Horizon 2020 Policy Support Facility

Mutual Learning Exercise Open Science, Challenge Paper 3: **Incentives and Rewards for Open Science**

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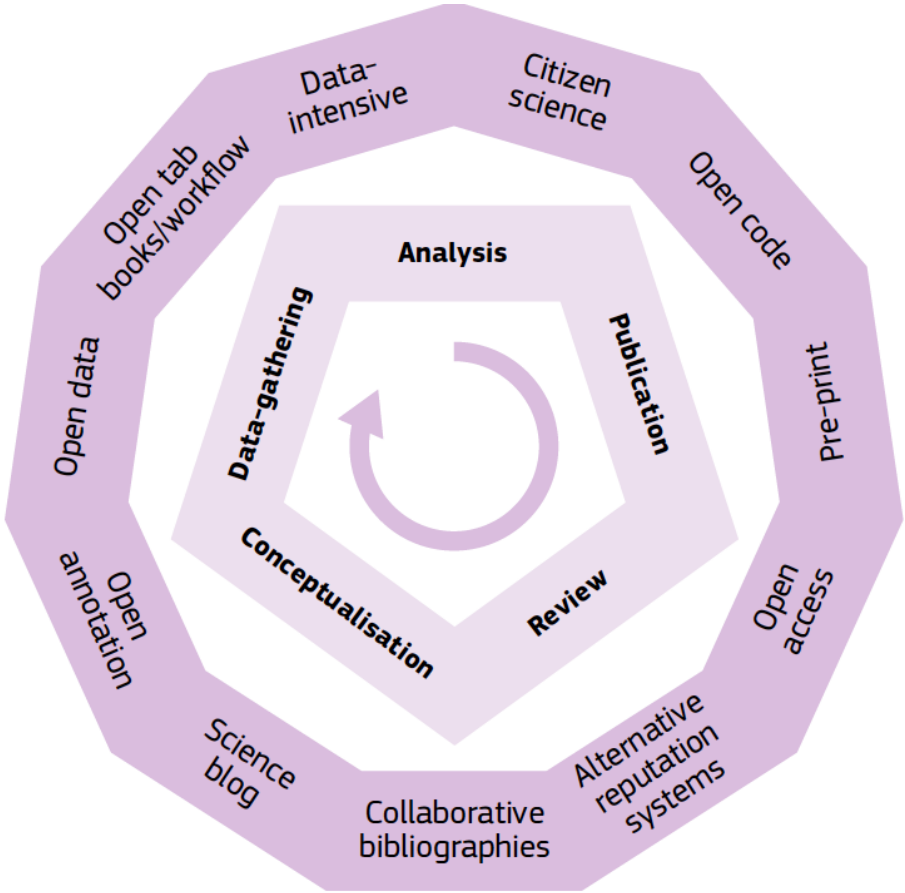
Outline

- The Value of Open Science
- Open Science Challenges
- Incentives and Rewards
  - For researchers
  - For research institutions and funding bodies
  - For national governments
- Key points from previous meetings
- Objectives and agenda for this working meeting

Open Science

Variously defined by

- the use of new digital tools
- a specific set of values
- practices of collaboration and sharing
- a specific view of the research workflow and related governance



Open Science

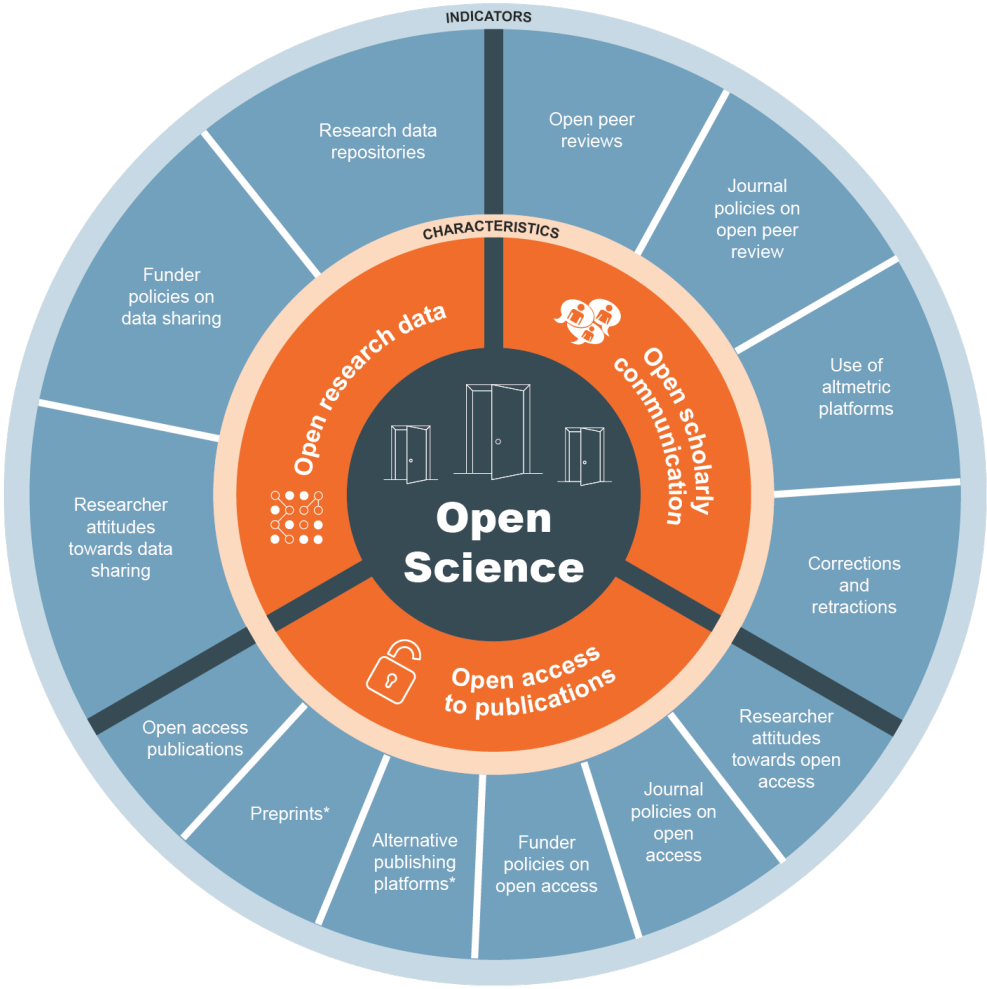
Widespread agreement on three aspects:

- GLOBAL SCOPE: affects all stages of the research process, and its implementation involves a wide set of governance structures
- SYSTEMIC REACH: involves a systemic shift in current practices of research, publishing and evaluation
- LOCAL IMPLEMENTATION: its implications for any one research systems need to be considered with reference to its specific characteristics, and thus the mechanisms through which OS is implemented are likely to vary

Open Science

"a new approach to the scientific process based on cooperative work and new ways of diffusing knowledge by using digital technologies and new collaborative tools.. [..] .. sharing and using all available knowledge at an earlier stage in the research process"

Open Innovation, Open Science, Open to the World (2015)



Openness as Fundamental (and Widely Recognised) Scientific Value

Long history of openness as key norm for science:

- Comes from researchers: natural history, meteorology, geology, astronomy..
- More recently particle physics, genomics

Public scrutiny, transparency and reproducibility of results define what science is, how it works, what counts as a research output

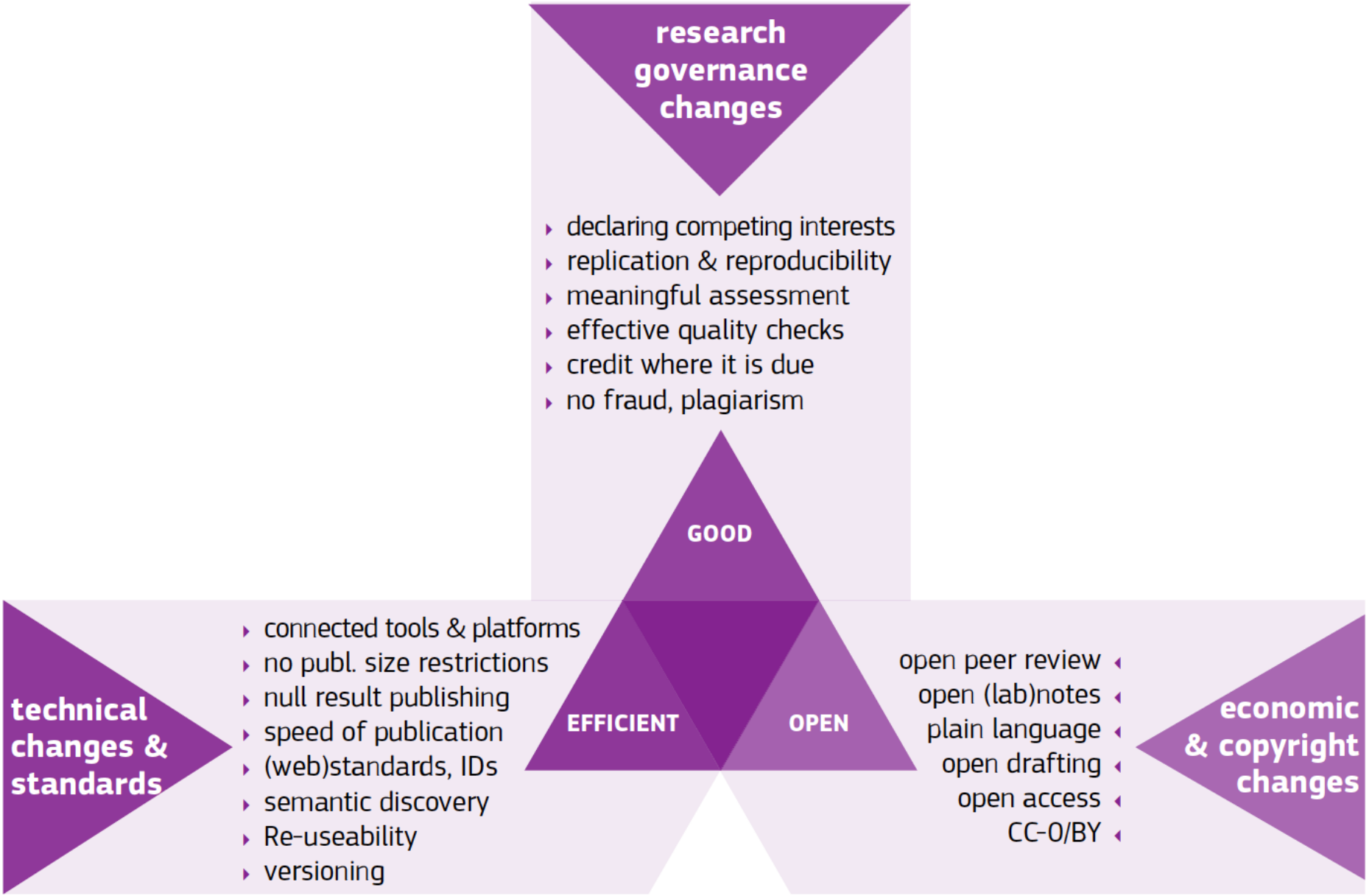
So what has gone wrong?

Current State and Social Function of Research

- Self-referential, hypercompetitive academic system
- Devaluation of quality and reproducibility of research outputs in favor of high volume and prestige
- Dominance of publication in high impact factors journals over more desirable research goals
- Lack of incentives and rewards for Open Science practices
- Result: disconnection between knowledge production and the social role of research

Open Science as

- A platform to debate what counts as science, scientific infrastructures and scientific governance, and how results should be credited and disseminated
- An opportunity to improve
  - pathways to and quality of discoveries
  - uptake of new technologies
  - collaborative efforts across disciplines, nations and expertises
  - research evaluation, debate and transparency
  - valuation of research components beyond papers and patents
  - fight against fraud, low quality and duplication of efforts
  - legitimacy of science and public trust
  - public engagement



- Source: Jeroen Bosman and Bianca Cramer, LSE Impact Blog, 2015

International cooperation and dialogue among stakeholders: Open Science Policy Platform

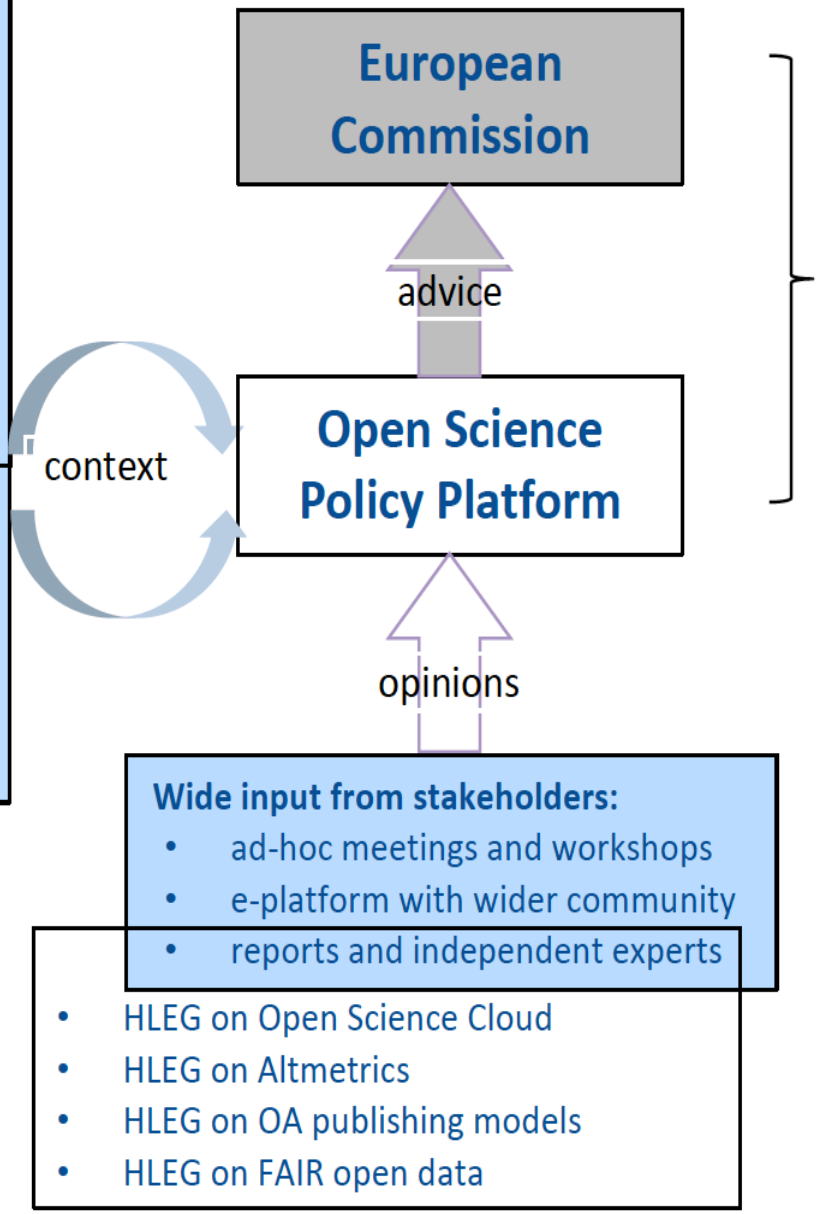
- Advisory body to EU Commission, providing policy recommendations
  - to help further develop and implement open science policy
  - support policy formulation: help identify issues to be addressed and provide recommendations on policy actions required
  - support policy implementation: review best practices, draw policy guidelines and foster uptake by stakeholders
- Representatives of European stakeholders, including science academies and learned societies, universities, research organisations, citizen science organisations, funders, publishers, Open Science platforms and libraries
- Balance between different stakeholders & input* from independent experts and relevant communities

ERA & framework conditions for actors:

- European Charter for researchers
- Code of conduct for Research Integrity
- Charter for Access to Research Infra
- …

DSM & framework conditions for data:

- Copyright - TDM
- Data Protection
- Free Flow of Data
- …



European Open Science Agenda:

1. OA publishing models
2. FAIR open data
3. Open Science Cloud
4. Altmetrics
5. Rewards & careers
6. Education & skills
7. Citizen Science
8. Research integrity

Wide input from stakeholders:

- ad-hoc meetings and workshops
- e-platform with wider community
- reports and independent experts

- HLEG on Open Science Cloud
- HLEG on Altmetrics
- HLEG on OA publishing models
- HLEG on FAIR open data

Obstacles to Making Science Open

1. evaluation and credit systems
2. diversity in research cultures
3. costs and accountabilities
4. skills and training
5. intellectual property regimes
6. semantic ambiguity
7. ethical and social concerns
8. high resource bias

Obstacles to Making Science Open 1: Evaluation and Credit Systems

Within current "publish or perish" model,

- "increasing transparency in research practices can have unintended consequences. Anything that is open to public scrutiny can be used to assess the practices in question, which may be premature for ongoing projects that need time to yield clear and widely intelligible results. It may also compound researchers' fears of being scooped. It is not hard to imagine that researchers forced to render lab or field notes, protocols or software freely accessible to others will feel the need to create shadow procedures and infrastructures for those parts of their practice that they do not want, or cannot share" (Leonelli et al 2015)
- Open Data can be a threat to researchers, particularly early career:
  - Lack of rewards
  - Risks of 'scooping'
  - Resources required

Obstacles to Making Science Open 2: Diversity in Research Cultures

- Enormous variation in methods, outputs and criteria for assessing excellence and quality
  - Between research fields
  - Within research fields
  - Between publicly funded and privately funded research
- OS needs to foster trust among researchers, which in turns requires mechanisms to guarantee reliability of outputs
- Crucial to address field-specific worries around research quality

Obstacles to Making Science Open 3: Costs and Accountabilities

- OS not quick nor cheap
- Implementation through coordination among many different stakeholders, both locally and internationally
- Who takes responsibility for what? Who pays?
- E.g. archives and long-term repositories

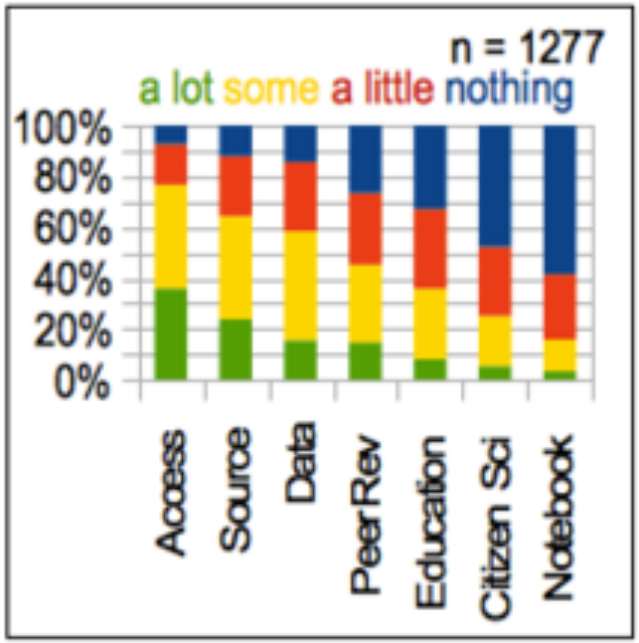
Obstacles to Making Science Open 4: Skills and Training

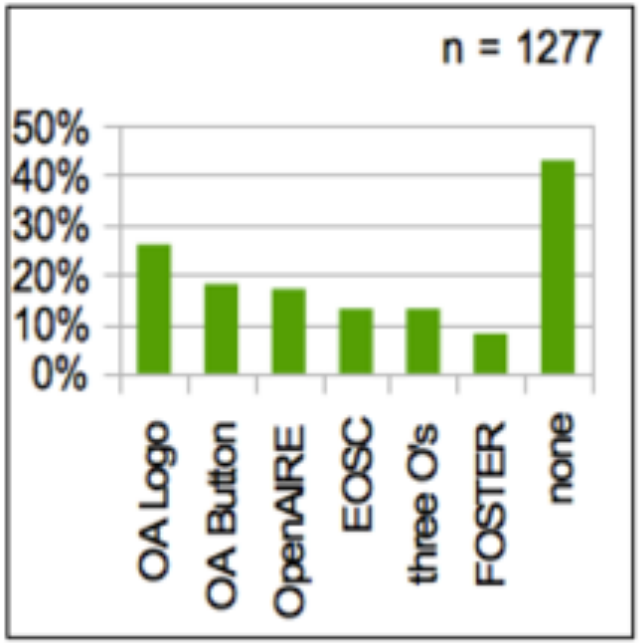
Confusion among researchers over

- What openness means in practice
- How can it be implemented
- What is legal
- What is recommended by whom (funders, learned societies, publishers, research institutions, governments..)

Obstacles to Making Science Open 4: Skills and Training

Low awareness of current OS activities and tools





(source: EU Working Group on Education and Skills under Open Science, 2017)

Obstacles to Making Science Open 4: Skills and Training

Complexity of tools and skills required to implement OS

(source: Leonelli et al 2017)

Table 1 | General tools for data management.

Type of tool	Function	Examples of relevance to the plant community
Open lab books	Digital and shareable version of traditional lab books	RSpace (http://www.researchspace.com)
Generic open data repositories	General storage for many different data types	Figshare (http://www.figshare.com) DataVerse (http://www.dataverse.org)
Specific databases	Fine-grained datasets that require subject-specific metadata	The Arabidopsis Information Resource (http://www.arabidopsis.org) The Bio-Analytic Resource for Plant Biology (http://www.bar.utoronto.ca) iHub (http://www.ionomicshub.org/home/PiiMS)
Data portals	Aggregating and providing visibility for various databases and resources	Araport (http://www.araport.org) Biosharing (http://www.biosharing.org) Agroportal[22]
Bio-ontologies	Keywords for the annotation, ordering and retrieval of data	Plant Ontology[15] Crop Ontology[21]
Metadata standards	Standardization of experimental data collection	Minimal Information on Biological and Biomedical Investigations (http://www.biosharing.org/standards) Minimal Information about a Microarray Experiment[17] Minimal Information about Plant Phenotyping Experiments (http://www.cropnet.pl/phenotypes/?page_id=15)
Identifiers for research materials	Annotation and retrieval of research materials on which experiments were originally performed	Germplasm Resource Information Network – Global (http://www.grin-global.org/) Multi-Crop Passport Descriptors (http://www.bioversityinternational.org/e-library/publications/detail/faobioversity-multi-crop-passport-descriptors-v2-mcpd-v2) Genesys (http://www.genesys-pgr.org)
Informatics standards	Software tools helping to format, store and visualize data	Breeding API (http://www.docs.brapi.apiary.io/) InterMINE (http://www.intermine.org)
Data annotation pipelines	Annotation of data from generation to reuse	Integrated Breeding Platform (http://www.integratedbreeding.net/) CropStore (http://www.cropstoredb.org/description.php) eDal (http://www.edal.ipk-gatersleben.de)
Guidelines of good practice	Articulation of data management principles and actions fostering data reuse	FAIR Data (http://www.force11.org/group/fairgroup/fairprinciples) Wheat Data Interoperability Guidelines[31]

Obstacles to Making Science Open 5: Intellectual Property Regimes

- Multiple intellectual property regimes
- Multiple and conflicting layers of accountability for researchers (from local to international)
- Authorship cultures
- Publishers' unclear licensing agreements and conditions

Obstacles to Making Science Open 6: Semantic Ambiguity

- OS is understood by different researchers to mean
  - "free of license"
  - "free of ownership"
  - "under CC-BY license"
  - "common good"
  - "good enough to share"
  - "unrestricted access and/or use"
  - "accessible without payment"

  (Grubb and Easterbrook 2011, Levin et al 2016)

- Unclear how openness applies to commercially or security sensitive research

Obstacles to Making Science Open 7: Ethical and Social Concerns

- Aim: human flourishing (Royal Society/British Academy 2017)
- Who decides what counts as ‘common’ or ‘public’ good, and how?
- What role do social goals play in research assessment?
- Role of ethics in Open Data:
  - Privacy and ownership concerns
  - Relation to General Data Protection Regulation

Obstacles to Making Science Open 8: High Resource Bias

- OS as playground for powerful research groups
- Most OS initiatives are led by rich, English-speaking labs within visible and popular research traditions, which deal with ‘tractable’ data formats and lead the way in methods and instrumentation
- Involvement of poor/unfashionable labs, developing countries & non-scientists is low and at the ‘receiving’ end
  - Systematic disadvantage of low-resource research environments
  - Vulnerability to predatory behaviors

Incentives and Rewards for Researchers

1. Assessment and Promotion Criteria
2. Training on OA Guidelines and Implementation Tools
3. Citation and Authorship Cultures
4. Guarantees of International and Sustainable Nature of OS Initiatives and Related Infrastructures
5. Open Science Prizes: Establishing Champions and Role Models

Incentives and Rewards for Researchers 1: Assessment and Promotion Criteria

- For researchers at all levels

Open Science Career Assessment Matrix (OS-CAM)

Open Science Career Assessment Matrix (OS-CAM)	
Open Science activities	*Possible evaluation criteria*
RESEARCH OUTPUT	
Research activity	Pushing forward the boundaries of open science as a research topic
Publications	Publishing in open access journals Self-archiving in open access repositories
Datasets and research results	Using the FAIR data principles Adopting quality standards in open data management and open datasets Making use of open data from other researchers
Open source	Using open source software and other open tools Developing new software and tools that are open to other users
Funding	Securing funding for open science activities
RESEARCH PROCESS	
Stakeholder engagement / citizen science	Actively engaging society and research users in the research process Sharing provisional research results with stakeholders through open platforms (e.g. Arxiv, Figshare) Involving stakeholders in peer review processes
Collaboration and Interdisciplinarity	Widening participation in research through open collaborative projects Engaging in team science through diverse cross-disciplinary teams
Research integrity	Being aware of the ethical and legal issues relating to data sharing, confidentiality, attribution and environmental impact of open science activities Fully recognizing the contribution of others in research projects, including collaborators, co-authors, citizens, open data providers
Risk management	Taking account of the risks involved in open science
SERVICE AND LEADERSHIP	
Leadership	Developing a vision and strategy on how to integrate OS practices in the normal practice of doing research Driving policy and practice in open science Being a role model in practicing open science
Academic standing	Developing an international or national profile for open science activities Contributing as editor or advisor for open science journals or bodies
Peer review	Contributing to open peer review processes Examining or assessing open research
Networking	Participating in national and international networks relating to open science

Open Science Career Assessment Matrix (OS-CAM)

RESEARCH IMPACT	
Communication and Dissemination	Participating in public engagement activities Sharing research results through non-academic dissemination channels Translating research into a language suitable for public understanding
IP (patents, licenses)	Being knowledgeable on the legal and ethical issues relating to IPR Transferring IP to the wider economy
Societal impact	Evidence of use of research by societal groups Recognition from societal groups or for societal activities
Knowledge exchange	Engaging in open innovation with partners beyond academia
TEACHING AND SUPERVISION	
Teaching	Training other researchers in open science principles and methods Developing curricula and programs in open science methods, including open science data management Raising awareness and understanding in open science in undergraduate and masters' programs
Mentoring	Mentoring and encouraging others in developing their open science capabilities
Supervision	Supporting early stage researchers to adopt an open science approach
PROFESSIONAL EXPERIENCE	
Continuing professional development	Investing in own professional development to build open science capabilities
Project management	Successfully delivering open science projects involving diverse research teams
Personal qualities	Demonstrating the personal qualities to engage society and research users with open science Showing the flexibility and perseverance to respond to the challenges of conducting open science

Incentives and Rewards for Researchers 2: Training

- Systematic, comprehensive training is crucial
  - For both researchers and professional services
  - Including data science, ethics and governance concerns
  - External support needed: infrastructures, qualified library staff, information management and engagement

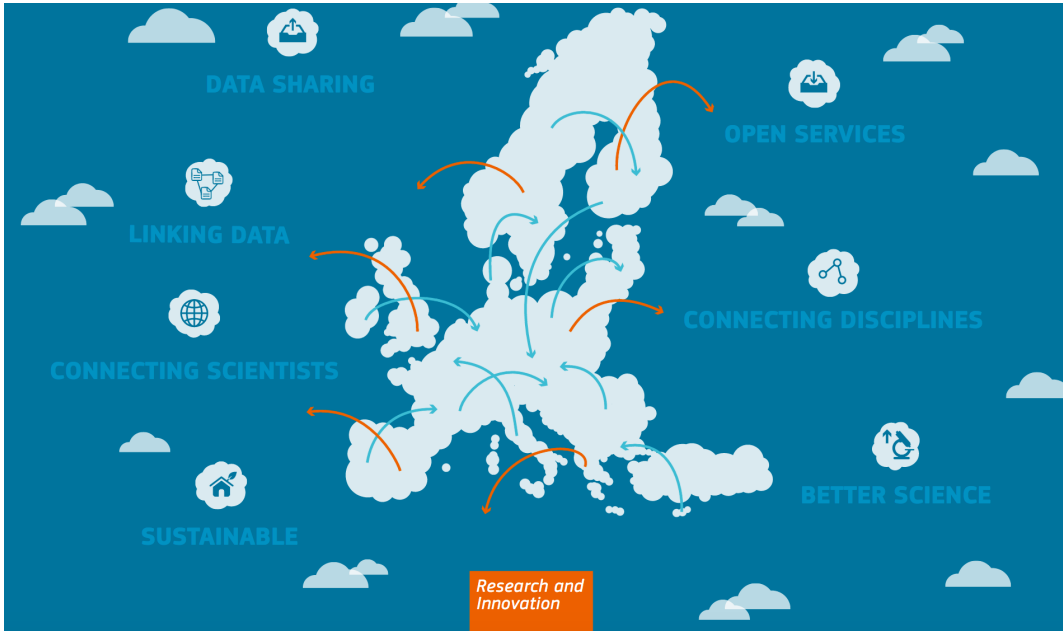
- Categories of training (EU Report):
  - for OA publishing
  - for Open Data sharing
  - for social relevance and integrity
  - for public engagement

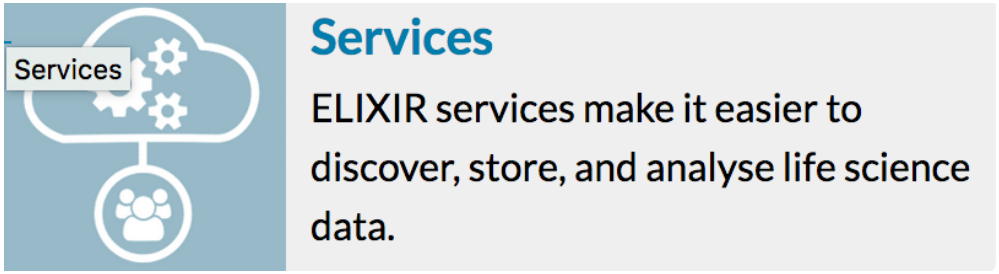
Incentives and Rewards for Researchers 3: Citation and Authorship Cultures

- What labour is recognised as ‘research’, and what warrants authorship?
- Citation of datasets
  - Empirically found to enhance visibility of research
- Valuing work that does not undergo peer review
- Authorship of peer reviews and evaluations

Incentives and Rewards for Researchers 4: Guarantees of International and Sustainable Nature of OS Initiatives and Infrastructures

- Serious concerns around long-term sustainability of OS infrastructures, e.g. data repositories
  - Who is responsible?
  - Trouble both with centralised and with local initiatives
- Federated, coordinated models:
  - European Open Science Cloud
  - ELIXIR



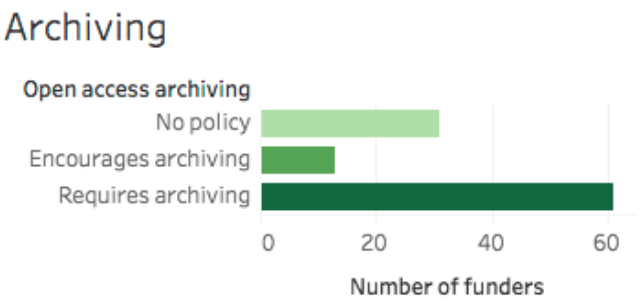


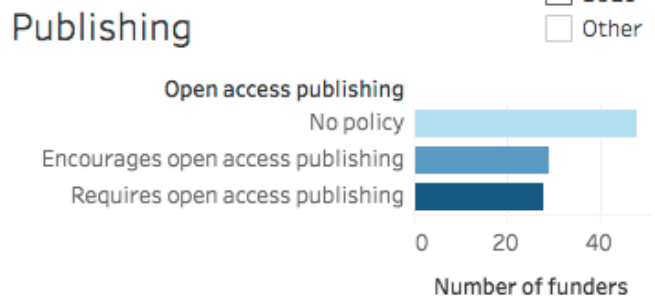
Incentives and Rewards for Researchers 5: Open Science Prizes – Establishing Champions and Role Models

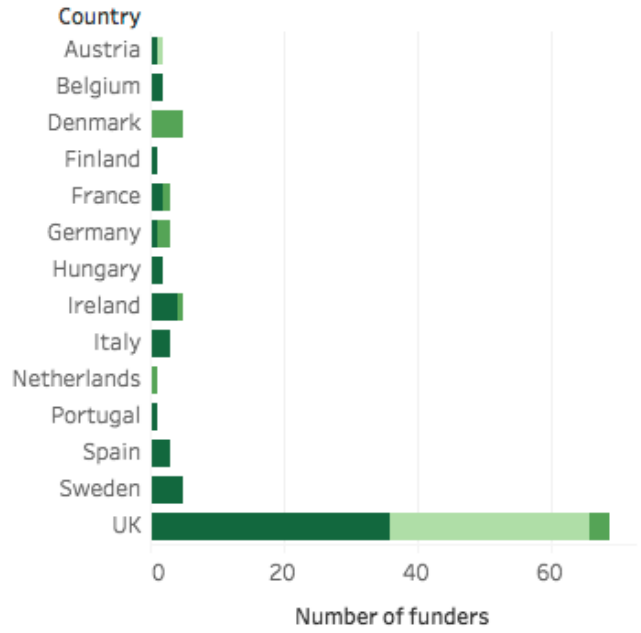
- Good way to
  - Evidence international recognition of OS activities
  - Bring attention to exemplars and role models
  - Demonstrate value of OS for researchers

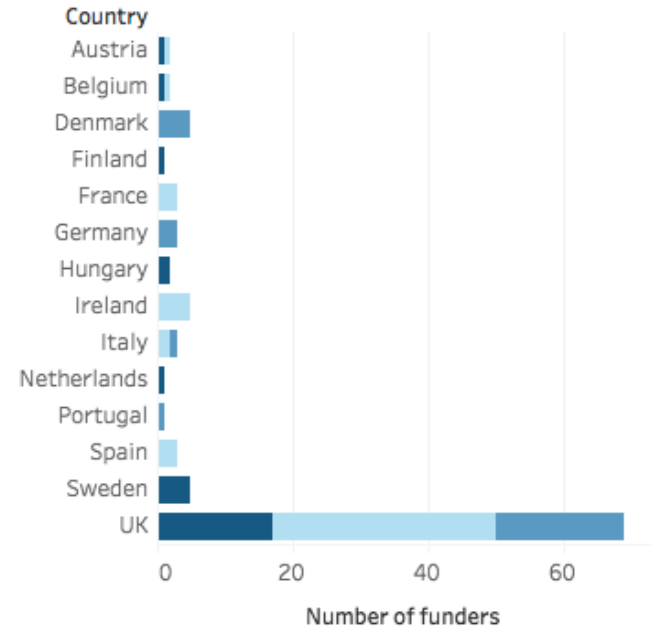
The Open Science Prize

Research Institutions and Funding Bodies









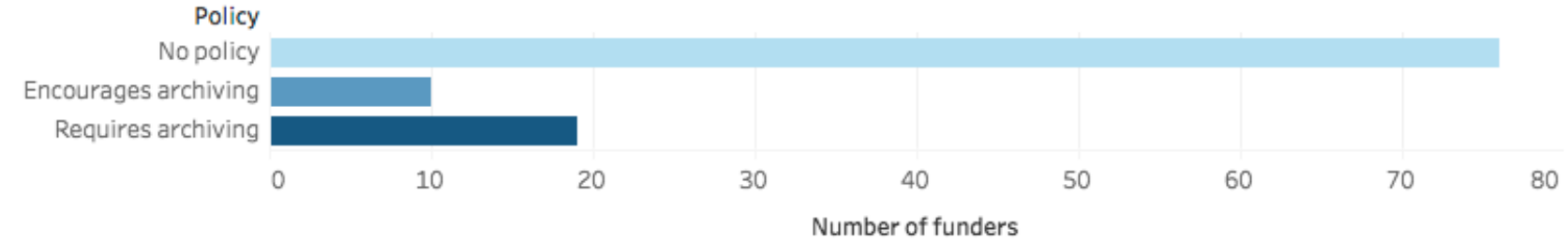
The grid to the right shows the number of funders with different combinations of archiving and publishing policies.

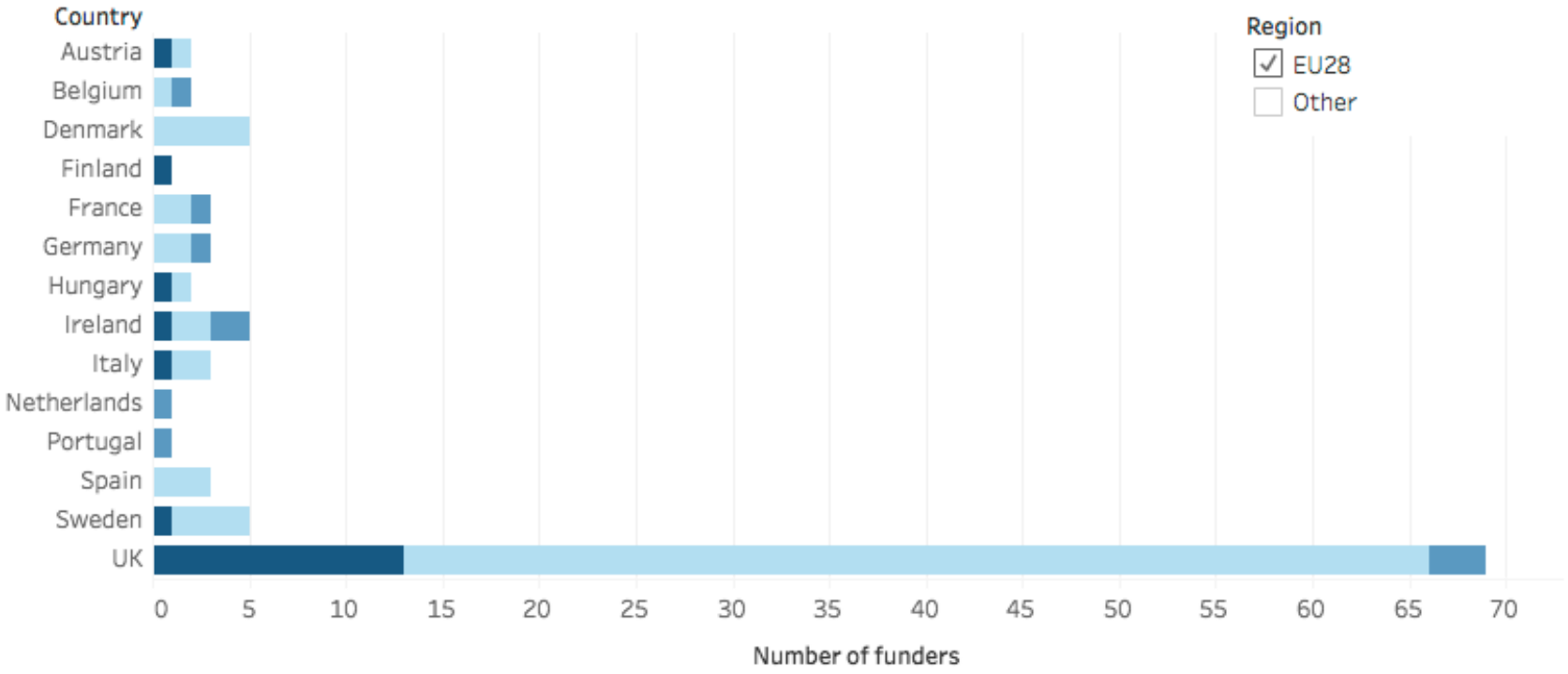
	Open access archiving		
Open access publishing	No policy	Encourages archiving	Requires archiving
No policy	26	3	19
Encourages open access publishing	4	9	16
Requires open access publishing	1	1	26

Information on this dashboard is derived from the Juliet database which is compiled by SHERPA and has been modified for use here.

Funder policies on data sharing

This visualisation shows data archiving policies for funders in SHERPA/Juliet.





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Incentives and Rewards for Research Institutions and Funding Bodies

- Fostering Interdisciplinary and Translational Research
  - Combining excellence with impact and engagement
  - Promote collaboration and service
  - Enhance speed of response to social challenges [e.g. Zika, Ebola]
- Promoting Social Engagement and Responsible Innovation
- Enhancing Educational Resources
  - Research-led teaching and problem-based reasoning
  - Better resources, more coordination across countries
  - Improved measures of student engagement

Incentives and Rewards for Research Institutions and Funding Bodies

- Improving Management Practice
  - Measuring research performance
  - Evaluations based on OS repositories
  - Forward-looking assessment (not just on published track record)
  - HR good practice across Europe
  - Position of libraries in research institutions and funding bids
- Improving Transparency and External Accountability
  - Improved documentation of research processes and investments
  - Monitoring of OS transition and swift identification of concerns
  - Open Peer Review (but challenges therein!)
- Enhancing International Visibility and Reputation
  - Especially for local, non-English-speaking contributions

Incentives and Rewards for National Governments

- Crucial role of government in setting agenda and providing general framework
- Strong interest, but lack of monitoring, agenda and contact points
- Particularly relevant where state regulates research institutions (e.g. Italy, Moldova, Slovenia)
- Good examples:
  - Netherlands and Finland: National Open Science Plan
  - UK Research Excellence Framework
  - Moldova, Croatia, Slovenia: centralised repository

Incentives and Rewards for National Governments

- Improving Transparency and External Accountability
- Promoting Social Engagement and Responsible Innovation
- Enhancing International Relations
  - Science diplomacy

	OS-CAM Research Evaluation	OS Training Provision & Education Resources	Shifts in Citation & Authorship	Long-Term Sustainability	Open Science Role Models	Responsible Innovation & Public Engagement	Transparency & Accountability	International Coordination & Science Diplomacy
Required conditions	Overhaul of evaluation procedures at research institutions & funding bodies	Resources and personnel to provide training locally and nationally	Overhaul of evaluation procedures and publishing formats	Complex coordination among stakeholders and long-term commitment	Establishment of criteria for successful open science within each field; buy-in from learned societies and science academies	Rewards for social interaction and non-traditional outputs; co-design of research with relevant stakeholders	Systems for tracking, visualizing and discussing the organization, outputs and funding of research.	Clear points of contact and communication channels/venues to debate Open Science implementation.
Pros	Most important set of incentives and rewards for researchers	Enables researchers to practice Open Science effectively; produces innovative education tools	Recognition of currently invisible efforts to support Open Science	Crucial incentive for researchers; ensures the long-term fruitfulness of current investments	Exemplifying advantages of Open Science, and ways to successfully implement it; enhance international status of research institutions.	Embedding of research in society, towards devising ethical and responsible solutions to global challenges.	Improved documentation and scrutiny of research processes and resources. Improved reproducibility and evaluation of accountabilities for given outcomes.	Enhanced international visibility, networking and diplomatic relations across institutions and nation states.
Cons	Time-intensive evaluation procedures	Investment in training provision and related staff; needs inclusion in researchers workload	Requires new policies tailored to each publication venue	Complex coordination among stakeholders and log-term financial support	Mobilize learned societies and science academies to actively promote Open Science.	Risk of less investment in fundamental research. Increased accountability for all research activities	Increased administration and more investment in data analysis and qualitative assessments.	Increased national research budgets; need for coordination between science and foreign policy.
Challenges	Administrative, cultural and financial	Administrative, financial and cultural	Cultural and logistical	Logistical and financial	Logistical	Cultural, administrative, logistical, financial	Administrative, cultural, logistical	Administrative, logistical, political
Who implements this?	Research institutions, funding bodies, researchers	Funding bodies, libraries	Research institutions, funding bodies, editors, publishers	EU, National governments, research institutions, libraries	National governments, funding bodies, learned societies	Funding bodies, research institutions, EU, National governments	Funding bodies, research institutions, EU, National governments	National governments, policy-makers, research managers

Questionnaire Responses: Key Points 1

- Success of Open Access archives: the vast majority of the "success stories" concern Open Access initiatives
  - Very few member states have provisions concerning research components other than publications
- The incorporation of Open Science goals in research evaluation and assessment lags far behind
  - Majority of countries relying on quantitative assessments of publications including impact factors
- Often unclear who holds responsibility for discussing and implementing Open Science policies at the national level.
  - Urgent need for opportunities and venues to deliberate on Open Science implementation and investment at the national level

Questionnaire Responses: Key Points 2

- Given international nature of OS, member states expect much of the support to come from European agencies
- Researchers and research organisations need to be involved in any decision-making process mapping future OS, so as to ensure uptake by the research community
  - However, concern around conservatism characterizing senior academics
  - Imperative to provide training and incentives
- Transition to OS likely to yield temporary difficulties. Need
  - close monitoring
  - clear points of contact within each member state to address challenges

Questionnaire responses: Main challenges

- Lack of knowledge, interest and/or commitment
- Lack of National Open Science agenda
- Unclear responsibilities
- Academic culture
- Public-private aims and interests

Questionnaire Responses: Incentives

- Grants specifically for publishing OA (Switzerland)
- Assessment grounded on OA repository (institutes and universities in Belgium, Croatia, UK)
- Points for depositing research data (Slovenia)
- Grants specifically for OS projects (Finland, UK)

Questionnaire Responses: Training

- Most often supplied by libraries
- Sometimes mentioned in ‘action plans’, but unclear implementation and resources as yet
- OA Helpdesk and training sessions for institutions and young researchers (Belgium)
- Networking with ongoing EU projects (e.g. Croatia and FOSTER, though short-time)
- Self-organised by researchers (Austria’s Open Knowledge Network, though short-time and reliant on volunteering)

Open Education as major interest for several respondents

Objectives for the 4th Working Meeting

- Discuss and provide feedback to challenge paper and presentation on incentives and rewards.
- Define scope of the fourth and final reports, and provide additional examples and materials on which to structure the challenge paper on experiences, models and strategies.

Questions to consider in break-out groups

Afternoon of Day 1:

- What incentives would work best in your country, and why?
- What do you see as the key obstacles to implementing those incentives?

Afternoon of Day 2:

- Discussion of lessons learnt and questions raised by expert presentations.
- How would you envisage a roadmap for Open Science implementation in your country?

Thank you for your attention!

Questions and discussion

Feedback:
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