Executive summary

This report covers publicly funded data for science, technology and innovation (STI). This includes both public-sector information (PSI)[1] used for research and innovation, and data produced by publicly funded research. It does not cover private-sector data – although they can be useful to science, because they raise policy issues of a different nature, such as the discussion of what data sets need to be shared due to public interest.

The benefits from enhanced access to publicly funded data for STI include: opportunity for new scientific discoveries; reproducibility of scientific results; facilitating cross-disciplinary co-operation; economic growth through better opportunities for innovation; increased resource efficiency; improved transparency and accountability regarding disbursement of public funds; better return on public investment; securing public support for research funding; and increasing public trust in research in general. Enhanced access also furthers other government/public missions, e.g. health, energy security and transportation. However, enhanced access also bears associated risks related to privacy, intellectual property, national security and the public interest, including the protection of rare and endangered species. These risks need to be adequately communicated and responsibly managed.

International initiatives are shaping national policy agendas promoting enhanced access to and data for STI. These initiatives include the OECD *Recommendation of the Council concerning Access to Research Data from Public Funding*; the OECD *Recommendation of the Council for Enhanced Access and More Effective Use of Public Sector Information*; the European Commission's *Recommendation on access to and preservation of scientific information*; and the *Directive on the Re-use of Public Sector Information*; the FAIR (Findable, Accessible, Interoperable and Reusable) principles; open-science cloud initiatives across the globe; the outputs of the Research Data Alliance; and the GO (Global Open) FAIR initiative.

National initiatives promoting enhanced access to data for STI are widespread and fall under the following categories: i) support for research infrastructure, including repositories and portals; ii) national policies and strategies promoting open access to data (often linked to broader open-science strategies or open-government initiatives); iii) creation of governance bodies to promote open access to data; and (iv) network and collaborative initiatives aiming to facilitate open access to data. These initiatives are sometimes driven from the top down, typically by a ministry or funding agency. They can also be driven from the bottom up, by individual institutions or consortia.

Although governmental policies and strategies often cite monitoring and evaluation of policy initiatives as a priority, few monitoring schemes have been implemented. The European Commission is showing a positive example by monitoring compliance with its Recommendation on access to and preservation of scientific information, as well as with its Open Research Data Pilot and Data Management Plan.

Overall, national policies promoting enhanced access to data are in the early phases of design and implementation. Scientific communities are not equally aware about the importance of access. Even so, the policy process has considerably enhanced stakeholder awareness of both the issue's importance and

[1] See Chapter 1 for definitions of research data and PSI.

potential benefits, and the measures undertaken to minimise and mitigate potential risks. A consensus-building process has gradually helped overcome cultural barriers to sharing. Adhering to international standards, and contributing to shaping those standards, is another achievement of those policies. In some cases, particularly where established physical repositories or portals are concerned, the impact can be quantified in terms of the volume of data stored and the extent of stakeholders' use of the data.

Nevertheless, challenges remain. Analytical work covered in this report has identified the following issues as requiring policy attention:

1. **Balancing the benefits and risks of data sharing**. "As open as possible, as closed as necessary" is complementary to the "open-by-default" principle advocated by the open-access movement. Opening data can provide benefits in advancing the STI agenda, but these need to be balanced against the issue of costs, privacy, security, intellectual property rights (IPRs) and preventing malevolent uses. A staged approach needs to be used to enhance access to data, including through sharing them within communities of certified users; adapting the degree of certification of users to the sensitivity of the data; and creating safe environments where certified users can access sensitive datasets in controlled environments.
2. **Technical standards and practices – keeping up with the pace of technological progress**. The FAIR principles all depend on the effective development and adoption of a common technical framework. The challenge is that technology development is now far outpacing standard-setting, creating regulatory gaps. Implementing the FAIR principles is an important initiative to close this policy gap.
3. **Defining responsibility and ownership**. IPR protection is a basic condition for incentivising innovation. However, advances in technology can provide opportunities for new methodologies, such as text and data mining (TDM). Copyright regulation which excludes temporary copies of text for the sole purpose of TDM can represent an impediment to research and innovation. In the case of public-private partnerships, policy objectives should be clearly defined to expressly allow or forbid private ownership over the data derived from publicly funded research.
4. **Incentives and rewards**. Recognition and rewards are needed to encourage researchers to share data. Current academic reward systems mostly encourage the publication of scientific results and do not sufficiently value data sharing. More remains to be done to raise researchers' awareness of open-government data and enhance the appeal of sharing access to data.
5. **Business models and funding** for enhanced data sharing. Costs are most often borne by data providers, while benefits accrue to users. Although shared access to data does not necessarily mean free data, in many research fields, data are expected to be provided free of charge at the point of use.
6. **Building human capital** and institutional capabilities to manage, create, curate and reuse data is a prerequisite for advancing data sharing.
7. **Exchange of sensitive data across borders**. Sensitive datasets can be shared on a more restricted basis with trusted and certified users. Significant barriers currently exist to providing such services across borders, owing to a lack of international legal frameworks ensuring similar levels of legal protection against misuse.

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