YUFERING Project

YUFE TRANSFORMING R&I THROUGH EUROPE-WIDE KNOWLEDGE TRANSFER

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D 5.2: YUFE Open Science Model and guidelines for researchers' evaluation

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List of Abbreviations and Definitions

APC	Article Processing Charges
ARRA	Agreement on Reforming Research Assessment
CERI	Community-Engaged Research and Innovation
CoARA	Coalition for Advancing Research Assessment
DORA	San Francisco Declaration on Research Assessment
EC	the European Commission
ERA	European Research Area
EU	the European Union
FAIR	Findable, Accessible, Interoperable, Reusable
FKT	Flipped Knowledge Transfer
FOS	Full Open Science pilot
GDPR	General Data Protection Regulation
JIF	Journal Impact Factor
LERU	the League of European Research Universities
NCU	Nicolaus Copernicus University
NOR-CAM	Norwegian Career Assessment Matrix
OA	Open Access
OS	Open Science
OS-CAM	Open Science Career Assessment Matrix
OTM-R	Open, Transparent, and Merit-Based Recruitment
RRA	Responsible Research Assessment
UAntwerp	University of Antwerp
UBremen	University of Bremen
UCY	University of Cyprus
UC3M	Universidad Carlos III de Madrid
UEF	University of Eastern Finland
UEssex	University of Essex
UM	University of Maastricht
UN	United Nations
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNIRI	University of Rijeka
WP	Work package
YERUN	Young European Research Universities Network
YUFE	Young Universities for the Future of Europe
YUFERING	YUFE Transforming Research and Innovation through Europe-wide Knowledge Transfer

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D5.2 YUFE Open Science Model and guidelines for researchers' evaluation

1 Introduction

Open Science (OS) is a top research policy priority in Europe and globally. Enabling the open sharing of knowledge and the re-use of research outputs is the first action for the period 2022–2024 in the European Research Area (ERA) (EC 2021a). OS is also a priority for YUFE (Young Universities for the Future of Europe), one of the European university alliances: openness to all is a fundamental element of the YUFE vision. In YUFE, OS is promoted through various initiatives, including the YUFERING project (YUFE Transforming Research and Innovation through Europe-wide Knowledge Transfer).[1] The goal of work package (WP) 5 in YUFERING is to establish OS as the new standard, 'the new normal'.

One of the central obstacles to promoting OS is the prevailing academic recognition and reward systems. Currently, these systems do not adequately reward researchers for their contributions to OS (e.g., UNESCO 2021; Saenen et al. 2019; Pontika et al. 2022; Allen & Mehler 2019). In many countries and institutions, research assessment places heavy emphasis on how many research proposals get granted and on traditional research outputs, such as research publications in prestigious journals (regardless of their openness) (Rice et al. 2020; Saenen et al. 2019). This emphasis on the quantity (e.g., the number of research publications) over the quality of contributions, along with the misuse of research metrics (e.g., emphasis on journal impact factor, JIF), has been recognized as a major problem in research assessment (Rice et al. 2020; Niles et al. 2020). Moreover, this problem has been identified as a significant hindrance to the effective implementation of OS (Méndez & Sánchez-Núñez 2023). Consequently, the reform of the assessment system for research, researchers, and institutions has been designated as a priority action in the European Research Area (EC 2021a).

It has been stated that due to the significant emphasis on research and publishing in particular, the scope of activities undertaken by researchers has been narrowed (de Rijcke et al. 2016). Furthermore, it has been noted that these tasks may not always align with the needs of society (Rice et al. 2020). For instance, essential contributions to academia, such as teaching and mentoring, often receive insufficient recognition in the assessment and promotion criteria for researchers. There is a growing call for greater engagement with society and addressing societal challenges in collaboration with various stakeholders. However, researchers may lack incentives to devote their

[1] Open Science and Open innovation was the focus also in the DIOSI project (http://www.diosi.eu) of YUFE alliance (2021–2022), targeted at training early career researchers.

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limited time in stakeholder engagement and outreach activities, as institutions do not consistently value or reward these practices in decisions related to promotion and tenure. Those teaching and research staff who dedicate a significant portion of their time to teaching or societal engagement at the expense of publishing and securing grants may even encounter hindrances in their career progression.

Furthermore, academic careers are today individually oriented and rewarded, driven by competition rather than collaboration, and aiming at survival and/or advancement in the career path. According to a recent survey (Ross-Hellauer et al. 2023) researchers themselves highly value collaboration, collegiality, and mentoring, but these values and practices are not considered in research assessment. Due to these various factors and the increasing discontent with entrusting their career prospects to publishers, intermediaries and JIFs, there is a growing consensus among researchers that the academic incentive structures require reform. The objective is to ensure that these systems recognize and appreciate a wide range of contributions, diverse roles within academic work, collaboration, and not just quantitative metrics. This need for reform was raised ten years ago by the San Francisco Declaration on Research Assessment (DORA 2013) and it has been relaunched by the Coalition on the Advancement of Research Assessment (CoARA)[2], creating an active bottom-up 'community of doers' and pushing forward the needed actions.

Questions of research quality, the phenomena of so-called 'publication overload', and the replication crisis in certain fields, such as medicine and psychology, have put the importance of transparency and responsible conduct of research into the spotlight. Thus, valuing researchers' contributions in OS, including the openness of the research process, is important both for the quality and the societal impact of research. Due to current dominant incentives and the pressure to adapt to them, researchers often prioritize what 'pays off' over what is considered 'relevant' in their work (Robinson-Garcia et al. 2023). In line with this, the report of the Open Science Policy Platform (EC 2020, 4) emphasizes the need for an academic career structure that promotes outputs, practices, and behaviors aimed at maximizing contributions to a shared research knowledge system.

The promotion of OS and more collaborative research practices require changes in the current incentive structures for researchers (CoARA 2022; UNESCO 2021). Promotion of the OS culture should be embedded through a holistic focus on fostering a healthy research culture. A systemic and cultural change requires action from multiple actors, including universities and other research-performing organizations, research funders, national or regional-level governments, and other central organizations in the global science system.

Universities and University Alliances have a central role when initiating changes in academic incentive structures, such as when deciding their internal criteria for academic recruitment and promotion. According to recent studies, universities' hiring

[2] See the Coalition on the Advancement of Research Assessment (CoARA), www.coara.eu.

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practices do not usually take researchers' contributions to OS into account (Khan et al. 2022; Pontika et al. 2022). Overall, the discussions on research assessment reform are tightly linked to the need of a renewed OS system and what kinds of research processes and outcomes, research and teaching contributions, and other academic contributions universities value.[3] YUFE universities are committed to develop practices that support Community-Engaged Research and Innovation (CERI) and Flipped Knowledge Transfer (FKT) (topics included in YUFERING WP2 and WP3). However, according to a survey conducted in the YUFERING project (Suma et al. 2022), researchers face barriers in the promotion of CERI and FKT, and these barriers are partly linked to the current incentive structures.

This deliverable presents a pilot model to perform researchers' evaluation focusing on and incentivizing Open Science (*the YUFE Open Science model and guidelines for researchers' evaluation*) in YUFE alliance members. It presents the YUFERING Academic Assessment Portfolio, which resembles a narrative CV template, developed jointly, and aligned with Task 4.3 of YUFERING (Novel recognition and reward scheme for researchers). The portfolio format serves the aim of delivering a model for piloting researcher assessment based on OS criteria. Open Science is an integral part of the YUFE Academic Assessment Portfolio: OS criteria have been integrated into it, making it a requirement for all researchers completing the portfolio to reflect on their contributions to OS.

In this deliverable, the YUFE Academic Assessment Portfolio is followed by a set of good practices in the assessment of researchers' contributions following the principles of OS and CoARA principles included in the Agreement on Reforming Research Assessment (ARRA)[4].

This deliverable is the result of Task 5.2 in YUFERING. Task 5.2 was related with the following sub-tasks:

1. A comprehensive analysis of the current OS indicators landscape. Analyzing the new Indicators for OS and best practices of accreditation tools used in YUFE academic partner institutions. Selecting the criteria and metrics to be used in the YUFE accreditation pilot (Task 4.3.).

2. YUFE OS support system and guidelines. Mapping the expertise of YUFE partner institutions on implementing the selected OS criteria and metrics.

3. Improving the model for accrediting researchers using OS criteria based on the pilot (together with Task 4.3). Presenting results in international forums to evaluate the usability of the model outside YUFE.

[3] The incentive structures within a university are likely to be connected to the incentives structures within the national higher education system (e.g., specific funding models that focus on certain indicators, encouraging universities in a specific country to focus on certain types of activity).
[4] To access the agreement: https://coara.eu/app/uploads/2022/09/2022_07_19_rra_agreement_final.pdf.

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Task 5.2 primarily addressed OS indicators at the researcher level rather than at the institutional level, such as university research assessment exercises. The task has been undertaken in close alignment with Task 4.3 of YUFERING, which focused on creating a novel recognition and reward scheme for researchers.

The model has the following objectives:

1. To assist YUFE universities in identifying researchers' contributions to OS, for example for the purposes of academic recruitment and promotion,
2. To aid individuals involved in assessments, including evaluators, in considering and evaluating researchers' contributions to OS, and
3. To help researchers recognize and document their OS activities and practices and open research outputs.

The model also takes into account the existing landscape of CoARA, in which most YUFE universities are already members[5]. It also considers the challenges and limitations associated with recognizing achievements in OS at the individual level.

[5] At the time when the YUFERING project was submitted for funding in May–June 2020, CoARA had not yet been established. However, this deliverable compiles the timely insights from YUFE institutions regarding the implementation of the ARRA principles within our institutions, with the aim of contributing to the global reform of research assessment.

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2 Process and methodology

The process in Task 5.2 included several steps, with data gathered on policy and institutional documents, a survey targeted to professional services staff at YUFE university libraries, and interviews of professional services staff and academic staff at YUFE universities. This data gathering aimed for a comprehensive analysis of the current OS indicators landscape (step 1 in the task), and the mapping of YUFE OS support systems and guidelines (step 2 in the task).

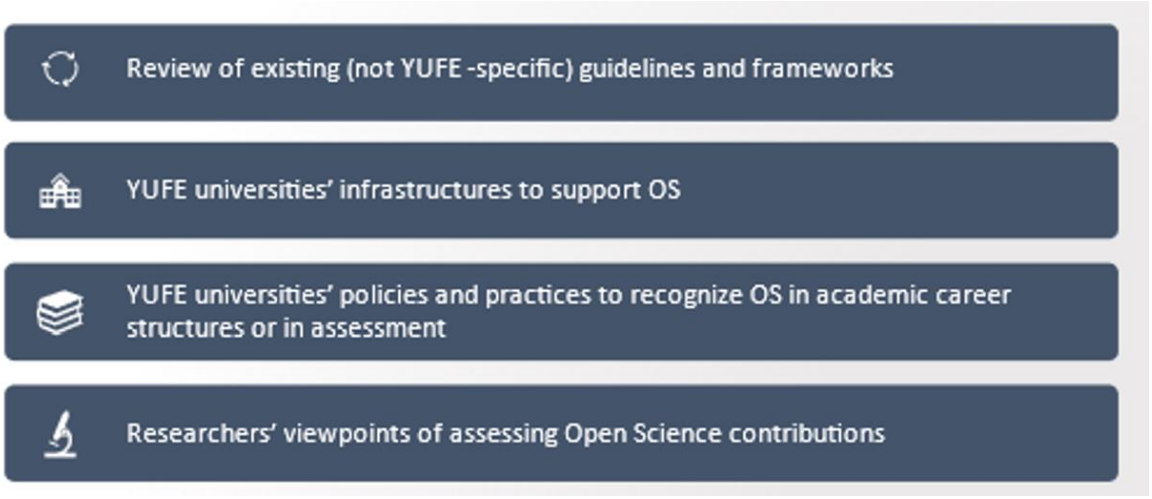

Figure 1. Phases of data gathering in Task 5.2.

2.1 Existing guidelines and frameworks

This state-of-the art research started by collecting and reviewing a set of central documents, which deal with the integration of OS indicators and merits in research assessment systems at the individual and/or group level. These documents included:

- **Declarations on Responsible Research Assessment (RRA)**
  - the DORA Declaration 2013 (DORA 2013),
  - the Leiden Manifesto 2015 (Hicks et al. 2015),
  - the Metric Tide 2015 (Wilsdon et al. 2015), and
  - the Hong Kong Principles for Assessing Researchers 2020 (Moher et al. 2020).
- **Position papers and agreements**
  - LERU's document 'Research universities and research assessment' 2012,
  - YERUN's Position Paper 'Reforming research assessment in Europe: YERUN's take on the issue' 2021,
  - Towards a reform of the research assessment system, scoping report by the European Commission 2021 (EC 2021b),
  - UNESCO Recommendation on Open Science 2021 (UNESCO 2021),

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    - CoARA Agreement on Reforming Research Assessment (ARRA) 2022, and
    - YERUN's Position Paper 'Towards a European Framework for Sustainable and Attractive Careers in Higher Education' 2023.
- **Central reports on Open Science indicators with a connection to career assessment**
    - the Open Science Career Assessment Matrix OS-CAM (EC 2017a),
    - Next-generation metrics: Responsible metrics and evaluation for open science (EC 2017b), and
    - Indicator frameworks for fostering open knowledge practices in science and scholarship (EC 2019).
- **National initiatives on Responsible Research Assessment and Open Science**
    - Room for Everyone's Talent program in the Netherlands (VSNU et al. 2019),
    - Good practice in researcher evaluation – Recommendation for the responsible evaluation of a researcher in Finland (Working group for responsible researcher evaluation 2020), and
    - A toolbox for recognition and rewards in academic careers, NOR-CAM (Universities Norway 2021).
- **Examples of narrative CVs as practical tools for broadening assessment**
    - ACUMEN portfolio and
    - Résumé for Researchers (Royal Society 2023).

2.2 YUFE universities' infrastructures to support OS

Recognizing and rewarding researchers' contributions in OS in assessment processes would, at least in an ideal case, mean that universities have reliable and up-to-date data on the versatile OS contributions made by each researcher. In the YUFE Academic Assessment portfolio, researchers are asked to present their main contributions in different areas of academic work (e.g., in research and teaching), and to provide examples and quality proxies to support their argument (e.g., by giving examples of research or teaching outputs, and their reach, use, or relevance). In an ideal case, it would be possible to connect the information provided by researchers in the portfolio to different databases or data sources (e.g., by adding links to repositories or web pages providing evidence of the researcher's argument), making it possible to verify the data.

We conducted a survey in summer–autumn 2021 to assess the status of YUFE universities' databases across various domains of OS. Notably, the universities' systems were most advanced in tracking open publications. For instance, all YUFE universities provided repositories to support open publishing, including archives covering journal publications, research monographs, and publications in conference proceedings. Most universities offered their own infrastructure for open data, and six out of ten universities had their own data repository. Furthermore, six universities had dedicated infrastructures to support the publishing of open educational resources, and one university maintained an archive for educational resources. According to the

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responses, the institutional tracking of scholarly publication outputs was more common than tracking other OS outputs or activities, such as open datasets and software. Some universities also used altmetric data, for example, to assist researchers in assessing the impact of their work.

Some YUFE universities have also been active in explicitly rewarding researchers for their activities in OS. As an example, during 2019–2020, Universidad Carlos III de Madrid (UC3M) ran a Full Open Science (FOS) pilot to recognize the research groups that are aligned with the objectives of OS. The groups that were able to reach the criteria set in the pilot were awarded a FOS badge that they can use in research funding applications. This FOS pilot has been continued and expanded in YUFERING WP5, Task 5.3 'Open Science bottom-up implementation: Full Open Science (FOS) Pilot'. As another example, University of Eastern Finland (UEF) has the tradition of nominating each year's top individual and top group in OS activities.

2.3 YUFE universities' policies and practices: recognition of OS in academic career structures

To develop the YUFE Open Science Model, we also collected input on the existing role of OS practices and achievements in YUFE universities' recognition and reward structures, especially related to academic recruitment and promotion. The data gathering included:

- Interviews of human resources (HR) officials or other staff with an expertise on academic recognition and reward structures in YUFE universities (12 respondents in summer–autumn 2021),
- Available documentation on the recognition and reward structures of the universities (e.g., documents on recruitment/promotion processes/criteria),
- Interviews of researchers at different disciplinary fields and career stages at one university (UEF),
- Visits and discussions at four YUFE universities (UC3M, UM, UAntwerp, UBremen) in fall 2022.

In the interviews, respondents at several YUFE universities stated that researchers' contributions in OS were considered positively in assessment, for example when applying for a position. However, OS was not yet in the focus of the assessments, nor were OS contributions required to be eligible for recruitment or promotion.

There are already some examples how YUFE universities formally recognize researchers' OS merits and achievements in assessments:

- **Policy example from University of Maastricht (UM)**: integrating an OS perspective explicitly in the university's recognition and rewards program – having OS as one of the university's core values in the academic profiles for different academic positions[6].

[6] In the guidelines of UM, Open Science refers, for example, to storing and (re)using scientific data based on FAIR principles, making data as open as possible and as closed as necessary, using open source software, and publishing in open access journals.

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- **Policy example from UC3M**: requiring some publications to be open access (specifically, green OA in the University repository) in order to be considered in individual-level researcher incentives. Another practice is taking the contributions in the university's OpenCourseWare repository into account in individual-level teacher assessments.
- **Policy example from the University of Bremen (UBremen):** having the promotion of research culture and knowledge transfer – having the transparency of research data and open access strategy, as desirable criteria in tenure track performance reviews, making it possible for a researcher to highlight one's contributions in OS explicitly as part of performance reviews in promotion processes.
- **Policy example from UEF:** having the promotion of OS as an area to be assessed in tenure track performance reviews, making it possible for a researcher to highlight one's contributions in OS explicitly as part of performance reviews in promotion processes.
- **Policy example from UM:** offering altmetrics as one source of evidence to indicate scientific and/or societal impact for one's work, for example, in narrative CVs.

2.4 Researchers' viewpoints

Researchers' voices should be incorporated when reforming the way in which they are assessed and rewarded, as outlined in the Agreement on Reforming Research Assessment (CoARA 2022). Among other benefits, this would make it more likely that disciplinary-specific and career-stage specific issues are considered. Engaging researchers in the process is also likely to improve the legitimacy and application of the policies.

We interviewed a total of 23 researchers at different career stages and in different disciplinary fields around the broader topic of assessment in academic careers in 2022 at UEF, as an example of YUFE university member. These interviews dealt with researchers' reactions to the consideration of OS contributions in assessment processes, for example, when recruiting or promoting researchers. While the researchers generally endorsed the aims of OS, they also pointed to many important challenges and practical problems, reflecting on their own field, research topics, and background. These points should be carefully considered when integrating an OS perspective into assessment at the individual researcher level. Researchers' reflections include:

- Low awareness and/or activity in OS, making it important first to raise awareness of the issue, for example, by offering tailored training (e.g., such as in the DIOSI project, which focused on training early career researchers).
- Dominance of traditional publishing outlets in one's field when choosing the publication arena (regardless of openness).
- Doubts about the quality and low reputation of some Open Access journals, damaging the reputation of all OA journals.
- High article processing charges (APCs) and inability to cover them, lack of knowledge of Green Open Access alternatives.

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- Sensitivity of the research data in one's field, and thus inability to open one's data sets.
- Demands for the protection of data (GDPR legislation), making it difficult to open one's data sets.
- Lack of time and other things being more urgent than engaging in OS (lack of time to open research data, lack of time to communicate about one's research findings, etc.).
- Seeing OS as a politically-driven, top-down agenda vs. scholarly-driven ideas about the quality of research and teaching.
- Emphasizing that the possibilities to engage in OS are globally unequally distributed[7] (e.g., researchers from developing countries may have had less support structures in OS) and at the individual level (e.g., researchers with less favorable work conditions, such as grant researchers, may have had fewer opportunities to pay the APCs required for open publishing, or to get other support needed in OS), making it problematic to require OS from all researchers who apply for academic positions.

The identified challenges point to the need to:

- Increase the awareness of the different possibilities in OS that fit each researcher's field, and his/her orientation in research (e.g., with initiatives such as the FOS pilot; Task 5.3 in YUFERING).
- Secure the resources of universities to support the implementation of OS strategies (e.g., by providing up-to-date infrastructures, training, professional personalized support, and by leaving enough time for researchers, for example in project-based employment, to engage in OS).
- Talk about the benefits of OS from the perspective of scholarly communities, considering field-specific characteristics and boundary conditions, or limitations from the perspective of openness.
- Consider the different backgrounds of researchers (including the support structures they have had) when assessing OS contributions.

[7] See also the study by Ross-Hellauer et al. (2022).

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3 YUFE Academic Assessment Portfolio

The YUFERING team has jointly developed the YUFE Academic Assessment Portfolio template to be used in individual-level researcher assessment (developed jointly by Task 4.3 and Task 5.2 of YUFERING). OS has been tightly incorporated into the portfolio format. The portfolio template resembles a researcher-driven narrative CV, which aims to capture a broad set of researchers' merits and achievements, and to make researchers' OS merits and achievements visible in assessment processes (e.g., in academic recruitment processes).

In the portfolio, a researcher applying for an academic position would be required to provide a narrative of their main merits and achievements in the core areas of academic work (research; teaching and supervision; community engagement and societal outreach; teamwork, management and/or leadership). The narrative should be supported by evidence, indicating tangible outputs or activities the researcher has produced or contributed to. These could include open access publications and openly available teaching materials, for example.

Furthermore, the researcher is asked to justify why they believe their work is important. They should explain how their work has benefitted the scholarly community or wider society. The evidence of reach, use, or relevance may include prizes or awards, keynotes or invited talks at academic or non-academic events, the number of citations in research publications or policy documents, references in news articles, the creation of new projects, or feedback on teamwork and leadership. Additionally, the researcher is asked to provide their plans for making their research and/or education open in the future.

3.1 Open Science in the YUFE Academic Assessment Portfolio

As stated, the OS dimension is visible in all the main sections of the portfolio. Table 1 presents the YUFE Academic Assessment portfolio, with the OS elements underlined for the purpose of this deliverable.

Table 1. YUFE Academic Assessment portfolio with the Open Science elements underlined.

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YUFE Academic Assessment Portfolio

***To the researcher**: You do not need to have merits/achievements/outputs in all the categories. If any of the categories are not relevant to you, please skip them.*

***To the recruiter**: If needed, you may add extra custom questions and/or components to the categories. You may emphasize specific categories over others according to the position in question. You may remove a specific category if it is not relevant for the position.*

(1) YUFE Academic Assessment Profile

1A How did your interest in your research area begin, what kinds of questions have you been particularly interested in, and how have your interests been shaped over the course of your career? (max. 1000 characters)

1B Describe your own strengths and skills as a researcher and/or as a teacher. What do you want to improve? (max. 1000 characters)

1C What is your vision for your career in the coming 5–10 years? (max. 1000 characters)

1D The YUFE universities place great importance on responsible research. This includes the support of the objectives of Open Science. Describe how you have made research and/or education more open, and what your plans in this domain are for the future. (max. 1000 characters)

(2) Main merits, achievements, and their significance

2A Research

What are your key merits or achievements in research? Describe concretely 1–3 of your key outputs in research to support your argument. Please mark the Open Science merits or achievements with the symbol "O". Justify why your merits and outputs are significant. (max. 3000 characters)

2B Teaching and supervision

What are your key merits or achievements in teaching and supervision? Describe concretely 1–3 of your key outputs in teaching and supervision to support your argument. Please mark the Open Science/open education merits or achievements with the symbol "O". Justify why your merits and outputs are significant. (max. 3000 characters)

2C Community engagement and societal outreach

What are your key merits or achievements in community engagement and societal outreach? Describe concretely 1–3 of your key outputs or examples to support your argument. Please explain explicitly how you have promoted the culture of open scholarship. Justify why your contributions are significant. Justify why your merits or achievements are significant. (max. 3000 characters)

2D Teamwork, management, and leadership

What are your key merits or achievements in teamwork, management and/or leadership? Describe concretely 1–3 of your key contributions to support your argument. Please explain

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explicitly how you have promoted the culture of open scholarship. Justify why your contributions are significant. (max. 3000 characters)

(3) Academic age

What is your academic age (please see the guidelines)?

Appendix: Guidelines for filling in the document

Please use full sentences when writing.

(1) YUFE Academic Assessment Profile

In this section (1A–D), describe your background, strengths, skills, and goals.

(2) Main merits, achievements, and their significance

In this section (2A–D), identify your main merits or achievements related to research; teaching and supervision; community engagement and societal outreach; and teamwork, management, and leadership. Explain why you think these merits or achievements, and the related concrete outputs or contributions matter.

Mark any merits in Open Science separately with the symbol "O". These merits may relate to concrete outputs (e.g., open access publications or research data) or to the promotion of an open research culture (e.g., incorporating open science into one's teaching). See examples of possible merits in Open Science for each subdivision (2A–D).

2A Research

In this section, describe how you have contributed to the generation of knowledge, including the creation of new ideas, hypotheses, methods, concepts, or tools.

When you describe your merits or achievements, please highlight your key outputs. Key outputs in research may include, e.g., research publications; collected data; presentations at conferences; software; simulations or codes; or new research methods.

Please indicate separately any merits or outputs in Open Science. Examples include open access publications; open access research data; open software/code; open research methods; and pre-registration of studies.

Explain why these merits and outputs matter. Focus on the quality and impact of research rather than the quantity or the publishing arenas. You can support your argument with indicators such as scientific prizes or awards, keynotes/invited talks, competitive research funding received, the number of citations, downloads, mentions, etc. to the most important publications you identify (mark the database you are using – Scopus, Web of Science, Google Scholar, PlumX, Altmetric Explorer).

2B Teaching and supervision

In this section, describe how you have contributed to teaching and supervision, including the development of teaching.

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When you describe your merits or achievements, please highlight your key outputs. Key outputs in teaching may be related, for example, to the courses or teaching events you have developed or taught; theses or dissertations supervised, or textbooks published. Please indicate separately any merits or outputs in open science/education. Examples include open online courses/MOOCs; courses/lectures on Open Science; lectures tailored for the general public; creation or use of open learning materials as Open Educational Resources (OER); and incorporation of Open Science principles or methods in the content of teaching.

Explain why these merits and outputs matter. You can support your argument with indicators, such as student feedback, teaching prizes or awards, invited lectures, or the enrollments/accesses of open online courses/MOOCs.

2C Community engagement and societal outreach

In this section, describe how you have contributed toward the wider society.

Your main merits, achievements, or outputs may relate to how your work has contributed to the development of new innovations, policies, or business opportunities; societal discussions or services; engagement with non-academic actors in your research; or organizing events for the general audience (e.g., school visits, science festivals).

Explain why these outputs/activities matter. You can support your argument with indicators, such as expert tasks in other organizations; spin-off companies or patents based on your research; new projects with non-academic partners; policy documents citing your research; utilization of research outputs resulting from private sector collaboration as openly as possible; engaging citizens or stakeholders in one's research process; popularized publications (publications for the wider audience); television or radio appearances; magazine or news articles based on your research; Twitter discussions based on your research; research blogs; encyclopedia articles produced (e.g., Wikipedia); encyclopedia articles (e.g. Wikipedia) citing your research.

2D Teamwork, management, and leadership

In this section, describe how you have contributed to teamwork, management, and/or leadership, including your contribution to the academic community. Reflect on your contributions as a team member and as an individual.

Your main merits, achievements or outputs may be related, e.g., to projects or research teams you have led; other membership and roles in research teams; mentoring students or colleagues; internship supervisions; editorial work; peer reviewing; memberships and positions of trust in scientific communities; management positions; administrative tasks; committee work; data management or data curation; international and national mobility; organizing or participating in conferences; promoting gender equality and/or diversity in academia.

Please indicate separately any merits and outputs in open scholarship. Examples include open peer reviewing (as author or as reviewer); working as an editor in open access scholarly journals; voluntary work in open access repositories (e.g., ArXiv, BioRxiv); incentivizing Open Science behavior (e.g., assessment criteria, acknowledgments, or rewards) as a leader.

Explain why these outputs/activities matter. You can support your argument with indicators, such as creation of new projects; Open Science or equality/diversity awards received; feedback on teamwork or leadership.

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(3) Calculating the academic age

Academic age = Total number of person-years worked in research organizations since the start of postgraduate (PhD) studies – person-years during which you have been on a family/parental leave – other academic career breaks in person-years.

If you have worked part-time in any year, take this into account when calculating your academic age (e.g., 50 % of working time for the whole year corresponds to 0.5 person-years). Consider family/parental leaves which you have taken due to the birth/adoption of a child, which you have taken after the start of postgraduate (PhD) studies. Other academic breaks may include, for example, working outside research organizations, military/civil service, and other leaves.

3.2 Guidelines for evaluation

We established general guidelines for evaluators assessing an individual researcher's YUFE Academic Assessment Portfolio.

- **Assessment should align with the requirements of the specific assessment case.** For example, when recruiting a project researcher for a research project, the required skillset may be well-defined, while in the case of recruiting a professor, the requirements might be less detailed.
- **Assessment should be holistic and consider different areas of academic work**.
- **Assessment should consider disciplinary differences** by acknowledging what type of OS outputs and activities are relevant and possible in a specific research field (with specific traditions and methodologies). For example, all data cannot be opened (e.g., sensitive data, or data gathered in collaboration with industry partners involving proprietary information), and in such cases, closing one's data should not be used against the researcher.
- **Assessment should consider that researchers have different opportunities to engage in OS.** For example, researchers from non-western countries or researchers without formal job contracts may have had limited access to institutional support structures that are important for practicing OS.
- **Assessment should consider the evidence provided by the researcher.** Does the researcher give concrete examples of his/her achievements? How reliable are the sources of evidence, and can the evidence be verified? The descriptions of researchers may be prone to mistakes or inaccuracies.[8]
- **Assessment should consider how the researcher's work has benefitted the scholarly community and/or the wider society and whom it has benefitted** (while acknowledging the career stage of the researcher).
- **Assessment should consider the career stage of the researcher.** Researchers with fewer years of experience can, on average, be expected to have fewer merits than researchers with more years of experience. In addition,

[8] If the YUFE Academic Assessment Portfolio is developed further, the YUFE community should think of ways to verify the descriptions of the researchers in the portfolio, for example, by encouraging them to link the examples they provide in the portfolio to databases or webpages.

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early career researchers may not be fully aware of the principles, practices, and benefits of OS, and they may have had limited access to the necessary resources, tools, or infrastructure to implement OS practices effectively.

- **Assessment should consider the academic age of the researcher to ensure fair and equitable evaluation.** Researchers at different career stages may have had different opportunities to engage in research, teaching, and societal interaction. Consider whether the researcher's employment contracts have been research- or teaching-intensive, whether the researcher has been working outside academia with implications on his/her achieved outputs and activities, and whether the researcher has had career breaks, such as parental leave or (longer) sick leave. Expectations for researchers should be aligned with their years of academic and other work experience.

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4 Good practices in the assessment of researchers' contributions following the principles of Open Science

Along with the introduction of a more open and transparent research culture aimed at recognizing diverse contributions of teaching and research staff, there is a need to update the guidelines for assessing researchers' contributions for various assessment cases (e.g., academic recruitment or promotion). For example, relying on traditional bibliometric indicators does not make researchers' contributions in OS (and all other academic contributions) visible.

The existing guidelines, initiatives, recommendations, and input from the YUFE universities described in Section 2 served as the basis for establishing the following good practices in the assessment of researchers' contributions. Of the available publications, we focused on the Agreement on Reforming Research Assessment (ARRA) of CoARA, the report 'Evaluation of research careers fully acknowledging Open Science practices – Rewards, incentives and/or recognition for researchers practicing Open Science (EC 2017a) and the report 'Indicator frameworks for fostering open knowledge practices in science and scholarship' (EC 2019), as they specifically focus on OS and research evaluation criteria and indicators.

In practice, we compiled a list of OS indicators identified as potentially useful for the purpose of career assessment in the report 'Indicator frameworks for fostering open knowledge practices in science and scholarship' (EC 2019). In spring 2022, members of WP5.2 discussed and refined this extensive list of OS indicators (see Appendix 1). The group chose to exclude indicators that were deemed too narrowly focused or not widely recognized in practice. Additionally, discipline-specific indicators were omitted. Indicators not applicable at the individual level were also removed. Where feasible, we gave particular attention to indicators that could be considered objective (unambiguous to interpret) and measurable. The group also added relevant indicators which were seen to be missing from the list.

YUFE universities have different profiles and strategies in research, teaching, and societal outreach. In addition, the infrastructures to support OS vary, also reflecting the national OS strategies and support structures in each country. Thus, when assessing researchers' merits and achievements, it is important to start with the valuations and ambitions of each university and to recognize what kinds of contributions they especially value and expect of researchers, with links to institutional strategies (cf. the SCOPE Framework 2021).

Within universities, it is important to retain flexibility and room for local adaptation to be able to prioritize the areas of academic work which in each assessment case are meaningful. For example, when recruiting a person to a research-intensive position with no teaching obligations, OS achievements in teaching may not be relevant.


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Good practice #1: Recognize and promote diverse contributions

Traditional bibliometric indicators often focus mainly on research publications and their scientific impact (measured via indicators, such as the number of citations). This approach prioritizes a quantitative focus that does not reflect all the possible contribution of the research output, but instead often considers where the research was published (with an emphasis of the journal or a publisher, for example). This focus on (narrowly defined) research performance does not acknowledge the full breadth of research activities and outputs (and their impact) nor other academic activities, such as teaching and mentoring, academic leadership, curation of research data, and stakeholder engagement.

In YUFE, we believe that when assessing teaching and research staff, we should recognize a wide range of areas in academic work. The areas of academic work identified as central in YUFE include research, teaching and supervision, community engagement and societal outreach[9], as well as teamwork, management, and leadership[10] (see Table 2). All these areas are included in the YUFE Academic Assessment Portfolio template described above.

In YUFE, research and teaching represent the core areas of academic work, which are interlinked in the academic job descriptions of many YUFE universities. Community engagement and societal outreach, as well as teamwork, management and leadership, represent cross-cutting competence areas, which are increasingly relevant across different positions. OS cuts across all the areas of academic work.[11] Naturally, if there is need for assessment at an institution/unit, the assessment should, in each case, be based on a clear idea of what the institution/unit wants to evaluate and for what purposes – linked to what the institution/unit values and wants to reward.

Some of the possible key outputs, examples, and contributions in OS are illustrated in Table 2 to showcase the kinds of OS outputs and activities that may be relevant to consider. A wide range of contributions should be recognized and valued. For example, open access research publications and presentations at conferences increase the availability of research findings among scholarly communities and society, enhancing both scientific and societal impact. Opening research data increases transparency in the research process and promotes reproducibility by allowing the reuse of resources in research. Open-source software and code sharing enable others to verify original studies and extend their work. Pre-registering studies increases research transparency and reduces publication bias. Openly available courses or teaching events are one

[9] WP2 'The YUFE model towards a community engagement-based research & innovation agenda' and WP3 'YUFE as a catalyst for flipped knowledge transfer and deployment in society' of YUFERING stress the interactions between universities and diverse societal actors.

[10] These areas were identified as central also in the WP4.2, 'YUFE Competence Profile for Researchers'.

[11] It is recognized that at YUFE universities, some areas of OS (such as open publishing) are likely to be more established than others.

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way to democratize education by reducing barriers to access and knowledge dissemination. Engaging stakeholders or citizens in one's research may direct research toward areas that societal actors consider relevant in their daily lives. However, it should be noted that the list is not exhaustive, and there may be also other outputs, examples, or contributions that are relevant.

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Table 2. Central areas of academic work in YUFE and possible OS outputs, examples, and contributions.

AREAS OF ACADEMIC WORK	Possible key outputs/examples/contributions
Research: *how one has contributed to the generation of knowledge, including the creation of new ideas, hypotheses, methods, concepts, or tools*	
	OA research publications
	OA presentations at conferences
	OA research data
	Open source software
	OA simulations or code
	Open source research methods
	Using open licenses in publications
	Using open licenses in research data
	Pre-registration of studies
Teaching and supervision: *how one has contributed to teaching and supervision, including the development of teaching*	
	Openly available courses or teaching events one has developed or taught
	OA textbooks published, other openly available teaching material produced
	Development of openly availabe teaching methods
	Use of open learning materials
	Courses/lectures in OS
	Lectures tailored for the general public
	Incorporation of open science principles and methods in the content of teaching
Community engagement and societal outreach: *how one has benefitted the wider society*	
	Expert tasks in other organisations
	Commercialisation of research: e.g., spin-off companies or patents based on one's research
	New projects with non-academic partners
	Utilisation of one's research in policy development or recommendations
	Citizen science or engagement of stakeholders in one's research
	Stakeholder interaction
	Organising events for the wider audience
	Popularised publications
	Television or radio appearences
	magazine or news articles based on one's research
	Exhibitions
	Social media activity
Teamwork and leadership: *how one has contributed to teamwork, management, and/or leadership, incl. contribution to the academic community*	
	Incentivising OS bejaviour as a leader or team member
	Working as editor in OA scholarly journals
	Open peer reviewing
	Voluntary work in OA repositories

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Good practice #2: Provide researchers and gatekeepers with adequate resources

Researchers require the necessary skills to incorporate OS practices into their work. This necessitates training across various facets of OS, as emphasized in YUFERING Task 5.4, at different stages of their academic careers, including doctoral training, which was a focal point in the YUFE project DIOSI. The training materials and guidelines should frame OS not as a burden or as a bureaucratic requirement but as an investment in one's future, whether one pursues an academic career or a career outside academia. Open Science should be seen as an integral component of high-quality research and teaching.

Ensuring that researchers have sufficient resources should also involve allotting them enough time within their work schedules to perform essential tasks, such as archiving and documenting code and research data.

In their work, researchers often rely on the support of various professionals, including those in university libraries, such as professional services staff and data stewards, who play a crucial role in assisting researchers with various aspects of the research process, including data curation. Researchers may require hands-on assistance in creating data management plans and comprehensive documentation that enables the re-use of data and code. Universities should allocate resources to sustain these services and ensure that the contributions of these professionals are duly recognized, for example, by offering career incentives to the staff providing these services.

Key gatekeepers, including evaluators and supervisors, may not possess qualifications in OS. Therefore, they also require training and guidelines when participating in assessment processes, such as recruitment, promotion, or funding competitions. Researchers who have embraced OS practices may, at a similar career stage, have fewer publications than their peers. Without appropriate guidance, OS practitioners may find themselves at a disadvantage within conventional career structures that often prioritize quantity of outputs, as noted in the publication by Allen and Mehler (2019).

Good practice #3: Recognize individual strengths

Open Science is integral to every central facet of academic work. However, when assessing an individual's contributions to OS, it is crucial to acknowledge their unique strengths, interests, and possibilities to engage in different areas of OS. Consequently, universities should facilitate and acknowledge diverse forms of OS that align with the specific research and teaching topics, research approaches, and methodologies of each researcher (and research group). This also implies that compelling researchers to adopt OS practices that do not align with their research and teaching approaches is not advisable.

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As universities face pressures to become more open to society at large, numerous new criteria are being introduced for assessing researchers. However, it is unrealistic to expect any one individual to meet all these expectations. Therefore, it is essential to recognize that not all researchers need to possess the same merits, skills, or competences, and that they need not excel in every aspect (as highlighted in the YUFE Competence Framework for Researchers; Task 4.1 in YUFERING).

It is also crucial to consider the specific activities and outputs that each university and department deems as especially valuable, aligning with their distinct strategies, and thus prioritize these aspects in assessments (cf. Robinson-Garcia et al. 2023).

Good practice #4: Evaluate the openness of the research and teaching process

In line with the significant global reform initiative under CoARA, the YUFE approach acknowledges the value of various outputs beyond traditional research publications. This includes open access research datasets and collaborations with non-academic partners.

In addition to identifying tangible outputs associated with OS, such as research outputs or dissemination activities, the YUFE approach places a strong emphasis on the openness and transparency of research and teaching processes. This encompasses engagement with stakeholders or citizens in research projects, pre-registration of studies, and the integration of OS principles and methods into one's teaching. Some researchers also actively interact with members of the research community and societal stakeholders in social media platforms. Activity on these communication channels should be acknowledged and supported by universities.

Good practice #5: Focus primarily on the content and quality of contributions

The YUFE approach aligns with the current reforms in research assessment, exemplified by the CoARA initiative. It emphasizes that it is problematic to rely on simple metrics when assessing researchers' merits and achievements. When assessing OS contributions, the primary focus should be on the content and quality of work. Thus, instead of simply counting the number of open access datasets, societal engagement activities, etc., a qualitative approach should be preferred, centering on the significance of these contributions. This is exemplified in the YUFE Academic Assessment Portfolio, where researchers are prompted to answer the 'so what question', requiring them to provide arguments about the broader impact of work. To evaluate research quality, universities are encouraged to use peer review supplemented by innovative data-supported narratives. It is crucial for universities to allocate sufficient time to assessment processes, as quality-oriented assessments can be time-intensive.

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Good practice #6: Make it transparent how contributions are assessed

Particularly when contributions are used in processes like recruitment or promotion, which can have significant implications for the researcher, universities should strive for maximum transparency in defining the criteria, data, and assessment methods. In recruitment, YUFE universities should adhere to the principles of open, transparent, and merit-based recruitment (OTM-R), as outlined in the YUFE Staff Recruitment Policy. The principle of transparency also extends to the assessment of OS merits and achievements.

Good practice #7: Explore the potential for assessing the wider impact of research

The impact of research and teaching is multifaceted, and cannot be distilled into a single indicator, such as the number of citations. Universities should acknowledge a variety of quantitative and qualitative indicators to assess the impact of scholarly contributions. The impact of research can encompass behavioral changes, improved well-being, increased productivity, or environmental well-being, among other aspects. Indicators might encompass policy influence at local, regional, national, or global levels; patents filed; media coverage; collaborative efforts involving researchers, industry, policymakers, and other stakeholders, or engagement with local communities and citizens. Several databases and tools are available for assessing the societal impact of research, including Altmetric, PlumX Metrics, SciVal, and Dimensions. Case studies can provide concrete examples of how research outcomes have led to societal, environmental, economic, or cultural changes.

Societal impact can manifest in various forms, necessitating consideration of its diverse dimensions. It is also important to recognize different timeframes, including immediate and long-term impact. It is likely that no single database or tool can offer a comprehensive view of impact. Contextual knowledge and expert judgment are vital for interpreting the data.

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5 Advancing societal collaboration and impact in YUFE through the vision of Open Science

This deliverable has introduced the YUFE Open Science Model and provided guidelines for evaluating researchers. In YUFE, our vision[12] is to break down the barriers between academia and society. This section of the deliverable focuses on future visioning: how we could expand the OS Model even further to fully achieve this vision.

According to the United Nations (UN) (2022), higher education institutions must play a more prominent role in addressing the world's most urgent challenges. The UN underscores the importance of higher education institutions becoming more open. Additionally, as part of the ERA, the EU is working towards the promotion of citizen science, societal engagement, the integration of OS practices, and the enhancement of collaboration between academia and business. There is a growing demand for higher education institutions to increase their societal impact and to engage in more proactive outreach activities. Furthermore, there is a need for transition towards inter- and transdisciplinary approaches to knowledge production and dissemination. OS serves as a vital tool for fostering epistemic dialogue, incorporating diverse knowledge perspectives, and generating societal impact.

In alignment with the visions of YUFE, the UN and the EU, as depicted in Figure 2, we present a next-generation OS model with the goal of further enhancing societal relevance and impact of research and teaching in YUFE. To realize these broader visions in the future, the OS approach should be adapted to encompass the overarching and expanding goals of universities. The future vision aims to intensify the interaction between academia and society, necessitating a heightened emphasis on the societal role of YUFE academic members.

[12] Please see YUFE vision here: https://yufe.eu/who-we-are/#yufe-vision.

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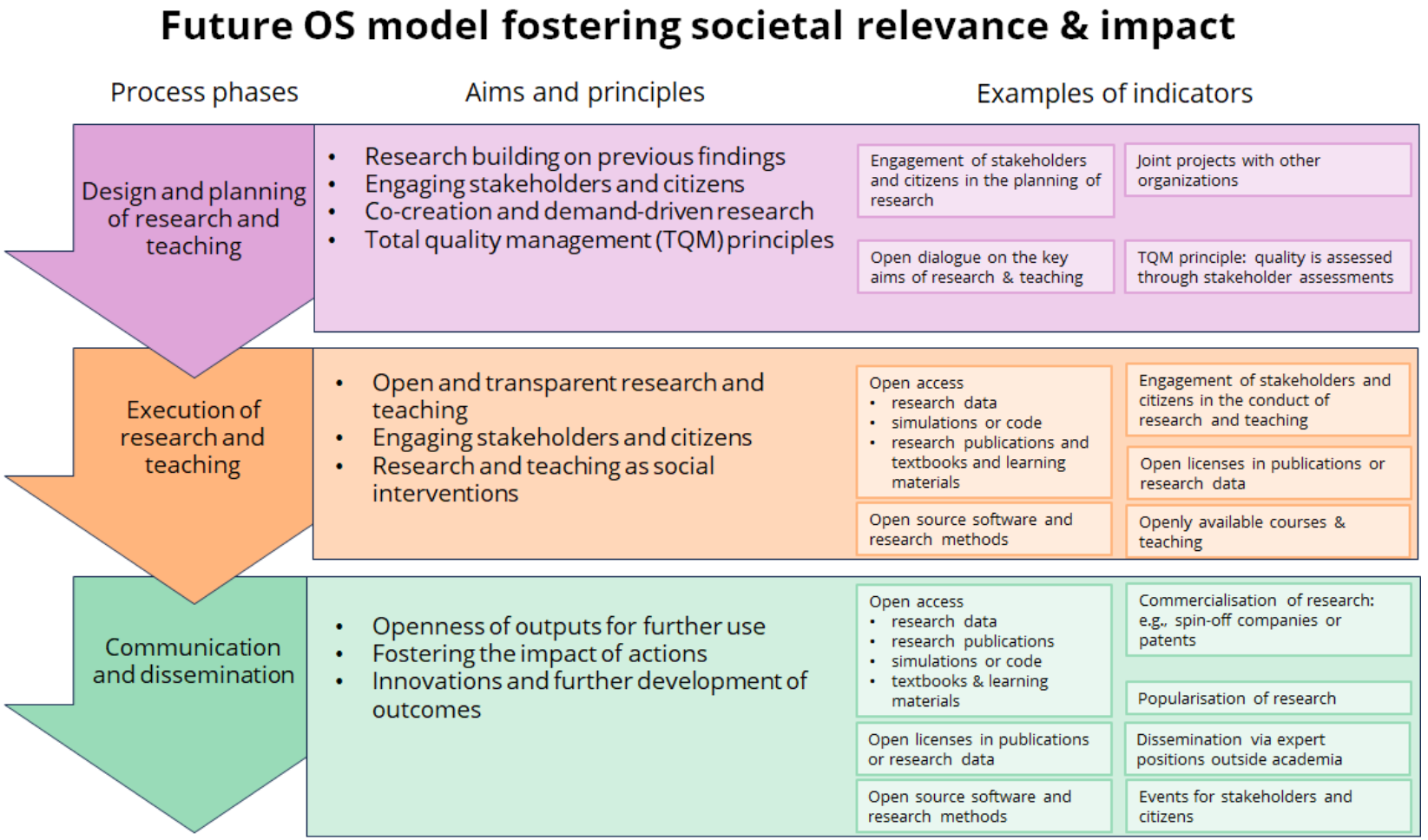

Figure 2. Future Open Science model fostering societal relevance and impact.

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In this vision, systematic and extensive communication would be integrated into the design, planning, and execution of research and teaching. Emphasizing societal interaction entails the necessity of expanding the criteria that universities employ to evaluate researchers. Traditional criteria tend to encourage researchers to focus primarily on intra-academic activities, often neglecting the extent of researchers' broader societal engagement.

In the proposed model, the primary foundation is interaction with broader society, including relevant stakeholders and citizens. The most relevant external stakeholders identified within YUFE[13] encompass citizens, cities, businesses, governments, and policymakers. YUFE is built on collaboration among universities, government entities, civil society, and businesses, known as the quadruple helix approach. For individual researchers and research groups, the specific target groups for interaction and collaboration may be more narrowly defined.

The future model is structured around three phases within the research and teaching process: 1) design and planning, 2) execution, and 3) communication and dissemination.

The first phase in the model encompasses the design and planning of research and teaching. Naturally, all research and teaching activities are built upon prior research and discoveries. In this model, when designing new research projects, relevant stakeholders and citizens are welcomed to actively engage at the early stages of the research process. This engagement may occur before research projects are fully defined or initiated. Such upstream public engagement in research is aimed at ensuring that research addresses relevant questions and concerns that are important to the community or society at large, for example with the methods of co-creation. Additionally, in alignment with the principles of total quality management, stakeholders play a crucial role in evaluating the quality of work.

The second phase of the model involves the execution of research and teaching activities, and it also actively involves stakeholders and citizens. Viewing research and teaching as social interventions highlights their potential to bring about positive societal changes by addressing societally relevant issues and influencing behavior and attitudes. Consequently, research and teaching may be seen as deliberate initiatives aimed at promoting social change and development. For example, in the realm of teaching, providing open access courses may encourage active participation in society, including groups which have previously faced educational barriers. Moreover, opening the research process can create new opportunities for local communities and businesses by sharing expertise, granting access to knowledge and innovation, facilitating knowledge transfer, and fostering new collaboration opportunities.

The third phase in the model focuses on communication and dissemination. While societal interaction does not automatically ensure societal impact, there is potential for enhancing the impact of actions through active communication. This may include

[13] Please see here: https://yufe.eu/who-we-are/

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making research findings openly available and engaging in dialogue with policymakers, practitioners, and the broader public regarding one's research. In certain instances, such efforts may result in research influencing policy debates, stimulating public discussions, or leading to the development of commercialized products or services.

The proposed future model takes the vision of OS of societal collaboration yet one step further, aiming at serving the local communities as a responsive university (Tierney 1998) and reaching out in order to act as a socially responsible university (Grau et al. 2017; Sørensen et al. 2019).

There is strong political pressure towards these objectives. However, fulfilling these aims would necessitate several prerequisites to be met in the complex interaction between academia and society. For example, the involved parties would need to identify and reach consensus on substantial issues to address. In practice, these topics would need to be strategic and of importance to all the parties involved. There should be adequate resources available, and a strong mutual interest driving the effort. Additionally, expectations regarding time frames should be aligned: universities often operate on much longer timescales (years, even decades) compared to private companies, which typically work with significantly shorter time frames.

It should be highlighted that the model described above does not suggest that all research and teaching should be oriented towards practical applications or designed and conducted in collaboration with stakeholders or citizens. On the contrary, the prerequisites for curiosity-driven basic research should be sustained (also possible applications arise from long-term foundational research). The actualization of the vision would depend on voluntary participation from the involved parties.

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6 Conclusion and future work

Task 5.2 of YUFERING entailed the compilation of a set of principles, criteria, reflections, and metrics designed for evaluating researchers' careers on the value of Open Science. This task encompassed an in-depth examination of existing and emerging OS indicators, the identification of best practices in evaluation within YUFE universities, and the integration of the OS indicators into the YUFE Academic Assessment Portfolio. As a result, the portfolio effectively fused OS with the novel recognition and reward scheme for researchers, outlined in Task 4.3.

Furthermore, the report presented guidelines for the evaluation of researchers, highlighting the potential benefits of including OS as a core component in assessment processes. However, the report also underscored the significant challenges associated with integrating an OS dimension into individual-level assessment. These challenges encompass various aspects, such as disparities in access to organizational support for OS initiatives.

The work and findings of Task 5.2 have been extensively disseminated and discussed in numerous international and national fora, as outlined in Annex 2, which presents a comprehensive record of dissemination activities.

Task 5.2 of YUFERING has contributed to both ERA Action one, which focuses on enabling OS, and ERA Action three, which is dedicated to reforming the assessment system for research, researchers, and institutions. Integrating OS elements among the criteria with which researchers are assessed and rewarded is one important way towards making OS the 'new normal' at YUFE. The development of this deliverable draws inspiration from the efforts of CoARA, which was not yet established when the YUFERING proposal was formulated.

Future endeavors in this realm could encompass continued dialogue and collaboration to explore how to viably integrate an OS perspective into individual-level assessment at YUFE. This process should be conducted with appreciation for the diversity of research and teaching traditions and perspectives, while also placing emphasis on addressing equity-related concerns.

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Appendixes

Appendix 1. List of possible Open Science indicators to be used in career assessment (retrieved from the report 'Indicator frameworks for fostering open knowledge practices in science and scholarship'; EC 2019).

Indicator	OS Dimension indicated	Data source
Attitudes of researchers to data sharing	Attitudes of researchers to data sharing	surveys
Nr. papers co-authored with civil society actors	Citizen science	WoS, SCOPUS
Nr participants in Zooniverse and Scistarter	Citizen science	Zooniverse and Scistarter
% researchers in citizen science programs	Citizen science	surveys
Data communication as recognized criterion for career progression (y/n)	Data communication	researchers, universities, funders
% of funded projects incorporating costs for data compilation, publication and maintenance (of the repository data)	Data compilation publication and maintenance costs	ministries, res councils, funders
% of researchers that are contacted about shared data by type of organisation	Data sharing adoption	surveys
Nr Citations to Data Journals	Data sharing adoption	DataCite
Nr Data Sharing Journals	Data sharing adoption	Vasilesky et al. 2017
Nr Open Data Repositories	Data sharing adoption	Re3Data
Nr of repositories with open meta-data	Data sharing adoption	OpenDoar
% of researchers that share data	Data sharing adoption	surveys
% Publications with data	Data sharing adoption	DataCite
% of researchers that shared data from their last project	Data sharing adoption	surveys
Effort required to make data fit for sharing	Data sharing adoption	surveys
Nr Data Sharing Funders	Data sharing adoption	Sherpa Juliet
% of researchers that take steps to manage their research data	Efforts in data management	surveys
% research that addresses problems identified by citizen groups	Engagement, citizen science	universities, funders
% of researchers per benefit of sharing data	Impact of data sharing on society	surveys
Nr of citations to Citizen Science projects in scientific literature	Influence of citizen science projects	WoS, SCOPUS
Is the (long-term) availability of the data guaranteed (availability of a sustainability plan, yes/no)	Long-term data availabilit	ministries, res councils, funders
% OA | Scopus	Open Access adoption	Scopus, Unpaywall

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% OA | WoS	Open Access adoption	Scopus, Unpaywall
P GoldOA | Scopus	Open Access adoption	Scopus, Unpaywall
P Green OA | Scopus	Open Access adoption	Scopus, Unpaywall
Nr. OA Journals	Open Access adoption	DOAJ
% researchers using OA repositories	Open Access adoption	surveys
% OA WoS based in Leiden Ranking	Open Access adoption	CWTS Website
% Gold OA | Scopus	Open Access adoption	Scopus, Unpaywall
% GreenOA | Scopus	Open Access adoption	Scopus, Unpaywall
% OA | Scopus	Open Access adoption	Scopus, Unpaywall
% OA | WoS	Open Access adoption	WoS, Unpaywall
Nr. Journals with OA policies	Open Access policies	Sherpa Romeo
Nr. of refereed publications authored with non-academics	Openness to non-academic stakeholders	WoS, Scopus
Nr. mentions in policy…	Openness to non-academic	Altmetrics.com
Nr. of invitations to advisory committees of non academic organisations	Openness to non-academic stakeholders	surveys
Nr of participants in social networks	Participation of researchers and scholars in social networking using social media	Social media surveys
% researchers with science communication training	Science communication	surveys
Nr. events run and organised for general audience	Science communication	surveys
No. appearances by university academics in regional, national or international TV or radio	Science communication	surveys
No. of times university or its faculty members are mentioned in newspapers because of their research and teaching activities	Science communication	specialised news databases
No. of non peer-reviewed publications (excluding books and book chapters)	Science communication	surveys
Nr. mentions in news of refereed articles	Science communication	Altmetrics.com (Dimensions), Plum X Metrics (Scopus)
Nr. mentions in blogs	Science communication	Altmetrics.com (Dimensions), Plum X Metrics (Scopus)
TRS(Academics) Total Readership Score by Academics	Science communication	Mendeley, Scopus, WoS
TRS(Professionals) Total Readership Score by Professionals	Science communication	Mendeley, Scopus, WoS
TRS(Students) Total Readership Score by Students using Mendeley	Science communication	Mendeley, Scopus, WoS
Nr publications with Mendeley readership	Science communication	Mendeley, Scopus, WoS
Nr publications mentioned in social media	Science communication	Social media surveys

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Nr tweets to publications from highly followed tweeters	Science communication	Twitter
Nr of tweets to a given publication with some degree of engagement	Science communication	Twitter
Nr of tweets to a given publication containing comments, hashtags or remarks from the users	Science communication	Twitter
Nr of tweeters tweeting the publication	Science communication	Twitter
Nr of highly followed tweeters tweeting the publications	Science communication	Twitter
Nr of tweets to the outputs from different fields	Science communication	Twitter
Nr of tweets to publications from social media users from different countries	Science communication	Twitter
Nr publications in Open Aire	Science communication	Open Aire
Nr F1000 Prime Reviews	Science communication	F1000
Nr Hybrid OA Publications	Science communication	WoS, Scopus
Nr Bronze OA Publications	Science communication	WoS, Scopus
Nr Readers in Zotero	Science communication	Zotero
Participation of researchers in open collaboration services	Scientific collaboration	Social media surveys
Participation of researchers in social networking services (ResearchGate; Academic.edu)	Scientific collaboration	Social media surveys
Nr of citations to software	Sharing code practices	DataCite
Nr of code projects with DOI	Sharing code practices	Mozilla Codemeta
Contribution to social media training of researchers	Teaching	Surveys
Developing curricula and programs in open science methods	Teaching	Surveys
Teaching open science	Teaching	Surveys
Nr of publishers that have adopted the TOP Guidelines	TOP Guidelines adoption	Cos.io
% of WoS publications with a DOI	Tracebility of scientific contributions	WoS
% of Scopus publications with a DOI	Tracebility of scientific contributions	Scopus
Openness on contributorship	Transparency about authorship	Frontiers, Plos One
Publication of co-author statements	Transparency about authorship	researchers, publishers, universities
Simulation results	Usability of simulation results (model, data, code)	Researchers

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Appendix 2. List of dissemination activities.

Number	Event	Type of activity	Presenter(s)	Title	Date	Place	Type of audience
1	the 43rd Annual EAIR Forum (European Higher Education Society)	Presentation	Jouni Kekäle, Maria Pietilä	High-level ambitions meet institutional reality: Promoting open data at selected European universities	9–11 September, 2021	Berlin, Germany	Scientific community, policy-makers
2	the 34th Annual Conference of the Consortium for Higher Education Researchers (CHER)	Organising and chairing a panel. Panelists: Ingvild Reymert (Institute for Social Research, OsloMet, Norway), Alex Rushforth (CWTS, Leiden University, the Netherlands), Malcolm Tight (Lancaster University, the United Kingdom)	Jouni Kekäle, Maria Pietilä, Katri Rintamäki (desginers and chairs)	Panel 'Research assessment under scrutiny – towards more holistic and qualitative-oriented systems?'	1–2 September, 2022	Jyväskylä, Finland	Scientific community
3	the 26th International Conference on Science, Technology and Innovation Indicators (STI Conference)	Presentation	Maria Pietilä, Katri Rintamäki (contributors also Raúl Aguilera, Belén Fernández del Pino, Eva Méndez, Núria Bautista-Puig)	Open Science Assessment and Incentives at the YUFE Alliance	7–9 September, 2022	Granada, Spain	Scientific community

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4	Nordic Workshop on Bibliometrics and Research Policy (NWB 2023)	Presentation	Jouni Kekäle, Maria Pietilä, Katri Rintamäki	High hopes and unmet expectations: adding open science elements in individual-level research assessment	21–23 September, 2022	Turku, Finland	Scientific community
5	2nd TORCH Annual Forum	Presentation	Jouni Kekäle, Maria Pietilä	YUFERING Portfolio in researcher assessment	8 March, 2023	Dublin, Ireland	Higher education community
6	the Finnish higher education institutions' quality network meeting	Presentation	Maria Pietilä	YUFERING Project, YUFE Transforming R&I Through Europe-wide knowledge transfer	20 June, 2023	Kuopio, Finland	Higher education community
7	the XV Symposium of the Consortium of Higher Education Researchers	Presentation	Maria Pietilä, Katri Rintamäki	Tutkimusmetriikasta laajempiin ansioihin: YUFERING-portfolio yksilötason tutkijanarvioinnissa [From research metrics to broader achievements: YUFERING portfolio in individual level researcher assessment]	15–16 August, 2023	Jyväskylä, Finland	Scientific community
8	the 35th Annual Conference of the Consortium for Higher Education Researchers (CHER Conference)	Presentation	Jouni Kekäle	Broadening the conception of 'what counts' – researcher assessment reform as a reflection of universities' societal expectations	30 August–1 September, 2023	Vienna, Austria	Scientific community

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9	Research Service Days 2023	Presentation	Maria Pietilä, Katri Rintamäki	YUFERING portfolio in individual-level researcher assessment	21–23 August, 2023	Espoo, Finland	Higher education community
10	KOTA seminar	Presentation	Maria Pietilä	YUFERING – Transforming Research and Innovation through Europe-wide Knowledge Transfer	28 August, 2023	Tampere, Finland	Policy-makers, higher education community
11	the 27th International Conference on Science, Technology and Innovation Indicators (STI 2023)	Poster presentation	Maria Pietilä, Katri Rintamäki	Broadening the conception of 'what counts' – example of a narrative CV in a university alliance	27–29 September, 2023	Leiden, the Netherlands	Scientific community
12	Nordic Workshop on Bibliometrics and Research Policy (NWB 2023)	Poster presentation	Katri Rintamäki	Broadening the conception of 'what counts' – example of a narrative CV in a university alliance	11–13 October, 2023	Gothenburg, Sweden	Scientific community

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