

OSIRIS POLICY BRIEF FOR RESEARCH INSTITUTIONS

SUMMARY

Open Science to Increase Reproducibility in Science (OSIRIS) contributes to reform of the research and innovation system from the top down and the bottom up, to regain overall trust in science, by investigating the underlying drivers and facilitators, co-creating and testing effective evidence-based solutions, identifying incentives for reproducibility by stakeholders, and embedding reproducibility in research design. The reproducibility of research results is fundamental for rigorous, trustworthy science.

We explored barriers, drivers, enablers and incentives to reproducibility through systematic literature review, interviews with researchers across Europe, focus group discussions with stakeholders, and an audit of policies and guidelines of public funders using Transparency and Openness Promotion (TOP) 2025 criteria. Through a Delphi exercise a checklist with 32 items considered important for research reproducibility was co-created.

Reproducibility is often hindered by unclear methodologies, inaccessible data and code, and limited technical skills. Training is a key facilitator—especially for early-career researchers—although it is unevenly distributed across regions and institutions. Structural enablers like policies, infrastructure, and staff roles help, but are implemented inconsistently. Despite widespread support for DORA and CoARA, actual shifts in assessment practices remain limited. A publish-or-perish culture is seen as a significant obstacle, particularly in high-funded institutions. The 32-item reproducibility checklist developed through stakeholder consultation offers a practical tool to guide improvement towards reproducible research.

Our recommendations urge research institutions to upskill junior and senior researchers through (mandatory) training; to embed reproducibility-related skills and responsibilities in support staff profiles; to develop institutional open science policies; to audit how to meet commitments for research assessment reform in practice; and to set up bottom-up researcher networks to foster sustainable change and embed reproducibility in research ecosystems.



BACKGROUND

multiple institutional stakeholders play an important role in the science ecosystem: research funders, publishers, journals, and research performing organisations. Through their policies, guidelines, initiatives, support, and interventions, they can influence the quality and trustworthiness of research by removing barriers that hinder reproducibility, and promoting facilitators that enhance it.

The reproducibility of research results is fundamental for rigorous science as it confirms or corrects the outcomes of single studies. Reproducibility is understood as a continuum from the reproduction of results – based on the same data, code and methodology – to replication – meaning the repeating of results using the same analytical method, but with different data. When results can be independently verified, research that goes on to influence future research and policy decisions moves forward with confidence. However, reproducibility remains a major challenge in many research disciplines.

OUR RESEARCH APPROACH

Open Science to Increase Reproducibility in Science (OSIRIS) investigates the underlying barriers, drivers, and facilitators; tests effective evidence-based solutions, identifying incentives for reproducibility by stakeholders, and embedding reproducibility in research design. In a systematic scoping review, we assessed the extent to which Open Science interventions have been rigorously tested for their effectiveness to improve reproducibility.

Interviews with 60 researchers across Europe examined views, practices, and motivations for reproducibility across disciplines, with factors that facilitate or hinder. Seven focus group discussions with research funders, journal editors, research institution leadership, national reproducibility networks, reproducibility journal clubs and civil society organisations (58 participants) explored roles and responsibilities of these stakeholders to assure the quality and trustworthiness of research, with initiatives to facilitate or remove barriers. An audit using Transparency and Openness Promotion (TOP) 2025 criteria assessed how research institutions, journals and funders address and promote reproducibility in their policies, procedures and guidelines.

Through a Delphi exercise, with 82 stakeholders from 21 countries (19.5% early-career, 17.1% mid-career, and 30.5% senior researchers, 9.8% research support or administrators, 6.1% journal editors or publishers, 8.5% funding agency members, 3.7% policymakers, and 4.9% others), we developed a list of 32 reproducibility checks that offers a robust starting point to identify key items to review to assess the reproducibility of research results before publication

WHAT RESEARCHERS SAY

For research institutions, reproducibility is usually embedded within institutional frameworks, woven into open science policies, data management plans, and ethical guidelines. This was elicited during focus group discussions. In interviews, 27 researchers gave examples of where institutional policies, support, infrastructure, and training facilitate reproducible research. These are perceived as supportive external factors, albeit that they are often inconsistently implemented.



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So this includes how we store data, ensuring it is preserved for like 10 years in university storage facilities. And then, theoretically, if others wish to use this data, they can request access. ... So, the university has become more rigorous in the past 2-3 years, and this is still relatively new. (Social scientist, UK)

When researchers attempt to reproduce the research of others, which is common in experimental research, many indicate this to be challenging. Methodological descriptions may miss crucial details, making reproduction an exercise in guesswork or reverse-engineering. Another challenge can be the (un)availability of data or code and the poor quality or usability of the shared materials.

These issues stem to a large degree from disparities in research skills, particularly regarding using specific software or tools. In other cases, researchers are willing to share their materials but are unsure how to do so, especially when working with qualitative materials or large, unstructured datasets. They may also hesitate to share data, code, and detailed methodology for fear of being scooped or losing control of their intellectual contributions.

CAPACITY AND SKILLS

Training is mentioned as an important facilitator. Where researchers had access to training or peer learning environments, they describe a stronger sense of competence and confidence in sharing their materials. Some point to awareness of open science practices or reporting guidelines as a critical starting factor. These accounts highlight that reproducibility is not merely a matter of will, but one of equipping researchers with feasible, learnable, and context-appropriate methods.

At my university, throughout the training, it was important to produce clean code and data for the purposes of just being a good researcher, but not necessarily explicitly about replicability. (Social scientist, Germany)

Sixty four percent of interviewed early career researchers receive some form of training that facilitates open science practices or reproducible research. This can be training on open science, data management, coding, version control, etc. This is much higher than more senior researchers we interviewed, indicating that such training provision may be on the increase. It is interesting to note that researchers from institutions that are amongst the top recipients of Horizon 2020 funding give more training compared to other research institutions (Table 2). When looking at potential regional differences, it is interesting to note that researchers in southern Europe seem to receive very little relevant training (Table 3). Several interviewees suggest that by integrating reproducibility training into graduate programs and making open science part of disciplinary norms, it can be built into research culture.

Interviewees commonly highlight the central role of structural enablers such as institutional policies, dedicated funding, research support staff, and training.

Table 2. Percentage of interviewees that receive and give training on research practices that enhance reproducibility, by career stage, and institution funding status (top recipients of Horizon2020 funding versus others) (N=60)

	First Stage Researcher	Recognized Researcher	Established Researcher	Leading Researcher	Top H2020 Recipients	Other Research Institutions
% Receive Training	64	30	5	20	23	26
% Given Training	7	10	29	47	36	19
N	14	10	21	15	22	31



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It was stressed that for sustainable change, reproducibility must become an integral part of project design, job expectations, and university strategies, including reward structures. During focus group discussions, a strong message is that early career researchers need training, mentorship, and a cultural environment to provide practical support to make their research reproducible. Early career researchers themselves indicate that they lack support from senior faculty. Leaders of research institutions voice the same concern, that while younger researchers appear more receptive to reproducibility practices, seasoned academics often needed extra support to adapt. Very few institutions provide training on reproducibility, and the training that exists is usually offered on a voluntary basis, usually attracting those already interested, rather than upskilling all researchers.

Table 3. Percentage of interviewees that receive and give training on research practices that enhance reproducibility by region (N=60)

	North (Denmark, Finland, Ireland, Sweden, UK)	East (Hungary, Lithuania, Poland, Romania)	South (Croatia, Greece, Italy, Portugal, Spain)	West (Belgium, France, Germany, Netherlands)
% Receive Training	25	40	7	36
% Given Training	44	13	20	21
N	16	15	15	14



RESEARCH CULTURE

The cultural environment and the way research is assessed and researchers are promoted is frequently cited as a main barrier for reproducible research. The publish or perish culture in research, which is in part a result of career development structures in academia, is signalled as a barrier to reproducible research by a third of interviewees. It appears to be a more important barrier for male (45%) versus female (24%) researchers; is weightier as barrier in top recipients of Horizon 2020 funding (41%) compared to other research institutions (26%); and is relatively insignificant as barrier in western Europe compared to other regions (14% W vs 33% E, 40% S, 50% N).

For my institution, it is to publish the projects in the highest possible impact factor journals - that's it. They don't care about sharing the knowledge.
(Leading medical scientist, Croatia)

TRANSPARENCY AND OPENNESS PROMOTION

The policy audit found that support for organisations that aim to reform how research is assessed, was relatively high, with a majority of institutions assessed in each category signing onto one or both of the DORA (Declaration on Research Assessment) or CoARA (Coalition for Advancing Research Assessment) initiatives. However, this has not manifested itself in the promotion of transparency and openness practices that can help improve reproducibility. Once again, most transparency and openness infrastructure at major European universities in our sample was focused on data sharing. While some of this data sharing infrastructure was expanded to other areas, such as code and materials, they were a much smaller focus.



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The reproducibility checklist developed through the Delphi process provides a common foundation for developing local initiatives focused on improving research quality. Within institutions, it is feasible to build internal networks of researchers engaged with reproducibility issues. The OSIRIS network has successfully brought together around 80 researchers, including a significant proportion of early career researchers.

...there's a big expectation from you to really have results. If you don't have like 3 research papers per year, then you're not a good researcher. And in the meantime, you have to teach, you have to apply for new grants, you have to apply for industrial projects, and so on (Leading natural scientist, Hungary).

The list of reproducibility checks developed during the Delphi process may be useful for individual researchers and institutions. These checks offer a structured foundation for fostering more rigorous and transparent research practices.

POLICY RECOMMENDATIONS FOR RESEARCH INSTITUTIONS

- All higher education institutions should include guidelines and (mandatory) short trainings in their doctoral programs, as well as upskill senior researchers, on transparency and openness criteria, to break negative feedback loops that these practices do not matter and are not worth investing time in.
- All research institutions should dedicate resources and staff effort towards promoting, facilitating, and educating about reproducibility and open science. This can be achieved both through creating new dedicated staff roles but also by ensuring that staff profiles for existing relevant positions, such as research integrity officers, research managers, data stewards and data managers, include reproducibility-related skills and responsibilities.
- All research institutions should have a clear, publicly available open science or research policy that outlines institutional commitments, norms, expectations, and resourcing to promote more open, transparent, rigorous, and reproducible research through practices such as code, data and material sharing.
- Institutions should consider the goals of research assessment reform organisations like DORA and CoARA and, for those already committed to these efforts, conduct frank and open audits of how they are meeting these commitments. Conducting open and transparent research should also be seen as desirable for tenure and promotion within the university ecosystem.
- Top-down initiatives should be supplemented by bottom-up approaches, such as ambassador programs or reproducibility networks, which actively involve researchers in collaboratively fostering a culture of reproducible research practices.



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