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Maturity Matrix for   
Research Data Infrastructures

TEMPLATE FROM THE SCIENCE EUROPE PRACTICAL GUIDE TO

SUSTAINABLE RESEARCH DATA

# How to use the maturity matrices?

This guidance is designed to support RPOs, RFOs, and RDIs in developing their agenda for research data to achieve sustainable data sharing and interoperable systems. It takes the form of three complementary maturity matrices to allow collaboration with other organisations.

The matrices present a framework and propose actions in six essential areas:

* Organisational engagement and commitment
* Policy environment
* Financial aspects
* Training
* Technical preparedness
* Communication and awareness raising

These areas were defined following discussions among the experts from the Science Europe’s WG DSSI, based on their experience and expertise, and extensive desk research. The areas were discussed and validated both by the WG DSSI and during a validation workshop with external experts.

## Goal-setting Depending on Strategic Priorities, Missions, Mandates and Needs

The matrices allow organisations to assess their own situation in relation to the six areas and to plan their next steps according to their organisational strategic priorities, mission, mandates, and needs. The matrices can also be used to compare actions, set collaborations, and/or seek and monitor alignment with other organisations. The interpretation and the application of the matrices may vary depending on internal organisational policies and needs, and/or on external factors ruling data management.

To assess its state of development towards sustainable research data, an organisation needs to consider its respective matrix as a whole. It should be seen as a guide for progressive development, starting with the first step for each area, ideally completing all actions proposed under one step before moving to the next one. It is, however, acknowledged that there will be cases of organisations that have reached higher progression steps without having completed all actions of the previous steps.

Organisations might find that they are more advanced in certain areas than in others. Depending on their organisational mission, strategic goals, and mandate, organisations will need to define which level they want to achieve in any given area. Not every organisation will have to reach the highest maturity level in all areas as certain actions may not be within the remit of their mission or mandate. Therefore, the potential next step needs to be defined for each area individually and in line with each organisation’s strategic goals.[[1]](#endnote-1) Some organisations may take on a driving role in a specific area, setting standards and leading policy developments, while others might have different priorities and could contribute to these efforts with expertise without having to take the lead. As the level of maturity advances, the level of collaboration with other RFOs, RPOs, RDIs, or other stakeholders will also increase.

## Definitions of progression steps in the matrices

The matrices present three progression steps for each of the six key areas:

* **Plans to develop:** The organisation has acknowledged the need to take action in a given area and is developing/has developed plans on how to proceed.
* **Development ongoing:** The organisation has done the groundwork in a given area to achieve the sustainability of research data, though more refinement is needed.
* **Developed on organisational level:** The respective area is addressed on a mature level within the organisation.

Organisations can identify which progression step they have reached in each area and which actions to undertake if they wish to progress on the journey towards sustainable research data. For many organisations, the step ‘Developed on organisational level’ will be the aspired final destination of their journey.

Organisations that have reached this step and wish to advance even further will find additional guidance under **Further advancement and alignment.** This part refers to organisational collaboration with (inter)national partners in order to align approaches and achieve a level playing field (at a national or an international level, with different disciplines).

## Definitions of the six areas in the matrices

The six areas in which each organisation should take action were defined along the following lines:

### Organisational engagement and commitment

* For all organisation types, this area refers to the organisation acknowledging the need to develop solutions for sustainable research data and being committed to seek alignment of approaches with other research stakeholders (such as RPOs, RFOs, RDIs, research communities).

### Policy environment

* For all organisation types, this refers to the organisation clarifying its objectives for data sustainability and interoperability and aiming at coherent policies for all types of organisations.
* For RFOs, this area will cover a range of issues related to RDM that reflect the way of working of the RFO, such as support for RDM infrastructure and/or training. The actual design of the organisational policy will depend on the mission of the RFO and the mandate it has in its national context.
* For RPOs, this area refers to principles and practices on RDM established by the RPO and to be followed by its researchers. The RPO will seek to provide the necessary support to its researchers.
* For RDIs, this area refers to principles and practices on RDM. These include services for researchers and take into account, where needed, disciplinary differences.

### Financial aspects

* For RFOs, this area relates to funding of and investment in RDM and RDIs.
* For RPOs, this area relates to access to funding for the RPO and how the funding is used to support data sharing and interoperability.
* For RDIs, this area refers to the development and implementation of business models for sustainable funding streams.

### Training

* For all organisation types: the common understanding of RDM, data sharing, and interoperability is considered a shared responsibility among all organisations. Training comprises both RDM training for researchers and for organisational staff.
* For RFOs, this area relates to the organisation’s contributions to building and maintaining skills and competencies for researchers, the organisations it supports, and their own staff involved in RDM.
* For RPOs, this area relates to training and competency enhancement for both researchers and RDM support staff.
* For RDIs, this area relates to training and competency enhancement of RDI staff, to support researchers in the RDM efforts, as well as training for the users of RDIs.

### Technical preparedness

* For RFOs, this area relates to investments in the development and implementation of technology to support RDM.
* For RPOs, this area relates to contributions to infrastructures, data hubs, interfaces, and information management issues that ensure interoperability.
* For RDIs, this area relates to professional technical support for data management, including metadata, storage, usage/accessibility, and APIs.

### Communication and awareness raising

* For RFOs, this area relates to stakeholder engagement and community development, especially with other RFOs, RPOs, and scientific communities.
* For RPOs, this area relates to both researcher engagement as well as engaging with the broader stakeholder community (such as scientific communities, other RPOs) to seek alignment of approaches.
* For RDIs, this area relates to engagement with researchers as users as well as with the researchers’ funding organisations and home institutions.

# Research Data Infrastructures (RDIs)

Maturity matrix for sustainable research data

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| --- | --- | --- | --- | --- |
| Maturity Level  Areas | Progression Steps | | | Further Advancement and Alignment |
| Plans to Develop | Development Ongoing | Developed on  Organisational Level |
| Organisational Engagement and Commitment | * RDI establishes links and collaborations and engages with RPOs/RFOs/other RDIs to develop the portfolio of services called for/needed. | * RDI has established links and collaborations with RPOs/RFOs/other RDIs (and government where applicable) and defines the services the RDI could provide. | * RDI starts to engage on RDM at an (inter)national level. * RDI provides a portfolio of services ready to be deployed as called for/needed by RPO/RFOs. | * RDI aligns on RDM at an (inter)national level through collaboration between RPOs, RFOs, RDIs, and research communities. * RDI provides co-ordinated procedures with other RDI to develop long-term sustainability and exit scenarios, for example through seamless exchange of data holdings. * RDI is connected to, and where applicable co-operating with, other relevant international RDM initiatives. |
| Policy Environment | * RDI has plans to develop policy for sustainable data management. Policies include measures to ensure FAIR data and continuity of data access and services. * RDI has started to collaborate with relevant actors (RFO, RPOs, RDIs) in policy development. | * RDI policy is developed in consultation with RFOs/RPOs where relevant. * RDI collaborates with relevant RDIs to improve the alignment of policies and technology. * RDI develops agreements with other RDIs for long-term continuity of data access and services. | * RDI has fully implemented policies. * RDI has signed MoUs or similar with RPOs where relevant. | * RDI has policies aligned with those of related RFOs/RPOs and other RDIs, as well as in a wider policy framework (such as EOSC). * RDI’s policies are an integrated part of the total (inter)national RDM policy environment. * RDI collaborates with research communities/ stakeholders with well-developed links for feedback to improve policies. |
| Financial Aspects | * RDI seeks partnering and collaboration with RFOs/RPOs/government to offer solutions for the sustainability of research outputs when relevant. * RDI has an understanding of costs and funding mechanism and has tested these assumptions. * RDI has initiated dialogue with relevant stakeholders for clarification of accountabilities. | * RDI has a regular funding stream, built from short-term projects and one-off funds. * RDI negotiates with potential partners/collaborators, RFOs, and RPOs on building critical mass funding. * RDI has started to develop a business model for long-term funding. * RDI’s risk assessment allows funding beyond the ‘event horizon’ of data loss and RDI identifies the timeframe of acceptable and unacceptable data risks. | * RDI has a sustainable short-term source of financing established. * RDI explores further business models for raising financial contributions. * RDI works to have complementary services to other relevant RDIs to make the RDI ecosystem financially robust. * RDI has plans for closure including a secure budget for data inventory transfer to other repositories if the funding stream fails. | * RDI has a sustainable source of both long- and short-term financing. * RDI has complementary services to other RDIs to ensure cost efficiency. * RDI is federated to EOSC or other relevant organisations to help improve access to funding. |
| Training | * RDI plans to establish links/co-operation with RFOs/RPOs and start discussions about the solutions the RFOs/RPOs need from the RDI. | * RDI establishes links and engaging/collaborating with RFOs and RPOs to understand support level and training needs. * RDI prepares a draft portfolio, including for example specialist, technical, and IT skills needed for FAIR data handling. * RDI takes measures to assure, in collaboration with RPOs, that the users of the RDI’s services can comply with the RDI’s demands for the quality of research data, methodologies, and processes. | * RDI has aligned to relevant RFOs and/or RPOs requirements and/or policy nationally. * RDI provides user guides and support information (helpdesk). * RDI offers easily accessible training courses. * RDI ensures sufficiently trained staff is available. | * RDI has training requirements aligned with international policies. * RDI provide a portfolio of solutions (such as training, documentation). * RDI offers specialist training activities (for example, on FAIR data, technical and IT skills, and financial and legal skills for data management services). |
| Technical Preparedness | * RDI explores technical solutions for alignment with RPOs, relevant scientific communities, collaborators and/or other RDIs. * RDI has relevant technology in place, but only on a low to medium level, and basic functionalities. * RDI acknowledges the need for user-/discipline-specific requirements on technology and services. * RDI plans to collaborate with other stakeholders/users to establish development priorities. | * RDI ensures alignment with technology developments supporting the wider use of scientific data. * RDI ensures findability and accessibility of datasets. * RDI has strategies to ensure that the technological solutions are maintained to relevant industry standards. * RDI has developed plans to implement interoperability standards and implementation has started. * RDI has established and/or is participating in a co-operative (inter)national RDI network. | * RDI considers support for FAIR data the norm. * RDI provides data management, networking, and storage services. * RDI has still some potential for further optimisation with respect to disciplinary metadata and standards. * RDI has an exit plan for ensuring sustainable access to research data (transfer to other repositories). * RDI has implemented technology using the highest quality standards, including frequent updates and further professionalisation perspectives. * RDI has a mid- to long-term strategic technological planning to ensure stable operability and service. | * RDI is an active member of national RDI network, exchanging experience on technology and aiming to ensure best practice for sustainability. * RDI participates in (inter)national consortia or organisations of computational centres where relevant. * RDI actively develops and applies modern, strategic technologies (AI, blockchain, and so on) for better data management and re-use possibilities, possibly in collaboration with other RDIs. * RDI provides co-ordinated procedures with other RDI to swap data holdings potentially seamlessly if necessary. * RDI provides targeted services (such as data curation, long-term preservation, data storage, computing facilities) to research groups or institutions. * RDI has complementary services to other RDIs. |
| Communication and Awareness Raising | * RDI starts to plan outreach to other stakeholders. * RDI starts to engage with the user communities. | * RDI develops a communications plan on which stakeholders they aim to reach and how. * RDI develops a communications plan to address user communities, RFOs, and RPOs. * RDI communicates available RDI services and access policies and requirements for the quality of research data, methodologies, and processes. | * RDI has a consolidated communications plan available to the user communities, RFOs, and RPOs. * RDI has identified the relevant stakeholders and defined communication channels with these stakeholders. | * RDI uses appropriate communications channels to present examples of successful use of research data (best practice examples). |

1. The strategic goals can refer to the timing of taking future actions as well as the decision of which progression step an organisation wants to reach. [↑](#endnote-ref-1)