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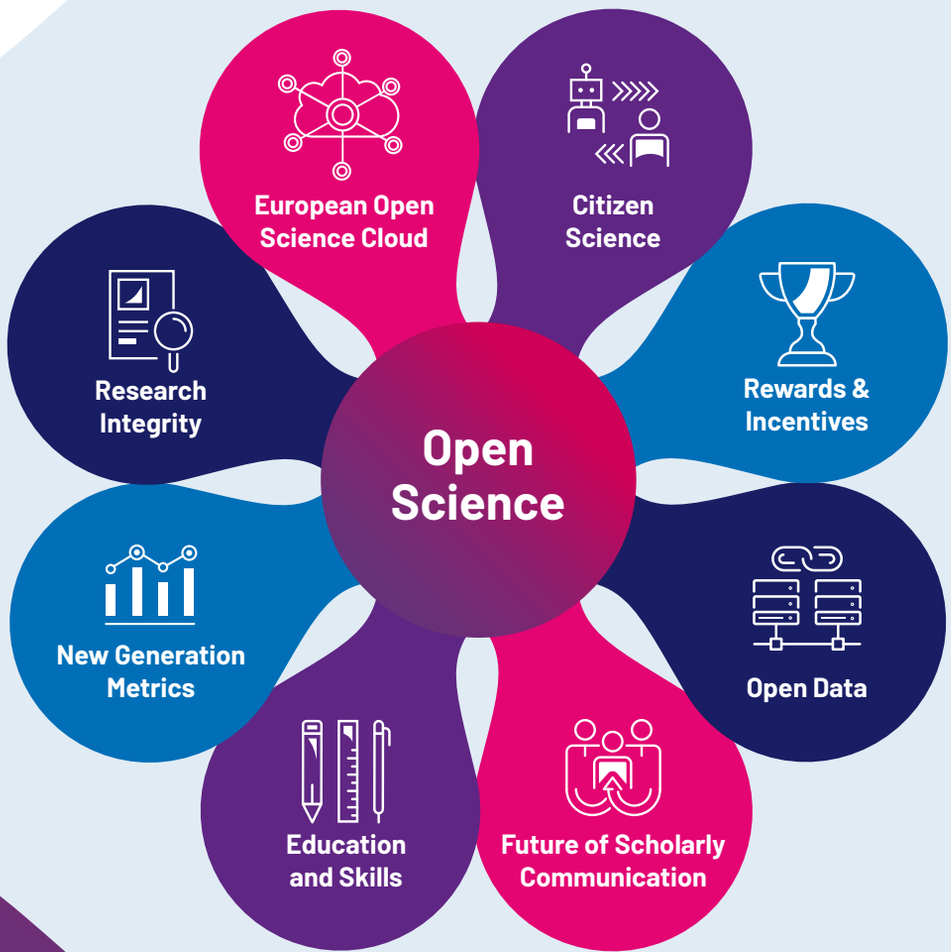
LERO

Open Science Charter



Lero's Open Science Charter identifies **eight Open Science ambitions**

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OPEN SCIENCE is the practice of science in such a way that others can collaborate and contribute, where research data, lab notes and other research processes are freely available, under terms that enable reuse, redistribution and reproduction of the research and its underlying data and methods.

Open Science may also be referred to as Open Scholarship or Open Research.

Openly sharing scientific outputs is an important aspect of research communication and technology transfer. Therefore, Open Science practices, which optimise access to research, are integral to Lero. Given the multi-disciplinary nature of Lero's research, our research outputs are also diverse, and include scientific publications, data, software, as well as hardware. Hence, Lero will adopt a comprehensive strategy towards Open Science which will lead to increased visibility for researchers, greater opportunities for collaboration, and greater transparency in the research process.

Lero's Open Science Charter is formulated in-line with the EU's Open Science policy, which identifies the following eight Open Science ambitions:

1. **Open Data**: FAIR (Findable, Accessible, Interoperable and Re-usable data) and open data sharing should become the default for the results of EU-funded scientific research.
2. **European Open Science Cloud** (EOSC): a federated ecosystem of research data infrastructures will allow the scientific community to share and process publicly funded research results and data across borders and scientific domains.
3. **New Generation Metrics**: New indicators must be developed to complement the conventional indicators for research quality and impact, so as to do justice to Open Science practices.
4. **Future of Scholarly Communication**: all peer-reviewed scientific publications should be freely accessible, and the early sharing of different kinds of research outputs should be encouraged.
5. **Rewards & Incentives**: research career evaluation systems should fully acknowledge Open Science activities.
6. **Research Integrity**: all publicly funded research in the EU should adhere to commonly agreed standards of research integrity.
7. **Education and Skills**: all scientists in Europe should have the necessary skills and support to apply Open Science research routines and practices.
8. **Citizen Science**: the general public should be able to make significant contributions and be recognised as valid European science knowledge producers.

The following sections summarise Lero's initiatives for each of these pillars.

1. Open Data and the FAIR principles

A well-established approach to Open Science and data management are the FAIR principles. The name FAIR stems from the fact that these principles ensure data is findable, accessible, interoperable, and reusable. Lero adopts the FAIR principles as the default approach. Furthermore, Lero extends the application of the FAIR principles beyond data to include all scientific outputs, i.e., documents and scientific publications, data, software, and hardware. Lero's default strategies are summarised in Table 1, and includes the use of unique persistent identifiers, as well as default licenses, which set clear permissions for re-use. Furthermore, Lero outputs are required to be accompanied by documentation and rich metadata and annotation. The table also distinguishes three forms of Open Science output sharing strategies:

- **Early access** aims to maximise and accelerate the communication and impact of Lero's scientific outputs, and includes sharing of pre-prints of upcoming publications.
- **Continuous access** goes beyond providing early open access, by providing access to the source throughout all stages of development. Continuous access to the source promotes transparency in the research process and fosters and leverages collaborative engagement with the wider community leading to greater potential impact of the research.
- **Long term persistent access** is ensured by uploading scientific outputs to dedicated stable research data repositories like ZENODO. Services like ZENODO offer permanent long-term storage and the creation of persistent Digital Object Identifiers (DOIs). Long term storage ensures use and re-use of outputs for the future, while the DOI's provide persistent and citable identifiers.

Table 1. Open Science Deployment Strategies

Open science output type	Default/preferred license	Early and continuous access	Long term persistent storage and access
Open Scholarship	CC-by-4.0 or open access journal equivalent	Pre/post-prints e.g. via Engineering Archive	Journal links, pre/post-prints e.g. via Engineering Archive
Open Source Software	**Code**: MIT, or OSI recommended **Documentation**: CC-by-4.0	Open software development via LERO GitHub page	Established versions: LERO ZENODO page
Open Data	**Data**: OKF recommended **Documentation:** CC-by-4.0	Continuous storage via LERO ZENODO page	LERO ZENODO page
Open Hardware	**CAD files**: OSHWA recommended **Documentation**: CC-by-4.0	Open hardware development LERO GitHub page	Established versions: LERO ZENODO page

To ensure all Lero members are familiar with the FAIR data principles, and the formulated default sharing pathways, Lero educates its members through regular training and workshops.

Although Open Science is the default, and sharing will be maximised, restrictions may apply, such as in relation to ethical and privacy legislation for medical data. Furthermore, successful technology transfer may depend on commercialisation and proprietary license models. For the latter, hybrid approaches will also be explored, i.e., where commercial and Open Science approaches may go hand-in-hand. In such cases researchers will consult with the Lero Open Source Programme Office (OSPO).

Further information on data sharing and data management can also be found in Lero's Data Management Policy.

2. Infrastructure and the European Open Science Cloud

The European Commission is in the process of setting up the European Open Science Cloud (EOSC). When fully operational, the EOSC aims to "*... to provide European researchers, innovators, companies and citizens with a federated and open multi-disciplinary environment where they can publish, find and reuse data, tools and services for research, innovation and educational purposes.*". Lero will closely monitor the developments and the establishment of the EOSC and will align its sharing strategies with this exciting novel platform as it becomes available.

Open infrastructure is the set of services, protocols, standards and software to deliver new improved collective benefits without restrictions, and for a healthy global interrelated infrastructure system. Open publishing platforms are a key tool in enabling Green, Gold or Diamond Open Access and all Lero's partners have repositories for collecting, preserving and making freely available scholarly communication, including peer-reviewed articles, working papers and conference papers, e.g., UL's ULIR (University of Limerick's Institutional Repository) which is currently being re-developed and migrated to a different platform and NUI Galway's ARAN (Access to Research at NUI Galway). For open software and hardware development Lero has created a GitHub page which can be accessed here LERO GitHub page. A Lero ZENODO page has been created for early and long-term persistent storage of data related to Lero research and can be accessed here LERO ZENODO page. Lero has established an Open Source Program Office (OSPO) https://sfi-lero.github.io/OSPO/About/ in collaboration with a number of US universities including the University of California Santa Cruz (UCSC), Brandeis, Johns Hopkins and Rochester Institute of Technology. Initiatives include tutorials on open-source software licenses, panel discussions, and Semesters of Code for undergraduate students.

3. New Generation Metrics

New generation metrics are concerned with the way in which bibliometrics are used in research particularly around the practice of using journal impact factors and citation counts as the primary measure of research quality. Lero wishes to contribute to the cultural shift towards new generation metrics that promotes the practice of drawing metrics from a wider range of sources that can lead to the increase of the significance and impact of the research. A broad range of outputs and activities should be recognised as part of any research evaluation process, not just publications. Lero is interested in developing and promoting best practice in the assessment of researchers and scholarly research as outlined in the Declaration on Research Assessment (DORA), to which Science Foundation Ireland (SFI) is a signatory.

Beyond citation metrics for scientific publications, Lero also promotes the use of persistent identifiers (Digital Object Identifiers or DOIs) for data, code, and hardware. Publication and citation of data, code, and hardware works, and creates an additional source of "academic credit" for researchers. Hence these offer another means to diversify academic research performance metrics.

4. Future of Scholarly Communication

This ambition is concerned with transitioning the current academic publishing model towards fully open access wherever possible. Protocols for research commercialisation are outlined in Ireland's National IP Protocol https://www.knowledgetransferireland.com/Reports-Publications/Ireland-s-National-IP-Protocol-2019-.pdf and creating a mutually beneficial environment in which enterprise, entrepreneurs and researchers can access and openly share knowledge, expertise, and technology will require stakeholders to make commercialisation decisions within the context of Open Science. The goal of open access is to make publications openly available online without restriction, free from the barriers imposed by subscription access.

Lero is committed to Ireland's goal of ensuring that all scholarly publications resulting from publicly funded research are openly available and endorses the National Framework on the Transition to an Open Research Environment and the EU Recommendations on access to and preservation of scientific information (2018). Lero will be guided by SFI's Open Access Policy and will support both types of open access: Green and Gold.

Green open access (or self-archiving) makes research freely available through an open access repository. Gold open access makes research freely available and reusable on the journal's website, immediately on publication. This means either publishing with a fully open access publisher, usually for a fee, or paying to make research open access with a subscription journal/traditional book publisher.

Institutions are negotiating publishing deals with publishers that enable authors to publish Gold open access without payments, and this has been successful with many publishers including Elsevier. This is part of a transformative process whereby the funds already in the publishing system for subscriptions are used to pay for open access. By their nature transformative agreements are transitional and academics are encouraged to keep up to date with developments in this area. Lero encourages publication in high-quality, peer-reviewed venues and recommends that all publications should be made freely available wherever possible from the date of publication.

5. Rewards and Incentives

Recognition for the work undertaken to manage research data and make publications openly accessible will encourage researchers to increase their engagement with the principles of Open Science. Lero's Annual Director's Awards will include a new award category of *Open Science Champion* to reward the researcher who has contributed the most in the previous year to developing Lero's Open Science culture. To monitor the commitment of researchers to Open Science, lists featuring all openly shared scientific outputs are made available on the Lero website. This includes not only open access publications but also, open data assets, open hardware projects, and open source software shared. All such outputs will be added to Lero's KPI metrics. As a starting point a baseline figure will be calculated in 2022, and annual targets set and reported on the Lero website. To further incentivise researchers to adopt Open Science practices, Lero training on Open Science includes treatment of the potential benefits of Open Science for the development of research careers. This includes higher citations rates of the research outputs, and thus increased visibility for researchers.

6. Research Integrity

This is the practice of researchers acting honestly, reliably, respectfully and being held accountable for their actions. Lero regards it as fundamental that research should be conducted with integrity, and that the results of research disseminated, honestly, accurately and in accordance with professional standards.

All partner institutions have a policy for Research Integrity aligned with the revised National Policy Statement on Ensuring Research Integrity in Ireland (2019) and with the European Code of Conduct for Research Integrity in 2017. All researchers at Lero are expected to undertake training in Research Integrity through Epigeum (Oxford University Press), with tailored courses according to career stage and discipline.

7. Education and Skills

Lero will ensure that researchers have knowledge of and access to training courses in Open Science such as making publications openly accessible, managing research data in-line with the FAIR principles and acting with integrity by collating and circulating information about training resources available locally at

each partner site. To supplement local Open Science education activities, Lero will provide researchers with a dedicated training workshop (WOW: Working Open Workshop) on Open Science practices. Training will cover all Open Science domains, and includes principles of open access and pre-printing, as well as open-source software, hardware, and data sharing. Importantly, the training will also provide community building, documentation and data annotation, licensing options, and practical skill development in Git and GitHub for collaborative and open development. Lero will promote the inclusion of Open Science skills training into postgraduate training programmes and into early careers research programmes across all disciplines.

8. Citizen Science

Citizen science has brought about a major change in the way research is conducted: it is no longer limited to academic researchers, and it encourages collaboration from groups across society. Lero has a long tradition of Citizen Science, and 'Engaged Research' forms one of three pillars of Lero's Education and Public Engagement strategy where engaging with stakeholders, policy makers, and the general public through Lero research domains is defined. Citizens and communities are involved in setting research priorities, engaged with the research process, help to translate outcomes for a non-scholarly public, and participate in public debate. Part of the strategy going forward will include the organisation of hackathons to promote community engagement with Lero's open source projects.

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