Open Innovation for Earth Observation Programmes

2-4 November 2022 | ESA-ESRIN | Frascati (Rm), Italy

ESA Open Science Status Quo

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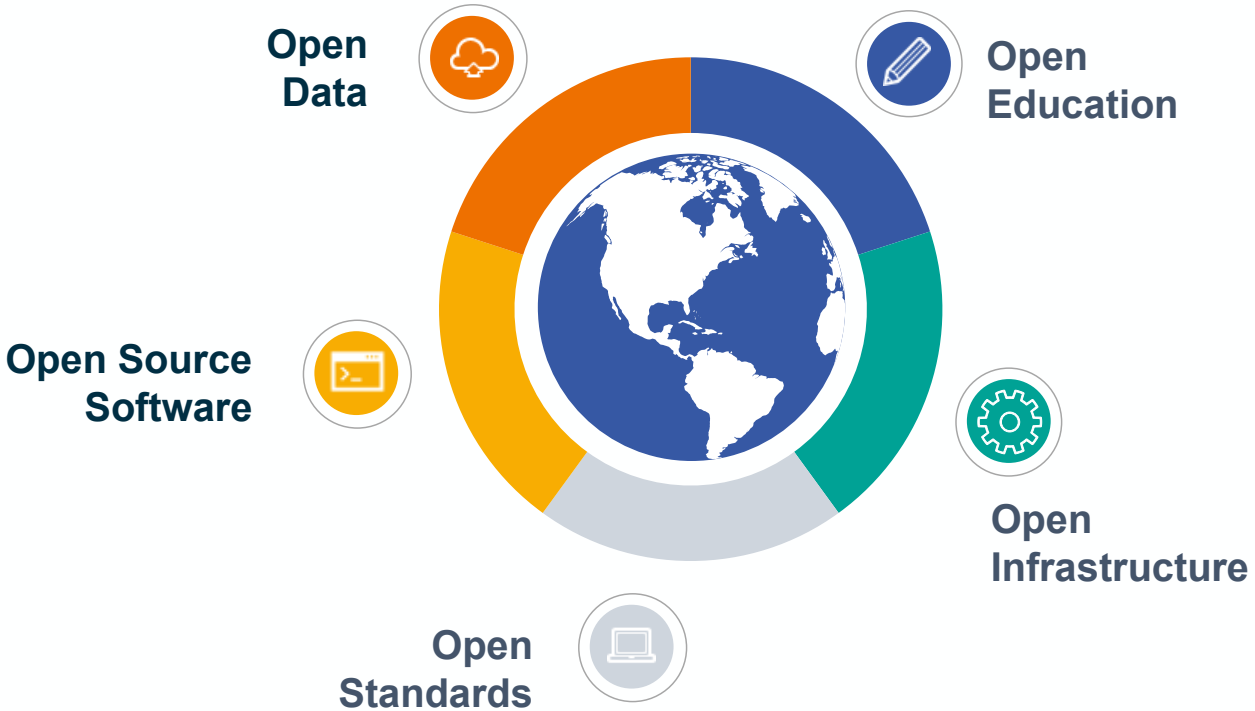
ESA EOP-SDD

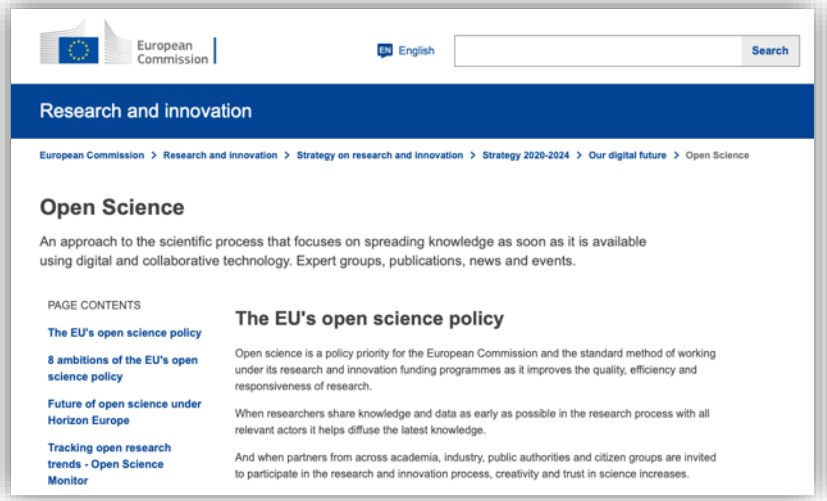
Open Science

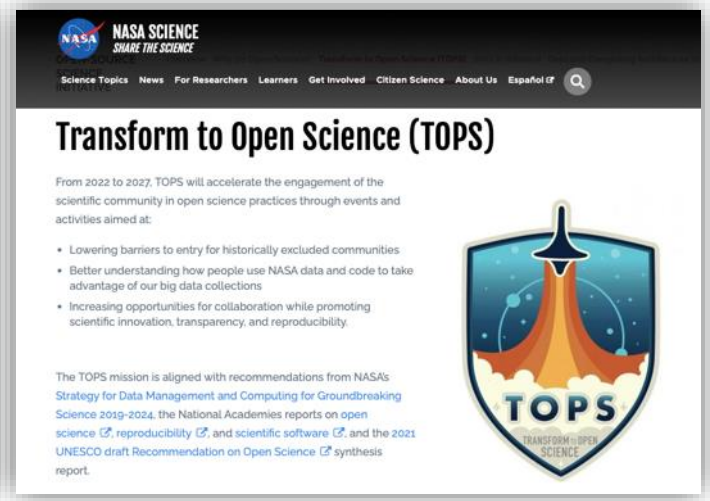
"Transparent and accessible knowledge that is shared and developed through collaborative networks"

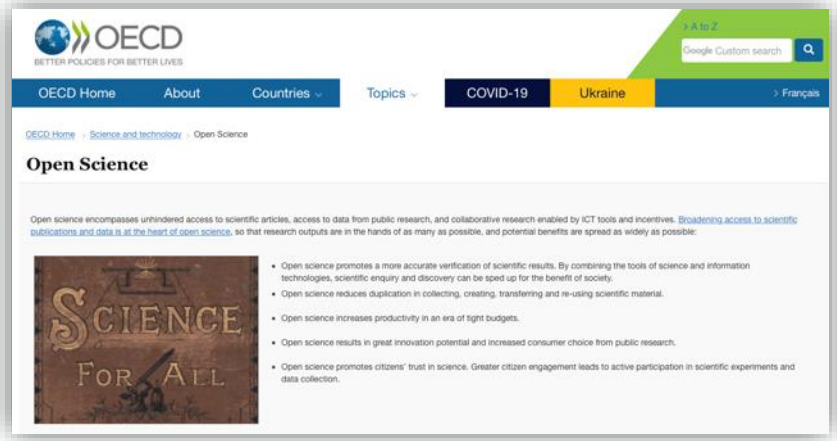
https://doi.org/10.1016/j.jbusres.2017.12.043



Open Science across organisations

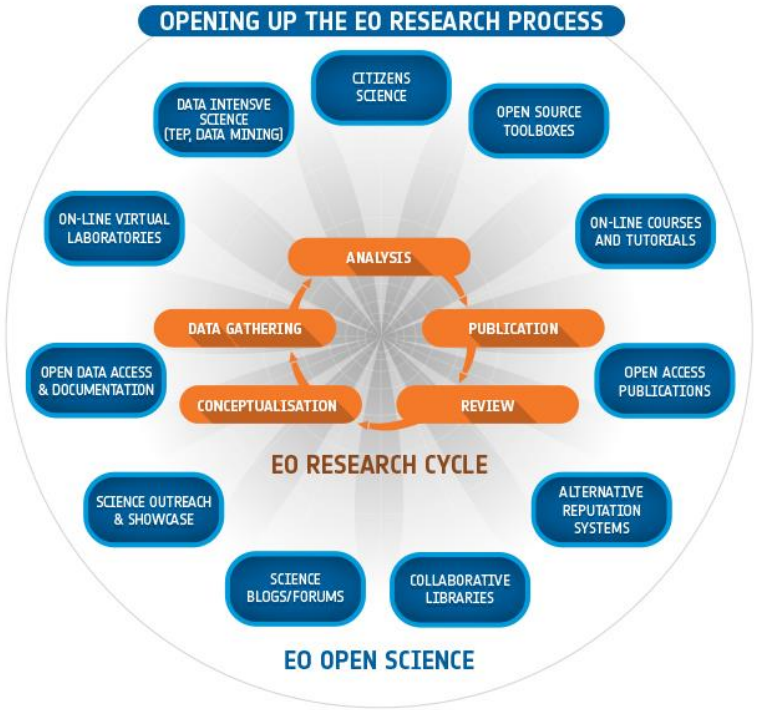




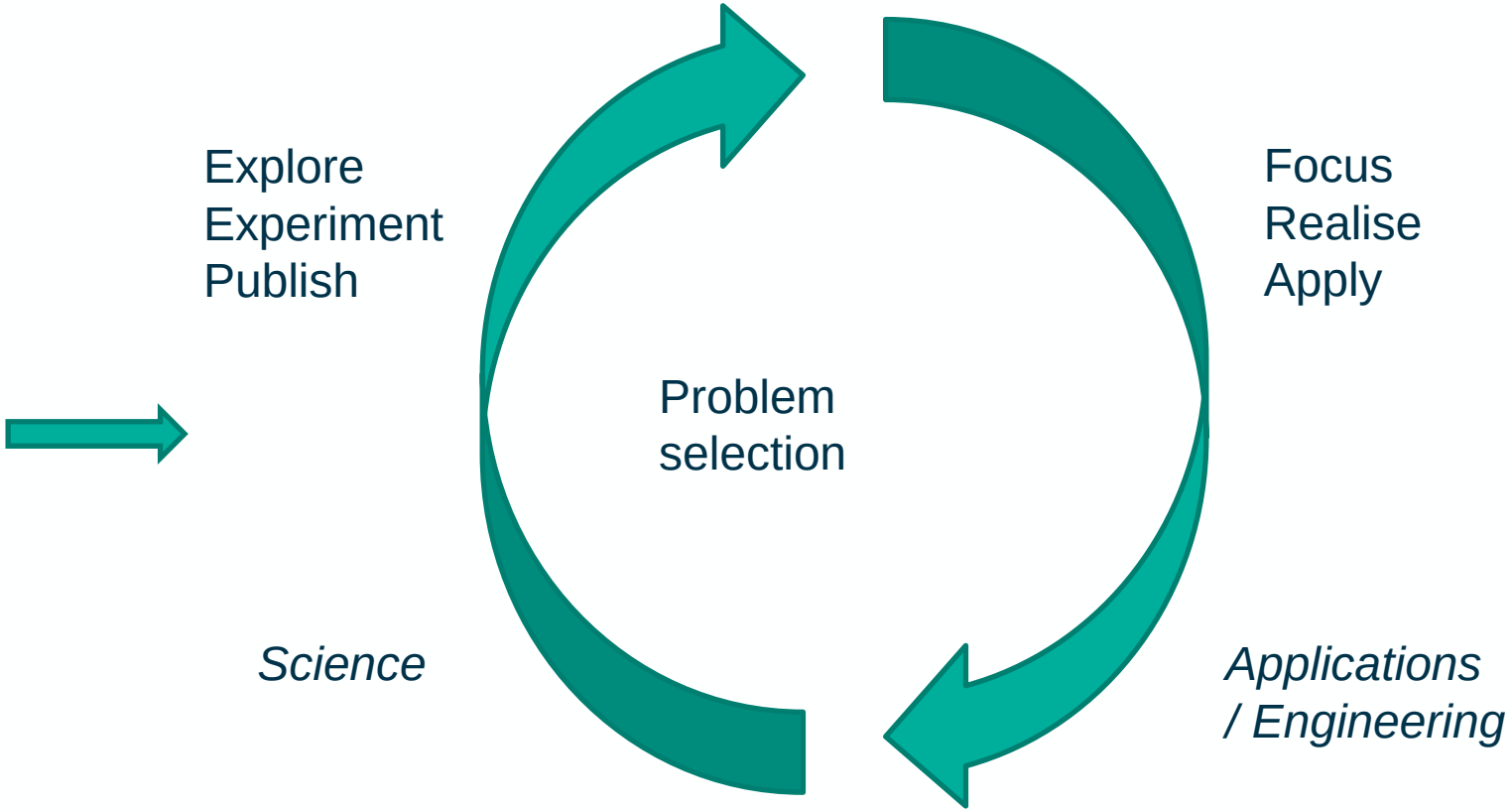


The Research Process in Science and Applications

Scientific Research Cycle



Science & Applications Cycle



Inspired by: https://www.microsoft.com/en-us/research/blog/microsoft-research-and-the-industrial-research-cycle/

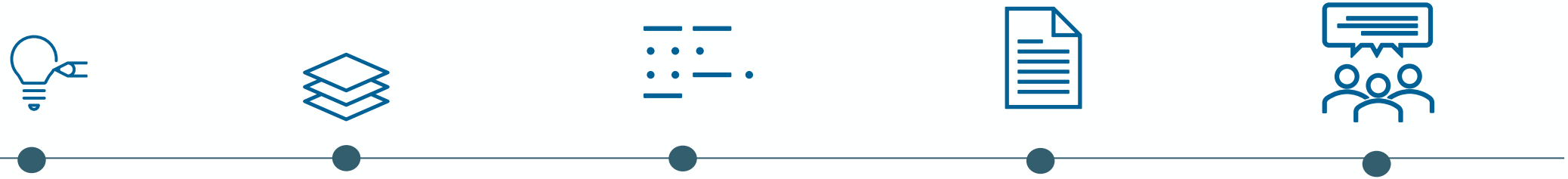
The Research Process in Science and Applications – ESA's role

- Community and user consultations
- Management of scientific studies
- Science Planning
- EO Mission requirements
- Education and Training

- PDGS, EO Data management
- EO Data processor development
- Cal-val
- Other non-EO data
- Campaigns
- End-to-end simulators

- EO Data exploitation programme
- Develop EO-based information services
- EO Exploitation Platforms

- User engagement, cooperation and partnerships
- Co-design with user communities and stakeholders
- Capacity building and training



- Develop new applications
- Broad spectrum of R&D activities, from science through to pre-commercial development of new applications

The Research Process in Science and Applications – ESA's role

CONCEPT

DATA

ANALYSIS

PUBLICATION

REVIEW

POLAR SCIENCE

22 SEPTEMBER 22

Kick off meeting: project ESA MOOC-EO open data science

ESA Φ-WEEK

11–15 October 2021 | Virtual event

Copernicus Open Access Hub

The Copernicus Open Access Hub provides complete, free and open access to Sentinel data products.

ACCESS DATA

ESA PDGS Data Cube

ESA's new service Data cube is now available and accessible with a valid EO Sign In account.

ACCESS DATA

MAAP

BioPAL

Welcome to the Open Science Catalog

ATMOSPHERE

CRYOSPHERE

LAND

openEO Platform

EOEPCA

BETTER ACCESS TO EARTH OBSERVATION

EURO DATA CUBE

EARTH SYSTEM DATA LAB

Earth Observing Dashboard

Global environmental changes observed by NASA, ESA, and JAXA

eo science for society

Scientific Papers

SMOS Space Weather

November 14 @ 13:00 - 17:00 UTC+2

ESA-ESRIN, Largo Galileo Galilei, 1 Frascati, RM 00044 Italy

The workshop will: report the results of ESA projects exploring usage of SMOS dataset to retrieve L-band Solar Flux and Total Electron Content of the atmosphere collect feedback and interest from the Space Weather Community and Solar scientist [...]

EVENT DETAILS

ESA Polar Science Collocation Meeting

November 23 @ 09:30 - November 25 @ 13:00 UTC+2

ESA-ESRIN, Largo Galileo Galilei, 1 Frascati, RM 00044 Italy

Background The ESA Polar Science Cluster involves a set of different ESA-funded scientific activities addressing different aspects of Polar research. Through this set of projects ESA aims at working hand by hand with the scientific community to: [...]

EVENT DETAILS

Earth Observation for Ecosystem Accounting Workshop (EO4EA 2022)

November 28 - December 1

The 2022 Workshop on Earth Observation for Ecosystem Accounting (EO4EA 2022) is organized by the European Space Agency in collaboration with the Environmental-Economic Account section of the United Nations Statistics Division (UNSD) and the Earth [...]

EVENT DETAILS

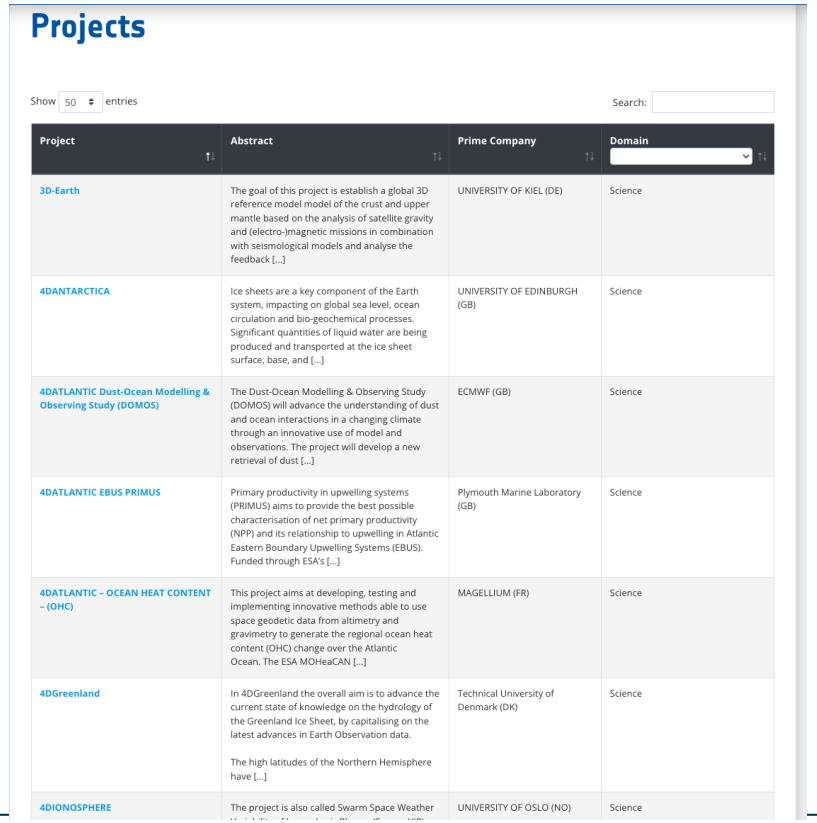
isprs

ISPRS ICWG IV/III/II

Openness in Geospatial Science and Remote Sensing

The Research Process in Science and Applications – ESA's role

FOCUS DEVELOP APPLY



Projects

Show 50 entries Search:

Project	Abstract	Prime Company	Domain
3D-Earth	The goal of this project is establish a global 3D reference model model of the crust and upper mantle based on the analysis of satellite gravity and (electro-)magnetic missions in combination with seismological models and analyse the feedback [...]	UNIVERSITY OF KIEL (DE)	Science
4DANTARCTICA	Ice sheets are a key component of the Earth system, impacting on global sea level, ocean circulation and bio-geochemical processes. Significant quantities of liquid water are being produced and transported at the ice sheet surface, base, and [...]	UNIVERSITY OF EDINBURGH (GB)	Science
4DATLANTIC Dust-Ocean Modelling & Observing Study (DOMOS)	The Dust-Ocean Modelling & Observing Study (DOMOS) will advance the understanding of dust and ocean interactions in a changing climate through an innovative use of model and observations. The project will develop a new retrieval of dust [...]	ECMWF (GB)	Science
4DATLANTIC EBUS PRIMUS	Primary productivity in upwelling systems (PRIMUS) aims to provide the best possible characterisation of net primary productivity (NPP) and its relationship to upwelling in Atlantic Eastern Boundary Upwelling Systems (EBUS). Funded through ESA's [...]	Plymouth Marine Laboratory (GB)	Science
4DATLANTIC – OCEAN HEAT CONTENT – (OHC)	This project aims at developing, testing and implementing innovative methods able to use space geodetic data from altimetry and gravimetry to generate the regional ocean heat content (OHC) change over the Atlantic Ocean. The ESA MOHeaCAN [...]	MAGELLIUM (FR)	Science
4DGreenland	In 4DGreenland the overall aim is to advance the current state of knowledge on the hydrology of the Greenland Ice Sheet, by capitalising on the latest advances in Earth Observation data. The high latitudes of the Northern Hemisphere have [...]	Technical University of Denmark (DK)	Science
4DIONOSPHERE	The project is also called Swarm Space Weather	UNIVERSITY OF OSLO (NO)	Science

https://eo4society.esa.int/projects/

Across the whole Science and Applications R&D Cycle, Open Science, Open Source are key enablers

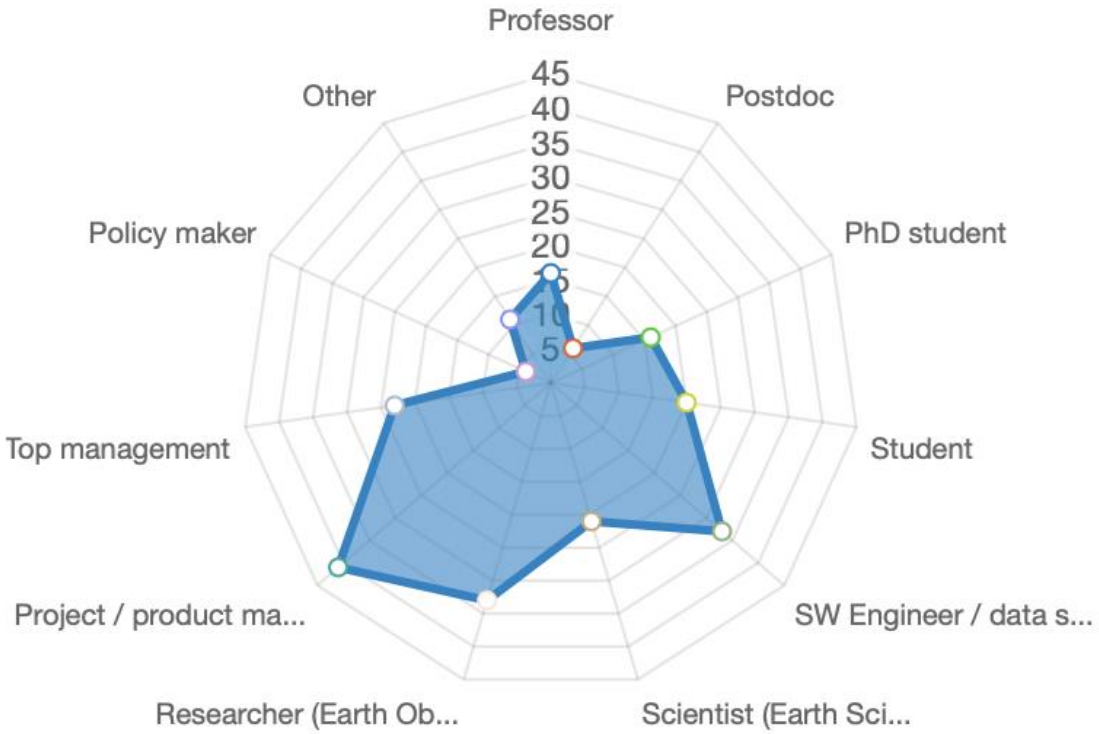
Need to streamline the Innovation Process, fostering Openness

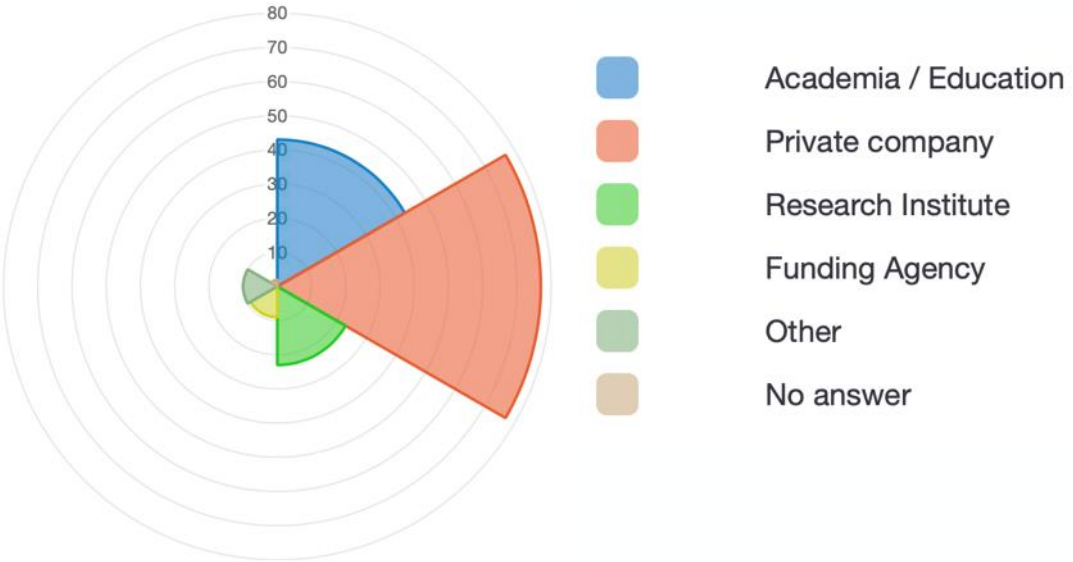
Open Science @LPS22

- Open Science Agora
- Open Science Community Survey

Open Science Community Survey 2022

Participants

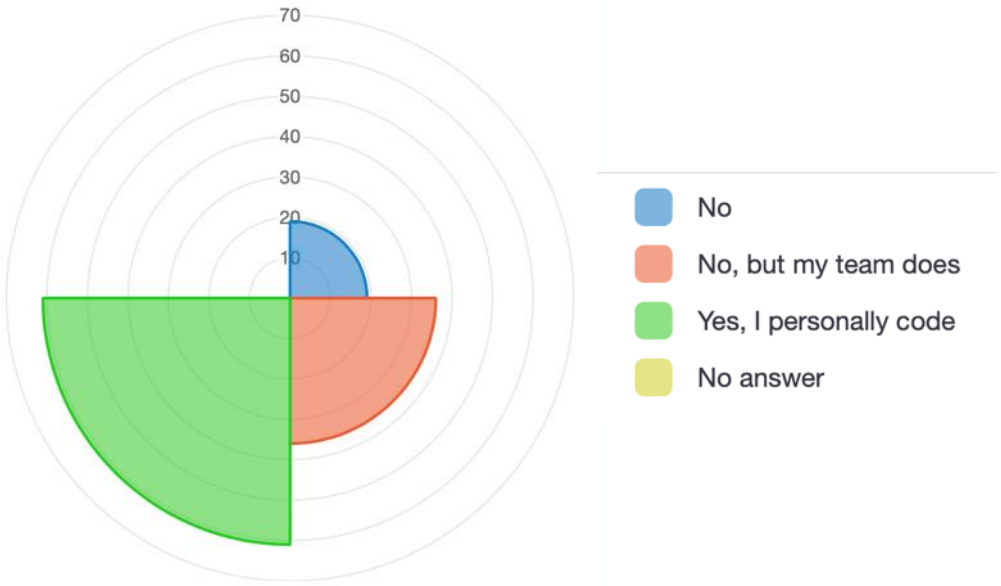




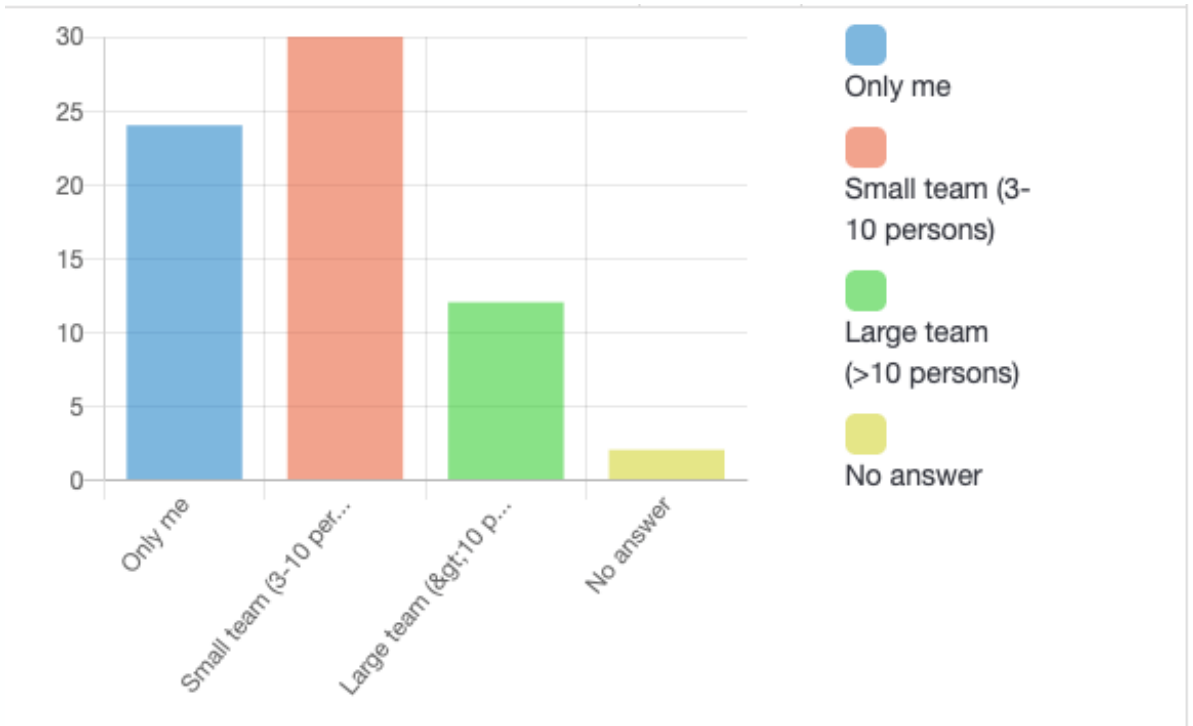
Open Science Community Survey 2022

Participants

Do you develop SW?



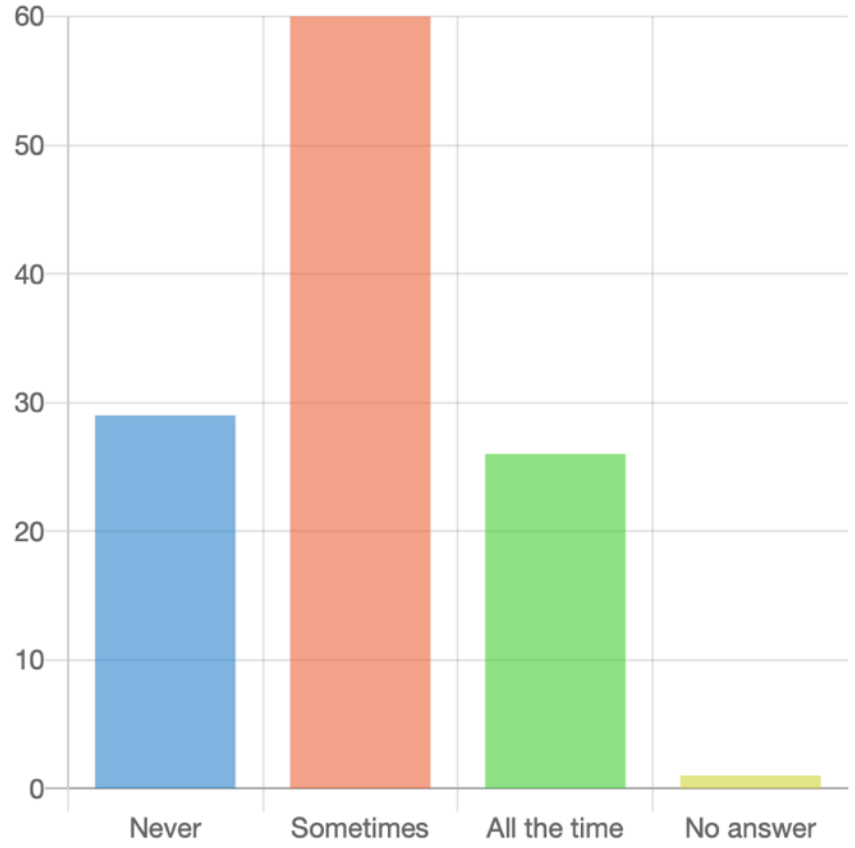
How big is the team you actively maintain Open-Source code with?



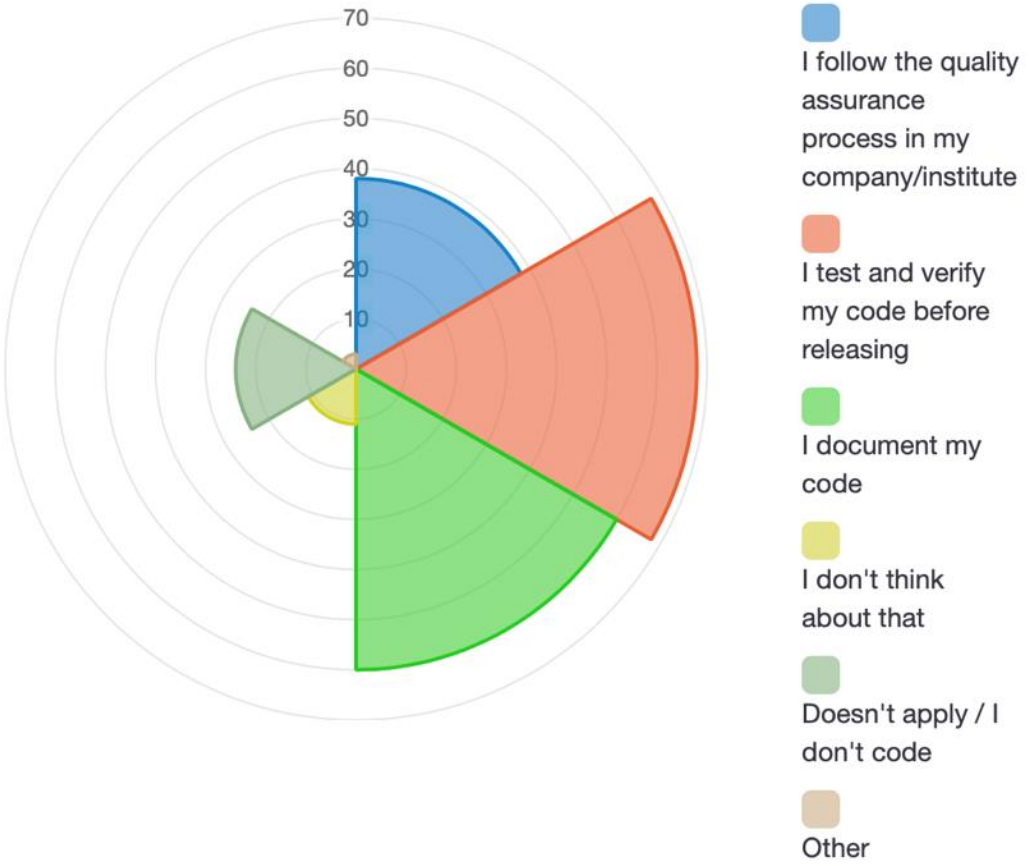
Open Science Community Survey 2022

Open Source Practice

Do you share your code publicly as Open Source?



How do you ensure the quality of your published Open Source code?



Open Science Community Survey 2022

Releasing Open Source Software

Top reasons to share code as Open-Source:

- Public money-public code
- To help others
- To gain community feedback and validation
- Increased scientific impact through reproducibility
- To promote good scientific practice
- To create trust and transparency
- To speed up the R&D
- To stimulate progress
- Unavailable solution in commercial SW
- Requirement by sponsor
- To attract more clients
- Company policy

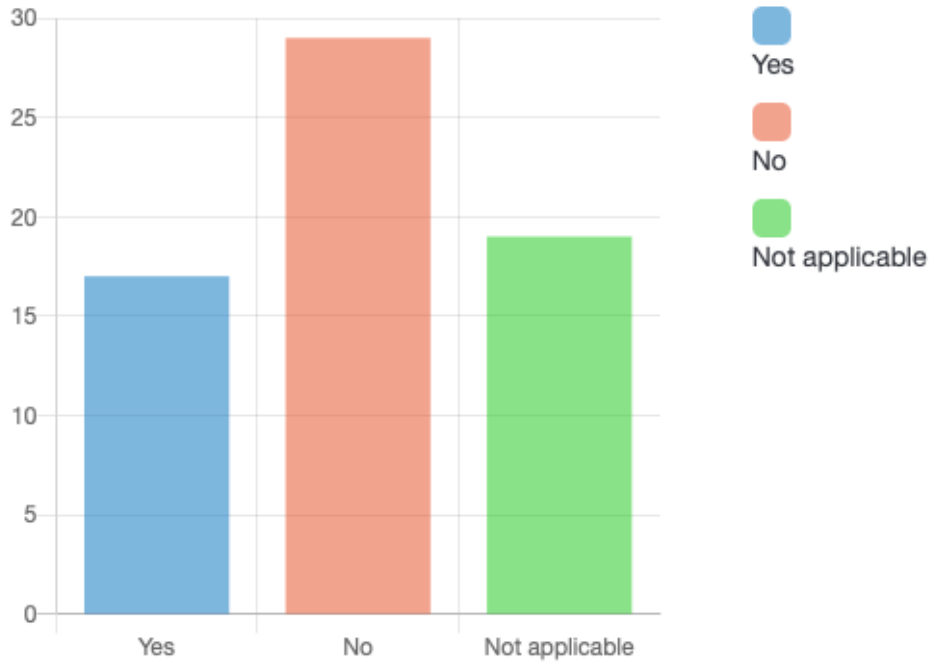
Top reasons not to share code as Open-Source:

- Not permitted by company policy
- If core-business of company is affected
- IPR restrictions
- Code is not mature enough
- Unable to recover the cost of the SW development
- Effort required for SW quality assurance
- Requirement by SW client
- Cost of long-term maintenance

Open Science Community Survey 2022

Open Source Practice

Do you offer open-source software products as part of your company's portfolio?



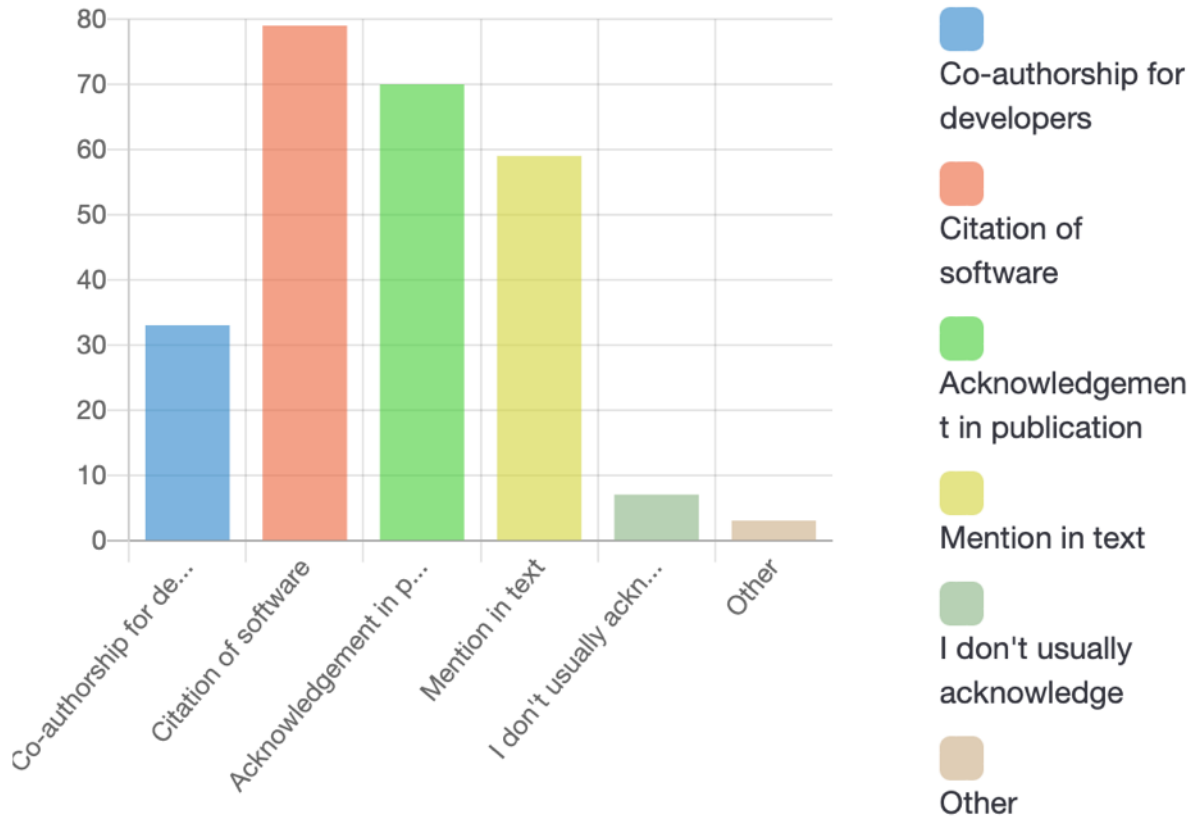
Business model:

- Free SW, commercial service/product:
  - Publishing methods/code as OS, charging for services and case studies made with the code
  - Clients don't pay for the SW, but pay for the use
  - Commercial product/platform based on OS software
- Training and support:
  - Provide support, training and development on bases of those open source software
  - Consultancy on OS SW
  - Hardware sales/support of open designs
  - Services on OS products, custom development and selling open HW
- Non-profit:
  - Non-profit sharing SW and data openly to grow credibility and visibility and increase chances of funding

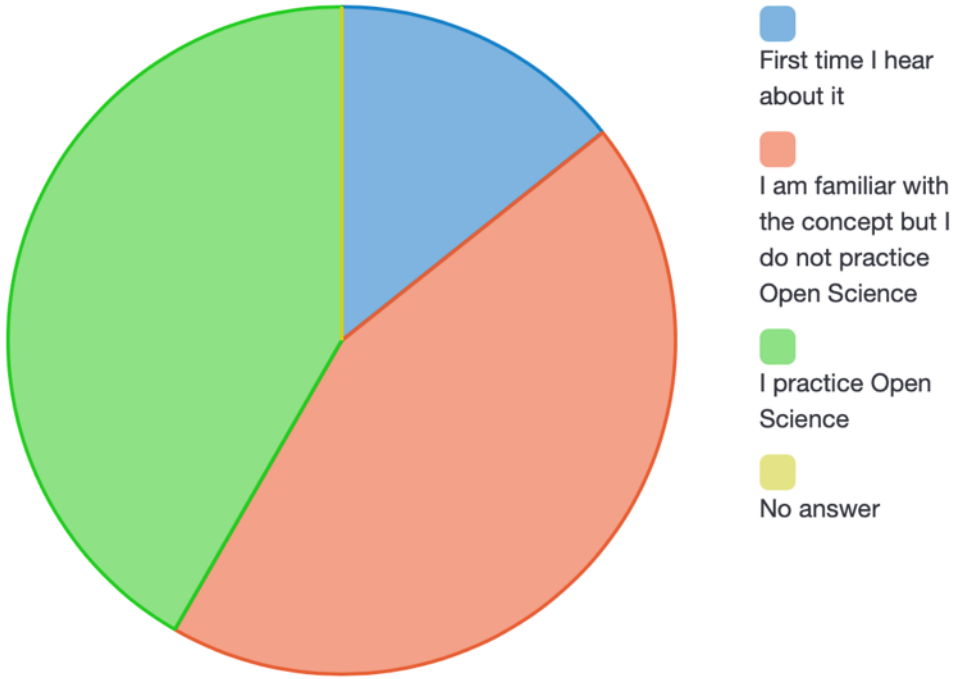
Open Science Community Survey 2022

Open Science Practice

How do you acknowledge the SW and data that you use?



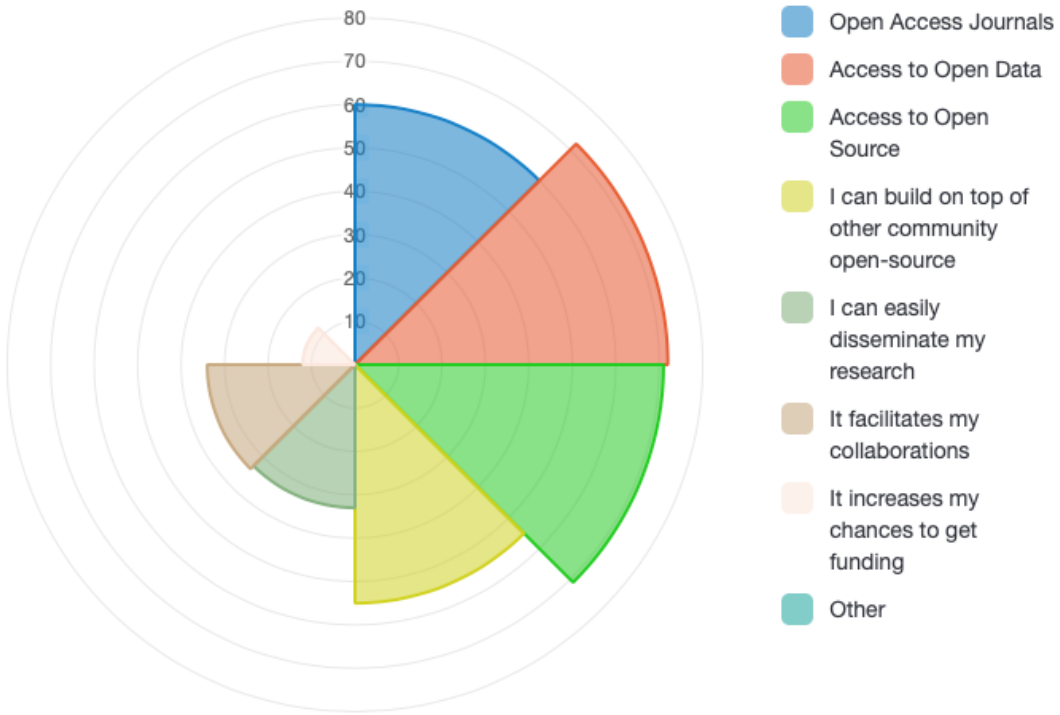
Are you with the concept of “Open Science”?



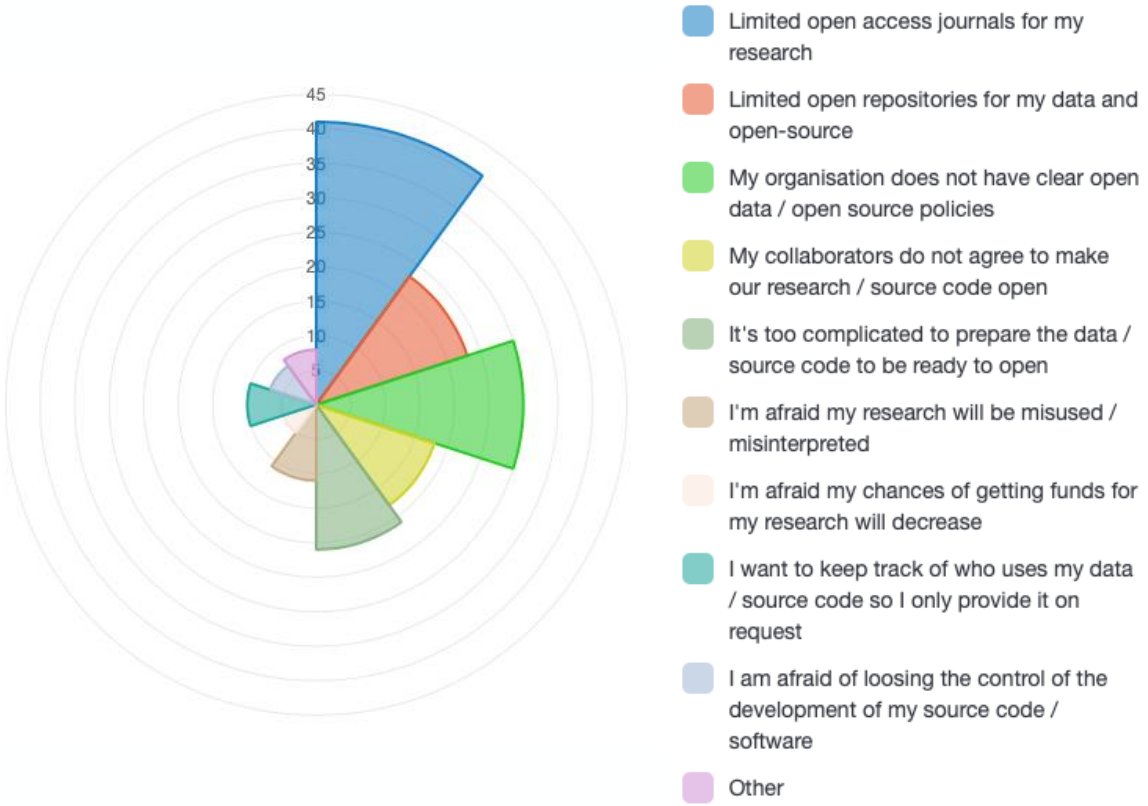
Open Science Community Survey 2022

Open Science Practice

In your daily practice, how does Open Science help you achieve your objectives?



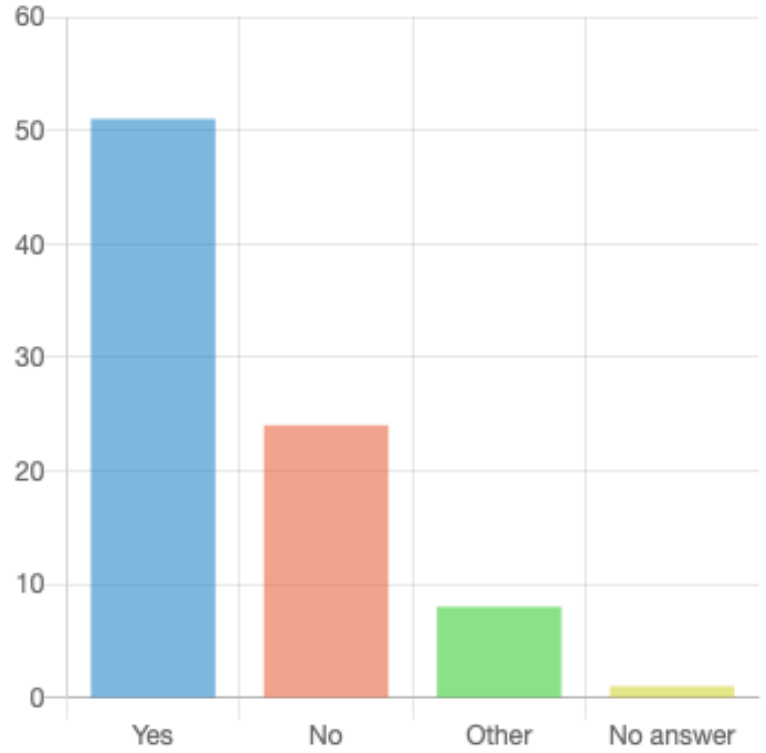
What is preventing you from adopting Open Science, in your daily practice?



Open Science Community Survey 2022

Challenges and Opportunities

Should journals require publishing all data and software used in the research together with the paper?



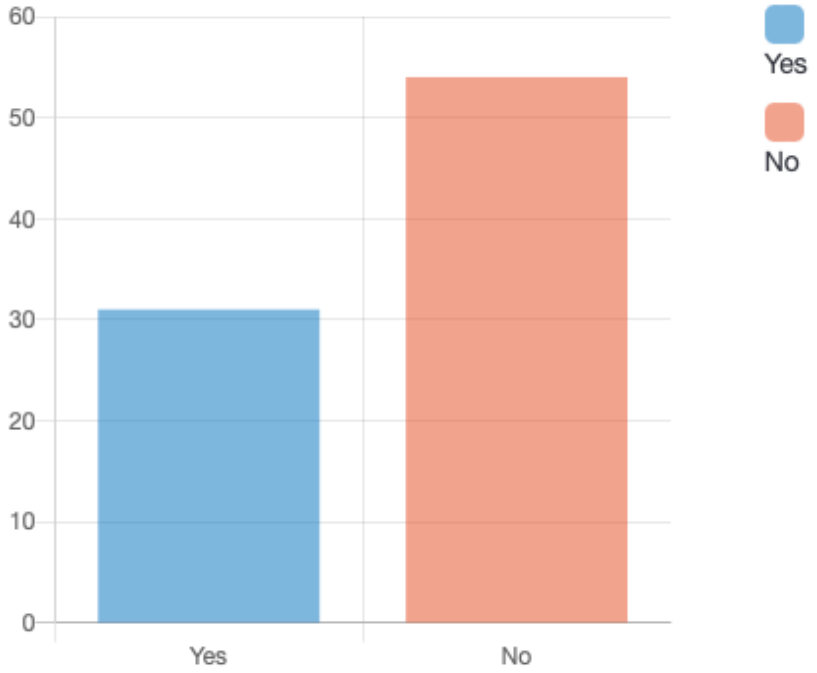
Other:

- Journals should require DOIs for data and persistent identifier and location for software. Not necessarily in same place.
- Depending on data and methodology, a hybrid approach could be used
- Where possible, a URL should be provided.
- Yes, but some data might be too big
- Yes, if not sensitive
- Authors should have the freedom to choose

Open Science Community Survey 2022

Challenges and Opportunities

Do you have any concerns of legal nature (e.g., license, data policy) regarding Open Science practices?



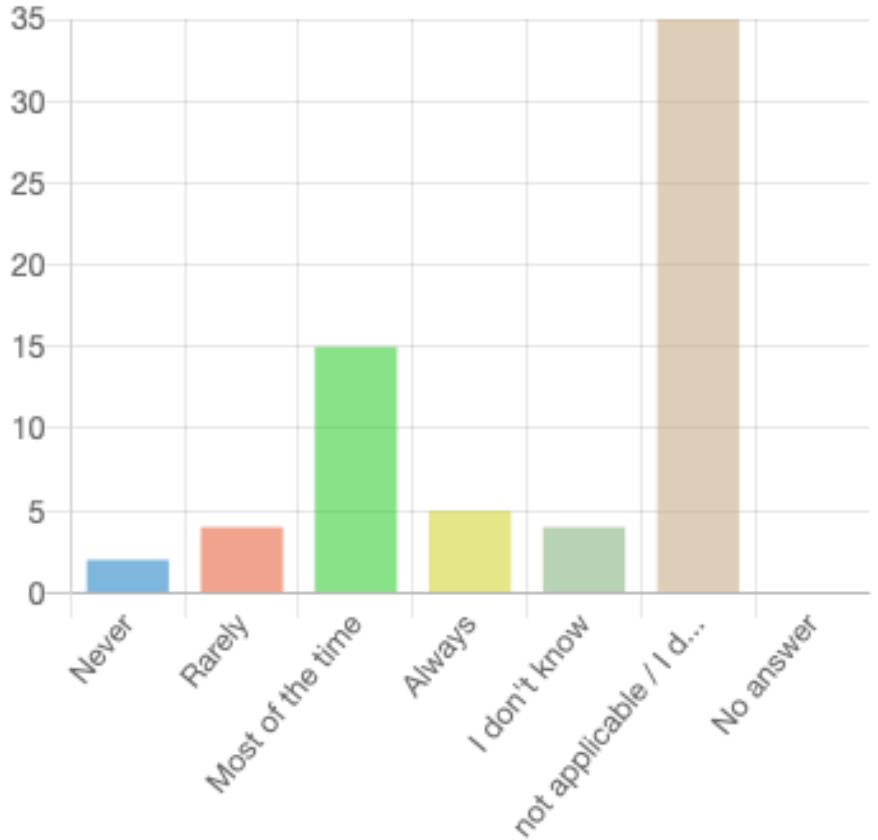
Concerns:

- IPR:
  - Open Science complicates industry collaborations due IPR.
  - IPRs might be misused
  - Replication of a product could be a potential threat.
  - Lack of trust
- Privacy and Data Protection:
  - If solution is co-owned with the customer / customer imposed restrictions
  - If the solution uses customer data / is built on customer/proprietary data
  - NDAs with customers
- Cost:
  - Some data sets are too massive to reasonably publicly host.
- Licensing:
  - Open source code being used in commercial products
  - Complicated rules, too many variants of commercially useable licenses
  - General lack of knowledge on Open SW and HW licenses in the Science and Engineering communities
  - Not sure how enforceable open source licenses are

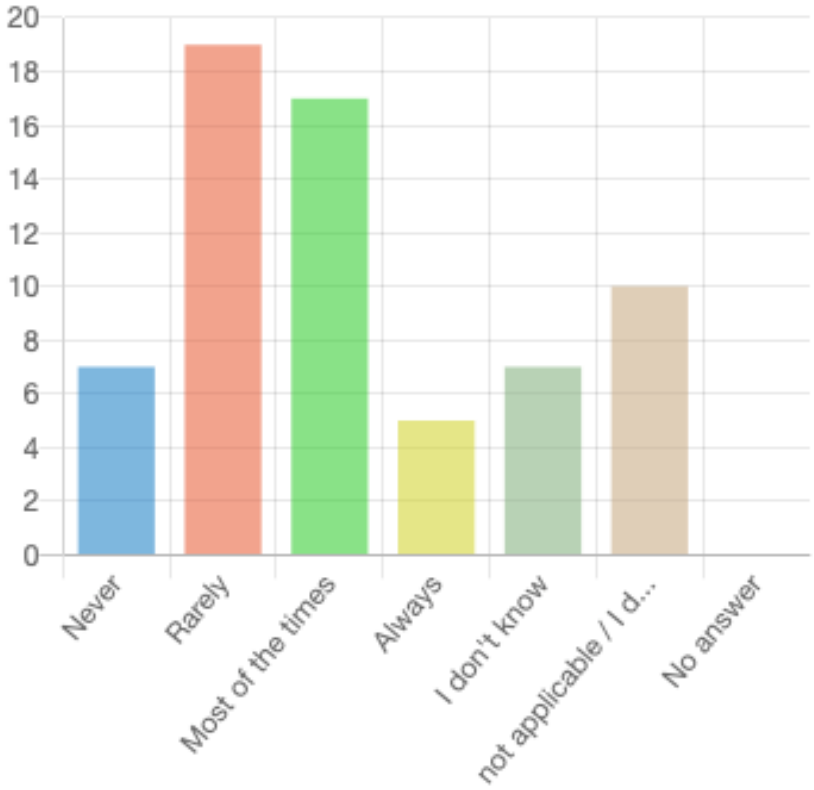
Open Science Community Survey 2022

Challenges and Opportunities

Asked the funders:
How often do you require adherence to Open Science?



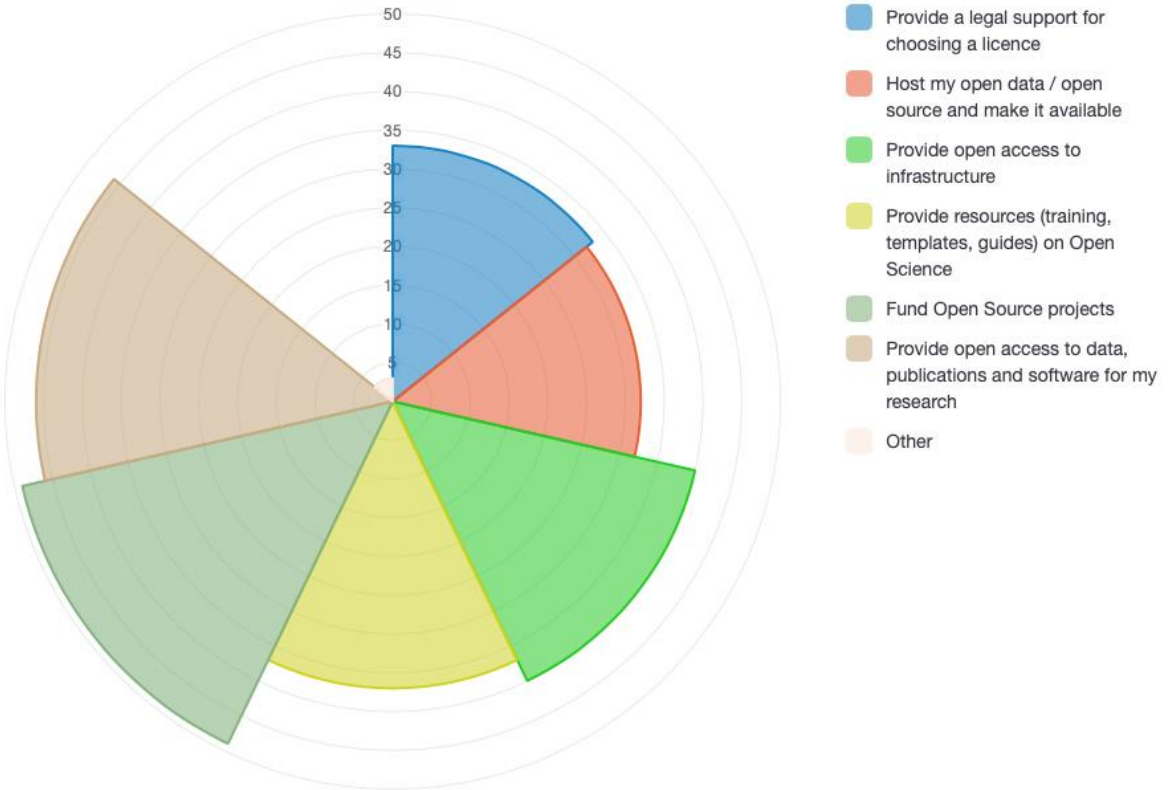
Asked the researchers:
How often are you required to adhere to Open Science?



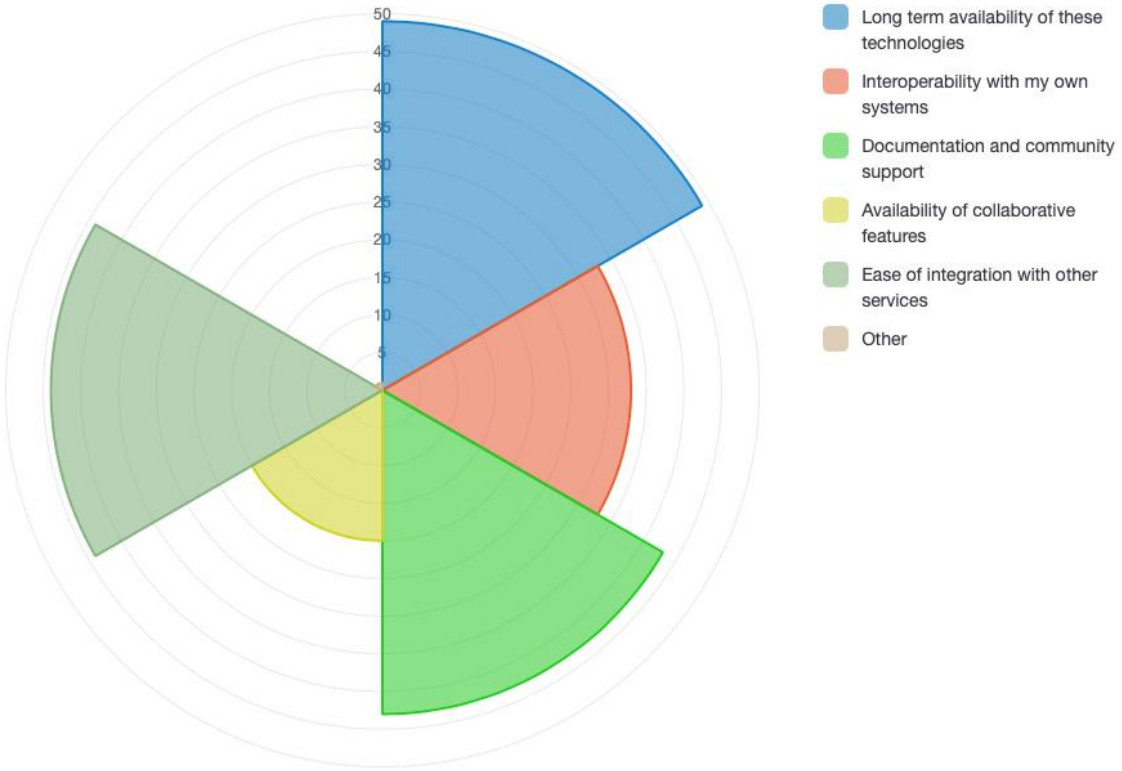
Open Science Community Survey 2022

Expectations from ESA

How could space agencies like ESA support you to move to Open Science?

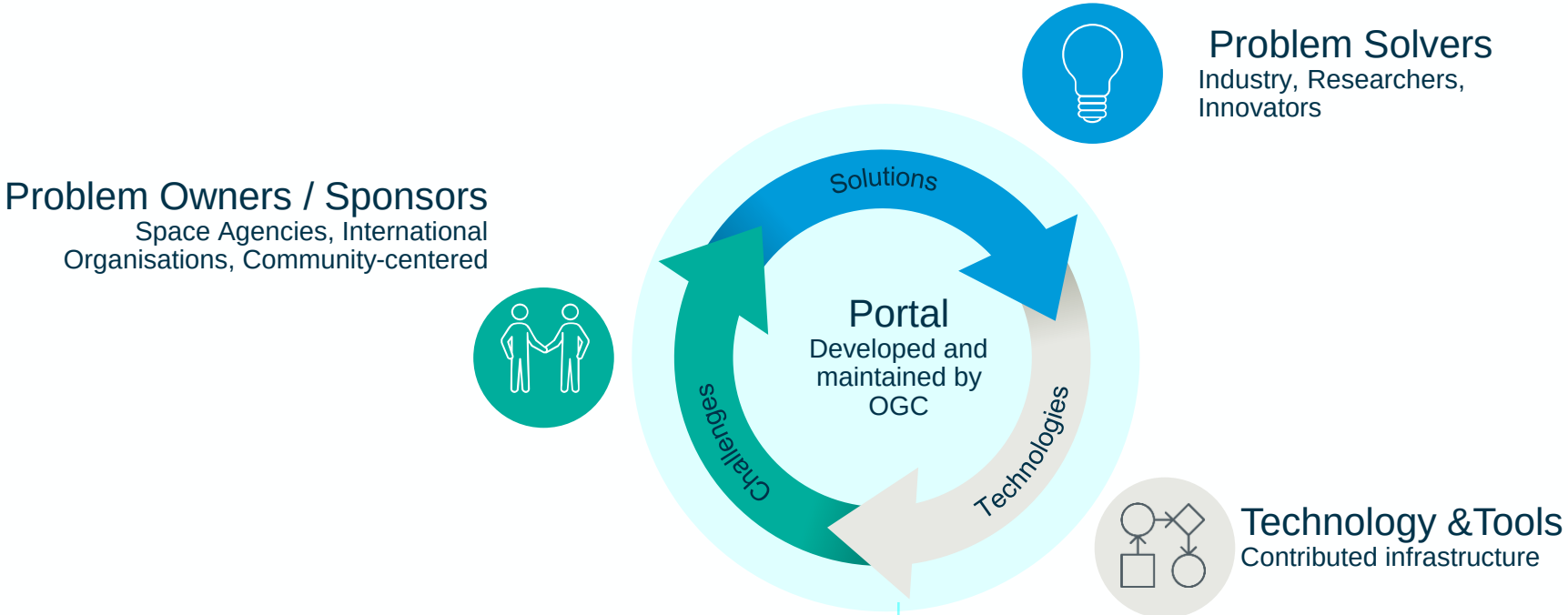


As a user of Open tools and technologies, what is most important for your work?



Towards Open Innovation

Open Science Persistent Demonstrator: create and capture value that dynamically transcends organizational boundaries



New Capability	Innovative Products	New Collaborations
Co-creation Innovation process in practice	Fostering new synergies of data & technology	Enhancing dissemination and visibility of industrial capability