institutions and gain lessons learned that can be useful in other pilots. It also involves exploiting an existing European RI project which is likely to become an ERIC or ESFRI in the forthcoming years. This European RI project is RISIS2[7](RI for Science and Innovation policy Studies).

The RISIS2 project has embarked upon an effort to lessen significantly the gap in data availability in R&I policy. The project has produced a novel composite infrastructure in R&I policy, which comprises a significant number of unique datasets at the country, institution and individual levels. The datasets which are available upon request either remotely or through *in situ* visits to the infrastructure sites include *inter alia:*

-   the SIPER (Science and Innovation Policy Evaluations Repository) is a rich and unique database and knowledge source of science and innovation policy evaluations worldwide
-   the LEIDEN ranking dataset with research output information for over 1000 academic institutions worldwide,
-   ETER with information on all European research institutions,
-   EU-PRO with information for all funded projects by EU FPs,
-   PROFILE, a longitudinal study focusing on the situation of doctoral candidates and their postdoctoral professional careers,
-   MORE, an internationally comparable data on personal characteristics and education of researchers, current employment and working conditions, as well as range of measures on international and sector mobility, and
-   The NANO database which comprises publications and patents between 1991 and 2011 about Nano Science & Technology.

The TWIN4MERIT project could contribute *inter alia* to the advancement of empirical knowledge in the field of economics and management of R&I by producing novel studies based on the above datasets and combinations thereof. The studies will utilise advanced econometric techniques such as panel data and multilevel models to estimate the determinants of research output and research funding. To the best of our knowledge, multilevel modelling has not been used in R&I policy extensively, albeit being an advanced econometric tool. The increased speed of statistical software nowadays that can accommodate the use of multilevel modelling, such as MLWin, Python and R, will allow to foster the different levels of information about research funding and research productivity into a complex multilevel model with random effects assigned for country, institution and scientific fields. This new approach is expected to allow for richer inference on the determinants of R&I funding and productivity. In addition, the conventional fixed effects panel data models will be used in parallel to secure robustness of the findings and address econometric challenges not taken into account by multilevel modelling such as unobserved heterogeneity and simultaneity due to time-invariant latent factors.

We anticipate that all studies will generate novel results that can be used by both the scientists active in the R&I policy field as well the competent policy-makers. The main

---

outcome we expect is to shed light on the determinants of research output and funding success. The proposed concept is by definition original for two main reasons: Firstly, it proposes the use of purely novel datasets for examining a very important problem in the economics and policy of R&I, that is, the determinants of research productivity and funding success. Secondly, the proposed methodology is new to the field and guarantees findings characterised by originality. Multilevel modelling allows for a more detailed treatment of effects at different levels than the first level, such as countries, institutions and scientific fields. Its approach matches the design of the proposed databases where emphasis was placed in acquiring this type of multilevel information.

The ultimate purpose of the TWIN4MERIT project in terms of RIs is to either create the institutional datasets that will enable the partners to qualify for hop-on participation in the project or to exploit this collaboration to follow up on creating a complementary RI in the Management and Economics of R&I to serve a different purpose than RISIS2. Nevertheless, the fact that 3 YUFE partners have already committed to share their RIs in this topic and project and the fact that other YUFE partners have already expressed interest to join this effort makes this pilot a successful bottom-up approach of sharing RIs and for exploiting existing European RI projects.

The TRIP2EXCELLENCE follow-up Action

As a follow up action to YUFERING and with reference to the RIs, the TRIP2EXCELLENCE proposal was submitted by 6 out of 10 YUFE partners, under the WIDERA European Excellence Initiative call for proposals of HE. Unfortunately, it was not funded and at the time this deliverable is being prepared is still in the reserve list.

In terms of RIs, the project aimed to upgrade and utilise the digital research collaboration platform, which will be created for all YERUN members, to open the RIs identified in YUFERING to all partners of TRIP2EXCELLENCE to facilitate collaboration for a cascade call for proposals in pre-identified research areas (Sustainability and Digitalisation). To that end a number of steps were planned:

- Provide the report of YUFERING on RIs and the related list to feed the requirements analysis for the creation of the digital research platform module for accessing and utilising RIs of the consortium.
- Collect information from the new partners of TRIP2EXCELLENCE to update the list of RIs.
- Utilise the platform once operational to facilitate joint proposals for research projects and knowledge valorisation through multidisciplinary collaboration of the research entities/units/centres.
- The platform will comprehend research publications from all partners and RIs/equipment that can be shared.
- The platform will help to identify potential areas for multidisciplinarity in the domain of EU Green Deal, the selected HE Missions and Green and Digital Transition. These areas will be prioritised for funding.
- The platform will also enable researchers to find the right RIs to support their collaborative research projects across the consortium.

If the TRIP2EXCELLENCE project is not funded, a number of these actions may still be feasible. The enrichment of the digital platform of YERUN in order to accommodate the RIs module is still under discussion and the other follow-up actions can be also addressed.

RI matchmaking based on thematic areas and research keywords

In an effort to find efficient tools to quickly identify potential synergies of RIs, we created a simple algorithm in Python which was tested in two out of the four main areas of interest of the YUFE alliance, Sustainability and Digitalisation. These two areas were also the foundations of the TRIP2EXCELLENCE EEI proposal explained in previous sections. The purpose of this algorithm was to provide a basic approach which can later be further developed through the advanced tools now available to become an indispensable component of the digital research collaboration platform to be created.

The YUFE alliance's deployment of a Python algorithm to sift through RIs pertinent to sustainability marks a tactical step towards nurturing thematic or multidisciplinary collaboration. By filtering research entities on preselected topics such as sustainability and environmental protection, the algorithm effectively searches extensive data sets to pinpoint relevant RIs. The existing process involves data cleansing to standardise text fields and excise superfluous columns, then utilising keyword matching to flag entities that correspond with the sustainability criteria. The resulting data can then be saved and disseminated, easing the process of pairing collaborators for joint efforts.

This rudimentary algorithm acts as a groundwork for a more intricate and nuanced search mechanism within the envisioned digital research collaboration platform by YERUN. To enhance this algorithm, forthcoming versions might integrate natural language processing (NLP) to discern context around keywords rather than just direct matches. Machine learning models could be developed to identify patterns and links between various research domains, which might not be overtly stated but are contextually pertinent. Moreover, mechanisms for user feedback could be instituted to perpetually refine the search results' relevance.

Embedding the algorithm into the digital platform would permit instantaneous pairing of RIs, reinforcing collaborative research prospects. The platform could offer advanced search filters, user preferences, and systems for recommending potential RI partnerships. Additionally, by regularly updating the dataset and the list of keywords, the platform could remain attuned to burgeoning research themes and interdisciplinary fields. For example, the integration of Application Programming Interfaces (APIs) to draw data from research publications and funding databases of the YUFE partners could ensure the platform's database is both current and comprehensive. Such enhancements would not only streamline the identification of RIs and research partners but also stimulate innovative projects, potentially leading to breakthroughs in sustainability, digitalisation and other critical areas of research of the YUFE partners.

5. Recommendations/ Action Plan

Now that YUFERING is reaching its completion, an Action Plan is necessary for RIs. A number of steps are necessary to enable the consortium to uptake the proposed solutions of this deliverable. Table 6 includes a number of scenarios that could be implemented and to that end a number of actions are listed below.

- Circulate the final/updated RIs list to all YUFERING partners.

- Utilise and extend the competent RI personnel in each YUFE partner to create a common group to discuss issues and uptake any solutions that will stem from this deliverable.

- Focus on the YUFE2030 project (WP5, Task 5.3) on developing further pilots for submitting joint proposals to further develop and utilise RIs.

- Test the YERUN digital collaboration platform and identify ways and tools to incorporate the RIs for joint use.

- Resubmit the TRIP2EXCELLENCE proposal under the WIDERA/EEI call in 2025 in order to invest in digitalisation of RIs through the upgrade of the YERUN platform.

- Advance further the algorithm created through LLM training in order to identify relevant research areas both vertically and in a multidisciplinary manner.

Depending on the priority given to RIs in the YUFE alliance, an ad-hoc committee or central unit for RIs could be formed to provide strategic recommendations and support. However, any unit created would have an advisory rather than prescriptive role as any actions leading to new collaborations or widening the access of infrastructures depend on the research groups and hence also needs bottom-up demand. A committee or central unit would have the role of providing information regarding RIs, contribute to creating a culture of sharing and opening up infrastructures, and supporting joint projects for RIs of the YUFE alliance.

The YUFE alliance has successfully secured funding from the Erasmus+ HEI Initiative. The proposal of the YUFE 2030 project drew on the implementation experience of YUFERING, hence, the new project will be able to extend some actions of the YUFERING project. A work package was dedicated for Research, among which is a task on creating research collaborations (Task 5.3), which aims to build further on the work of the YUFERING project on RIs. This approach will partially ensure that insights, deliverables, and other material generated in the YUFERING project will be utilised or implemented in the immediate future through the YUFE 2030 project.

All YUFE alliance academic institutions are part of the YERUN network. YERUN has created a digital research collaboration platform which will be available for use for all its members. Since all the YUFE alliance academic institutions are also members in YERUN, the YUFE alliance will be able to utilise this digital tool to enhance its collaboration and seamless operations. However, this platform does not provide

harmonisation of calls, a list of infrastructures, or opportunities for connecting researchers. An added feature can be created by the YUFE alliance through a future YUFE-alliance project such as the TRIP2EXCELLENCE proposal. In particular, relevant calls for RIs like the forthcoming WIDERA/European Excellence Initiative call for proposals in 2025 might also be considered to take further steps in efficiently sharing RIs within the YUFE alliance institutions.

The scenarios in the Table below have identified potential areas for collaboration or pilots. Given the lack of centralised knowledge regarding RIs at the YUFE academic institutions it is possible that opportunities for sharing infrastructures or creating new collaborations might have been missed.

Table 6 Scenario Recommendations for Sharing RIs within the YUFE alliance

	Scenario A	Scenario B	Scenario C
Level	Bottom-up	Top-Down	Combined (Bottom-up and Top-Down)
Approach	Project-based approach	Institutional-based approach	Project-based and institutional-based approach
Focus	Top-down information shared with research groups and gathering interest for opening RIs with research groups of other YUFE partners -Eventually having most RIs being shared	A memorandum of understanding could be prepared to enable sharing of RIs – The aim would be to have a step-wise approach and lead all RIs to be shared	Combination of top-down and bottom-up push for sharing of infrastructures and collaboration among research groups
Implementation Process	A new joint project could provide an add-on to the YERUN tool that incorporates and matches infrastructures, groups and projects, allowing research groups to connect and share RIs among them	Discussion with faculties or research groups on opening RIs to research groups located at other YUFE alliance institutions and identifying terms of agreement	Gathering interest from research groups and starting pilot Studies and Feasibility Analysis. Creation of a digital platform or adding features to the YERUN Platform. Monitoring of RIs Sharing RIs vs Creating Research Collaborations/Nodes

Additional Considerations	Providing networking opportunities for research groups to meet and start bottom-up actions	Consultation or creation of committee with faculty members to ensure that a top-down approach does not risk the autonomy of research groups and impose actions that do not align with research groups	Mobility of Researchers between YUFE academic institutions during pilots would be useful to ensure that a bottom-up with a top-down approach works in practice

Given that this report is the first undertaking of the YUFE alliance towards mapping and identifying opportunities for sharing RIs, these potential scenarios have been identified and provided as recommendations.

6. Conclusions

Identifying research collaboration potential within the YUFE university alliance involves a strategic approach that leverages the strengths, expertise, and resources of each institution. Based on comprehensive desk research, quantitative analysis, pilots and interviews with key individuals from each university, several effective strategic directions have emerged for fostering collaboration of RIs over the next five years.

The scenarios of Table 5 provided a general framework on how to move forward and these were further elaborated in the Action Plan section. In what follows we try to recap on the tangible strategic directions that draw from these scenarios and all the work done in this deliverable.

First, the establishment of a centralised digital research collaboration platform is crucial. This platform should serve as a repository of ongoing research projects, expertise, and resources available across the alliance. By providing visibility into each university's strengths and research interests, the platform will facilitate matchmaking among researchers with complementary skills and objectives, thereby sparking collaborative initiatives. The YERUN digital research platform seems to be the right means to serve this purpose. It would be crucial to create a module for listing, booking, accessing and utilising the RIs of the YUFE alliance members. For this purpose, all information collected through the work of this deliverable can be included and the Python algorithm for matching RIs can be further developed and incorporated in the digital platform.

Second, through the YUFE 2030 project, the implementation of regular thematic and interdisciplinary workshops that include the use of RIs within the alliance is recommended. These events will provide opportunities for researchers to use the RIs of the YUFE partners, to share their work and explore areas of mutual interest. Such gatherings can be thematic, focusing on pressing global challenges where interdisciplinary approaches are particularly valuable. These can be accommodated under the YUFE 2030 WP5 and particularly Task 5.3 where such activity was planned in the proposal.

Third, joint funding initiatives can significantly enhance collaboration of RIs. The alliance should consider establishing a small dedicated fund to support collaborative research projects that utilise RIs. This fund could provide seed money for promising initiatives, with the potential to attract external funding from HE and other funding schemes. Prioritising projects that involve researchers from multiple institutions will encourage cross-university partnerships.

Fourth, fostering mobility among researchers is essential. Exchange programmes and visiting scholar to RIs initiatives can help build strong networks amongst RIs and enhance understanding of each institution's capabilities and research culture. Such exchanges will lay the groundwork for future RI collaborations.

By focusing on these strategic directions, the YUFE alliance can create a vibrant ecosystem of RI collaboration, leveraging the combined expertise and resources of its members to achieve greater scientific breakthroughs and societal impact. The present deliverable will ideally be the cornerstone of building and eventually achieving this vision with respect to the YUFE alliance RIs.

Annex 1 Interview Questions

INFRASTRUCTURE CAPACITY

1. Which are the 5 top infrastructures of your institution in terms of research excellence? Follow up question: Why did you select these five?

2. From our desk research, we have identified a number of infrastructures of your institution participating in ESFRI and/or other EU infrastructures.

   a. Do you agree with the figures provided?

   b. Please describe your experience with ESFRI and/or other EU infrastructures. What are the benefits of your participation in these? What challenges do you face?

3. Can you open your infrastructures to external users? Do you have an established regulatory framework for this? If yes, please explain.

INFRASTRUCTURE FUNDING

4. Do you have any funding figures for the national funding of your infrastructures? If yes, please send this information to yufering @ucy.ac.cy.

5. We have identified a number of research funding calls for proposals for infrastructures.

   a. Is the information relevant for your institutional needs?

   b. Are there any other funding opportunities at national level? Please send yufering@ucy.ac.cy any relevant info.

6. Is there recurrent funding from the government, university or other funding sources for sustaining your RIs?

7. Are your infrastructures supported or planned to be supported by the European Structural and Investment Funds (ESIFs) and the Recovery and Resilience Funds (RRF)?

INFRASTRUCTURE GROWTH & STRATEGY

8. Based on the quantitative analysis made in this task:

   a. Do these figures represent the current state of H2020 funding for your infrastructures at your institution?

   b. What do you think are the main reasons for the success in securing H2020 funding of these identified infrastructures (if applicable)?

9. Is there a strategic direction in your country generally to create new infrastructures and/or to join existing ESFRI and other EU-based infrastructures consortia?

10. Do your infrastructures offer services to enterprises, government or societal stakeholders?
    a. If yes, could you please give us an example of an infrastructure you consider successful and explain its strengths?
    b. Can you specify a top list (max. 10) of such projects?
    c. If not, do you have short-term plans for your infrastructure to offer such services?

11. Do you face any problems in sustaining the operations of the RIs you have at your institution? If yes, please elaborate.

INFRASTRUCTURE & COMMUNITY ENGAGEMENT

12. Do your infrastructures have a multidisciplinary focus? Please elaborate and provide examples.

13. Do you have infrastructures with a community-engaged character?

   a. If yes, please give us a few examples.

   b. Can you provide a list of CERI infrastructures?

14. How can your CERI RIs (if applicable) be improved through collaboration with partners that come from the networks/local ecosystems of other YUFE partners?

15. Do you give access to citizens through targeted visits, trainings and/or co-creation events to increase awareness and impact coming from their engagement? If yes, please elaborate.

16. Do you have any co-working space for R&I co-creation of RIs/entities and their personnel with citizens? If yes, please elaborate.

Annex 2: List of funded RI projects of YUFERING partners from H2020/HE

PARTNER	Project Acronym	Project Number	Project Title	Programme
NCU	IPERION CH	654028	Integrated Platform for the European RI ON Cultural Heritage	H2020
NCU	RadioNet	730562	Advanced Radio Astronomy in Europe	H2020
NCU	E-RIHS PP	739503	The European RI for Heritage Science Preparatory Phase	H2020
NCU	IPERION HS	871034	Integrating Platforms for the European RI ON Heritage Science	H2020
NCU	ORP	101004719	Opticon RadioNet Pilot	HE
NCU	E-RIHS IP	101079148	European RI for Heritage Science Implementation Phase	HE
NCU	POLARIN	101130949	POLARIN: POLAR RI NETWORK	HE
UANT	RINGO	730944	Readiness of ICOS for Necessities of integrated Global Observations	H2020
UANT	InGRID-2	730998	Integrating RI for European expertise on Inclusive Growth from data to policy	H2020
UANT	EUSMI	731019	European infrastructure for spectroscopy, scattering and imaging of soft matter	H2020
UANT	EURHISFIRM	777489	Historical high-quality company-level data for Europe	H2020
UANT	ID-EPTRI	777554	Infradev - European Paediatric Translational RI	H2020
UANT	ICEI	800858	Interactive Computing E-Infrastructure for the Human Brain Project	H2020
UANT	ESTEEM3	823717	Enabling Science and Technology through European Electron Microscopy	H2020
UANT	PRACE-6IP	823767	PRACE 6th Implementation Phase Project	H2020
UANT	SSHOC	823782	Social Sciences & Humanities Open Cloud	H2020
UANT	EOSC Future	101017536	EOSC Future	HE

UANT	PAUL	101037319	Pilot Application in Urban Landscapes - Towards integrated city observatories for greenhouse gases	HE
UANT	AgroServ	101058020	Integrated SERvices supporting a sustainable AGROecological transition	HE
UANT	GUIDEPREP	101078945	Growing Up in Digital Europe Preparation Phase (GUIDEPREP)	HE
UANT	ET-PP	101079696	Preparatory Phase for the Einstein Telescope Gravitational Wave Observatory	HE
UANT	IMPRESS	101094299	Interoperable electron Microscopy Platform for advanced RESearch and Services	HE
UANT	RIANA	101130652	RI Access in NAnoscience & nanotechnology	HE
UANT	NUBICOS	101130676	New Users for a Better ICOS	HE
UANT	IRISCC	101131261	Integrated RI Services for Climate Change risks	HE
UBREMEN	OpenAIRE2020	643410	Open Access Infrastructure for Research in Europe 2020	H2020
UBREMEN	THOR	654039	THOR – Technical and Human Infrastructure for Open Research	H2020
UBREMEN	COOP_PLUS	654131	COOPERATION OF RIs TO ADDRESS GLOBAL CHALLENGES IN THE ENVIRONMENT FIELD	H2020
UBREMEN	ENVRI PLUS	654182	Environmental RIs Providing Shared Solutions for Science and Society	H2020
UBREMEN	ODIP 2	654310	Extending the Ocean Data Interoperability Platform	H2020
UBREMEN	EMSODEV	676555	EMSO implementation and operation: DEVelopment of instrument module	H2020
UBREMEN	RINGO	730944	Readiness of ICOS for Necessities of integrated Global Observations	H2020
UBREMEN	OpenAIRE-Connect	731011	OpenAIRE - CONNECTing scientific results in support of Open Science	H2020
UBREMEN	EUMarineRobots	731103	Marine robotics RI network	H2020
UBREMEN	ECDP	777449	European Cohort Development Project	H2020
UBREMEN	FREYA	777523	Connected Open Identifiers for Discovery, Access and Use of Research Resources	H2020

UBREMEN	EurofleetsPlus	824077	An alliance of European marine RI to meet the evolving needs of the research and industrial communities.	H2020
UBREMEN	FAIRsFAIR	831558	Fostering FAIR Data Practices in Europe	H2020
UBREMEN	NEANIAS	863448	Novel EOSC services for Emerging Atmosphere, Underwater and Space Challenges	H2020
UBREMEN	OPTED	951832	Observatory for Political Texts in European Democracies - A European RI	H2020
UBREMEN	FAIR-IMPACT	101057344	Expanding FAIR Solutions across EOSC	HE
UC3M	EURHISFIRM	777489	Historical high-quality company-level data for Europe	H2020
UC3M	FAIRsFAIR	831558	Fostering FAIR Data Practices in Europe	H2020
UC3M	SLICES-DS	951850	Scientific Large-scale Infrastructure for Computing/Communication Experimental Studies - Design Study	H2020
UC3M	RADNEXT	101008126	RADiation facility Network for the EXploration of effects for indusTry and research	HE
UC3M	SLICES - SC	101008468	Scientific Large-scale Infrastructure for Computing/Communication Experimental Studies – Starting Community	HE
UC3M	AI4LIFE	101057970	Artificial Intelligence for Image Data Analysis in the Life Sciences	HE
UC3M	Skills4EOSC	101058527	Skills for the European Open Science Commons: Creating a Training Ecosystem for Open and FAIR Science	HE
UC3M	SLICES-PP	101079774	Scientific Large-scale Infrastructure for Computing/Communication Experimental Studies - Preparatory Phase	HE
UCY	OpenAIRE2020	643410	Open Access Infrastructure for Research in Europe 2020	H2020
UCY	OpenAIRE-Advance	777541	OpenAIRE Advancing Open Scholarship	H2020
UCY	NI4OS-Europe	857645	National Initiatives for Open Science in Europe	H2020

UCY	ERIGrid 2.0	870620	European RI supporting Smart Grid and Smart Energy Systems Research, Technology Development, Validation and Roll Out – Second Edition	H2020
UCY	ELIXIR-CONVERGE	871075	Connect and align ELIXIR Nodes to deliver sustainable FAIR life-science data management services	H2020
UCY	ELIXIR-STEERS	101131096	ELIXIR-STEERS	HE
UCY	EvolveBBMRI	101131701	Accelerating datafication for support of EU health priorities, greening of biobanks and integrated approach to "One Health"	HE
UCY	RISEnergy	101131793	RI Services for Renewable Energy	HE
UEF	EUROCHAMP-2020	730997	Integration of European Simulation Chambers for Investigating Atmospheric Processes – Towards 2020 and beyond	H2020
UEF	EU_FT-ICR_MS	731077	European Network of Fourier-Transform Ion-Cyclotron-Resonance Mass Spectrometry Centers	H2020
UEF	EOSC-Nordic	857652	EOSC-Nordic	H2020
UEF	EATRIS-Plus	871096	Consolidating the capacities of EATRIS-ERIC for Personalised Medicine	H2020
UEF	ATMO-ACCESS	101008004	Solutions for Sustainable Access to Atmospheric Research Facilities	HE
UEF	ISIDORe	101046133	Integrated Services for Infectious Disease Outbreak Research	HE
UEF	GraspOS	101095129	GraspOS: next Generation Research Assessment to Promote Open Science	HE
UEF	TITAN	101129822	TITAN: Trusted envIronments for confidenTiAl computiNg and secure data sharing	HE
UEF	IRISCC	101131261	Integrated RI Services for Climate Change risks	HE
UESSEX	SERISS	654221	Synergies for Europe's RI in the Social Sciences	H2020
UESSEX	CESSDA-SaW	674939	Strengthening and widening the European infrastructure for social science data archives.	H2020
UESSEX	RISCAPE	730974	European RIs in the International Landscape	H2020

UESSEX	InGRID-2	730998	Integrating RI for European expertise on Inclusive Growth from data to policy	H2020
UESSEX	ECDP	777449	European Cohort Development Project	H2020
UESSEX	SSHOC	823782	Social Sciences & Humanities Open Cloud	H2020
UESSEX	FAIRsFAIR	831558	Fostering FAIR Data Practices in Europe	H2020
UESSEX	TRIPLE	863420	Transforming Research through Innovative Practices for Linked interdisciplinary Exploration	H2020
UESSEX	ESS-SUSTAIN-2	871063	Next Steps in Securing the Sustainability of the European Social Survey, European RI Consortium (ESS-SUSTAIN-2)	H2020
UESSEX	COORDINATE	101008589	COhort cOmmunity Research and Development Infrastructure Network for Access Throughout Europe	HE
UESSEX	PAUL	101037319	Pilot Application in Urban Landscapes - Towards integrated city observatories for greenhouse gases	HE
UESSEX	FAIR-IMPACT	101057344	Expanding FAIR Solutions across EOSC	HE
UESSEX	eRImote	101057557	European RIs - Pathway to Improved Resilience and Digital and Remote Access	HE
UESSEX	OSTrails	101130187	Open Science Plan-Track-Assess Pathways	HE
UESSEX	EOSC-ENTRUST	101131056	EOSC-ENTRUST: A European Network of TRUSTed research environments	HE
UESSEX	Infra4NextGen	101131118	Providing RI services to support Next Generation EU	HE
UM	ELIXIR-EXCELERATE	676559	ELIXIR-EXCELERATE: Fast-track ELIXIR implementation and drive early user exploitation across the life-sciences.	H2020
UM	NanoCommons	731032	The European Nanotechnology Community Informatics Platform: Bridging data and disciplinary gaps for industry and regulators (NanoCommons)	H2020
UM	OpenRiskNet	731075	OpenRiskNet: Open e-Infrastructure to Support Data Sharing, Knowledge Integration and in silico Analysis and Modelling in Risk Assessment	H2020

UM	ICEI	800858	Interactive Computing E-Infrastructure for the Human Brain Project	H2020
UM	EOSC-Life	824087	Providing an open collaborative space for digital biology in Europe	H2020
UM	IMPRESS	101094299	Interoperable electron Microscopy Platform for advanced RESearch and Services	HE
UNITOV	GREST	653982	Getting Ready for EST	H2020
UNITOV	EoCoE	676629	Energy oriented Centre of Excellence for computer applications	H2020
UNITOV	PRE-EST	739500	Preparatory Phase for the European Solar Telescope	H2020
UNITOV	XLS	777431	CompactLight	H2020
UNITOV	ESCAPE	824064	European Science Cluster of Astronomy & Particle physics ESFRI RIs	H2020
UNITOV	SOLARNET	824135	Integrating High Resolution Solar Physics	H2020
UNITOV	EoCoE-II	824158	Energy Oriented Center of Excellence: toward exascale for energy	H2020
UNITOV	VIPERLAB	101006715	Fully connected virtual and physical perovskite photovoltaics lab	HE
UNITOV	EuPRAXIA	101079773	EuPRAXIA Preparatory Phase Project	HE

Annex 3: Python Code for clustering algorithm of RIs

3.1 Sustainability pilot

```python
# Importing necessary libraries
import pandas as pd

file_path_uploaded = '/mnt/data/YUFERING_Task2.6_ResearchEntities_UCY_tg.xlsx'
data_uploaded = pd.read_excel(file_path_uploaded)

# Cleaning and preparation steps
# Removing unnecessary columns and standardising text data
columns_to_keep_uploaded = ['University Name', 'Entity name (Research Lab, Centre, Unit)',
'Departments', 'Research Fields', 'Key Words / Research Lines']
cleaned_data_uploaded = data_uploaded[columns_to_keep_uploaded]
cleaned_data_uploaded['Research     Fields']     =     cleaned_data_uploaded['Research
Fields'].astype(str).str.strip().str.lower()
cleaned_data_uploaded['Key Words / Research Lines'] = cleaned_data_uploaded['Key Words
/ Research Lines'].astype(str).str.strip().str.lower()

# Defining the function to check sustainability-related entities
def is_sustainability_related(fields, keywords):
    sustainability_keywords = [
        'sustainability', 'sustainable development', 'environmental protection',
        'economic development', 'green transition', 'climate neutrality',
        'environment', 'ecology', 'green', 'climate', 'renewable',
        'conservation', 'biodiversity', 'sustainable', 'energy efficiency'
    ]
    text = fields.lower() + " " + keywords.lower()
    return any(keyword in text for keyword in sustainability_keywords)

# Identifying sustainability-related entities using the same criteria as before
sustainability_related_entities_uploaded                                          =
cleaned_data_uploaded[cleaned_data_uploaded.apply(
    lambda x: is_sustainability_related(x['Research Fields'], x['Key Words / Research Lines']),
axis=1)]
# Saving the filtered entities to a CSV file
output_file_path_uploaded = '/mnt/data/sustainability_related_entities_uploaded.csv'
sustainability_related_entities_uploaded.to_csv(output_file_path_uploaded, index=False)
output_file_path_uploaded
```

3.2 Digitalisation Pilot

```python
# Defining a function to check if an entity's research interests fall under the broad category of
digitalisation/digital transformation
def is_digitalisation_related(fields, keywords):
    # Keywords and phrases indicating digitalisation or digital transformation
    digitalisation_keywords = [
        'digitalisation', 'digital transformation', 'digital technology', 'digitalization',
        'informatics', 'information technology', 'cyber', 'computing', 'data science',
        'machine learning', 'artificial intelligence', 'blockchain', 'iot', 'internet of things',
        'big data', 'cloud computing', 'cybersecurity', 'virtual reality', 'augmented reality',

    ]

    # Checking if any of the digitalisation keywords are in the research fields or keywords
    text = fields.lower() + " " + keywords.lower()
    return any(keyword in text for keyword in digitalisation_keywords)

# Applying the function to the dataset to identify digitalisation-related entities
digitalisation_related_entities = cleaned_data_uploaded[cleaned_data_uploaded.apply(
    lambda x: is_digitalisation_related(x['Research Fields'], x['Key Words / Research Lines']),
axis=1)]

# Attempting to save the filtered entities to a CSV file
output_file_path_digitalisation = '/mnt/data/digitalisation_related_entities.csv'
digitalisation_related_entities.to_csv(output_file_path_digitalisation, index=False)

output_file_path_digitalisation
```