



D.6.8
OSIRIS Policy Brief I.
Advancing Open Science

**Creating Trust in Open Science &
Reproducibility through Accessibility
and Transparency!**



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GLOSSARY

OA	Open Access
OS	Open Science
OSC	Open Science Communities
OSIRIS	Open Science to Increase Reproducibility in Science

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1. EXECUTIVE SUMMARY

The OSIRIS Policy Brief (PB) presents the significance of Open Science as a transformative force in the scientific community. It serves as an initial rallying call to policymakers, researchers, and institutions to embrace and fortify the pillars of Open Science, recognizing them not just as ideals but as imperatives for the continued progress and reliability of scientific research. As well as it is summarizing initial experiences of OSIRIS consortium from first year of the project.

1. In the rapidly evolving landscape of scientific research, [the principles of Open Science have emerged as catalysts for transformative change](#). Open Science plays in shaping the trajectory of scientific research, underscoring its impact on transparency, collaboration, and the very nature of knowledge dissemination.
2. Scientific discovery has long been the compass that guides humanity toward [understanding the complexities of our world](#). However, the traditional model of scientific research is undergoing a profound metamorphosis, and at the heart of this evolution lies the paradigm of Open Science.
3. [Open Science is not merely a departure from established norms; it is a redefinition of the scientific ethos itself](#). It goes over the boundaries of laboratories and academic institutions, inviting a broader community into the discourse of knowledge creation. At its core, Open Science is about tearing down the walls that have confined research to exclusive domains, advocating for an inclusive and transparent approach that empowers researchers, policymakers, and the public alike.
4. [The importance of Open Science cannot be overstated](#). It illuminates the path toward a future where the fruits of research are not confined to ivory towers but are accessible to all who seek to understand, challenge, and build upon them. In an era marked by global challenges, Open Science serves as a linchpin for tackling complex issues collaboratively. It propels scientific research beyond the confines of individual disciplines, fostering interdisciplinary collaboration that is essential for addressing the multifaceted challenges facing society.
5. When considering future of scientific research, [the transformative potential of Open Science](#) becomes evident. It redefines the relationship between researchers and the broader community, sparking a symbiotic exchange that enriches both. It promises a future where the pace of scientific discovery is accelerated, innovation is democratised, and the impact of research is felt far beyond the laboratory or academic institution.
6. [This policy brief serves as a roadmap for policymakers and stakeholders navigating the terrain of Open Science based on first twelve months of experiences gaining from OSIRIS project](#). It outlines key considerations and recommendations to fortify the foundations of Open Science, recognising it not only as an ideal, but as an imperative for the progress, credibility, and societal relevance of scientific research.

2. Definitions

Open Science¹

Open Science (OS) is the movement to make scientific research, data and their dissemination available to any member of an inquiring society, from professionals to citizens.

¹ OSIRIS Open Science definition is adjusted definition coming from "Understanding open science". [unesdoc.unesco.org](https://unesdoc.unesco.org/UNESCO.org). UNESCO.org. 2022. Retrieved 1 June 2023.



Paths to openness

Paths to Open Science focus on its value in improving research quality and transparency, the public ownership of science, data and resource sharing, and the policies to put in place to support the EU in this scientific revolution.

Open Access - Publishing Open Science

Replacing the current scientific publishing model is a major goal of OS. New organizations and not-for-profit research and educational institutions are experimenting and adopting the open access paradigm

Open data – Open Science Cloud

A key step in making science open and transparent is open access to research data, also known as open data. As research is more and more data-driven, progress in scientific knowledge becomes intimately tighten to data availability. Open data policy enables researchers to make use of existing knowledge in innovative, complementary ways.

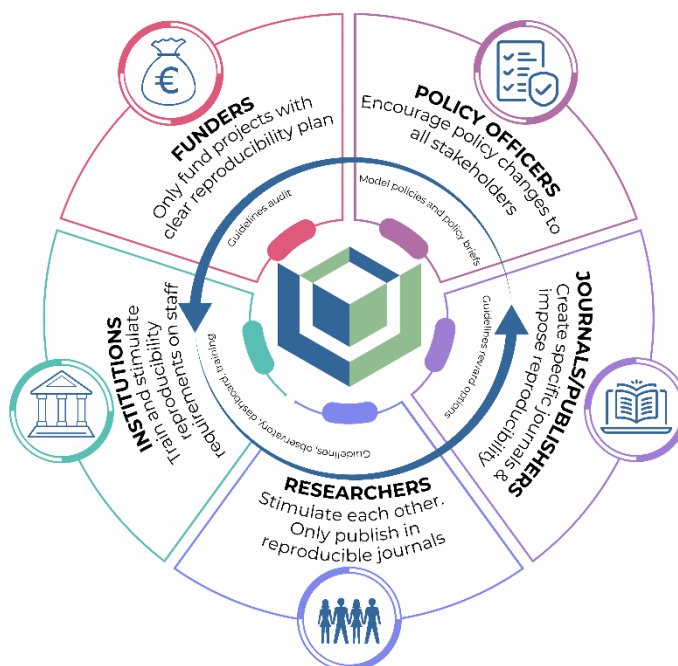


Figure 1. OSIRIS project and its main target stakeholders

3. Background

To understand the significance of Open Science and its contemporary relevance, it is imperative to look into the historical evolution and fundamental components that have shaped this paradigm shift in scientific inquiry.

Evolution of Open Science - Historical Context and Response to Contemporary Challenges

Historical Context

The roots of Open Science can be traced back to the Enlightenment era, where the ideals of openness, free inquiry, and the dissemination of knowledge gained prominence. Scholars of that era championed the notion that knowledge should not be confined to the privileged few but should be accessible to the broader public. Over the years, this ideal evolved in response to the changing landscape of scientific research, technology, and the societal demand for increased transparency.

Emergence as a Response to Contemporary Challenges

The contemporary scientific research is marked by unprecedented challenges and opportunities. Issues such as reproducibility crises, concerns about scientific rigour, and the growing complexity of research questions have prompted a re-evaluation of traditional scientific practices. Open Science, in its modern manifestation, has emerged as a response to these challenges, with the aim of addressing the limitations of closed and opaque research processes.

Today, Open Science stands as a progressive response to the dynamic nature of knowledge creation. It recognises that collaborative and transparent sharing of information is not only conducive to scientific progress, but is also essential to building public trust in the scientific enterprise.

Key Components - Overview of the Main Elements of Open Science

Open Access

At the core of Open Science is the principle of open access – the unrestricted availability and accessibility of research outputs. This includes not only scholarly articles, but also datasets, methodologies, and supplementary materials. Open access ensures that the fruits of scientific inquiry are not confined behind paywalls but are freely available for scrutiny, replication, and application.

Data Sharing

A fundamental tenet of Open Science is the sharing of research data. This involves making raw data openly available, allowing others to verify and build upon existing findings. Data sharing improves the transparency and reproducibility of research, fostering a culture of openness and collaboration.

Collaborative Practices

Open Science promotes collaborative approaches to research that transcend traditional disciplinary boundaries. Collaborative practices involve openly sharing ideas, methodologies, and findings, creating a dynamic ecosystem where diverse perspectives contribute to scientific progress. This collaborative ethos extends to both intra- and interdisciplinary collaboration, recognising that complex challenges often require multifaceted solutions.

In essence, the key components of Open Science collectively contribute to a scientific landscape that is transparent, accessible, and collaborative. As we explore the policies and recommendations in subsequent sections, it is vital to keep in mind that these components form the bedrock upon which Open Science stands, reshaping the way we approach, conduct, and disseminate scientific research.





4 . Rationale for Open Science

Understanding the rationale behind Open Science is essential to appreciate its transformative impact on scientific knowledge, innovation, and societal well-being. This section explores why Open Science is not merely an alternative approach but a necessary evolution in the scientific paradigm.

Transparency and Credibility - Enhancing the Scientific Path

Opening the Black Box of Research

One of the primary rationales for Open Science lies in its capacity to bring transparency to the scientific process. Openness ensures that the methodologies, data, and analyses that underpin research are laid bare for scrutiny. This transparency acts as a powerful check against questionable research practices, contributing to the overall credibility of scientific outcomes. By allowing others to evaluate and replicate findings, Open Science establishes a robust foundation upon which the scientific community can build with confidence.

Mitigating Reproducibility Concerns

In the age of scientific inquiry, concerns about the reproducibility of research findings have gained prominence. Open Science directly addresses these concerns by providing a platform for sharing raw data and detailed methodologies. This not only facilitates the verification of results but also enables researchers to identify potential pitfalls and refine experimental approaches, thereby enhancing the overall reliability of scientific knowledge.

Collaboration and Innovation - Fostering a Culture of Collective Progress

Breaking Down Silos

Open Science acts as a catalyst for collaboration, breaking down traditional disciplinary silos that have hindered the exchange of ideas and methodologies. Through open access to data, publications, and research processes, Open Science creates a collaborative ecosystem where researchers from diverse backgrounds can converge to tackle complex challenges. This collaborative ethos not only accelerates the pace of scientific discovery but also fosters an environment where innovation flourishes at the intersection of different fields.

Democratizing Innovation

By encouraging the sharing of research tools, methodologies, and insights, Open Science democratizes the innovation process. Innovations become collective assets that are accessible to a broader community of researchers and practitioners. This not only accelerates the translation of research into practical applications, but also ensures that the benefits of innovation are widely disseminated, contributing to societal progress.

Broader Societal Impact - Aligning Science with Societal Needs

Addressing Societal Challenges

Open Science transcends the laboratory to address real-world challenges. The openness and accessibility of research findings enable scientific knowledge to be applied more directly to societal issues. Whether it's in the realms of public health, environmental sustainability, or social justice, Open Science ensures that research is not confined to academic circles but actively contributes to addressing the multifaceted challenges faced by society.

Building Public Trust

In an era of increasing scepticism, Open Science is a powerful tool for building and maintaining public trust in the scientific enterprise. By making research processes and outcomes accessible, understandable, and verifiable, Open Science helps bridge the gap between the scientific community and the broader public, fostering a sense of



inclusivity and shared ownership of scientific knowledge.

In summary, the rationale for Open Science lies in its potential to revolutionize the scientific research. It goes beyond methodological considerations to embrace a cultural shift that emphasises transparency, collaboration, and societal impact. As we navigate the policy recommendations, it is essential to recognise that Open Science is not just a theoretical ideal but a practical imperative for advancing science and addressing the challenges of our time.



5. Challenges to Open Sciences

The journey towards Open Science, while promising transformative benefits, is not without its share of challenges. Recognising and addressing these challenges is essential for the successful implementation of Open Science principles. This section outlines key hurdles associated with the adoption of Open Science and proposes strategies to overcome them.

Data Privacy Concerns - Balancing Openness and Confidentiality

Striking the Right Balance

One of the central challenges to Open Science revolves around the delicate balance between openness and the protection of sensitive information. Researchers often handle data containing personally identifiable information or commercially sensitive details. Navigating the terrain of data privacy requires robust mechanisms to de-identify, anonymise, or secure such data without compromising the integrity of the research.

Legal and Ethical Frameworks

Addressing data privacy concerns requires the development and adherence to clear legal and ethical frameworks. Policymakers must collaborate with legal experts to establish guidelines that protect individuals' privacy rights while still facilitating the sharing of critical research data. This includes considerations for obtaining informed consent, defining data ownership, and establishing secure data storage and transmission protocols.

Incentive Structures - Realigning Recognition and Rewards

Publication Metrics and Quality

The existing incentive structures within academia often prioritise quantity over quality, creating a disincentive for researchers to fully embrace Open Science. Traditional publication metrics may not adequately reward practices such as data sharing, methodological transparency, or collaboration. A critical challenge is to realign these incentives to ensure that researchers are recognised and rewarded for the quality and openness of their contributions, rather than sheer volume.

Recognition for Open Practices

Creating a culture that values open practices requires not only changing formal reward structures, but also fostering a shift in the academic mindset. Encouraging academic institutions to consider researchers' contributions to Open Science in hiring, promotion, and funding decisions is crucial for building a community that values and actively participates in the open exchange of knowledge.

Technological and Infrastructural Barriers - Overcoming the Digital Divide

Access to Technology

Not all researchers and institutions have equal access to the technological resources required for effective implementation of Open Science practices. This is especially the case of some areas outside of European Union (specifically the Global South, particularly Southeast Asia, Latin and Central America and Africa), but even inside the European Union. Bridging the digital divide is essential to ensure that researchers, regardless of their geographical location or resource constraints, can actively participate in the Open Science movement.

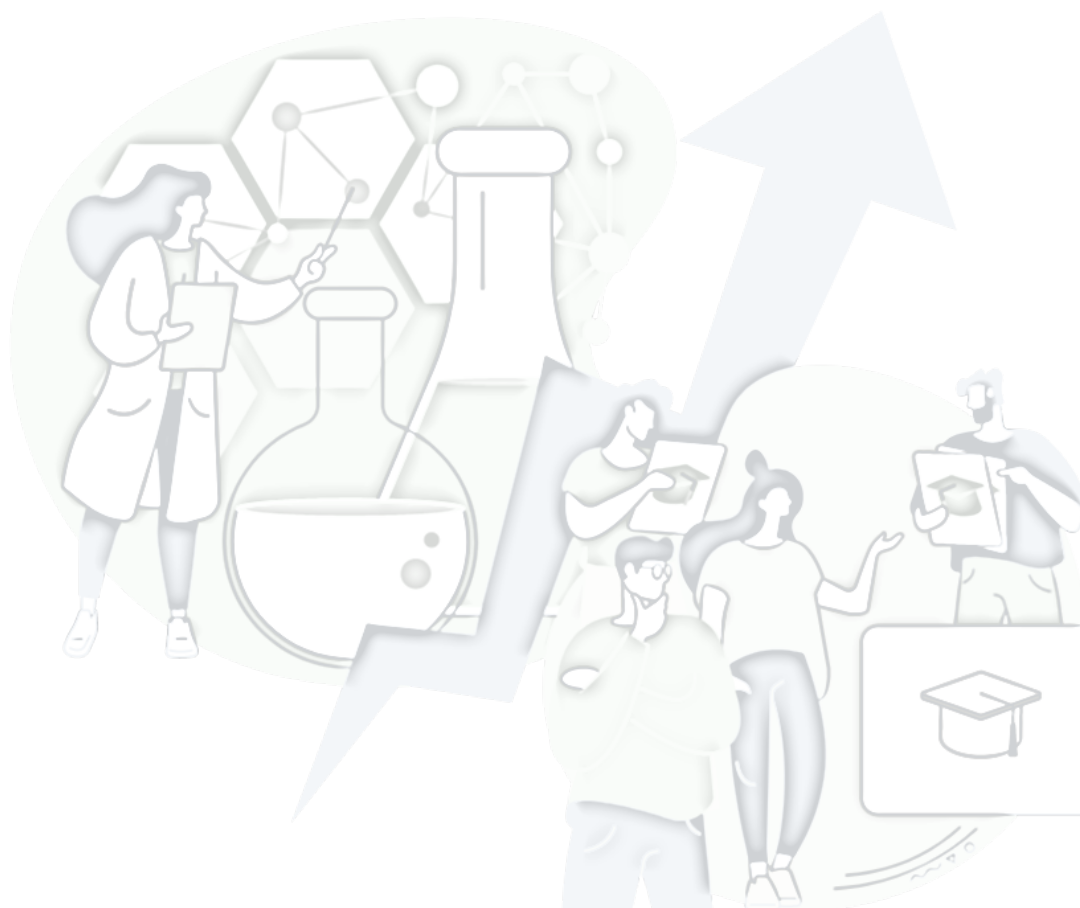
Standardisation and Compatibility

The absence of standardised practices and interoperability among research tools and platforms poses a significant technological challenge. Creating and promoting standards for data formats, metadata, and interoperability can improve the efficiency of data sharing and collaboration. Additionally, investments in developing user-friendly, open-source tools can empower researchers to overcome technological barriers.

In navigating these challenges, policymakers must adopt a nuanced approach, recognising that a one-size-fits-all solution may not be suitable. Collaborative efforts between policymakers, researchers, institutions, and



technology developers are essential to develop adaptive strategies that foster the ideals of Open Science while mitigating its associated challenges. By addressing these challenges head-on, the scientific community can pave the way for a more open, transparent, and collaborative research environment.



6. Policy recommendations

To transform the principles of Open Science into tangible realities, policymakers must enact strategic measures that address legislative, financial, technological, and educational dimensions. This section outlines concrete and actionable recommendations for policymakers to champion Open Science effectively.

Legislation and Funding - Nurturing Open Science through Policy Frameworks

Integration into Legislative Frameworks

Policy makers play a central role in shaping the research landscape. By incorporating Open Science principles into legislative frameworks, policymakers can mandate and incentivize practices that promote transparency, collaboration, and data sharing.

This includes:

- Establishing requirements for open access to publicly funded research outputs.
- Encouraging the use of open licenses for research publications and data.
- Recognising and rewarding researchers who actively engage in Open Science practices.

Alignment of Funding Priorities

Directing funding towards Open Science initiatives is critical for fostering a culture of openness and collaboration.

Policymakers should consider the following:

- Allocating funds specifically for projects that embrace Open Science principles.
- Supporting initiatives that develop and maintain open-access repositories.
- Encouraging funding agencies to require Open Science components in research proposals.
- Infrastructure Support: Building the Foundations for Openness

Technological Infrastructure

Investing in robust technological infrastructure is essential to facilitate the seamless implementation of Open Science.

- Policymakers can support the development and maintenance of open-access platforms and repositories.
- Invest in the creation of interoperable tools that facilitate data sharing and collaboration.
- Collaborate with technology developers to ensure that research tools align with Open Science standards.

Institutional Support via institutions play a crucial role in fostering a culture of Open Science.

Policymakers should consider:

- Encouraging universities and research institutions to adopt Open Science policies.
- Providing financial incentives for institutions that actively promote and implement Open Science practices.
- Collaborating with academic organisations to develop best-practices and guidelines for institutional support.

Capacity Building - Empowering Researchers for Open Science Engagement

Incorporating Open Science in Educational Curricula

Policymakers should advocate for the integration of Open Science principles into educational curricula at all levels.

This includes:

- Incorporating training on Open Science practices in undergraduate and graduate programs.
- Offering continuing education opportunities for researchers to enhance their Open Science skills.



- Collaborating with educational institutions to develop resources and training modules.

Establishing Training Programs

Creating targeted training programs can equip researchers with the skills needed to embrace Open Science.

Policy makers can:

- Allocate funds for the development of Open Science training programs and workshops.
- Collaborate with research organizations and professional societies to offer training opportunities.
- Encourage the inclusion of Open Science training as a requirement for research funding eligibility.

By adopting these policy recommendations, policymakers can actively contribute to the establishment of an Open Science ecosystem. The interplay between legislation, funding priorities, infrastructure development, and capacity building creates a holistic framework that empowers researchers, institutions, and the broader scientific community to embrace and advance the principles of Open Science.



7. Implementation strategies

Policy recommendations are the first step, but effective implementation strategies are crucial to translating these recommendations into tangible and lasting changes in the scientific landscape. This section outlines practical steps and strategies to bring Open Science policies to fruition.

Pilot Programs - Testing and Refining Open Science Practices

Designing Targeted Pilot Programs

Implementing Open Science practices on a large scale can be complex. Pilot programs offer a controlled environment to test and refine Open Science initiatives.

Policymakers should:

- Identify specific areas or research domains where pilot programs can be most effective.
- Collaborate with research institutions, funding agencies, and researchers to design pilot projects that align with Open Science goals.
- Establish metrics for success and lessons learned to inform the broader implementation.

Evaluating Impact and Success

Pilot programs should be accompanied by rigorous evaluation mechanisms.

Policymakers can:

- Establish evaluation criteria to measure the impact of Open Science practices.
- Solicit feedback from participating researchers to identify challenges and successes.
- Use the insights gained from pilot programs to refine and optimize policy recommendations.

Collaboration with Stakeholders - Building a Coalition for Open Science

Engaging Academic Institutions

Academic institutions are key stakeholders in the Open Science ecosystem.

Policymakers should:

- Foster partnerships with universities and research institutions to align policies with institutional goals.
- Encourage institutions to establish Open Science committees or units to oversee implementation.
- Offer incentives, such as grants or recognition, to institutions actively promoting Open Science practices.

Forging Partnerships with Publishers

Collaboration with publishers is essential for mainstreaming Open Science.

Policymakers can:

- Engage in dialogues with publishers to encourage the adoption of open access policies.
- Advocate for transparent publishing practices, including sharing data and methodologies.
- Explore partnerships with publishers to develop and support open-access platforms.

International Collaboration

Open Science is a global topic, and international collaboration is crucial.

Policymakers should:

- Establish collaborations with international bodies to align Open Science policies on a global scale.
- Participate in forums and initiatives that promote cross-border cooperation in Open Science.
- Share best practices and learn from international experiences to inform domestic policies.



Communication and Outreach - Building Awareness and Support

Communication Campaigns

Implementing Open Science requires a shift in culture and mindset.

Policymakers can:

- Launch communication campaigns to raise awareness about the benefits of Open Science.
- Using various channels, including social networks, conferences, and workshops, to distribute information.
- Highlight success stories and case studies to illustrate the positive impact of Open Science.

Training and Capacity Building

Building a community of practitioners is essential.

Policymakers should:

- Invest in training programs to enhance researchers' skills in Open Science practices.
- Collaborate with educational institutions and professional organizations to offer targeted workshops.
- Provide resources and support for researchers transitioning to Open Science.

By strategically implementing these strategies, policymakers can help bring forward a culture of Open Science, laying the groundwork for sustained openness, collaboration, and transparency in the scientific community.

The success of Open Science relies on the active engagement of stakeholders, thoughtful experimentation, and ongoing adaptation based on real-world experiences.



8. CONCLUSION

In the tapestry of scientific progress, **Open Science emerges not only as a paradigm shift but as an imperative for shaping the future of research and its societal impact.** As we navigate the intricacies of policy recommendations and implementation strategies, the urgency and importance of adopting Open Science practices become ever more apparent, resonating not only within academic circles but echoing throughout society.

Embracing Open Science for a Transformative Future

Urgency of Open Science

The challenges facing our world demand a scientific approach that is agile, transparent, and collaborative. Open Science, with its emphasis on openness, reproducibility, and shared knowledge, is the antidote to the hurdles that traditional scientific practices face. The urgency lies not only in addressing current scientific challenges but also in fostering a culture that is resilient and adaptive to the unpredictable demands of the future.

Benefits for Scientific Research

The potential benefits of embracing Open Science reverberate across the scientific world. Transparency in research processes improves the credibility of results, ensuring that scientific knowledge rests on a solid foundation. Collaboration, stimulated by the principles of openness, propels innovation and drives breakthroughs at the intersection of diverse fields. The integration of open access, data sharing, and collaborative practices not only accelerates the pace of discovery but ensures that knowledge is a collective asset, accessible to all who seek to build upon it.

Societal Impact

Beyond the area of laboratories and academic institutions, Open Science resonates with broader societal aspirations. It is a channel for addressing real-world challenges, from public health crises to environmental sustainability. Open Science aligns research more closely with societal needs, fostering a dynamic exchange between the scientific community and the public. In doing so, it not only builds public trust in science, but it also empowers individuals and communities to actively engage with and benefit from scientific advancements.

In this concluding part of our policy brief, the call to embrace Open Science is not just a directive to policymakers; it is an invitation to all stakeholders in the scientific world. It is a call to researchers, institutions, publishers, and the global community to collaborate, innovate, and contribute to a future where the gates of scientific knowledge are wide open.

The adoption of Open Science is not a mere adjustment to the status quo but a commitment to a new era of scientific world —one that is inclusive, transparent, and impactful. The potential benefits for scientific research and society are vast, and the time to act is now. Together, let us shape a future where the principles of Open Science are not just ideals but the very fabric of scientific progress and societal well-being.

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