Open and Universal Science Project (OPUS)

DELIVERABLE D3.1

OPUS helps reform the assessment of research towards a system that incentivise researchers to practice #OpenScience

WP3
INDICATORS AND METRICS TO TEST IN THE PILOTS

Deliverable 3.1
Indicators and Metrics to Test in the Pilots

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Abbreviations and Acronyms

AAM	Author Accepted Manuscript
CERN	European Organisation for Nuclear Research
CoARA	Coalition for Advancing Research Assessment
DORA	San Francisco Declaration on Research Assessment
FAIR	Findable, Accessible, Interoperable, and Reusable
FTE	Full Time Equivalent
ICoRSA	International Consortium of Research Staff Associations
IPR	Intellectual Property Rights
JIF	Journal Impact Factor
LERU	League of European Research Universities
LIBER	Association of European Research Libraries
MCAA	Marie Curie Alumni Association
MESR	Minister of Higher Education and Research of France
OPUS	Open Universal Science
OSPP	Open Science Policy Platform
RAF	Researcher Assessment Framework
RDF	Researcher Development Framework
RFO	Research-funding Organisation
RPO	Research-performing Organisation
SU	Stockholm University
TGB	Technopolis Group Belgium
VoR	Version of Record

1. Introduction

This report is deliverable D3.1 of the OPUS project [1] on Indicators and Metrics to Test in the Pilots. The report proposes a **first draft of a researcher assessment framework (RAF) to assess researchers in an academic context**. This includes assessing researchers applying for positions at a research-performing organisation (RPO), assessing researchers in their career development and progression at an RPO, and assessing grant applications by researchers at an RPO or research-funding organisation (RFO). The framework includes an Open Science dimension, whereby Open Science practices are explicitly recognised and rewarded. The implementation of the framework is supported by accompanying interventions for RPOs and RFOs, which are further described in deliverable D2.1 of OPUS on Interventions to Test in the Pilots [2]. Selected indicators and metrics from the framework and related interventions will be tested in pilots at 3 RPOs and 2 RFOs in OPUS.

The RAF builds on **key policy developments in research assessment and Open Science** as identified in deliverable D1.2 of OPUS on State-of-the-Art on an Open Science Ecosystem [3]:

- San Francisco Declaration on Research Assessment (DORA) [4]
- Leiden Manifesto for Research Metrics [5]
- Hong Kong Principles [6]
- Recommendations by the Open Science Policy Platform (OSSP) [7] [8]
- Recommendations on Science and Scientific Researchers [9] and Open Science [10]
- Agreement on Reforming Research Assessment [11]
- Research Evaluation in a Context of Open Science and Gender Equality [12]
- Conclusions on Research Assessment and Implementation of Open Science [13]
- European Framework for Research Careers including European Charter for Researchers [14]

The RAF also builds on **key frameworks in research assessment and Open Science** with a focus on developing new indicators and metrics and supporting Open Science as identified in D1.2:

- Researcher Development Framework (RDF) [15]
- Evaluation of Research Careers Fully Acknowledging Open Science Practices [16]
- Next-generation Metrics [17]
- Recommendations of the OSPP on Next-Generation Metrics [18]
- Mutual Learning Exercise on Open Science on Altmetrics and Rewards [19]
- Open Science Monitor [20]
- Indicator Frameworks for Fostering Open Knowledge Practices in Science and Scholarship [21]
- A Pathway towards Multidimensional Academic Careers [22]

The RAF further builds on **key recommendations for a framework for researcher assessment from D1.2** which incorporates the recognition and reward of Open Science practices by researchers:

- Develop a comprehensive RAF of indicators and metrics for RPOs and RFOs
- Include both research and non-research activities by researchers in the RAF
- Include both a generic and Open Science approach to assessment in the RAF
- Include both a quantitative and qualitative approach to assessment in the RAF
- Integrate relevant indicators and metrics from existing frameworks into the RAF

The RAF has been developed in close **collaboration with key stakeholders in research assessment and Open Science**. This includes project partners and especially the pilot organisations[1] which are already implementing researcher assessment and Open Science and will pilot the RAF in OPUS. This also includes members of the Advisory Board[2] in OPUS and key external stakeholders[3] as identified in D1.1 of OPUS on State-of-the-Art on an Ecosystem for Open Science [23]. This lastly includes the GraspOS project [24] and other relevant stakeholders[4]. This first draft of the RAF will be further developed in iterations, including testing and feedback from the pilots, targeted feedback from key stakeholders, and an open consultation with the wider research community.

The RAF consists of a **comprehensive framework of indicators and metrics for researcher assessment at RPOs and RFOs** linked to the full spectrum of activities carried out by researchers. The RAF essentially offers a wide range of indicators and metrics for RPOs and RFOs to develop or update their own researcher assessment systems. The RAF consists of 4 main categories for research, education, leadership, and valorisation activities, which are further subdivided into relevant subcategories consisting of specific sets of indicators and metrics. The RAF furthermore consists of 2 main dimensions for generic and Open Science activities, whereby the indicators remain the same for both categories, but the metrics are either generic or specifically focused on Open Science. The framework is intended to be universally applicable across countries, across disciplines, and across organisations, whereby RPOs and RFOs can tailor the framework to their own interests and needs.

The report begins with the guiding principles behind the RAF and describes the overall structure and implementation of the RAF at RPOs and RFOs in **Section 2**. The report next presents the generic RAF and lists the generic indicators and metrics for researcher assessment at RPOs and RFOs in **Section 3**. The report then presents the Open Science RAF and lists the indicators and metrics to recognise and reward Open Science practices in researcher assessment at RPOs and RFOs in **Section 4**. The report lastly offers conclusions and next steps for OPUS in **Section 5** and provides the full RAF with all generic and Open Science indicators and metrics in table format in **Appendix 1**.

2. Researcher Assessment Framework

2.1. Guiding Principles behind the Framework

The RAF has been developed and should be implemented according to **10 guiding principles,** which the project has formulated based on existing work and feedback from relevant stakeholders:

1. Provide a comprehensive framework of indicators and metrics for RPOs and RFOs
2. Provide a framework which applies across countries, disciplines, and organisations
3. Provide a framework which combines both quantitative and qualitative assessment
4. Focus on the assessment of individual researchers and not teams, groups, or units
5. Cover the full spectrum of activities by researchers and not just research activities
6. Offer a generic framework which allows open and non-open activities by researchers
7. Offer a specific framework which focuses on Open Science activities by researchers
8. Distinguish process, output, and outcome indicators to capture the lifecycle of activities
9. Formulate indicators and metrics at a high level of description for universal application
10. Leave selection, refinement, and prioritisation of indicators and metrics to RPOs and RFOs

The RAF is **not intended to be prescriptive** but rather provides RPOs and RFOs with a suite of indicators and metrics, which can be selected and further refined according to the interests and needs of the organisations. The RAF does not prioritise any indicators and metrics, does not rank or weigh any indicators and metrics, does not propose benchmarks or targets for any indicators and metrics, and does not propose a scoring system for the outcome of an assessment. The RAF also does not prioritise any generic or Open Science indicators and metrics but leaves the selection and prioritisation of generic or Open Science indicators and metrics to RPOs and RFOs. The organisations thus select and potentially combine indicators and metrics from the generic and Open Science frameworks, refine if needed the selected indicators and metrics, prioritise and rank and weigh the selected indicators and metrics, and determine the scoring system for a given assessment.

The RAF should be **translated into a workable tool** for practical implementation by RPOs and RFOs. The translation of the RAF will undoubtedly be different for RPOs versus RFOs. One example is that the RAF will likely focus on a recent (potentially annual) evaluation time frame for assessing researchers in their career development and progression at an RPO, but will be more encompassing and cumulative (including all previous activities) for assessing researchers applying for positions at a RPO or grant applications by researchers at an RPO or RFO. The translation of the RAF will also be different across RPOs and RFOs. The flexibility of the framework naturally allows for individual RPOs and RFOs to assess their researchers according to their own interests and needs. The translations of the RAF by RPOs and RFOs may lastly be presented to researchers through questionnaires or digital tools and will require clear guidelines explaining the RAF and assessment procedure for researchers.

2.2. Structure and Components of the Framework

The RAF is structured around **4 main categories of activities**, which are divided into **subcategories** of these activities, and which in turn consist of **indicator groups** of associated metrics as in Figure 1:

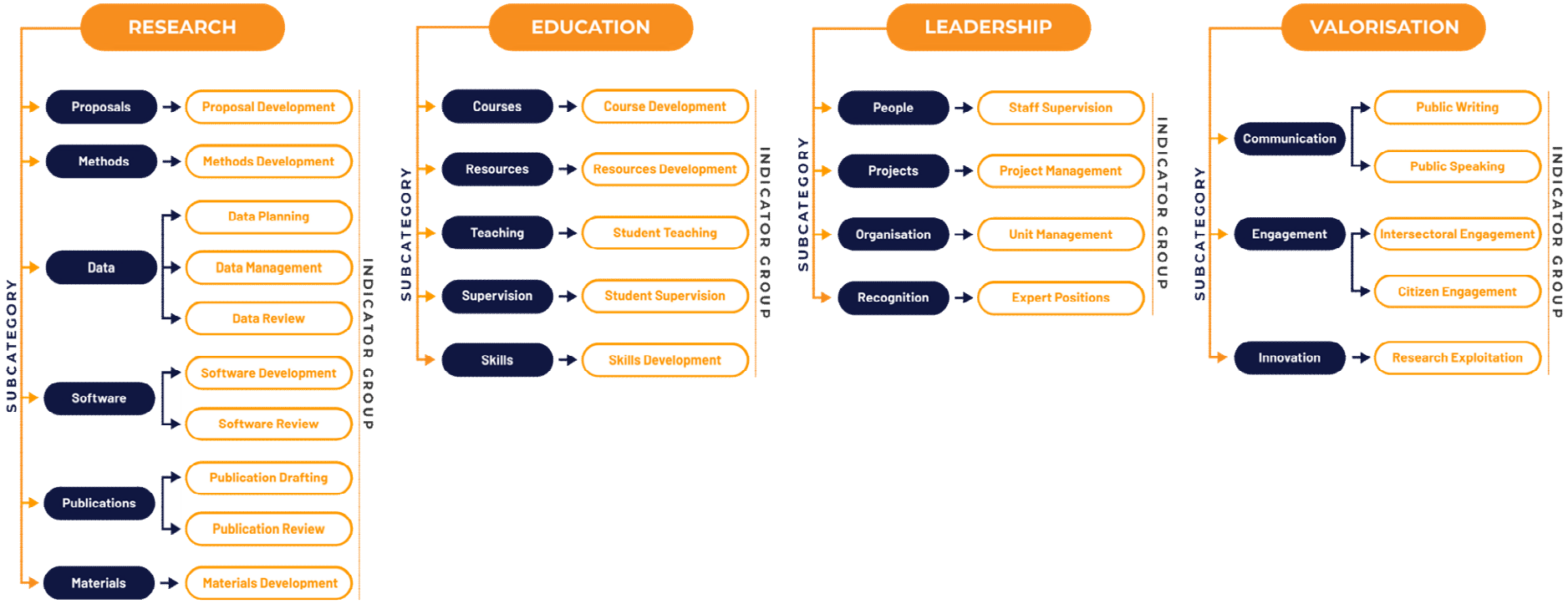
- Research:
  - Proposals = Proposal Development
  - Methods = Methods Development
  - Data = Data Planning, Data Management, and Data Review
  - Software = Software Development and Software Review
  - Publications = Publication Drafting and Publication Review
  - Materials = Materials Development
- Education:
  - Courses = Course Development
  - Resources = Resource Development
  - Teaching = Student Teaching
  - Supervision = Student Supervision
  - Skills = Skills Development
- Leadership:
  - People = Staff Supervision
  - Projects = Project Management
  - Organisation = Unit Management
  - Recognition = Expert Positions
- Valorisation:
  - Communication = Public Writing and Public Speaking
  - Engagement = Intersectoral Engagement and Citizen Engagement
  - Innovation = Research Exploitation

Each indicator group further consists of **3 types of indicators**[5] defining the lifecycle of an activity:

- Process: Activity which is in development or is ongoing
- Output: Clear endpoint or tangible product of a process
- Outcome: Immediate or short-term result of an output

The RAF is designed to comprehensively cover the **full spectrum of researcher activities** and offer researchers the possibility to be assessed on all relevant activities in a given assessment period, rather than solely on the traditional metrics of number of peer-reviewed publications and citations and journal impact factor (JIF). The inclusion of Open Science metrics in a given RAF at an RPO or RFO ensures that Open Science activities are explicitly recognised in the assessment. It remains the prerogative of RPOs and RFOs to determine how exactly to reward researchers for Open Science.

***Figure 1**: Categories, Subcategories, and Indicator Groups of Researcher Assessment Framework*



3. Generic Researcher Assessment Framework

3.1. Research

The research category consists of 6 subcategories for proposals, methods, data, software, publications, and materials with related generic indicators and metrics for researcher assessment.

3.1.1. Proposals

This subcategory focuses on proposals for research projects to an RPO or RFO as in Table 1. The qualitative description of the proposal may include the associated funding call and roles, activities, and efforts of the researchers involved in the proposal development and in the to-be-granted project.

Table 1: Generic Indicators and Metrics for Category Research Subcategory Proposals

Indicator Group	Indicator Type	Quantitative Metric
Proposal Development	Process	# of Project Proposals Being Developed
	Output	# of Project Proposals Submitted
	Outcome	# of Project Proposals Granted
		€ of Project Proposals Granted

3.1.2. Methods

This subcategory focuses on methods to conduct research as in Table 2. There is flexibility in the definition of 'methods' which may include research methodologies and protocols. There is also flexibility in how the method sets are 'implemented' such as by the researcher themself or by others, how the method sets are 'accessed' which may include restricted forms of access, and how the method sets are cited which may be dependent on standard practices within a specific discipline.

Table 2: Generic Indicators and Metrics for Category Research Subcategory Methods

Indicator Group	Indicator Type	Quantitative Metric
Methods Development	Process	# of Method Sets Being Developed
	Output	# of Method Sets Finalised
	Outcome	# of Method Sets Implemented
		# of Method Sets Accessed
		# of Method Sets Cited

3.1.3. Data

This subcategory focuses on research data planning, management, and peer review as in Table 3. There is flexibility in the definition of 'data management plan', which may be dependent on standard practices within a specific discipline. There is also flexibility in the inclusion or exclusion of a focus on adopting the Findable, Accessible, Interoperable, and Reusable (FAIR) principles for research data [25]. There is further flexibility in how data sets are 'archived' which may be in a trusted repository with(out) long-term preservation, how data sets are 'accessed' including restricted forms of access, and how data sets are 'cited' which may depend on standard practices within a specific discipline. Data set peer reviews involve formal peer review requested by an academic venue or publisher.

Table 3: Generic Indicators and Metrics for Category Research Subcategory Data

Indicator Group	Indicator Type	Quantitative Metric
Data Planning	Process	# of (FAIR) Data Management Plans Being Developed
	Output	# of (FAIR) Data Management Plans Finalised
	Outcome	# of (FAIR) Data Management Plans Implemented
Data Management	Process	# of (FAIR) Data Sets Being Developed
	Output	# of (FAIR) Data Sets Finalised
		# of (FAIR) Data Sets Archived
	Outcome	# of (FAIR) Data Sets Accessed
		# of (FAIR) Data Sets Cited
Data Review	Process	# of (FAIR) Data Set Peer Reviews Being Drafted
	Output	# of (FAIR) Data Set Peer Reviews Submitted
	Outcome	# of (FAIR) Data Set Peer Reviews Accepted

3.1.4. Software

This subcategory focuses on research software development and peer review as in Table 4. There is flexibility in the definition of 'software', which may include algorithms, code, and packages. There is also flexibility in how the software sets are ‘archived’ which may be in a trusted repository with(out) long-term preservation, how the software sets are ‘accessed’ including restricted forms of access, and how the software sets are ‘cited’ which may be dependent on standard practices within a specific discipline. Software set peer reviews may include non-editorial board and security check requests.

Table 4: Generic Indicators and Metrics for Category Research Subcategory Software

Indicator Group	Indicator Type	Quantitative Metric
Software Development	Process	# of Software Sets Being Developed
	Output	# of Software Sets Finalised
		# of Software Sets Archived
	Outcome	# of Software Sets Accessed
		# of Software Sets Cited
Software Review	Process	# of Software Set Peer Reviews Being Drafted
	Output	# of Software Set Peer Reviews Submitted
	Outcome	# of Software Set Peer Reviews Accepted

3.1.5. Publications

This subcategory focuses on research publications and peer reviews as in Table 5. There is flexibility in the definition of 'publications', which may include books, chapters, and articles. There is also flexibility for the recognition of the JIF of the academic venue or publisher. There is further flexibility in how publications are ‘archived’ which may be in a trusted repository with(out) long-term preservation, how publications are ‘accessed’ including restricted forms of access, and how publications are ‘cited’ which may depend on standard practices within a discipline. Publication peer reviews always involve formal peer review which is requested by an (editorial board of an) academic venue or publisher.

Table 5: Generic Indicators and Metrics for Category Research Subcategory Publications

Indicator Group	Indicator Type	Quantitative Metric
Publication Drafting	Process	# of Publications Being Drafted
	Output	# of Publications Submitted
	Outcome	# of Publications Published
		# of Publications Accessed
		# of Publications Cited
Publication Review	Process	# of Publication Peer Reviews Being Drafted
	Output	# of Publication Peer Reviews Submitted
	Outcome	# of Publication Peer Reviews Accepted

3.1.6. Materials

This subcategory focuses on research materials as in Table 6. There is flexibility in the definition of 'materials' which may include artwork, tools, instruments, and hardware. There is also flexibility in how the material sets are 'implemented' and 'accessed' which may be dependent on the type of materials and how the material sets are cited which may be dependent on standard practices in a discipline.

Table 6: Generic Indicators and Metrics for Category Research Subcategory Materials

Indicator Group	Indicator Type	Quantitative Metric
Materials Development	Process	# of Material Sets Being Developed
	Output	# of Material Sets Finalised
	Outcome	# of Material Sets Implemented
		# of Material Sets Accessed
		# of Material Sets Cited

3.2. Education

The education category consists of 5 subcategories for courses, resources, teaching, supervision, and skills development with associated generic indicators and metrics for researcher assessment.

3.2.1. Courses

This subcategory focuses on educational courses as in Table 7. There is flexibility in the definition of 'courses', which may include variation in the scope and duration of the courses. There is also flexibility in how the courses are 'implemented' such as by the researcher themself or by other researchers.

Table 7: Generic Indicators and Metrics for Category Education Subcategory Courses

Indicator Group	Indicator Type	Quantitative Metric
Course Development	Process	# of Courses Being Developed
	Output	# of Courses Finalised
	Outcome	# of Courses Implemented

3.2.2. Resources

This subcategory focuses on educational resources as in Table 8. There is flexibility in the definition of 'resources' which may include articles, books, recordings, images, games, and digital tools. There is also flexibility in how the resources are 'implemented', 'accessed', and 'cited' which may depend on the type of resources and also on the standard practices for resources within a specific discipline.

Table 8: Generic Indicators and Metrics for Category Education Subcategory Resources

Indicator Group	Indicator Type	Quantitative Metric
Resource Development	Process	# of Resources Being Developed
	Output	# of Resources Finalised
	Outcome	# of Resources Implemented
		# of Resources Accessed
		# of Resources Cited

3.2.3. Teaching

This subcategory focuses on teaching students and courses as in Table 9. There is flexibility in the definition of 'courses' which may include variation in course scope and duration as well as 'students' which may include bachelor, master, and if applicable doctoral students. There is also flexibility in the number of students 'passed in courses' which may be the number per course or total across courses.

Table 9: Generic Indicators and Metrics for Category Education Subcategory Teaching

Indicator Group	Indicator Type	Quantitative Metric
Student Teaching	Process	# of Course Hours Assigned
	Output	# of Courses Hours Taught
	Outcome	# of Students Passed in Courses

3.2.4. Supervision

This subcategory focuses on supervising students as in Table 10. There is flexibility in the definition of 'supervision' which may include mentoring students and supervision of student theses as well as in the definition of 'students' which may include bachelor, master, and if applicable doctoral students.

Table 10: Generic Indicators and Metrics for Category Education Subcategory Supervision

Indicator Group	Indicator Type	Quantitative Metric
Student Supervision	Process	# of Students Being Supervised
	Output	# of Students Supervised
	Outcome	# of Supervised Student Theses
		# of Supervised Students Graduated

3.2.5. Skills

This subcategory focuses on skills development by researchers as in Table 11. There is flexibility in the definition of 'courses' and 'certificates', which may include variation in course scope and duration. The courses and certificates may cover any research, education, leadership, and valorisation skills.

Table 11: Generic Indicators and Metrics for Category Education Subcategory Skills

Indicator Group	Indicator Type	Quantitative Metric
Skills Development	Process	# of Skills Courses Being Followed
	Output	# of Skills Courses Completed
	Outcome	# of Skills Certificates Obtained

3.3. Leadership

The leadership category consists of 4 subcategories for managing people, projects, organisational units, and recognition with associated generic indicators and metrics for researcher assessment.

3.3.1. People

This subcategory focuses on supervising staff as in Table 12. There is flexibility in the definition of 'supervision' which may include mentoring staff and supervision of (post)doctoral theses as well as 'staff' which may include local and visiting (post)doctoral and senior researchers and other staff. There is also flexibility in the definition of 'theses', which may include (post)doctoral theses as well as 'projects' which may include research and non-research projects managed by supervised staff.

Table 12: Generic Indicators and Metrics for Category Leadership Subcategory People

Indicator Group	Indicator Type	Quantitative Metric
Staff Supervision	Process	# of Staff being Supervised
	Output	# of Staff Supervised
	Outcome	# of Supervised Staff Theses
		# of Supervised Staff Projects

3.3.2. Projects

This subcategory focuses on managing projects as in Table 13. There is flexibility in the definition of 'projects' which may be funded or non-funded but should involve official management responsibility. A project which is 'successfully evaluated' has been formally reviewed and successfully closed.

Table 13: Generic Indicators and Metrics for Category Leadership Subcategory Projects

Indicator Group	Indicator Type	Quantitative Metric
Project Management	Process	# of Projects Being Managed
	Output	# of Projects Completed
	Outcome	# of Projects Successfully Evaluated

3.3.3. Organisation

This subcategory focuses on managing organisational units as in Table 14. There is flexibility in the definition of 'units' which may include a team, group, institute, faculty, or university. The 'positions' should involve official management responsibility. There is also flexibility in the selection of unit 'unit management outputs' and 'unit management outcomes' which could be taken from relevant outputs and outcomes identified in the RAF and should likely be formally agreed within the organisation.

Table 14: Generic Indicators and Metrics for Category Leadership Subcategory Organisation

Indicator Group	Indicator Type	Quantitative Metric
Unit Management	Process	# Unit Management Positions Assigned
	Output	# Unit Management Positions Completed
		# Agreed Unit Management Outputs
	Outcome	# Agreed Unit Management Outcomes

3.3.4. Recognition

This subcategory focuses on the recognition of researchers through expert positions as in Table 15. There is flexibility in the definition of 'expert positions' including invited strategic, advisory, and honorary roles which recognise researchers for their expertise and experience. There is also flexibility in the definition of 'expert position outputs' which may include meetings, presentations, and reports as well as 'expert position outcomes' depending on the type of expert position. The 'achievement awards' may be for any recognised research, education, leadership, and valorisation contributions.

Table 15: Generic Indicators and Metrics for Category Leadership Subcategory Recognition

Indicator Group	Indicator Type	Quantitative Metric
Expert Positions	Process	# of Expert Positions Assigned
	Output	# of Expert Positions Completed
		# of Expert Position Outputs
	Outcome	# of Expert Position Outcomes
		# of Expert Achievement Awards

3.4. Valorisation

The valorisation category consists of 3 subcategories for communication, engagement, and innovation activities along with associated generic indicators and metrics for researcher assessment.

3.4.1. Communication

This subcategory focuses on research communication via public writing and public speaking as in Table 16. There is flexibility in the definition of 'publications' which may include print and social media and 'appearances' which may be physical or digital and include talks, conferences, workshops, and recordings. There is also flexibility in the definition of 'accessed' which may include readership, attendees, views, and downloads and 'cited' which may include mentions in print and social media.

Table 16: Generic Indicators and Metrics for Category Valorisation Subcategory Communication

Indicator Group	Indicator Type	Quantitative Metric
Public Writing	Process	# of Publications Being Drafted
	Output	# of Publications Published
	Outcome	# of Publications Accessed
		# of Publications Cited
Public Speaking	Process	# of Appearances Planned
	Output	# of Appearances Made
	Outcome	# of Appearances Accessed
		# of Appearances Cited

3.4.2. Engagement

This subcategory focuses on intersectoral and citizen engagement as in Table 17. There is flexibility in the definition of 'intersectoral' which may include academic, public, and private organisations and 'collaborations' which may include research collaboration, staff secondments and exchanges, volunteering and advocacy, and policy development. There is also flexibility in the definition of 'citizen science', which may include any research activities with citizens and encompass activities in projects with a citizen science dimension or full projects on citizen science. There is also flexibility in the selection of 'intersectoral outputs' and 'intersectoral outcomes' as well as 'citizen science outputs' and 'citizen science outcomes' which could be taken from relevant outputs and outcomes in the RAF.

Table 17: Generic Indicators and Metrics for Category Valorisation Subcategory Engagement

Indicator Group	Indicator Type	Quantitative Metric
Intersectoral Engagement	Process	# of Intersectoral Engagements
	Output	# of Intersectoral Outputs
	Outcome	# of Intersectoral Outcomes
		# of Organisations Engaged
Citizen Engagement	Process	# of Citizen Science Activities Ongoing
	Output	# of Citizen Science Activities Completed
		# of Citizen Science Outputs
	Outcome	# of Citizen Science Outcomes
		# of Citizen Scientists Engaged

3.4.3. Innovation

This subcategory focuses on the innovation of research through research exploitation and entrepreneurial spirit as in Table 18. There is flexibility in the definition of 'being legalised' including defining Intellectual Property Rights (IPR), patenting, and licensing of research outputs, which may include innovative products and services. There is also flexibility in the size of spin-offs and start-ups as well as the definition of 'employees' in terms of number of people or Full Time Equivalent (FTE).

Table 18: Generic Indicators and Metrics for Category Valorisation Subcategory Innovation

Indicator Group	Indicator Type	Quantitative Metric
Research Exploitation	Process	# of Research Outputs Being Legalised
	Output	# of Research Outputs with Defined IPR
		# of Research Outputs Patented
	Outcome	# of Research Outputs with Licenses
Entrepreneurial Spirit	Process	# of Spin-offs/Start-ups Being Created
	Output	# of Spin-offs/Start-ups Created
	Outcome	# of Spin-off/Start-up Employees
		# of Spin-off/Start-up Products
		# of Spin-off/Start-up Services

4. Open Science Researcher Assessment Framework

4.1. Research

The research category consists of 6 subcategories for proposals, methods, data, software, publications, and materials with Open Science indicators and metrics for researcher assessment.

4.1.1. Proposals

This subcategory focuses on proposals for research projects to an RPO or RFO, which are openly available as in Table 19. There is flexibility in how the proposals are made 'openly available'.

Table 19: Open Science Indicators and Metrics for Category Research Subcategory Proposals

Indicator Group	Indicator Type	Quantitative Metric
Proposal Development	Process	# of Developing Project Proposals Openly Available
	Output	# of Submitted Project Proposals Openly Available
	Outcome	# of Granted Project Proposals Openly Available
		€ of Granted Project Proposals involving Open Science

4.1.2. Methods

This subcategory focuses on methods to conduct research, which are openly available as in Table 20. There is flexibility in how the method sets are actually made 'openly available' for use by the public.

Table 20: Open Science Indicators and Metrics for Category Research Subcategory Methods

Indicator Group	Indicator Type	Quantitative Metric
Methods Development	Process	# of Developing Method Sets Openly Available
	Output	# of Finalised Method Sets Openly Available
	Outcome	# of Openly Available Method Sets Implemented
		# of Openly Available Method Sets Accessed
		# of Openly Available Method Sets Cited

4.1.3. Data

This subcategory focuses on research data planning, management, and peer review, which are openly available as in Table 21. There is flexibility in the inclusion or exclusion of a focus on FAIR and how data management plans, data sets, and data peer reviews are made 'openly available' for public use.

Table 21: Open Science Indicators and Metrics for Category Research Subcategory Data

Indicator Group	Indicator Type	Quantitative Metric
Data Planning	Process	# of (FAIR) Developing Data Management Plans Openly Available
	Output	# of (FAIR) Finalised Data Management Plans Openly Available
	Outcome	# of (FAIR) Implemented Data Management Plans Openly Available
Data Management	Process	# of Developing (FAIR) Data Sets Openly Available
	Output	# of Finalised (FAIR) Data Sets Openly Available
		# of Archived (FAIR) Data Sets Openly Available
	Outcome	# of Openly Available (FAIR) Data Sets Accessed
		# of Openly Available (FAIR) Data Sets Cited
Data Review	Process	# of Draft (FAIR) Data Set Peer Reviews Openly Available
	Output	# of Submitted (FAIR) Data Set Peer Reviews Openly Available
	Outcome	# of Accepted (FAIR) Data Set Peer Reviews Openly Available

4.1.4. Software

This subcategory focuses on research software development and peer review, which are openly available as in Table 22. There is flexibility in software sets and peer reviews being 'openly available'.

Table 22: Open Science Indicators and Metrics for Category Research Subcategory Software

Indicator Group	Indicator Type	Quantitative Metric
Software Development	Process	# of Developing Software Sets Openly Available
	Output	# of Finalised Software Sets Openly Available
		# of Archived Software Sets Openly Available
	Outcome	# of Openly Available Software Sets Accessed
		# of Openly Available Software Sets Cited
Software Review	Process	# of Draft Software Set Peer Reviews Openly Available
	Output	# of Submitted Software Set Peer Reviews Openly Available
	Outcome	# of Accepted Software Set Peer Reviews Openly Available

4.1.5. Publications

This subcategory focuses on research publications and peer reviews, which are openly available as in Table 23. There is flexibility in how the publications and peer reviews are made 'openly available'. There is also flexibility in the version of the publication, which may be a preprint, Author Accepted Manuscript (AAM), or Version of Record (VoR) as well as the type of open access such as green or gold. There is further flexibility in whether the publications adhere to the principles of Plan S [26].

Table 23: Open Science Indicators and Metrics for Category Research Subcategory Publications

Indicator Group	Indicator Type	Quantitative Metric
Publication Drafting	Process	# of Draft Publications Openly Available
	Output	# of Submitted Publications Openly Available
	Outcome	# of Published Publications Openly Available
		# of Openly Available Publications Accessed
		# of Openly Available Publications Cited
Publication Review	Process	# of Draft Publication Peer Reviews Openly Available
	Output	# of Submitted Publication Peer Reviews Openly Available
	Outcome	# of Accepted Publication Peer Reviews Openly Available

4.1.6. Materials

This subcategory focuses on research materials, which are openly available as in Table 24. There is flexibility in how the material sets are made 'openly available' depending on the type of materials.

Table 24: Open Science Indicators and Metrics for Category Research Subcategory Materials

Indicator Group	Indicator Type	Quantitative Metric
Materials Development	Process	# of Developing Material Sets Openly Available
	Output	# of Finalised Material Sets Openly Available
	Outcome	# of Implemented Material Sets Openly Available
		# of Openly Available Material Sets Accessed
		# of Openly Available Material Sets Cited

4.2. Education

The education category consists of 5 subcategories for courses, resources, teaching, supervision, and skills development with related Open Science indicators and metrics for researcher assessment.

4.2.1. Courses

This subcategory focuses on educational courses which are on Open Science or openly available as in Table 25. There is flexibility in the definition of courses on ‘Open Science’, which may focus on many or specific Open Science practices as well as how the courses are made 'openly available'.

Table 25: Open Science Indicators and Metrics for Category Education Subcategory Courses

Indicator Group	Indicator Type	Quantitative Metric
Course Development	Process	# of Open Science Courses Being Developed
		# of Developing Courses Openly Available
	Output	# of Open Science Courses Finalised
		# of Finalised Courses Openly Available
	Outcome	# of Open Science Courses Implemented
		# of Implemented Courses Openly Available

4.2.2. Resources

This subcategory focuses on educational resources which are on Open Science or openly available as in Table 26. There is flexibility in the definition of resources on 'Open Science', which may focus on many or specific Open Science practices as well as how the resources are made 'openly available'.

Table 26: Open Science Indicators and Metrics for Category Education Subcategory Resources

Indicator Group	Indicator Type	Quantitative Metric
Resource Development	Process	# of Open Science Resources Being Developed
		# of Developing Resources Openly Available
	Output	# of Open Science Resources Finalised
		# of Finalised Resources Openly Available
	Outcome	# of Open Science Resources Implemented
		# of Implemented Resources Openly Available

4.2.3. Teaching

This subcategory focuses on teaching students and courses which are on Open Science or openly available as in Table 27. There is flexibility in the definition of courses on 'Open Science', which may focus on many or specific Open Science practices as well as how the courses are 'openly available'.

Table 27: Open Science Indicators and Metrics for Category Education Subcategory Teaching

Indicator Group	Indicator Type	Quantitative Metric
Student Teaching	Process	# of Open Science Course Hours Assigned
	Output	# of Open Science Course Hours Taught
	Outcome	# of Students Passed in Open Science Courses
		# of Students Passed in Openly Available Courses

4.2.4. Supervision

This subcategory focuses on supervising students in Open Science and making student theses openly available as in Table 28. There is flexibility in the definition of 'Open Science', which may include many or specific Open Science practices and how the student theses are 'openly available'.

Table 28: Open Science Indicators and Metrics for Category Education Subcategory Supervision

Indicator Group	Indicator Type	Quantitative Metric
Student Supervision	Process	# of Students Being Supervised in Open Science
	Output	# of Students Supervised in Open Science
	Outcome	# of Supervised Student Theses Openly Available
		# of Supervised Students in Open Science Graduated

4.2.5. Skills

This subcategory focuses on skills development in Open Science by researchers as in Table 29. There is flexibility in the definition of 'courses' and 'certificates' which may include variation in course scope

and duration and 'Open Science' which may focus on many or specific Open Science practices. Courses and certificates may cover research, education, leadership, and valorisation skills.

Table 29: Open Science Indicators and Metrics for Category Education Subcategory Skills

Indicator Group	Indicator Type	Quantitative Metric
Skills Development	Process	# of Open Science Skills Courses Being Followed
	Output	# of Open Science Skills Courses Completed
	Outcome	# of Open Science Skills Certificates Obtained

4.3. Leadership

The leadership category consists of 4 subcategories for people, project, and organisational unit management and recognition with Open Science indicators and metrics for researcher assessment.

4.3.1. People

This subcategory focuses on supervising staff in Open Science as in Table 30. There is flexibility in the definition of 'Open Science' which may include many or specific Open Science practices. There is also flexibility in how theses are 'openly available' and how projects are 'involving Open Science'.

Table 30: Open Science Indicators and Metrics for Category Leadership Subcategory People

Indicator Group	Indicator Type	Quantitative Metric
Staff Supervision	Process	# of Staff Being Supervised in Open Science
	Output	# of Staff Supervised in Open Science
	Outcome	# of Supervised Staff Theses Openly Available
		# of Supervised Staff Projects involving Open Science

4.3.2. Projects

This subcategory focuses on managing projects involving Open Science as in Table 31. There is flexibility in the definition of 'involving Open Science', which may include variation in the scope and duration of projects and 'Open Science', which may include many or specific Open Science practices.

Table 31: Open Science Indicators and Metrics for Category Leadership Subcategory Projects

Indicator Group	Indicator Type	Quantitative Metric
Project Management	Process	# of Projects involving Open Science Being Managed
	Output	# of Projects involving Open Science Completed
	Outcome	# of Projects involving Open Science Successfully Evaluated

4.3.3. Organisation

This subcategory focuses on managing organisational units involving Open Science as in Table 32. There is flexibility in the definition of 'Open Science', which may include many or specific Open Science practices. There is also flexibility in the selection of 'unit management outputs' and 'unit management

outcomes' involving Open Science which could be taken from relevant outputs and outcomes identified in the RAF and should likely be formally agreed within the organisation.

Table 32: Open Science Indicators and Metrics for Category Leadership Subcategory Organisation

Indicator Group	Indicator Type	Quantitative Metric
Unit Management	Process	# Unit Management Positions in Open Science Assigned
	Output	# Unit Management Positions in Open Science Completed
		# of Agreed Unit Management Outputs involving Open Science
	Outcome	# of Agreed Unit Management Outcomes involving Open Science

4.3.4. Recognition

This subcategory focuses on the recognition of researchers through expert positions in Open Science as in Table 33. There is flexibility in the definition of 'Open Science' including many or specific practices and how 'expert position outputs' and 'expert position outcomes' are 'openly available'.

Table 33: Open Science Indicators and Metrics for Category Leadership Subcategory Recognition

Indicator Group	Indicator Type	Quantitative Metric
Expert Positions	Process	# of Expert Positions in Open Science Assigned
	Output	# of Expert Positions in Open Science Completed
		# of Open Science Expert Position Outputs
		# of Expert Position Outputs Openly Available
	Outcome	# of Expert Position Outcomes Openly Available
		# of Expert Achievement Awards for Open Science

4.4. Valorisation

The valorisation category consists of 3 subcategories for communication, engagement, and innovation along with associated Open Science indicators and metrics for researcher assessment.

4.4.1. Communication

This subcategory focuses on research communication via public writing and public speaking, which is openly available as in Table 34. There is flexibility in how the publications and appearances are made 'openly available' and also in the definition of 'Open Science' including many or specific practices.

Table 34: Open Science Indicators and Metrics for Category Valorisation Subcategory Communication

Indicator Group	Indicator Type	Quantitative Metric
Public Writing	Process	# of Draft Publications Openly Available
	Output	# of Published Publications Openly Available
	Outcome	# of Openly Available Publications Accessed
		# of Openly Available Publications Cited
Public Speaking	Process	# of Appearances on Open Science Planned
	Output	# of Appearances on Open Science Given
	Outcome	# of Appearances on Open Science Accessed
		# of Appearances on Open Science Cited
		# of Appearances Openly Available

4.4.2. Engagement

This subcategory focuses on intersectoral and citizen engagement involving Open Science as in Table 35. There is flexibility in the definition of 'Open Science' including many or specific Open Science practices. There is also flexibility in the selection of 'intersectoral outputs' and 'intersectoral outcomes' as well as 'citizen science outputs' and 'citizen science outcomes' for Open Science which could be taken from relevant outputs and outcomes for Open Science already identified in the RAF.

Table 35: Open Science Indicators and Metrics for Category Valorisation Subcategory Engagement

Indicator Group	Indicator Type	Quantitative Metric
Intersectoral Engagement	Process	# of Intersectoral Engagements involving Open Science
	Output	# of Intersectoral Outputs involving Open Science
	Outcome	# of Intersectoral Outcomes involving Open Science
		# of Organisations Engaged for Open Science
Citizen Engagement	Process	# of Citizen Science Activities involving Open Science Ongoing
	Output	# of Citizen Science Activities involving Open Science Completed
		# of Citizen Science Outputs involving Open Science
	Outcome	# of Citizen Science Outcomes involving Open Science
		# of Citizen Scientists Engaged in Open Science

4.4.3. Innovation

This subcategory focuses on the open innovation of research including research exploitation and entrepreneurial spirit involving Open Science as in Table 36. There is flexibility in the definition of 'Open Science' including many or specific Open Science practices and how research outputs are 'openly available'. Spin-offs and start-ups may be focused on supporting or exploiting Open Science.

Table 36: Open Science Indicators and Metrics for Category Valorisation Subcategory Innovation

Indicator Group	Indicator Type	Quantitative Metric
Research Exploitation	Process	# of Openly Available Research Outputs Being Legalised
	Output	# of Openly Available Research Outputs with Defined IPR
		# of Openly Available Research Outputs Patented
	Outcome	# of Research Outputs with Open Licenses
Entrepreneurial Spirit	Process	# of Open Science Spin-offs/Start-ups Being Created
	Output	# of Open Science Spin-offs/Start-ups Created
	Outcome	# of Open Science Spin-off/Start-up Employees
		# of Open Science Spin-off/Start-up Products
		# of Open Science Spin-off/Start-up Services

5. Conclusion

The **RAF is a comprehensive framework of indicators and metrics to assess researchers** in their applications for positions, in their career development and progression, and in their applications for grants and projects at RPOs and RFOs. The RAF offers a framework which covers the full spectrum of research, education, leadership, and valorisation activities by researchers and which is applicable across countries, disciplines, and organisations. The RAF combines a quantitative and qualitative approach to assessment, whereby the framework is based on quantitative metrics that are always and necessarily accompanied by qualitative descriptions. The RAF also combines a generic and Open Science approach to assessment, whereby the generic framework recognises all activities and the Open Science framework recognises Open Science activities by researchers. The RAF further distinguishes process, output, and outcome indicators to capture the lifecycle of researcher activities and formulates indicators and metrics at a high level of description for universal application.

The **RAF provides a suite of indicators and metrics, which can be selected and refined** according to the interests and needs of RPOs and RFOs. It remains the prerogative of the organisations to select, refine, prioritise, and rank or weigh the indicators and metrics for their own researcher assessment. It also remains the prerogative of the organisations to include relevant indicators and metrics for Open Science and how exactly to reward researchers for Open Science. While the RAF is focused on the assessment of individual researchers, there must be a comparative benchmarking of peer groups of researchers at a given RPO and RFO. An individual researcher cannot be assessed in isolation but must be compared to either standarised figures or actual figures for a given assessment period for selected indicators and metrics for a specific peer group. Such peer groups could be defined according to researcher stage or research discipline or an organisational unit. The successful implementation of the RAF will further require a variety of tailored interventions to support adoption of the RAF and help researchers understand and use the RAF at RPOs and RFOs.

The **first draft of the RAF will be subject to extensive consultation with key stakeholders** in research assessment. The RAF will be piloted by 3 RPOs and 2 RFOs in OPUS, will be sent for feedback to key organisations, and will be openly shared with the research community. Questions remain if the RAF is comprehensive enough and captures all relevant activities by researchers, if the right categories and indicator groups have been selected, if the distinction in indicator types is useful, if the right metrics have been selected, and if the metrics are formulated at the right level of description. Questions also remain about the implementation of the RAF at RPOs and RFOs including the interplay between the generic and Open Science frameworks, interplay between the quantitative and qualitative approaches, selection and eventual refinement and prioritisation of specific indicators and metrics, and actual translation of the RAF into questionnaires and digital tools for researchers. These questions will be addressed in future deliverables on the RAF and interventions in OPUS.

End Notes

[1] There are 5 pilot organisations in OPUS. The 3 pilot RPOs are Nova University of Lisbon, University of Cyprus, and University of Rijeka. The 2 pilot RFOs are Research Council of Lithuania and Executive Agency for Higher Education, Research, Development, and Innovation Funding.

[2] We would like to thank Amanda Crowfoot, Barend Mons, Cecilia Cabello Valdés, Volker Beckmann, and Wilhelm Widmark for their input and feedback on the framework and deliverables.

[3] We would like to thank Association of European Research Libraries (LIBER), Coalition for Advancing Research Assessment (CoARA), cOAlition S, EOSC Steering Board, and European Organisation for Nuclear Research (CERN) for preliminary discussions on the framework.

[4] We would like to thank Clifford Tatum, Ismael Refols Garcia, Karel Luijben, Ludo Waltman, and Mark van de Sanden for extensive discussions on the framework and research assessment.

[5] Five types of indicators were originally considered: Input; Process; Output; Outcome; Impact. The input indicator was ruled out as this was not deemed relevant for the activities of researchers. The impact indicator was also ruled out as this typically looks at long-term and societal impact which is difficult to define and causally prove within the scope of individual researcher assessment.

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Appendix 1: Researcher Assessment Framework with Indicators and Metrics

Category	Subcategory	Indicator Group	Dimension	Indicator Type	Quantitative Metric
Research	Proposals	Proposal Development	Generic	Process	# of Project Proposals Being Developed
				Output	# of Project Proposals Submitted
				Outcome	# of Project Proposals Granted
					€ of Project Proposals Granted
			Open	Process	# of Developing Project Proposals Openly Available
				Output	# of Submitted Project Proposals Openly Available
				Outcome	# of Granted Project Proposals Openly Available
					€ of Granted Project Proposals involving Open Science
	Methods	Methods Development	Generic	Process	# of Method Sets Being Developed
				Output	# of Method Sets Finalised
				Outcome	# of Method Sets Implemented
					# of Method Sets Accessed
					# of Method Sets Cited
			Open	Process	# of Developing Method Sets Openly Available
				Output	# of Finalised Method Sets Openly Available
				Outcome	# of Openly Available Method Sets Implemented
					# of Openly Available Method Sets Accessed
					# of Openly Available Method Sets Cited
	Data	Data Planning	Generic	Process	# of (FAIR) Data Management Plans Being Developed
				Output	# of (FAIR) Data Management Plans Finalised
				Outcome	# of (FAIR) Data Management Plans Implemented
			Open	Process	# of (FAIR) Developing Data Management Plans Openly Available
				Output	# of (FAIR) Finalised Data Management Plans Openly Available
				Outcome	# of (FAIR) Implemented Data Management Plans Openly Available

		Data Management	Generic	Process	# of (FAIR) Data Sets Being Developed
				Output	# of (FAIR) Data Sets Finalised
					# of (FAIR) Data Sets Archived
				Outcome	# of (FAIR) Data Sets Accessed
					# of (FAIR) Data Sets Cited
			Open	Process	# of Developing (FAIR) Data Sets Openly Available
				Output	# of Finalised (FAIR) Data Sets Openly Available
					# of Archived (FAIR) Data Sets Openly Available
				Outcome	# of Openly Available (FAIR) Data Sets Accessed
					# of Openly Available (FAIR) Data Sets Cited
		Data Review	Generic	Process	# of (FAIR) Data Set Peer Reviews Being Drafted
				Output	# of (FAIR) Data Set Peer Reviews Submitted
				Outcome	# of (FAIR) Data Set Peer Reviews Accepted
			Open	Process	# of Draft (FAIR) Data Set Peer Reviews Openly Available
				Output	# of Submitted (FAIR) Data Set Peer Reviews Openly Available
				Outcome	# of Accepted (FAIR) Data Set Peer Reviews Openly Available
	Software	Software Development	Generic	Process	# of Software Sets Being Developed
				Output	# of Software Sets Finalised
					# of Software Sets Archived
				Outcome	# of Software Sets Accessed
					# of Software Sets Cited
			Open	Process	# of Developing Software Sets Openly Available
				Output	# of Finalised Software Sets Openly Available
					# of Archived Software Sets Openly Available
				Outcome	# of Openly Available Software Sets Accessed
					# of Openly Available Software Sets Cited
		Software Review	Generic	Process	# of Software Set Peer Reviews Being Drafted
				Output	# of Software Set Peer Reviews Submitted
				Outcome	# of Software Set Peer Reviews Accepted

			Open	Process	# of Draft Software Set Peer Reviews Openly Available
				Output	# of Submitted Software Set Peer Reviews Openly Available
				Outcome	# of Accepted Software Set Peer Reviews Openly Available
	Publications	Publication Drafting	Generic	Process	# of Publications Being Drafted
				Output	# of Publications Submitted
				Outcome	# of Publications Published
					# of Publications Accessed
					# of Publications Cited
			Open	Process	# of Draft Publications Openly Available
				Output	# of Submitted Publications Openly Available
				Outcome	# of Published Publications Openly Available
					# of Openly Available Publications Accessed
					# of Openly Available Publications Cited
		Publication Review	Generic	Process	# of Publication Peer Reviews Being Drafted
				Output	# of Publication Peer Reviews Submitted
				Outcome	# of Publication Peer Reviews Accepted
			Open	Process	# of Draft Publication Peer Reviews Openly Available
				Output	# of Submitted Publication Peer Reviews Openly Available
				Outcome	# of Accepted Publication Peer Reviews Openly Available
	Materials	Materials Development	Generic	Process	# of Material Sets Being Developed
				Output	# of Material Sets Finalised
				Outcome	# of Material Sets Implemented
					# of Material Sets Accessed
					# of Material Sets Cited
			Open	Process	# of Developing Material Sets Openly Available
				Output	# of Finalised Material Sets Openly Available
				Outcome	# of Implemented Material Sets Openly Available
					# of Openly Available Material Sets Accessed
					# of Openly Available Material Sets Cited

Education	Courses	Course Development	Generic	Process	# of Courses Being Developed
				Output	# of Courses Finalised
				Outcome	# of Courses Implemented
			Open	Process	# of Open Science Courses Being Developed
					# of Developing Courses Openly Available
				Output	# of Open Science Courses Finalised
					# of Finalised Courses Openly Available
				Outcome	# of Open Science Courses Implemented
					# of Implemented Courses Openly Available
	Resources	Resource Development	Generic	Process	# of Resources Being Developed
				Output	# of Resources Finalised
				Outcome	# of Resources Implemented
					# of Resources Accessed
					# of Resources Cited
			Open	Process	# of Open Science Resources Being Developed
					# of Developing Resources Openly Available
				Output	# of Open Science Resources Finalised
					# of Finalised Resources Openly Available
				Outcome	# of Open Science Resources Implemented
					# of Implemented Resources Openly Available
	Teaching	Student Teaching	Generic	Process	# of Course Hours Assigned
				Output	# of Course Hours Taught
				Outcome	# of Students Passed in Courses
			Open	Process	# of Open Science Course Hours Assigned
				Output	# of Open Science Course Hours Taught
				Outcome	# of Students Passed in Open Science Courses
					# of Students Passed in Openly Available Courses
	Supervision	Student Supervision	Generic	Process	# of Students Being Supervised
				Output	# of Students Supervised

				Outcome	# of Supervised Student Theses
					# of Supervised Students Graduated
			Open	Process	# of Students Being Supervised in Open Science
				Output	# of Students Supervised in Open Science
				Outcome	# of Supervised Student Theses Openly Available
					# of Supervised Students in Open Science Graduated
	Skills	Skills Development	Generic	Process	# of Skills Courses Being Followed
				Output	# of Skills Courses Completed
				Outcome	# of Skills Certificates Obtained
			Open	Process	# of Open Science Skills Courses Being Followed
				Output	# of Open Science Skills Courses Completed
				Outcome	# of Open Science Skills Certificates Obtained
Leadership	People	Staff Supervision	Generic	Process	# of Staff Being Supervised
				Output	# of Staff Supervised
				Outcome	# of Supervised Staff Theses
					# of Supervised Staff Projects
			Open	Process	# of Staff Being Supervised in Open Science
				Output	# of Staff Supervised in Open Science
				Outcome	# of Supervised Staff Theses Openly Available
					# of Supervised Staff Projects involving Open Science
	Projects	Project Management	Generic	Process	# of Projects Being Managed
				Output	# of Projects Completed
				Outcome	# of Projects Successfully Evaluated
			Open	Process	# of Projects involving Open Science Being Managed
				Output	# of Projects involving Open Science Completed
				Outcome	# of Projects involving Open Science Successfully Evaluated
	Organisation	Unit Management	Generic	Process	# Unit Management Positions Assigned
				Output	# Unit Management Positions Completed
					# of Agreed Unit Management Outputs

				Outcome	# of Agreed Unit Management Outcomes
			Open	Process	# Unit Management Positions in Open Science Assigned
				Output	# Unit Management Positions in Open Science Completed
					# of Agreed Unit Management Outputs involving Open Science
				Outcome	# of Agreed Unit Management Outcomes involving Open Science
	Recognition	Expert Positions	Generic	Process	# of Expert Positions Assigned
				Output	# of Expert Positions Completed
					# of Expert Position Outputs
				Outcome	# of Expert Position Outcomes
					# of Expert Achievement Awards
			Open	Process	# of Expert Positions in Open Science Assigned
				Output	# of Expert Positions in Open Science Completed
					# of Open Science Expert Position Outputs
					# of Expert Position Outputs Openly Available
				Outcome	# of Expert Position Outcomes Openly Available
					# of Expert Achievement Awards for Open Science
Valorisation	Communication	Public Writing	Generic	Process	# of Publications Being Drafted
				Output	# of Publications Published
				Outcome	# of Publications Accessed
					# of Publications Cited
			Open	Process	# of Draft Publications Openly Available
				Output	# of Published Publications Openly Available
				Outcome	# of Openly Available Publications Accessed
					# of Openly Available Publications Cited
		Public Speaking	Generic	Process	# of Appearances Planned
				Output	# of Appearances Made
				Outcome	# of Appearances Accessed
					# of Appearances Cited
			Open	Process	# of Appearances on Open Science Planned

				Output	# of Appearances on Open Science Given
				Outcome	# of Appearances on Open Science Accessed
					# of Appearances on Open Science Cited
					# of Appearances Openly Available
	Engagement	Intersectoral Engagement	Generic	Process	# of Intersectoral Engagements
				Output	# of Intersectoral Outputs
				Outcome	# of Intersectoral Outcomes
					# of Organisations Engaged
			Open	Process	# of Intersectoral Engagements involving Open Science
				Output	# of Intersectoral Outputs involving Open Science
				Outcome	# of Intersectoral Outcomes involving Open Science
					# of Organisations Engaged for Open Science
		Citizen Engagement	Generic	Process	# of Citizen Science Activities Ongoing
				Output	# of Citizen Science Activities Completed
					# of Citizen Science Outputs
				Outcome	# of Citizen Science Outcomes
					# of Citizen Scientists Engaged
			Open	Process	# of Citizen Science Activities involving Open Science Ongoing
				Output	# of Citizen Science Activities involving Open Science Completed
					# of Citizen Science Outputs involving Open Science
				Outcome	# of Citizen Science Outcomes involving Open Science
					# of Citizen Scientists Engaged in Open Science
	Innovation	Research Exploitation	Generic	Process	# of Research Outputs Being Legalised
				Output	# of Research Outputs with Defined IPR
					# of Research Outputs Patented
				Outcome	# of Research Outputs with Licenses
			Open	Process	# of Openly Available Research Outputs Being Legalised
				Output	# of Openly Available Research Outputs with Defined IPR
					# of Openly Available Research Outputs Patented

				Outcome	# of Research Outputs with Open Licenses
		Entrepreneurial Spirit	Generic	Process	# of Spin-offs/Start-ups Being Created
				Output	# of Spin-offs/Start-ups Created
				Outcome	# of Spin-off/Start-up Employees
					# of Spin-off/Start-up Products
					# of Spin-off/Start-up Services
			Open	Process	# of Open Science Spin-offs/Start-ups Being Created
				Output	# of Open Science Spin-offs/Start-ups Created
				Outcome	# of Open Science Spin-off/Start-up Employees
					# of Open Science Spin-off/Start-up Products
					# of Open Science Spin-off/Start-up Services