European Commission

Specific Support to Malta

"Open Access: an opportunity for Malta"

Recommendations for the Development of a National Policy for Open Access to publications, research data and related issues

Horizon 2020 Policy Support Facility

Research and Innovation

Specific Support to Malta – "Open Access: an opportunity for Malta"
Recommendations for the Development of a National Policy for Open Access to publications, research data and related issues

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EUROPEAN COMMISSION

Specific Support to Malta

"Open Access: an opportunity for Malta"

Recommendations for the Development of a National Policy for Open Access to publications, research data and related issues

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2020 Directorate-General for Research and Innovation EN

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MESSAGE FROM THE CHAIR

In this report, we have as per the request of the Maltese authorities primarily focused on Open Access to publications and data. While these aspects are truly important, they only constitute part of the Open Science realm, which encompasses all aspects of the research cycle. Moreover, Open Science should not only be understood instrumentally as a way of opening up the research process. Rather, it should be embraced as a driver for innovation, integrity and inclusiveness and therefore be an integral part of research and innovation strategies: "Open Science is science for the twenty-first century."[1]

Malta is an innovative country with a twenty-first century approach to digitisation and economic development, e.g. as concerns blockchain technology. Access to research results lies at the very core of the innovation economy. However, Malta is not yet up to speed when it comes to practicing Open Science, which creates a discrepancy between two interrelated areas: research and innovation.

The implementation of our recommendations in this report will help Malta pave the way towards an Open Science environment and thereby create the necessary synergy between research and innovation. This synergy will enable Malta to harness the full potential of research and innovation, which will help accelerating the Maltese economy.

With the new European Commission looking into reforming the European Research Area and Horizon Europe taking shape, Malta is at a crossroads. If no actions towards facilitating the circulation of knowledge are taken, Malta will find itself lagging behind and out of sync with key European Open Science initiatives.

Mostly, however, we see a window of opportunity for Malta. With the existing Open Access and digital skills that are already in place institutionally and among individual researchers, we have experienced a readiness for further progress and for including more actors in a coordinated way. For Open Science to make a real difference it is vital to broaden the perception and scope of relevant actors in Malta. During our country visits, we have met a variety of institutions, which all bring important contributions to the national development of Open Science, although they may not be research performing organisations (RPOs) in the traditional sense. We think that our proposed governance model will facilitate their participation and engagement.

We have also noted that the peer review of the Maltese research and innovation system[2] emphasises as a key policy message that Malta needs to invest in "[…]

[1] Burgelman J-C et al. (2019): Open Science, Open Data, and Open Scholarship: European Policies to Make Science Fit for the Twenty-First Century. Front. Big Data 2:43. doi: 10.3389/fdata.2019.00043

[2] Peer Review - Maltese Research and Innovation System (2019), European Commission, https://rio.jrc.ec.europa.eu/en/policy-support-facility/peer-review-maltese-research-and-innovation-system

fundamental and application-oriented research;"[3] Our report strongly supports this message. Governmental funding is needed in order to develop those Open Science infrastructures and services that are essential to cater for the needs of twenty-first century research. We have provided recommendations and a roadmap that can bring Malta onto the right track, but real change will only happen when all stakeholders are willing to commit, invest and engage in the process. Now is the time to do so. Now is the time for Malta to exploit this great moment of opportunity in a united way.

Niels Stern on behalf of the expert group

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There are a number of people who have been very helpful and kind to us while we have been conducting this study. We are very grateful to all the support given to us by MCST. Director of the MCST secretariat Johann Caruana and his team have been very helpful arranging our interviews with Maltese stakeholders, ensuring excellent facilities for our meetings and workshops and very importantly providing us with valuable and constructive feedback on our draft recommendations. We want to thank MCST for all this effort and a special thanks to Dr. Richard Blundell for a continuous and very qualified dialogue. We also send our sincere thanks to all the Maltese stakeholders which spent their time giving us important insights during thorough interviews and those who took part in our high-level and expert workshops, fuelling us with important knowledge about Maltese specificities and providing us with constructive feedback on our draft recommendations. The supporting team at Technopolis Group, especially Anabelle Schatten, have helped us immensely throughout the study. Jean-Francois Dechamp from the European Commission's Open Science Unit in the Directorate-General for Research and Innovation provided valuable feedback and input. We sincerely thank you for all your support. A very special thank you goes to Petra Kennedy from the PSF Team in the European Commission's Directorate-General for Research and Innovation ('ERA and country intelligence' Unit). Without her skills and coordination, we would not have come this far.

Finally, we want to thank the PSF Team for assigning us with this exciting and meaningful task.

[3] Ibid p. 11.

EXECUTIVE SUMMARY

- Currently, the Maltese Research and Innovation (R&I) system is characterised by a rather conservative publication culture and a lack of structured data sharing. Improving the circulation of knowledge through the introduction of an Open Access and an Open Data policy will improve scientific research, as well as accelerating innovation and involving society, thus providing clear advantages for Malta as an outward looking island-based EU Member State.

- This expert group has therefore been tasked to develop recommendations for a Maltese policy for Open Access to scientific publications and Open/FAIR Data. In this context, researcher assessment, skills, training, awareness and support are also included in the report. For each section we develop a high-level ambition as well as outlining concrete recommendations on how this vision can be implemented.

- In the long term, given the global move towards openness by default, Malta needs to transform its scientific system to reflect this. However, we are conscious of the fact that such a transformation of the scientific system must be undertaken in a way that is appropriate for the local Maltese context and its framework conditions. We identified three such framework conditions that require special attention in order not to become barriers for the implementation of our recommendations: (i) awareness, (ii) commitment and (iii) funding.

- We therefore recommend a "phase-in" approach for Open Access to scientific publications and Open/FAIR Research Data under the principle of "as open as possible as closed as necessary", as well as related actions on awareness raising, skills and training, support and career assessment. We believe that such a "phase-in" approach strikes the right balance between an over-ambitious policy, which would not find local stakeholder support, and an unambitious policy, which would be uncontroversial but would not significantly improve the state of Open Access and Open Data in Malta.

- We provide a timeline with milestones for the implementation of the most important recommendations developed in this report, starting from the dissemination of the report and the launch of a national policy at the beginning of 2021, with full implementation by the end of 2025.

- As part of this time-lined "phase-in" roadmap we recommend that the following high-level ambitions be implemented:

  - We envisage that Malta transitions to immediate Open Access by 2025. In order to do so, we propose a variety of actions targeting Open Access publications, self-archiving and Open Access journals, which are described in Section 3.

  - For research data we envisage that Malta phases in the necessary infrastructure (technical, legal, cultural) for FAIR research data management under the principle of "as open as possible, as closed as

necessary" by 2025. Detailed recommendations on how to do so are contained in Section 4.

- We also envisage that by 2025 Malta adopts research assessment and evaluation practices, which reflect and adequately reward Open Science practices. Details on relevant initiatives are contained in Section 5.

- Furthermore, we envisage that by 2025 Malta systematically integrates Open Access in its PhD training and systematically builds up skills, competencies and training, as well as support mechanisms for research data management, including Open/FAIR Data. The launch of the policy should be accompanied by a broad awareness-raising campaign.

- As for governance, after an initial phase where a working group for information exchange is sufficient, we envisage Malta setting up a three-layered governance structure for policy implementation, consisting of a politically responsible steering committee, an executive committee for implementation, and expert groups (as needed). The representation of the key stakeholders in the governance structure is vital. We also recommend exploring regional cooperation possibilities on Open Access.

- Implementing Open Access, Open Data and related issues does involve costs and some level of additional public investment is necessary. As a first step, an economic model to estimate Open Access and Data funding in Malta is provided in Annex I.

KEY TERMS

Open Science (OS) is a comprehensive term spanning all parts of the research cycle, from idea creation to final publication (see FOSTER Open Science taxonomy). However, as per the PSF request of the Maltese authorities, we will focus on two key aspects, namely Open Access to scientific peer reviewed publications and Open/FAIR Research Data.

Open Access (OA) **to scientific peer reviewed publications** can be defined as the practice of providing online access to scientific information that is free of charge to the user and that is re-usable. Two main models for Open Access to publications have been developed:

Open Access publishing, also referred to as 'Gold' Open Access, means that an article is immediately provided in Open Access mode when published. In this model, the payment of publication costs is shifted away from readers (paying via subscriptions) to the author, often – but not always – through a one-off charge, a so called 'Article (sometimes 'Author') Processing Charge' (APCs). These are usually borne by the university or research institute to which the researcher is affiliated, or to the funding agency supporting the research. In other cases, the costs of Open Access publishing are covered by subsidies or other funding models; in these cases, no APCs arise. Such models are sometimes referred to as 'Diamond' or 'Platinum' OA.

Self-archiving, also referred to as 'Green' Open Access, means that a copy of the article published in a traditional subscription journal is archived (deposited) by the author – or a representative – in an online repository where it is made available openly, usually after a so-called embargo period, which is often requested by the publisher in order to protect the value of the journal subscriptions they sell.

Open Data vs FAIR Data: FAIR Data and Open Data, although similar and somewhat overlapping concepts, are different. Open Data is available for everyone to reuse but may not bring the full characteristics of FAIR: e.g. no consistent way of accessing it, may lack in machine readability and may be harder to be interpreted (no semantics). On the other hand, FAIR Data presents a well curated digital manifestation of the data, persistent and consistent in the way it is accessed, but may be (partially) closed, or may be free for particular types of use/reuse only (under the principle of "as open as possible, as closed as necessary").

Research data refers to resources which the researcher produces or uses during the research process. It is needed to validate the research and it is meritorious in research if it is published. A globally agreed set of aspirational norms for how to publish data covers the following six principles: 1. Open by default, 2. Timely and comprehensive, 3. Accessible and Usable, 4. Comparable and interoperable, 5. For Improved Governance and Citizen Engagement, 6. For Inclusive

Development and Innovation.[4] Even though Open Research Data (ORD) is the ultimate vision, both researchers and policy makers realise that this cannot always be achieved. The 2016 'FAIR Guiding Principles for scientific data management and stewardship' constitutes a globally accepted set of principles that provide guidelines to improve the **F**indability, **A**ccessibility, **I**nteroperability, and **R**euse of digital assets, as a primary ingredient in all Open Science activities. The principles emphasise machine-actionability (i.e. the capacity of computational systems to find, access, interoperate, and reuse data with no or minimal human intervention) because humans increasingly rely on computational support to deal with data as a result of the increase in volume, complexity, and creation speed of data.

A list of abbreviations is available at the end of the document.

[4] International Open Data Charter, https://opendatacharter.net/principles/

STRUCTURE OF THIS REPORT

To help the reader through this report we follow a rather simple structure. We open with an introduction of our overall methodology, which includes a description of the activities undertaken within the framework of this Policy Support Facility for Malta. Based on insights given in the background report to our study we outline the benefits of opening up research in Malta. This leads us to presenting our overall vision and goal for our recommendations and the most important framework conditions identified for our recommendations to become successfully implemented in Malta.

Following this introduction, we then turn to the specific subject areas for which we give our recommendations: 1) Open Access to publications, 2) Open Research Data and relevant infrastructure, 3) Assessment practises, 4) Awareness raising, skills, training and support, and 5) Governance and sustainability. Each section follows the same structure. First, we present the baseline for the subject area with a specific focus on Malta in a European context. We then describe a number of scenarios and give a list of recommendations for each subject area using a "phase-in" approach. The scenarios and recommendations for each phase build on each other as shown in the timeline presented in Section 2. In this way, we wish to make our recommendations as operational as possible, thus providing Malta with an actionable roadmap towards achieving a national policy for Open Access to publications and research data, as well as related issues. Further information, including an economic model, is provided in Annex I.

1 Background and methodology

To support countries in reforming their research and innovation systems, the European Commission's Directorate General for Research & Innovation has set up a 'Policy Support Facility' (PSF), which aims at "improving the design, implementation and evaluation of R&I policies". The PSF provides best practice, leading expertise and guidance to Member States (MS) and Associated Countries on a voluntary basis, through a broad range of services to address their specific needs.

One of the services provided by the Horizon 2020 PSF is "specific support" to countries, providing concrete operational recommendations on how to tackle specific R&I policy issues or reforms.

Malta has requested support in developing a tailor-made Open Access policy. The aim of this PSF Specific Support is to provide external advice and operational recommendations on defining the vision, goals and scope of the national Open Access policy, and on clarifying the requirements for its implementation. These include setting up the key infrastructure and its governance, including fair use of data.

The PSF specific support was carried out by four experts,[5] appointed by the Commission:

- Niels Stern (Chair, Denmark) is Head of License Management at the Royal Danish Library which includes responsibility for the national license negotiations in Denmark. Furthermore, he works as an independent expert for the European Commission on issues related to Open Science, e.g. evaluation of project applications and review of Horizon 2020 projects. Niels Stern has more than 15 years of experience in academic publishing. Since 2007, he has been involved in Open Access publishing, a subject that he has written articles and reports about, e.g. "A landscape study on Open Access and monographs" together with Dr. Frances Pinter and Eelco Ferwerda. Beginning his career in academic book publishing, he moved on to work as Head of Publishing at the Nordic Council of Ministers where he among other things developed and implemented an Open Access policy and repository. Niels Stern holds an MA in Literature and Nordic languages (Univ. of Copenhagen) and an MA in Communication (Goldsmiths College, Univ. of London).
- Daniel Spichtinger (Rapporteur, Austria) is an independent consultant working in the field of Open Access. From 2012-2018, he was a policy officer for Open Access to scientific peer reviewed publications and research data at the European Commission. In this capacity he contributed to the development of Open Access policies in Horizon 2020 and in the Member States.
- Robert Van der Vooren (Expert, the Netherlands) is one of the Netherlands' most experienced advisors in the field of Open Data and Research Data

[5] see also https://rio.jrc.ec.europa.eu/en/file/12816/download?token=Sg46RYJb

Management. Robert has a background in public administration (University of Twente) with a specialisation in healthcare. Since 2014, he has focused on universities' science policy. In 2014, he was the interim head of research and valorisation of the Dutch University Association (VSNU). During his appointment at the VSNU, he contributed to the Dutch science vision and coordinated the societal cost-benefit analyses of universities. In 2015, Robert started as the national project leader for Dutch universities in an ambitious plan to realise Open Access publications with a unique negotiations model. In two years' time, the number of Open Access publications in the Netherlands increased by roughly 20 %. During the Dutch Presidency of the European Union in 2016, Robert fulfilled a preparatory role in the Amsterdam Call for Action. Robert frequently visits foreign negotiators and directors for Open Access negotiations. For the Radboud University in Nijmegen, he has led a research data management project for two years. In 2018 he was named special advisor of the Working Group on Open Science 2.0 of the European Universities Association. More recently, Robert has worked on consultancy projects for EWI in Flanders, HEA in Ireland, Science Europe in Belgium, CESSDA in Norway and several higher education organisations in the Netherlands.

- Natalia Manola (Expert, Greece): has been the Managing Director of OpenAIRE (www.openaire.eu) since 2009, with an extensive knowledge and experience in Open Science policies, both in their design and implementation. In particular, OpenAIRE operates a 34-member network in all Europe, aligning Open Access policies among its members, providing a living platform for exchanging practices on policy design and specificities. In addition to OpenAIRE, Natalia Manola currently participates in the following high-level committees: National advisory committee for Open Science for the General Secretariat of Science and Technology in Greece (rapporteur); Open Science Policy Platform (OSPP), an EC High-Level Advisory Group to provide advice about the development and implementation of Open Science policy in Europe. She is currently appointed to the European Open Science Cloud Executive Board for the implementation of Open Science in Europe. Her experience on the legislative frameworks are related to OpenAIRE's legal studies and her participation in a H2020 project – FutureTDM (which aimed to develop policy and legal frameworks to reduce the barriers of TDM uptake in Europe).

The expert group for this Specific Support on the Development of a National Open Access policy in Malta have prepared their recommendations based on:

- *The background report prepared by Technopolis Consulting Group*

  The report summarises the relevant background on Open Access in Malta. It complements a recent background report and expert report about the Maltese research and innovation system. The background report is available on the PSF website and its key findings are referenced in Section 2.1., as well as throughout this report, where relevant.[6]

[6] See https://rio.jrc.ec.europa.eu/en/library/specific-support-malta-background-report

- *Stakeholder interviews performed during our first country visit*

  The expert group's first country visit took place from October 2 to October 4 and included visits to the key stakeholders in the Maltese R&I and scientific publication system, namely:

  - Tech MT
  - Malta Enterprise
  - MCST (different departments)
  - Malta Chamber of Science
  - University of Malta (different stakeholders, including the vice-rectorate, the library and individual scientists)
  - Malta Data Protection Office
  - National Library of Malta
  - MEDE (Scholarships)
  - MEAE (Funding)
  - National Archives.

  The interviews with these stakeholders were based on a semi-structured questionnaire, developed in advance.

- *Two workshops (high level and expert) held during our second country visit, including "pre-mortem" exercise*

  During our second visit to Malta the expert group undertook two workshops[7] to which the stakeholders interviewed during the first country visit were invited. The first workshop was held with high-level representatives from key institutions in Malta. During this workshop the experts presented draft recommendations and performed a so-called **pre-mortem exercise**. The pre-mortem technique[8] can be seen as a deep risk analysis which is played in a way that forces the participants to be more imaginative than usual. A pre-mortem – as opposed to a post-mortem – identifies and analyses the potential critical problems of a given project before it is too late. The core of the pre-mortem in this context was to imagine a situation one year after the Maltese national policy on Open Access has been launched. It is assumed that it turned out to be a disaster. Why did it become a disaster? That is the essence of the exercise.

  The first part of the exercise is to brainstorm all imaginable reasons for the failure. The point is to get as many explanations as possible, no matter their probability and without thinking about solutions. The institutions invited to

[7] see workshop programme, in annnex.

[8] Description of the pre-mortem technique by its inventor Dr. Gary Klein, in Harvard Business Review: https://hbr.org/2007/09/performing-a-project-premortem

the workshop were recommended to prepare their input in advance but were also given time during the workshop for preparing input. All the results of the brainstorm were written on a large screen for everyone to see.

The aggregated input from the high-level workshop fuelled the following expert workshop and generally helped in shaping the recommendations and the proposed roadmap and methodology for implementing them. From the pre-mortem the expert group learned that many issues related to funding, copyright, concepts of quality, industry interests and reproducibility, for example, concern the Maltese stakeholders. As such, the pre-mortem made it clear that implementing Open Access to publications and data in Malta is not an easy switch. It will take time and a lot of effort to align all actors and collectively move forward towards openness. The stakeholder feedback made it clear that a step-by-step approach is essential for the policy to gain acceptance.

- *Relevant initiatives and activities in similar countries and at the EU level:*

  Initiatives and activities related to Open Access to scientific publications, Open research data, FAIR data and research data management, as well as activities related to research assessment, skills, support, training and governance, are mentioned in the relevant chapters in the report. Additionally, we have taken into consideration national Open Science policy initiatives currently in development, most notably in Greece and Austria.

- *The PSF Peer Review on the Maltese Research and Innovation System*

  The aim of the Peer Review of Malta's R&I system[9] was to feed into the preparation of Malta's national strategy for R&D and innovation post-2020. It concluded that despite its publicly stated ambition and efforts undertaken during recent years, Malta has not yet fully embraced the need to evolve towards a knowledge-based society. There is a need to invest today in the creation of the foundations for this knowledge-based society. Reaching this ambitious goal calls for reforms in many important areas of society: education at all levels; fundamental and application-oriented research; innovation in all its forms; as well as effective structures at governmental level. The expert group considers the R&I Peer Review as providing the relevant background to its more specific recommendations.

- *The experts' collective expertise in the field of Open Access to scientific publications and research data.*

  The competences of the experts are described in the individual CVs referenced above.

[9] See https://rio.jrc.ec.europa.eu/en/policy-support-facility/peer-review-maltese-research-and-innovation-system

2 Why Open Access? Vision, scope, goals and timeline

2.1 Open Access and related issues in Malta: background

This chapter provides a brief summary of some of the key findings from the background report, which formed the initial basis for the work of the expert group. The reader is also referred to Section 2.4.1 for an analysis of how the specifics of Malta have influenced our choice of policy recommendations.

In Malta, the University of Malta (UM) is the only state-funded university offering doctoral and post-doctoral research positions and is the most prominent research performer in the higher education sector. The tertiary education sector is most importantly complemented by the Malta College of Arts, Science and Technology (MCAST), which provides vocational programmes at EQF levels (1-4), and professional higher education programmes at EQF levels (5-7). Malta does not have a dedicated national funding body for scientific publications.

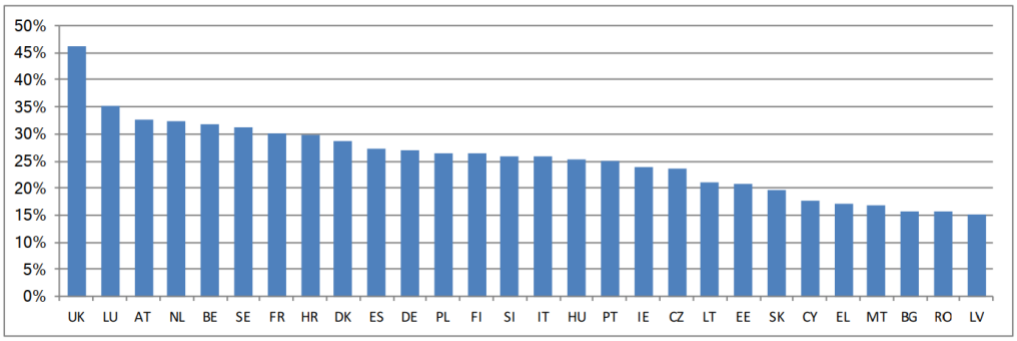
The Malta Council for Science and Technology (MCST) is an important actor as it advises the government on science and technology policy and manages the national R&I funding programme. It is now also responsible, among other things, for designing a national Open Access policy.

During the period 2013-2018, 620 publications can be identified as having Maltese authors, i.e. persons affiliated with Maltese institutions. The majority of these Maltese scientific publications (articles, reviews) originated from the University of Malta, followed by its medical branch, the Mater Dei Hospital. A significant proportion (26.4 %) of the publications were in medical journals, followed by the social sciences (10.6 %). The journals where Maltese authors mostly published were the following:

- Malta Medical Journal (University of Malta)
- Early Human Development (Elsevier)
- European Journal of Cancer (Elsevier)
- BMJ Case Reports (BMJ)
- PLOS One.

The figure below shows the share of Open Access publishing across the EU-28 Member States in 2016. Malta's share of 17 % was thus below the EU average of 20 %. There were seven EU MS with OA shares below the 20 % mark.

Figure 1: Shares of OA publishing in 2016 (EU Member States)



Source: MoRRI, 2017; Data: WoS, Calculation: CWTS

To support Open Access, in 2014, the UM Library implemented the first institutional repository (OAR@UM) on the Maltese Islands. It is an online platform that collects, preserves and disseminates via Open Access a variety of scholarly research, generated by UM academics and researchers.

In 2017, the UM implemented an Open Access policy which *recommends* that academics and researchers upload their research papers onto OAR@UM in Open Access. The UM Open Access policy encourages authors to take the Green OA path, but supports Gold OA publishing when funds for 'Article Processing Charges' are available. While authors are free to publish in journals of their own choice, the OAR@UM gives researchers an Open Access option for peer-reviewed publications. MCAST also has a repository for publications.

None of the key organisations who contribute to the production of research have concrete policies for, or around, research data. From a significant number of interviews, it was evident that that Open/FAIR Data and/or good research data management (RDM) is not the first priority when doing or delivering research or when interacting with third parties. Furthermore, there is significant lack of awareness on the topic, with researchers expressing a keen interest in using Open Data, but often not showing a corresponding willingness to share their own data.

2.2 The benefits of opening up research

Scientists, innovative business and societal actors need access to scientific results in order to generate new scientific knowledge, ensure its industrial uptake and retain societal support for research and innovation. These aspects are recognised in the European Commission's investment plan for Europe where it is stated that in order to "boost research and innovation, EU competitiveness would benefit from fewer barriers to knowledge transfer, Open Access to scientific research and greater mobility of researchers."[10]

[10] (Com 2014 903 final) p.16.

For science, opening access to the results of research aims to:

- increase impact – scientific articles that are available in the open are between 26 % and 64 % more cited on average (citation advantage)[11]
- combat scientific fraud through increased reproducibility
- promote re-use through increased accessibility of results
- boost collaboration
- speed up the research process,
- make the assessment of research more transparent,
- promote public access to scientific results.[12]

But is this really the case? The comprehensive literature review by McKieran et al. (2016)[13] finds strong evidence that openly sharing articles, code, and data is beneficial for researchers:

> *Each year, more studies are published showing the open citation advantage; more funders announce policies encouraging, mandating, or specifically financing open research; and more employers are recognizing open practices in academic evaluations. In addition, a growing number of tools are making the process of sharing research outputs easier, faster, and more cost-effective.*[14]

Going beyond the scientific system, when research is open, research outputs, data, methods and infrastructures can be used more widely, and the effectiveness and mobility of research-based knowledge is increased. This in turn promotes the societal knowledge base and the creation of innovation. By facilitating equal access to research-based knowledge, openness thus ultimately increases equality in the research community and society at large. For instance, Moorhead et al.

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[11] Swan, Alma (2010) The Open Access citation advantage: Studies and results to date s.n. https://eprints.soton.ac.uk/268516/
Piowar et al. (2018) The state of OA: a large-scale analysis of the prevalence and impact of Open Access articles. Peer J. https://peerj.com/articles/4375/?utm_source=TrendMD&utm_campaign=PeerJ_TrendMD_0&utm_medium=TrendMD

[12] See OSPP-REC p.4, https://ec.europa.eu/research/openscience/pdf/integrated_advice_ospp_recommendations.pdf

[13] https://elifesciences.org/articles/16800

[14] Although policy initiatives remain vital in supporting this shift. See https://blogs.lse.ac.uk/impactofsocialsciences/2020/01/17/not-yet-the-default-setting-in-2020-open-research-remains-a-work-in-progress/

(2015) have shown that health NGO staff utilise more research if this is research is available as Open Access.

The following list summarises the benefits of Open Research Data (ORD), specifically:[15]

- **Research & Innovation:** ORD improves the integrity of the scientific and scholarly record. An instrument for breaking down information gaps across disciplines, countries and industries, bringing collaboration and allowing researchers to build on the work of others. Use of open-data analytics (often combined with proprietary data) helps uncover hidden knowledge, allowing improvements of new products and processes.

- **Economic**: ORD brings efficiency in the form of access cost savings, labour cost savings (or productivity improvements), reduced transaction costs. Enablement comes in the form of new products, services, companies and collaborations.[16]

- **Societal**: ORD provides transparency and accessibility to scientific information and processes, often used in policy making for everyday lives and fact checking. Moreover, Open Data enhances collaboration, participation and social innovation.

- **Education:** ORD significantly facilitates and promotes the education of new generations of scientists and scholars, with data intensiveness in the centre of the new digital skilled societies.

- **Governance**: ORD supports improved, evidence-based decision making and transparency in government and society.

[15] CODATA, & Uhlir, P. (2015, November 16). The Value of Open Data Sharing: A CODATA Report for the Group on Earth Observations. Zenodo. http://doi.org/10.5281/zenodo.33830

[16] Michael J. Fell, The Economic Impacts of Open Science: A Rapid Evidence Assessment, https://doi.org/10.3390/publications7030046

Such benefits can be specifically broken down for the Maltese context, as depicted in Table 1:

Table 1: Benefits of Open Science for Malta

Benefit category	Impact	Comment
Improving scientific research – contributing to excellence	Increased reproducibility of research, avoiding unnecessary duplication, resulting in better use of limited resources Increasing number of citations for MT researchers publishing in OA	Resources for R&D in Malta – in particular basic research – are currently scarce (see results of the PSF Peer Review of the Maltese Research and Innovation System). Sharing of results is thus beneficial for Maltese researchers and a win-win situation, since Maltese researchers also have access to international resources which are available Open Access. According to CWTS, Malta is below EU average as regards the top 10 % of highly cited publications.[17]
Accelerate innovation – contributing to the economy	Increased uptake of scientific information by MT companies, in particular SMEs	While some industry-academia collaboration exists, Open Science makes it easier for MT companies to reuse information from academia but needs flanking by supporting measures.
Involve society – contribute to citizen well-being	Increased availability of scientific information for societal use	This could be useful, e.g. for information on MT historical heritage, culture and traditions, as well as for evidence-based policy making. However, this may need to be coupled with actions to improve scientific literacy.

[17] Peer Review of the Maltese Research and Innovation system, p.28

In several aspects our report goes beyond Open Access to scientific publications and Open/FAIR Data in addressing related Open Science issues which are pivotal for successfully implementing Open Access to publications and Open Research Data, namely (a) how researchers are assessed, (b) the necessary awareness, skills, training and support, and (c) the governance of the policy.[18]

2.3 What Open Access is not: plagiarism, predatory publishing and relations to Intellectual Property Protection

After defining what Open Access and Open Data are and what they are good for (see above and Section on Key Terms), it is also important to define what they are not. Most notably, in discussions with stakeholders (*inter alia* during the study visits to Malta) the following two issues often arise:

i) Quality – it is important to stress that Open Access publications are expected to go through **the same level of scientific scrutiny, that is a robust peer-review** process, as subscription-based publications. This is the case with both green and gold Open Access processes, if they are correctly implemented. In both subscription-based and Open Access publications proper credit must always be given to the original authors. If such credit is not provided, this is often a case of plagiarism.[19]

Proper peer-review is also important to distinguish real high-quality journals from 'fake' journals, which are referred to as predatory journals (or publishers). Predatory publishing is exploitative in that it involves charging publication fees to authors without providing the editorial and publishing services associated with legitimate journals (Open Access or not).[20] The idea that such journals/publishers are 'predatory' is based on the view that academics are tricked into publishing with them.

ii) Relations with intellectual property – feedback suggests that there is still considerable confusion over the relationship between Open Science and intellectual property protection.[21] As the graphic below illustrates, it is up to researchers to decide what to do with their results. If researchers decide for commercialisation, e.g. through IP protection, then no publication (either Open Access or otherwise) is made, at least before a patent is applied for. In other

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[18] For instance, Prof. Finance and Prof. Rentier state in their introduction to the 2019 EUA research assessment survey that ""no matter how hard advocates strive, Open Science will never be achieved unless accompanied by a change in the way researchers are evaluated." (EUA 2019: Research Assessment in the Transition to Open Science. https://eua.eu/downloads/publications/research%20assessment%20in%20the%20transition%20to%20open%20science.pdf

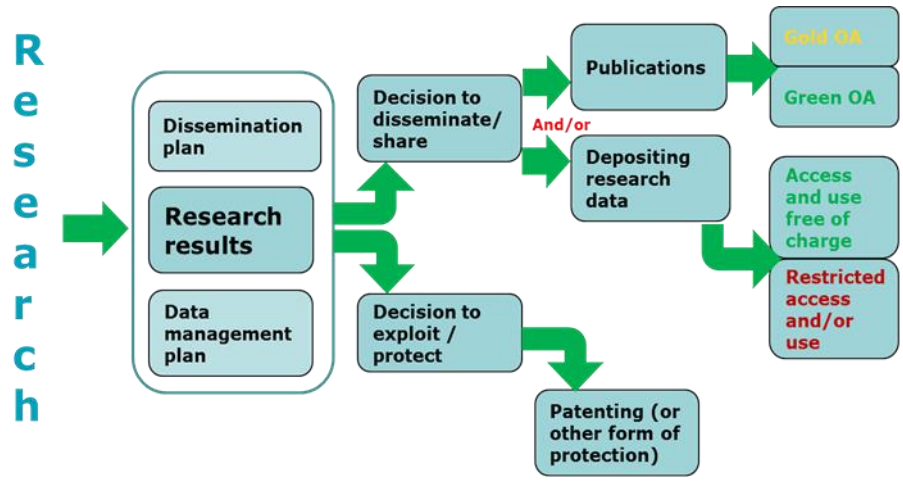
[19] See e.g. Masic (2012) Plagiarism in Scientific Publishing https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3558294/

[20] See University of Pretoria library website: https://up-za.libguides.com/c.php?g=834649

[21] There are many types of intellectual property, the most well-known types being copyrights, patents, trademarks, and trade secrets.

words, it is only after the decision whether to protect or to disseminate is made that Open Access to publications and data comes into play (see figure below).

Figure 2: OA/ORD and IP



Source: European Commission / IP helpdesk

2.4 *Vision, goals, framework conditions and timeline for an Open Access Policy for Malta*

Through the so-called "3Os" – open innovation, Open Science and open to the world – the European Commission has accelerated and supported the concept of openness for research and innovation in Europe. Building on the EC Recommendations on Access to and Preservation of Scientific Information (2012, revised 2018)[22] and the Council Conclusion on the transition towards an Open Science system (2016)[23], an increasing number of EU Member States have developed national policies and action plans supporting Open Science, although not all have achieved this so far.

As a helping hand to align with the European vision, the Open Science Policy Platform (made up by stakeholders from all over the EU)[24] has formulated a number of useful recommendations in several thematic areas of Open Science. As a concrete tool for the realisation of the vision, the European Open Science Cloud (EOSC) is currently being developed and implemented, as recently noted by the new president of the European Commission, Ursula van der Leyen, at a keynote speech in Davos.[25]

[22]https://ec.europa.eu/digital-single-market/en/news/recommendation-access-and-preservation-scientific-information

[23] https://data.consilium.europa.eu/doc/document/ST-9526-2016-INIT/en/pdf

[24] See https://ec.europa.eu/research/openscience/index.cfm?pg=open-science-policy-platform

[25] https://www.eosc-portal.eu/news/ec-president-ursula-von-der-leyen-talks-eosc-davos

In Malta, the overall number of scientific publications has been increasing but the percentage of Open Access is among the lowest in the European Union (see Section 2.1.). There is no dedicated infrastructure for (open) research data, and only some activities relating to skills and training, while research assessment is undertaken on a traditional basis.

2.4.1 Vision for an Open Access Policy for Malta

Box 1: Our vision for openness of research in Malta

In the long term, we envisage a global scientific system where openness is the default and in which Malta participates on an equal footing.

We are conscious of the fact that such a transformation of the scientific system must be undertaken in a way that is appropriate for the local Maltese context and its framework conditions (see Section 2.4.2.), which is why we recommend a "phase-in" approach for Open Access to scientific publications, Open/FAIR Research Data under the principle of "as open as possible, as closed as necessary", and related actions on awareness raising, skills and training, support and career assessment. We envisage this transition to be complete by the end of 2025.

For each of our thematic recommendations we define concrete "phases", which we define as a) having specific time durations which are agreed upon in advance, and b) include a consultation and a co-creation phase, both being necessary to engage all interested parties so as to shift the research culture to more openness (see Section 7 on governance).

This process will align Malta with European initiatives and allow the country to harness their potential, as well as future proofing, as far as possible, Maltese policy with regard to the upcoming Horizon Europe framework programme.[26]

2.4.2 Relation to the specific framework conditions for Open Access in Malta: why a "phase-in" approach?

Our vision, including our proposal for a "phase-in" approach, is grounded in the specificities of Malta as we understand them from the background report and the two country visits. During the first country visit, when we conducted bilateral interviews it became apparent that the Maltese publication system is traditional; for many institutions Open Access and Open Data are not high on the list of priorities; concerns are voiced as regards the career opportunities for young researchers and the costs involved; the issue of IP is sometimes raised. There is also a lack of structured data sharing and a lack of a data sharing culture in the private sector. This contrasts with an electoral mandate to introduce a national Open Access policy.

[26] While Horizon Europe is at the time of writing not yet fully developed, it is already clear that Open Science will be the „modus operandi" of the new framework programme, building on the provisions of Horizon 2020.

These findings were further complemented by the workshop held during the second country visit, which helped us to test and further substantiate our recommendations. As described in the methodology Section, we conducted a pre-mortem exercise. The feedback from this exercise addressed issues related to funding, copyright, concepts of quality, industry interests and reproducibility concerning the Maltese stakeholders. As such, the pre-mortem made it clear that implementing Open Access to publications and data in Malta will not be easy. It will take time and a significant effort to align all actors and collectively move forward towards openness.

We believe that the "phase-in" approach strikes the right balance between an over-ambitious policy, which would not find local stakeholder support, and an unambitious policy, which would be uncontroversial but would not significantly improve the state of Open Access and Open Data in Malta. Furthermore, due to the diversified nature of the Maltese stakeholders' interest in and knowledge about Open Access issues, the "phase-in" approach has to be supported by a strong governance structure that will ensure a well-coordinated effort based on inclusiveness, trust and commitment.

As a further outcome of the pre-mortem exercise we categorised the input from the brainstorm phase into distinct categories of framework conditions that require special attention in order not to become barriers for the implementation of our recommendations: (i) awareness, (ii) commitment and (iii) funding. These framework conditions also build on each other: only if there is awareness of the importance of Open Access will there be commitment and only if there is commitment will sufficient funding be made available.

In the following, we discuss these framework conditions in more detail.

a) Awareness

Awareness raising of the benefits and challenges of Open Science among all relevant stakeholders (academia, citizens, politicians, industry) in Malta is necessary to ensure understanding, support, and commitment to a national Open Access policy. It is important to succinctly present the arguments for such a policy and to create customised narratives for the different stakeholders, which should be communicated not only at specific Open Access events but also at general events attended by the scientific community, the business community and the public (e.g. researchers' night or nuit blanche).

This requires an overarching organisation responsible for awareness raising, which should be followed up by actions at sectorial levels. Structure and coordination for all communication activities are essential and, to ensure this, it is recommended to place the strategic responsibility and operational coordination for awareness raising at MCST because this actor is already associated with research policy in Malta.

b) Commitment

Without the involvement of key stakeholders, the Open Access policy will not be successful. A regular dialogue between those stakeholder groups must be ensured, keeping under consideration their communalities but also their intrinsic differences. This dialogue – which relates to the awareness raising described above – should be based on a coherent strategy and operationalised through narratives that explain for each stakeholder group what they gain from the policy. Commitment is likely to arise only if actors see how such a policy is beneficial for the community.

It is recommended that MCST ensures ongoing conversations with all relevant actors as to maximise the level of commitment. This is a very specific task that needs to be planned for (including HR resources for a position as community manager or equivalent). This task is also needed to identify actors that are not among the 'usual suspects', i.e. all those who are currently not aware of Open Access issues or who have no interest in them (mentioned during the expert workshop as the "voiceless"). Although incentivising them to become involved is a demanding task, there is a significant risk that without such bottom-up support the policy will ultimately not be successful.

c) Funding

Implementing Open Science does involve costs[27] and some level of public investment is necessary; this need for investment is also addressed in the recent Peer Review of the Maltese Research and Innovation system:

"IV.1 As a small and open economy, Malta relies on competing in the global marketplace for exports, investment, talent, innovation and even research. Hence it is crucial that Malta further reinforces international, multilateral and bilateral collaboration as a key element of its research and innovation strategy. Malta has already gained many benefits from Horizon 2020 (H2020) and defined priorities for participating in EU-level networks. Investing more in R&D and reinforcing its national R&I system is the first step to further enhance this participation and meet its goals in the European Research Area (ERA) roadmap."[28] (Peer Review – Maltese Research and Innovation System, European Commission (2019), p.15).

Without proper investment and readiness by stakeholders to take on some additional costs that will be attached to the implementation of the Open Access policy, there is great risk that the policy will be very difficult – if not impossible – to implement.

It is therefore recommended that a sustainable funding structure is implemented alongside the Open Access policy. This necessitates identifying through which

[27] e.g. for data infrastructures, OA publication costs etc, as described in more detail in the thematic chapters below.

[28] Peer Review – Maltese Research and Innovation System, European Commission, 2019

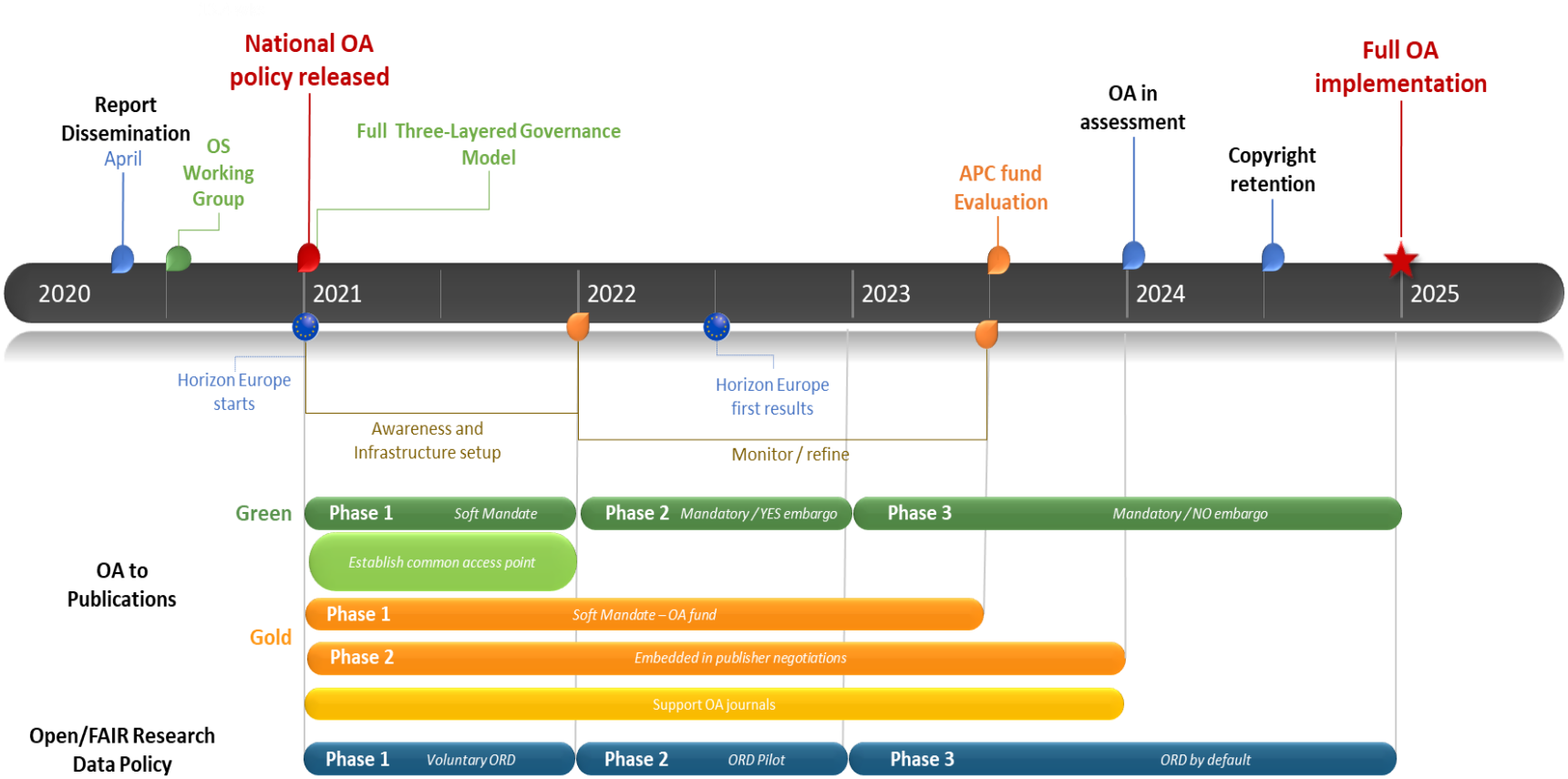
agencies(s) and funding streams the financial resources will be provided. The choice of organisation(s) will have to be based on efficiency and administrative cost-effectiveness. An economic model to estimate Open Access and Data funding in Malta is provided in Annex I.

2.4.3 "Phase-in" approach timeline

Another reason for suggesting a "phase-in" approach for the implementation of Open Access in Malta derives from basic principles of good project management. Time planning with milestones is a key component of project management. The timeline below is a way of setting such milestones and thereby helping Malta to prioritise. The expert group believes that this approach will make the end goal more realistic because progression can be tracked during the implementation process and because each phase can build upon the previous one. Each phase and the relations between the phases have been carefully designed to make the end goal achievable.

For our planning we presume the launch of a national policy in the beginning of 2021, with full implementation by the end of 2025. The timeline visualisation covers the main elements of the recommendations that we describe in more details during the remainder of this report (not all details may be visualised).

Figure 3: "Phase-in" timeline for roadmap



3 Open Access to publications

High-level ambition: In line with our vision (introduced in Section 2) and the practice of other funders, we aim for Malta to phase in immediate Open Access by 2025. In order to do so we propose a variety of actions targeting Open Access publication, self-archiving and Open Access journals.

3.1 Baseline

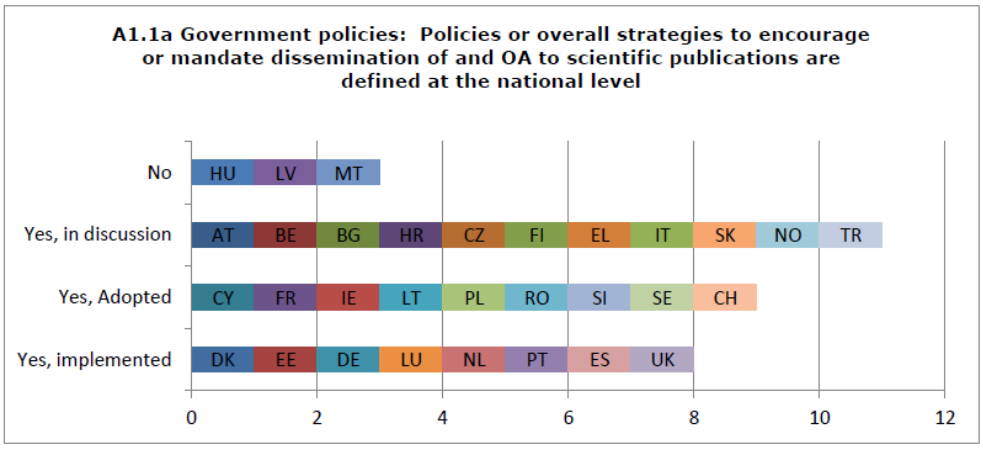
In recent years **many academic institutions and governments worldwide have supported a shift to Open Access** since the traditional subscription-based system forces taxpayers to pay for research twice: once to generate scientific knowledge (through universities and research institutes funded with public money) and the second time to access this knowledge through subscription-based journals.[29] To protest the rising costs of subscriptions, several universities have cancelled agreements with commercial publishing conglomerates; one notable recent example being the announcement of the University of California not to renew its subscriptions with Elsevier in early 2019.[30]

Within the European Union and associated countries, those countries participating in the Commission expert group on National Points of Reference on Scientific Information (E03477) report overwhelmingly that policies have been adopted and/or implemented or are under discussion regarding Open Access to publications (see Figure 4).

[29] According to Johnson et. al (2017) the value of the Scientific Publishing Market is in the range of USD 10 billion, with significant profit margins for individual publishing houses and vendors. See Johnson R, et al. Towards a Competitive and Sustainable OA Market in Europe – A Study of the Open Access Market and Policy Environment. Research Consulting/OpenAIRE. 2017. https://explore.openaire.eu/search/publication?articleId=dedup_wf_001::b6bca11290dd66de0eb839d67f93a926

[30] https://osc.universityofcalifornia.edu/open-access-at-uc/publisher-negotiations/uc-and-elsevier

Figure 4: OA government policies

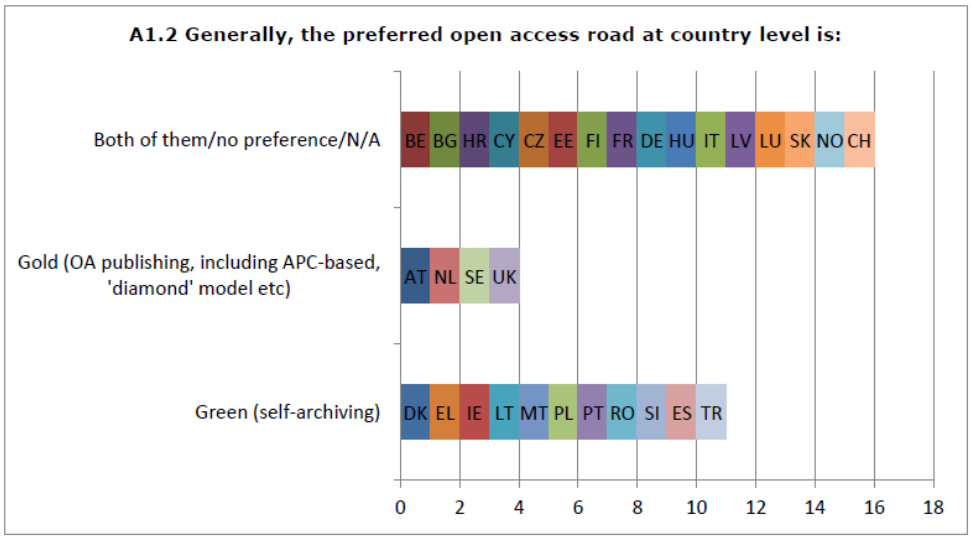


Source: European Commission (2018) Access to and Preservation of Scientific Information in Europe. Report on the implementation of Commission Recommendation C(2012) 4890 final.

To give one example, in Cyprus the national policy regarding OA to scientific information was adopted in February 2016. It was communicated to all interested parties and was expected to take immediate effect and be implemented through a series of specified measures.

As to the question on preferred routes towards Open Access, the 2018 report on the Implementation of the Recommendation on Access to and Preservation of Scientific Information ("NPR report") found that for half of the countries Open Access publishing and self-archiving were reported as equally preferred paths in their policies; in one third of cases, policies require deposit in a repository, while four countries reported preferring Open Access publishing as part of their policy (see figure below).

Figure 5: Preferred OA road at country level



Source: European Commission (2018) Access to and Preservation of Scientific Information in Europe. Report on the implementation of Commission Recommendation C(2012) 4890 final.

At *funder level,* one third of countries reported that public funding organisations have no Open Access policies, and another third that some of their funders do have an Open Access policy. At institutional level, only two countries reported that all institutions have Open Access policies to publications, while most countries reported that some of them do.

On the systemic level, one recent initiative to make the change to an Open Access system is **Plan S,** which was launched in 2018 by major national research agencies and funders which have come together in a consortium called "cOAlition S". The umbrella organisation Science Europe coordinates the initiative. The plan is structured around 10 principles. The key principle states that by 2021, research funded by public or private grants must be published in Open Access journals or platforms or made immediately available in Open Access repositories without an embargo.[31]

As regards the situation in Malta, the background report (see also summary in Section 2) describes in detail that, while the overall number of scientific publications in Malta has been increasing, the number of Open Access publications remains fairly low, only 17 %, which ranks Malta as the fourth lowest in the EU. Only Bulgaria, Romania and Latvia have lower Open Access percentages. The amount of Green OA is higher than Gold OA, which has seen an increase in recent years, however (see background report).

[31] https://www.coalition-s.org/. Hybrid Open Access is only allowed as part of transitional agreements.

The UM Library implemented its Institutional Repository – OAR@UM in 2014.[32] Most content on the repository is either peer-reviewed research articles or electronic theses and dissertations. However, only theses and dissertations with a distinction grade are Open Access. The UM policy recommends (but does not mandate) that academics and researchers upload their research papers into OAR@UM. Embargo periods follow the prescriptions of the relevant scientific publisher. Furthermore, there are currently 73 full-text Maltese journals available in Open Access on the repository. However, only two OA journals are indexed in DOAJ. MCAST also has a repository for publications.

3.2 Scenarios and Recommendations

Both self-archiving (Green OA) and Open Access publishing (Gold OA) have an important role to play in the Open Access ecosystem, each with its own distinct advantages and disadvantages.[33] This is why we propose to strengthen both Green and Gold Open Access in Malta through the principles of the "phase-in" approach outlined in the vision Section of this document (see Section 2.1.4). As a result of implementing the recommended policy actions below, Malta's Open Access policy would *in the long term* enable immediate Open Access, which would thus align it with Plan S as well as complying with future policies in Horizon Europe (as far as is currently known), which is important since the framework programme is Malta's primary source of external grants. Such a policy would therefore be 'future proof' and the measures outlined below should be seen as tools to implement it as such.

3.2.1 Upscaling Green Open Access

Phase 1: common access point

Objectives: awareness and promotion, infrastructure set-up

Duration: maximum 1 year

In phase 1, a **common access point** for all research publications produced by Maltese institutions and the researchers working there should be established. Those institutions that do not already have an Open Access policy should develop one. In this phase, deposition and providing Open Access in line with the embargo periods stipulated by the respective publishers should be encouraged but will remain voluntary for Maltese researchers.

While it is already possible for researchers outside UM to deposit their material in OAR@UM, a distinct identity would need to be built up, which could take the following forms:

i. A common 'national' repository, building on but further developing the current UM publications repository to serve all Maltese publications and

[32] Running on Dspace version 6.3. since July 2019.

[33] See e.g. http://spichtinger.net/eublog/2020/01/06/which-form-of-open-access-is-the-best/

institutions under a common identity and common management. This would require buy-in and cooperation among the key actors (see also Section on governance) and the provision of common resources, as well as a branding distinct from UM.

ii. Retaining the UM repository and MCAST repository, building up repositories for other actors and then linking them together through a common access portal. Content would remain on these institutional repositories but would be findable through the common access portal. This would be a federated model (a mini-EOSC for Malta).

In both cases the repository infrastructure would need to be technically up to date and include ORCID and PID (where this is not yet the case) in order to clearly identify an author and a research output. It is recommended that the final decision on which option to choose is decided on in a working group, to be set up in the proposed governance structure (see Section 7).

Phase 2: mandatory deposit

Objective: implementation and monitoring

Duration: maximum 2 years

Once the infrastructure is ready, **it should become mandatory for researchers in Malta to self-archive** ('deposit') a copy of a published article in the repository.[34] This copy will then become Open Access, in line with an embargo period of 6 months (for natural sciences) and 12 months (for social sciences and humanities), which is in line with the provisions of Horizon 2020.

As of this phase, only publications provided in Open Access should be used in researcher assessment (see Section 5). In this context it is important to note that self-archiving is even possible with such high-level publishers as Nature.[35] It should also be noted that a key factor in the acceptance of such a policy would be ensuring easy depositing for researchers, with sufficient resources and easy-to-use tools, as well as dedicated support.

This requirement should also apply to research funded under the FUSION programme and any other national programmes and funding schemes, including MEDE scholarships and MEAE funding.

The UM, which already has a policy and repository in place, should directly mandate implementing this mandatory requirement even during phase 1.

[34] Or to provide Open Access via the gold model, see below,

[35] Details of their policy available at: https://www.nature.com/nature-research/editorial-policies/self-archiving-and-license-to-publish

Phase 3: zero embargo

Objective: strengthen policy

Duration: as of year 3

This phase consists of phasing in a **zero-embargo period** in order to ensure immediate Open Access through either the Gold or Green route. This requirement would align Malta with key policy initiatives and mandates at the international level, such as plan S, the Gates Foundation, and the Wellcome Trust, as well as potentially Horizon Europe and a future US-based policy (the latter not officially confirmed at the time of writing).

This requires the creation of the necessary legal base so that the embargo periods mandated by publishers can be overruled. This can be achieved by **requiring that authors and/or their employers (as applicable) retain their copyright and grant adequate licences to publishers instead, such as Creative Commons.**

Box 2: Copyright transfer vs. creative commons licenses

Traditionally, authors of a scientific article have often been required to transfer their copyright to the journal publisher as part of the process of submitting an article. More recently, however, there has been a gradual shift (also due to the Open Access movement) towards granting a license to publish instead.

Creative Commons (CC) provides free and easy-to-use copyright licenses giving the public the right to share, use, and even build upon an author's creative work. Licensing OA articles under a Creative Commons license has thus evolved as the standard for OA publishing. One of the most liberal CC licenses for publishing scientific articles is the Creative Commons Attribution (CC BY) license, as it allows the public to adapt and share an author's work, even for commercial use, as long as the author is properly cited. Several other licenses also exist, which allow for fine-grained decisions of which rights the author wants to grant (e.g. as concerns commercial or non-commercial reuse).[36]

The European Commission announced it has adopted CC BY 4.0 and CC0 to share published documents, including photos, videos, reports, peer-reviewed studies, and data.[37]

[36] See http://creativecommons.org/licenses/"

[37]https://creativecommons.org/2019/04/02/european-commission-adopts-cc-by-and-cc0-for-sharing-information/

3.2.2 Upscaling Gold Open Access

In Malta there are currently no specific measures in place to support Gold Open Access. Two measures could be undertaken in parallel to provide such support:

Phase 1: Gold Open Access fund

Objective: strengthen policy

Duration: trial for 3 years, as of year 1

In this phase, Open Access publishing would be supported through piloting a separate fund which would cover article processing charges. It is important that such a fund would be governed by clear and stringent criteria. Following the examples of similar funds in Germany (DFG), COST[38] and the OpenAIRE FP7 post-grant pilot[39] (now defunct), such criteria would include:

- maximum number of publications per individual author (usually 3)
- non-eligibility of hybrid Open Access
- ceiling for maximum cost per publication: this would need to be further discussed but could be between USD 1,600[40] ([approx. EUR 1,450] the average APC charged) and EUR 2,000 (the amount of money provided by the DFG programme).

This would address a grievance of researchers who are reluctant to use funding from a personal pot, which may cover items such as infrastructure, travel costs or human resources. Such a fund has been implemented in German universities through a dedicated DFG programme.

Box 3: German DFG programme for Open Access

Through the Open Access Publishing Programme, the *Deutsche Forschungsgesellschaft* (DFG) helps German universities (through their libraries) to set up publication funds, which can be used to pay the fees required to publish articles in Open Access journals. The aim is to promote sustainable and reliable structures for the funding of Open Access publications.

More info:
https://www.dfg.de/en/research_funding/programmes/infrastructure/lis/open_access/funding_open_access/index.html

[38] https://www.eurestore.eu/oa/

[39] https://ec.europa.eu/digital-single-market/en/news/results-fp7-post-grant-open-access-pilot

[40] According to Delta Think's Open Access Data & Analytics Tool.

While the German Programme is currently undergoing evaluation, there are some results available for the Commission's FP7 post-grant pilot, run by OpenAIRE. This pilot funded 1,323 publications: 1,232 articles, 71 monographs, 18 book chapters and 2 conference proceedings. The average author fee for articles processed was EUR 1,474 and the median fee was EUR 1,446.[41] An independent review concluded that "the FP7 Post-grantOA Pilot had a measurable and positive impact on beneficiaries' publishing practice" but that the uptake was lower than expected.[42]

We provide indications for the costs of such a fund within the economic model to estimate Open Access and Data funding in Malta which is annexed to this report. Based on an estimation of 150 articles by Maltese authors annually (data from background report) and an average APC of EUR 1,400 this would result in costs of EUR 210,000 annually. However, this is under the assumption that all publications would make use of this fund. Further monitoring of numbers of publications and APC costs is recommended. Such monitoring should feed into open APC, a tool to monitor the fees paid for Open Access journal articles by universities and research institutions.[43]

The piloted fund should be evaluated as to its cost-benefit ratio (uptake, number of publications funded, overall costs and cost per publication) after the piloting phase of 3 years. A decision can then be made whether to retain this scheme.

Phase 2: integrate OA in publisher negotiation

Objective: strengthen policy

Duration: trial for 3 years as of year 1 (can be undertaken in parallel with phase 1)

In this phase it is proposed to integrate Open Access in licensing negotiations with publishers ("transformative arrangements"), following international best practice principles (e.g. as developed by LIBER).[44] In other words, any agreement with publishers would allow authors active in Malta to publish their articles as Open Access in the journals managed by those publishers, with APCs priced into these agreements. Such agreements have increased significantly in recent years in a range of countries, see box below.

[41] See https://zenodo.org/record/1304908/files/D%205.6%20Final%20report.pdf?download=1

[42] See https://explore.openaire.eu/search/publication?articleId=dedup_wf_001::b6bca11290dd66de0eb839d67f93a926

[43] https://www.intact-project.org/openapc/

[44] https://esac-initiative.org/guidelines/

Box 4: The case of Poland and Hungary: including Open Access in publisher contracts

The Polish Read and Publish (Springer Compact) agreement

The Polish Read and Publish (Springer Compact) agreement means affiliated researchers from Polish HEIs can publish their articles as Open Access, at no cost to them, in more than 1,850 Springer hybrid journals. In addition, they can enjoy full access to all Springer subscription journal content. This agreement will run through 31 December 2021. Springer has conducted several similar agreements with other countries, including Austria, Finland, Hungary, Germany (Max Planck), Netherlands, Qatar, Sweden and the UK.

EISZ Elsevier agreement

Elsevier and the Hungarian consortium EISZ have entered a pilot agreement which provides researchers from Hungarian institutions access to Elsevier journals, while supporting Open Access publishing. When publishing in applicable Elsevier journals, eligible authors will be able to choose the Open Access model at no additional cost to the author.

More information: https://www.springer.com/gp/open-access/springer-open-choice/springer-compact/agreements-polish-authors

https://www.elsevier.com/about/open-science/open-access/agreements/hungary

As the inclusion of Open Access in agreement with publishers seems to be rapidly expanding, we recommend for Malta to **establish connections with other consortia which have successfully concluded such deals to ascertain their feasibility**. Such agreements should aim for cost neutrality.

3.2.3 Support Open Access journals

Objective: strengthen policy

Duration: trial for 3 years as of year 1 (can be undertaken in parallel with phase 1)

With only 2 out of 73 (or even more) Maltese Open Access journals being registered in the Directory of Open Access Journals (DOAJ)[45] there is a need to strengthen their quality and encourage their registration in the DOAJ. The DOAJ quality criteria include most notably (1) Basic Journal Information, (2) Quality and Transparency of the Editorial Process, (3) Openness of the journal, (4) Content Licensing and (5) Copyright issues. Beyond these criteria, DOAJ has developed a quality seal which outlines the best practices set out in the following text box:

[45] DOAJ is a community-curated online directory that indexes and provides access to high quality, Open Access, peer-reviewed journals. See https://doaj.org/

Box 5: DOAJ Quality Seal

Have an archival arrangement in place with an external party for the long-term preservation and archiving of the journal's published content.

Provide permanent identifiers in the papers published. By permanent identifiers we mean a unique identifier that is assigned to the article upon publication and remains with the article forever. The most common of these is the DOI which is used in a scheme governed by Crossref.

Provide article-level metadata to DOAJ. A grace period of three months exists to allow publishers to get their content into the right format for ingestion into DOAJ.

Embed machine-readable CC licensing information in article-level metadata, as we mentioned above. It is important that, wherever someone is reading the content, they know exactly what they are allowed to do with the content, especially around reuse and sharing.

Allow reuse and remixing of content in accordance with a creative commons licence or other type of licence with similar conditions.

Have a deposit policy registered in a deposit policy directory. It is often the case that a journal indexed in DOAJ will have a skeleton entry in the SHERPA/RoMEO database[46] because the latter has ingested our metadata. This skeleton entry is not enough, and publishers are encouraged to contact SHERPA/RoMEOdirectly and update their entry

Allow the author to hold the copyright without restrictions. This is the newest seal criteria.

Maltese Open Access journals should be financially supported to further increase their quality according to these criteria. This could be implemented through an application process in which the journal outlines the costs associated with becoming DOAJ quality seal compliant. The full or partial amount could then be reimbursed in a one-time payment. The shape of the financial support could be discussed further in a dedicated working group to be set up under the proposed governance framework (Section 7).

[46] Sherpa/romeo is an online resource that aggregates and analyses publisher Open Access policies from around the world and provides summaries of self-archiving permissions and conditions of rights given to authors on a journal-by-journal basis. See https://v2.sherpa.ac.uk/romeo/

4 Open Research Data and relevant infrastructure

High-level ambition: We envisage that Malta phases in the necessary infrastructure (technical, legal, cultural) for FAIR Research Data management under the principle of "as open as possible, as closed as necessary" by 2025.

4.1 Baseline

4.1.1 Towards Open and FAIR Data: implementation

While Open Access to scientific publications has been implemented for a decade and is increasing in terms of acceptance and use, Open Access to research data and FAIR data (see Key Terms Section) is more recent but very topical.

As with any other implementation, the realisation of Open/FAIR Research Data requires the **definition of policies (rules) and the development of the necessary infrastructure (services)** to shift the research culture of researchers, funders, administrators, service providers, innovators and the public to more openness.

Policies: The EU has developed and operates on a set of macro policies related to the reduction of frictions in the free flow of data. These are essentially high-level policies which are further refined in order to be adopted and implemented at national and institutional settings (from macro to micro policies). These policies cover a wide scope of data sources (public sector, private sector, personal and non-personal data) and in that sense they are the most relevant ones for fostering the free flow and access of research data. The following macro policies relate to ORD and must be taken into consideration on any design and implementation of it:

- Free flow of personal data in accordance with rules protecting personal data, including ethics (General Data Protection Regulation) and professional standards[47]
- Free flow of non-personal data (proposal for a regulation for the free flow of non-personal data)[48]
- Reuse of Public Sector Information,[49] as open government data is interchangeably used for research

[47] http://ec.europa.eu/justice/data-protection/reform/index_en.htm

[48] https://ec.europa.eu/digital-single-market/en/free-flow-non-personal-data

[49]https://ec.europa.eu/digital-single-market/en/european-legislation-reuse-public-sector-information

- Framework for the reuse of Geodata (INSPIRE)[50]

- Policies for the free flow of cultural data (Europeana),[51] particularly relevant to digital humanities research[52]

- Policies for the free reuse of Language Data (ELRC),[53] applicable to emerging AI use

- Policies regarding harmonisation of orphan works,[54] and collective rights management[55] regulations, as well as copyright limitations and exceptions,[56] particularly in relation to text and data mining

- Policies for supporting Open Science,[57] as manifested by the "Open Science, Open Innovation, Open to the world" declaration,[58] the European Open Science Cloud and EC funding guidelines for H2020 (emerging for Horizon Europe).[59]

Infrastructure: The infrastructure needed to achieve sharing/opening of research includes the end-to-end digitisation of the research process, from the infrastructures used to perform research, to the transport, storage, processing and dissemination of data. It also covers the services deployed to facilitate both the research process and its scholarly communication, the monitoring of the research pathways (impact of openness), the entirety of the education process and means, and the support of citizen science as an instrument for the deeper engagement of local communities and increasing the impact of research results.

In this context, the European Commission has largely invested via its Infrastructures programme in the last two decades. Research Infrastructures manage the transnational and global access to large research facilities and are key producers and keepers of research data, placing practices and standards around its storage, preservation and reuse within research communities. E-

[50] https://inspire.ec.europa.eu/

[51] https://ec.europa.eu/digital-single-market/en/europeana-european-digital-library-all

[52] https://pro.europeana.eu/what-we-do/academic-research

[53] http://www.lr-coordination.eu/

[54] http://ec.europa.eu/internal_market/copyright/orphan_works/index_en.htm

[55] https://ec.europa.eu/digital-single-market/en/eu-copyright-legislation

[56]https://ec.europa.eu/digital-single-market/en/modernisation-eu-copyright-rules#improvedrules

[57] These include all the aforementioned policies, mostly in relation to infrastructure, data and services but also skills and education

[58]https://ec.europa.eu/digital-single-market/en/news/open-innovation-open-science-open-world-vision-europe

[59]https://ec.europa.eu/research/participants/data/ref/h2020/other/hi/oa-pilot/h2020-hi-erc-oa-guide_en.pdf

Infrastructures provide services at different layers of the data stack: network connectivity and trusted identification (GEANT), federation of open and linked research results (OpenAIRE), computing federation (EGI), common data services for preservation (EUDAT), sharing access to high-performance computing resources (PRACE), a forum for data interoperability (RDA).[60] In addition, they play an important role in setting the standards and mechanisms for all national data infrastructure and services. The European Open Science Cloud (EOSC) is the umbrella initiative to implement key high-level Open Science policies.[61]

4.1.2 ORD / data management practices in similar countries

ORD is a new topic and not many countries in Europe or around the world have established coherent national strategies, policies and infrastructures. European countries follow different models and levels of implementation. Countries who have successfully implemented Open Access infrastructures for publications, via repositories and OA journals, are currently transitioning these to data, a process that requires careful design and resource allocation. To name two such examples, France issued a national strategy in 2018,[62] and is now in the policy refining and infrastructure development phase by bridging existing services (focus is on the long tail of science and social sciences and humanities) following a top-down approach by the Ministry of Science; Portugal, which has been a success story of a decentralised institution-based infrastructure founded on a coherent national policy for OA in publications (top-down), is starting a bottom-up approach for the sharing of the research data.

Box 6: ORD in similar European countries

Cyprus – In 2016, the Council of ministers approved the adoption of the National policy for Open Access in Cyprus. The Cyprus OA policy document is available on the National Strategy for Research and Innovation page of the Directorate General for European Programmes, Coordination and Development. The National policy provides guidelines and support for the implementation of Open Access for research outputs that are funded locally, aligned with the European policies and based on the already established infrastructure at European level (e.g. OpenAIRE). Several activities are taking place in Cyprus in order to support the adoption of the national policy and ensure the success of its implementation.

The choice of long-term data repository is left to the researchers. The policy encourages the use of either disciplinary data archives, institutional repositories, or Zenodo. A Zenodo community named CYPRUS has been created and is curated by OPENAIRE Cyprus NOAD and all universities, researchers and research institutions are encouraged to make use of this. The Cyprus Institute (www.cyi.ac.cy) operates a thematic data repository, DARECLIMED for climate, water resources, and energy related data, but the creation of a national data

[60] www.geant.org , www.openaire.eu, www.eudat.eu, www.egi.eu, www.rd-alliance.org, www.prace-ri.org

[61] A detailed explanation can be found in the EOSC Pilot policy deliverables https://www.eoscpilot.eu/eoscpilot%E2%80%99s-contributions-policy-setting-eosc

[62] https://www.ouvrirlascience.fr/

archive was discussed at a May 2018 meeting of the National Working Group. Cyprus also participates in H2020 project NI4OS (https://ni4os.eu/) which aims to bring Cyprus closer to the EOSC infrastructure.

Ireland – Ireland has been a front runner in Open Science in both policy and infrastructure and is now full speed into implementing it. Starting with a bottom-up approach, a collection of like-minded organisations who came together in 2012 to advocate for Open Access publication established the National Steering Committee on Open Access Policy. The committee published the first National Principles on Open Access Policy Statement, which issued recommendations for a position statement, and was subsequently adopted by the Irish Government. This led to the formation of the National Open Research Forum (NORF – http://norf-ireland.net/), which is responsible for delivering an Irish agenda for open research. NORF combines the expertise of representatives from policy, research funding, research performing, library sector and other key stakeholders in the research system across Ireland. In addition, it operates working groups addressing Open Access to publications, Open Research Data, infrastructure, and human resources, and is co-chaired by the Higher Education Authority (HEA) and the Health Research Board (HRB) with a secretariat from the Department of Business, Enterprise and Innovation (DBEI). The recent 2019 publication 'National Framework on the transition to an Open Research Environment' sets an agreed-by-all framework for the principles of an open research system and is the forerunner of the National Action Plan[63] to be gradually rolled out. In addition to the National Policy, most Irish funding agencies and some Higher Education Institutions have Open Access policies.

In parallel to policy, Ireland has been building its infrastructure. It has 20 institutional literature repositories (for Green OA) and four data governmental repositories, all visible through the national aggregator RIAN (http://rian.ie/). It has nine data repositories listed in re3data.org, one of which is the Digital Repository of Ireland (DRI – https://www.dri.ie/) a trusted national repository and infrastructure for the preservation, curation and dissemination of Ireland's humanities, social sciences, and cultural heritage data.

Source: OpenAIRE[64]

4.1.3 The situation in Malta

Policies: None of the key organisations who contribute to the production of research have concrete policies for, or around, research data. The only noteworthy activity is part of the implementation of the Public Sector Information Re-Use (PSI) Directive, for which MITA on behalf of the Government of Malta is currently drafting a strategy that provides a holistic and comprehensive vision for the management of data across the whole Public Administration. This is in the context of the Public Administration being one of the pillars of the Digital Malta Strategy together with the Citizen and the Business perspectives. The proposed

[63] http://norf-ireland.net/wp-content/uploads/2019/07/NORF_Framework_10_July_2019-2.pdf

[64] https://www.openaire.eu/frontpage/country-pages

National Data Strategy is primarily comprised of a set of General Principles and Best Practices that should guide future investments in this domain.

Technical Infrastructure: Malta's infrastructure currently evolves around the following organisations:

1. **University of Malta** operates two data centres (one under development) to support researchers in their data analytics needs but does not have a data repository for them to publish the research data. The library aspires to develop research data policies via its connection to OpenAIRE (Guidelines and exchange of best Research Data Management practices). University officials participate in EU e-Infrastructures and related fora (e-IERG, GEANT) bringing good knowledge and expertise in the national setting. Senior researchers are in contact with related European initiatives (e.g. COST actions, Europeana). Furthermore, **MCAST** operates a data repository built on Moodle.

2. **Malta Information Technology Agency (MITA)** is the central driver of government Information and Communications Technology (ICT) policy, programmes and initiatives in Malta. MITA's role is to deliver and implement the assigned programmes as set out in the Digital Malta National ICT Strategy 2014-2020 and as directed by the Parliamentary Secretariat for Financial Services, Digital Economy and Innovation. MITA manages the implementation of IT programmes in government to enhance public service delivery and provides the infrastructure needed to provide ICT services to government. MITA is also responsible for propagating further use of ICT in society and the economy and to promote and deliver programmes to enhance ICT education and the use of ICT as a learning tool.

Supporting structures: We have identified the following supporting mechanisms:

- University of Malta runs an IP office for innovation coming from university research results;

- Ministry of Justice Directorate runs a Data Protection and Freedom of Information Officer network and acts as reference point for the public administration by providing policy guidelines, templates, awareness.

Collaborations: Maltese researchers sometimes exchange experience and knowledge ad hoc (e.g. in joint projects or European infrastructures) but no structured channels have been established, in particular across organisations.

Behaviours: From a significant number of interviews it was evident that Open/FAIR Data and/or good RDM is not the first priority when doing or delivering research or when interacting with third parties. Furthermore, there is a lack of awareness on the topic, with researchers expressing a keen interest in using Open Data but often being not quite as willing to share their own data. The key player who contributes to the generation of research data is the University of Malta, whose researchers exchange data with national and international

colleagues in an ad hoc way, mostly following EU Research Infrastructures guidelines; we did not find much awareness of ORD best practices. For the University of Malta, as well as many other organisations, a key issue is to first address how to resolve the openness of data along with IP (see also Section 2).

4.2 Scenarios and Recommendations

The objective is for Malta to reach a status of Open/FAIR Research Data by 2025. We propose a phased approach for Open Data policies, where each phase develops, tests and establishes processes, procedures and infrastructure, *which become permanent to be used in the next phase*.

4.2.1 Phase 1: Voluntary ORD

Objectives: awareness and promotion, infrastructure setup

Duration: maximum 1 year

This scenario foresees a soft 'mandate' on Open/FAIR Data, with a clause for voluntary Open Data for all publicly funded research. The aim is to gradually develop the necessary infrastructure (technical, training, legal), to bring awareness to researchers and all stakeholders involved and to develop the necessary synergies in the country.

This policy would be a first step to accomplish the final goal, a fact that should be clearly communicated to all stakeholders (government agencies) and beneficiaries. It would apply to public funding[65] from national agencies (such as MCST and Ministry of Education scholarships programmes) and should come with incentives for the researchers (see Section 5).

Policy outline[66]

- **Encourage** the submission of a Data Management Plan (DMP) in the first six months of the project, as a means to promote awareness for issues around data collection, processing and dissemination.
- **Request** the deposition of research data underpinning research in publications, with a minimum embargo period (up to six months before opening the data.
- **Mandate** metadata to be immediately open by default.

[65] We are referring primarily to national funds here. For Horizon 2020, an Open Data policy already exists. For shared management funding (regional funding, e.g. Interreg) it would need to be clarified whether this funding stream can also be used for data related activities.

[66] These measures will be carried over into the following phases.

- **Encourage** the deposition of other data generated along the research life cycle.

- **Strongly encourage** the adoption of FAIR practices. Aim for minimal requirements through the use of well-recognised and accredited data repositories:

  - Identifiers: **request** deposition in repositories which provide a persistent identifier. Encourage researchers to use Research Infrastructure or publisher guidelines and domain discipline repositories; recommend Zenodo as a repository of choice for all others;

  - Accessibility: **request** deposition in repositories which provide unrestricted APIs for machine readability;

  - Interoperability: **endorse** the use of repositories which offer metadata according to OpenAIRE / DataCite Metadata Guidelines as a minimum; encourage the use of discipline domain metadata;

  - Reusability: **request** permission for text and data mining, exploitation, reproduction and dissemination (free of charge for any user); **request** the use of simple open licenses, promote Creative Commons).

- **Allow** data stewardship costs as eligible costs in funding schemes.

- **Require** beneficiaries to report back all deposited/Open Data at project assessment time (interim and final); require as a minimum data identifier and license.

Infrastructure

This phase (lasting maximum one year) may start immediately and will provide the responsible agencies in Malta with sufficient time to develop and implement the appropriate infrastructure. This would include:

1. The set-up of a national repository for research data (a single access point with possibly decentralised repositories for the long tail of science, and a more centralised one for big data sets), a central entry for access to identifier systems (e.g. DataCite and ORCID), an Authentication and Authorisation service from the University of Malta acting as the NREN, and organisational tailor-made DMP services

2. A set of common data policies for Research Funding Organisations (RFOs) and Research Performing Organisations (RPOs)

3. The development and delivery of training programmes for all relevant stakeholders (see Section 6)

4. Appropriate monitoring mechanisms in place.

As infrastructure may not be initially in place, beneficiaries should be advised to use EU e-/Research Infrastructure repositories and services. For long-tail-of-science purposes researchers may be advised to use a variety of off-the-shelf tools and services, such as re3data.org as a means to discover appropriate data repositories, Zenodo as a repository of choice (create a national community requesting all depositions to be under), Amnesia as a means to anonymise sensitive/private data before publishing, and Argos or DMP Online for formulating, updating and sharing Data Management Plans. [67] For more intensive data science, researchers could be using services offered by Research Infrastructures, e.g. gene/protein databases or Galaxy instances from Elixir. The OpenAIRE National Open Access Desk (Malta University Library)[68] is well positioned to play a central role in this and would be instrumental in preparing a list of services and contacts available for use, as well as appropriate guidelines. A good start to identifying such services would be the EOSC Portal or the pan-European ongoing data cluster projects Panosc (Photon and Neutron Open Science Cloud), EOSC-Life for life sciences, SSHOC (Social Sciences & Humanities Open Cloud), ESCAPE for Astronomy and Particle Physics, and ENVRI-FAIR for the environmental sciences.

4.2.2 Phase 2: Open/FAIR Research Data pilot with opting out

Objectives: piloting the implementation of FAIR/Open Data; establishing the mechanisms for monitoring of the policy and the results

Duration: maximum 2 years

This scenario introduces a more concrete and firm policy for Open/FAIR Data by running a pilot which **targets specific thematic areas** of publicly funded research. Its objective is to test out the infrastructure already implemented in scenario/phase 1, to monitor researcher uptake, behaviours and needs, and refine them where appropriate. This mandate effectively reflects the EC Open Research Data Pilot (2014-2016)[69] and sets out the foundations for Malta to be an active member in EOSC through its contribution of Open/FAIR Data.

For the pilot to have the biggest possible impact, it is important to identify the right criteria for the selection of the thematic areas, such as: strategic importance of the theme for the Maltese government; links to a strong EU/global community with similar practices; number of synergies and collaborations to be developed in the country, either between commercial or public entities.

Considering figure 6 below and taking into consideration private investments, number of researchers and neighbouring organisations, candidate programmes for the ORD pilot which would have an impact are related to **Engineering and**

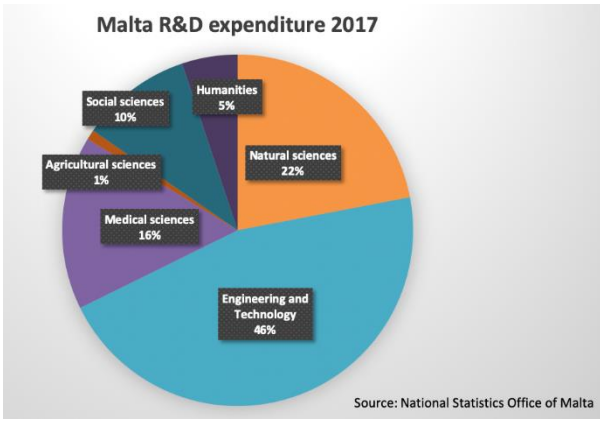
[67] www.zenodo.org, amnesia.openaire.eu, argos.openaire.eu, https://dmponline.dcc.ac.uk/

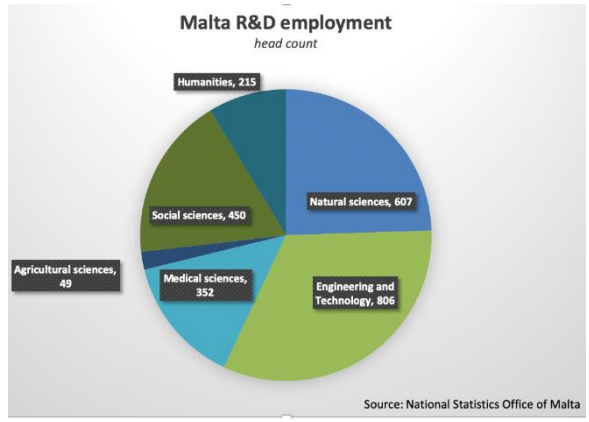
[68] https://www.openaire.eu/67-kevin-j-ellul (Jan 2020)

[69] http://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/hi/oa_pilot/h2020-hi-oa-data-mgt_en.pdf

Technology (e.g. gaming, block chain, industrial production lines targeted by government innovation agencies), **Natural Sciences** (close links to EU open infrastructures) and **Humanities** (a long tradition and participation of many Maltese organisations in national and European Digital Culture Heritage).[70]

Figure 6: Malta R&D statistics





Policy outline

This policy builds on the previous phase, and effectively shifts from voluntary to mandatory for the selected programmes (see previous paragraph).[71]

- **Mandate** the submission of a DMP during the first six months of the grant. The DMP needs to be updated, as a minimum, in time with the periodic evaluation/assessment of the project and over the course of the project whenever significant changes arise.

- **Mandate** the deposition of research data needed to validate the results presented in scientific publications.

- **Mandate** deposited research data underpinning research in publications to be open by default, as soon as possible (immediate may not be possible as we need to consider article publication delays, or organisations' IP office procedures, which may need additional time). Set embargos at a maximum of 12 months for sciences and 24 months for humanities, or until the end of the project, whichever comes first.

[70] Medical sciences are not recommended as they may post additional data privacy issues

[71] These measures will also apply for the following phase.

- **Allow** opting out of Open Access only if fully justified. Opting out may happen before or during the project lifetime. Indicative[72] reasons for opting out are:
  - Copyright/IP (e.g. collaboration with industry, pending patents)
  - Privacy/sensitive data
  - Identified government-related economic advantage
  - Identified government/EU defence relationships.
- **Mandate** metadata to be immediately open by default. No opting out for metadata.
- **Request** other data specified in the DMP (for instance data not directly attributable to a publication, or raw data), including associated metadata, to be deposited and if possible open.
- **Mandate** the adoption of FAIR practices for research data needed to validate the results presented in scientific publications; **request** it for other data. Aim for requirements using well-recognised and accredited data repositories:
  - Identifiers: **mandate** deposition in repositories which provide a persistent identifier. Encourage researchers to use Research Infrastructure or publisher guidelines, domain discipline, institutional or national repositories;
  - Accessibility: **mandate** deposition in repositories which provide unrestricted APIs for machine readability;
  - Interoperability: **mandate** the use of repositories which offer metadata according to OpenAIRE / DataCite Metadata Guidelines as a minimum; encourage the use of discipline domain metadata;
  - Reusability: **mandate** permission for text and data mining, exploitation, reproduction and dissemination (free of charge for any user); **request** the use of simple open licenses, promote Creative Commons CC-0 or CC-BY version 4.0).
- **Allow** data stewardship costs as eligible costs in funding schemes.
- **Mandate** beneficiaries to report back all deposited/Open Data at project assessment time (interim and final); require as a minimum data identifier and license.

[72] Can be further refined for various programmes.

Infrastructure

This phase (also lasting a maximum of two years) assumes infrastructure is in place, both for researchers to deposit and open research data, and for funders and institutions to monitor it, and that it is aligned and connected with EU e-Infrastructures and EOSC (e.g. OpenAIRE Guidelines, GEANT AAI/EduGain, EOSC Rules of Participation). Specifically, for repositories some additional effort should be anticipated to register them in re3data.org, to ensure compatibility with EC guidelines, and possibly to pass them through a certification process (e.g. Core Trust Seal).[73]

4.2.3 Phase 3: Open/FAIR Research Data by default, with opting out

Objectives: implementation of reproducible research, monitoring

Duration: continuous

This scenario introduces research data to be FAIR by default, as open as possible (immediately, no embargos), as closed as necessary (opting out) for all research data being generated at different stages of a project. This would bring Malta up to speed with the current European Commission Horizon 2020 Open Data Policy, which has replaced the previous Open Research Data and now mandates "Open Data by default" (whilst allowing opt-outs). This policy is likely to also form the basis of provisions in the new Horizon Europe programme and would thus simplify the work of most researchers, as they would be able to follow the same rules with their peers and collaborators in the EU.

Policy outline

This policy would build on the previous ORD pilot (Phase 2) introducing the following changes:

- **Mandate** other data specified in the DMP (for instance data not directly attributable to a publication, or raw data), including associated metadata, to be deposited and if possible open.

- **Mandate** the adoption of FAIR practices, for research data needed to validate the results presented in scientific publications, **mandate** it for other data.

Aiming to make science truly reproducible, and anticipating a broader European Commission Open Science policy, include in the mandate research software, code, protocols and other methods:

- **Mandate** metadata of research data to fully embrace linked science through mandatory use of OpenAIRE Guidelines (citations to publications, software, services).

[73] https://www.coretrustseal.org/

- **Request** publishing of research software data needed to validate the results presented in scientific publications.

- **Request** publishing of other research outputs (e.g. protocols, studies) needed to validate the results presented in scientific publications.

- **Formulate** estimated costs of Research Data Management (RDM) for FAIR in the proposal (even if in-kind contribution provided by national infrastructure).[74]

Implications

The implementation of a fully-fledged ORD policy requires Research Performing Organisations to develop and maintain a set of well-defined and embedded supporting mechanisms (people, processes, workflows) to:

- support researchers in data stewardship activities

- ensure understanding of timely and justified opting out

- address the clarity of rules on IP and DP by providing detailed descriptions and if possibly preparing and adopting model contracts.

Support structures are further addressed in Section 6.

[74] See https://www.openaire.eu/openaire-fp9-pdf for a set of recommendations for funders to pursue Open/FAIR Data.

5 Assessment practices

High-level ambition: We envisage that by 2025 Malta adopts research assessment measurement that reflects and adequately rewards Open Science practices.

5.1 Baseline

We are convinced that a lasting change towards Open Access, Open Data and Open Science will only materialise if such practices are incentivised in assessment practices. The European Working Group on Rewards under Open Science[75] distinguishes between two levels at which research assessment needs to incentivise and reward Open Science practices:

- Research Performing Organisations (RPOs) should be strongly encouraged to include Open Science practices in the evaluation of performance and of career development.

- Research Funding Organisations (RFOs), at regional[76], national, EU and international level, (including managing authorities that fund research as part of their programmes), should be strongly encouraged to include OS practices in the evaluation criteria for funding proposals and as part of the assessment of the researchers.

As the working group notes, it is therefore important to go beyond Open Science and frame this discussion in the broad context of the evaluation of researchers. European and indeed national policy across Europe promotes the mobility of researchers across borders, disciplines and sectors. Combined with Open Science, this can only be achieved if a far more comprehensive assessment of researchers by their employers and funders is introduced.

Any changes to how researchers are evaluated must permeate through all stages of the researcher's career; in terms of the European Framework for Research Careers (EFRC), from First Stage Researcher (R1) through Recognised Researcher (R2) and Established Researcher (R3) to Leading Researcher (R4). This will be absolutely necessary if the practice of Open Science is to be embedded in the entire researcher community.

In general, evaluating a researcher cannot be reduced to a number, because their merits and achievements are a complex set of different variables difficult to summarise as a single figure. A better approach is through multi-dimensional criteria evaluation, taking into consideration what is expected from a researcher and what is relevant for his/her career/recruitment.

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[75] See their 2017 report on *Evaluation of Research Careers fully acknowledging Open Science Practices Rewards, incentives and/or recognition for researchers practicing Open Science*

[76] See also the recommendation for regional cooperation in the governance Section.

In order to implement Open Science practices, several tools are available, two of the most important of which are the expert groups OS-CAM and DORA.

The Open Science Career Assessment Matrix (OS-CAM) incorporates broader aspects of being an excellent researcher, such as service and leadership, research impact and contribution to teaching, many of which are starting to be included in Research Performing Organisations' job descriptions and promotion criteria. OS-CAM provides a framework that can be used to develop evaluation systems that can be applied in various contexts – at individual level for the purpose of recruitment and promotion, at individual or group level in the evaluation of grant and fellowship applications – or adapted to develop institutional funding allocation models or incentives focused on building Open Science capacity.

Secondly, the **Declaration on Research Assessment (DORA)** recognises the need to improve the ways in which the outputs of scholarly research are evaluated. The declaration was developed in 2012 during the Annual Meeting of the American Society for Cell Biology in San Francisco. The following recommendations are of particular relevance:[77]

1. Do not use journal-based metrics, such as Journal Impact Factors, as a surrogate measure of the quality of individual research articles, to assess an individual scientist's contributions, or in hiring, promotion, or funding decisions.

2. Be explicit about the criteria used in evaluating the scientific productivity of grant applicants and clearly highlight, especially for early-stage investigators, that the scientific content of a paper is much more important than publication metrics or the identity of the journal in which it was published.

3. For the purposes of research assessment, consider the value and impact of all research outputs (including datasets and software) in addition to research publications, and consider a broad range of impact measures including qualitative indicators of research impact, such as influence on policy and practice.

4. Be explicit about the criteria used to reach hiring, tenure, and promotion decisions, clearly highlighting, especially for early-stage investigators, that the scientific content of a paper is much more important than publication metrics or the identity of the journal in which it was published.

5. For the purposes of research assessment, consider the value and impact of all research outputs (including datasets and software) in addition to research publications, and consider a broad range of impact measures

[77] See https://sfdora.org/read/

including qualitative indicators of research impact, such as influence on policy and practice.

Compared to OS-CAM it seems that more organisations have implemented DORA. Several good practice examples on their website[78] include:

- ANR, the French National Research Agency
- Australian National Health and Medical Research Council (NHMRC)
- Austrian Science Fund (FWF)
- Cancer Research UK (CRUK)
- European Molecular Biology Organisation (EMBO)
- European Commission (see OS-Cam above)
- Health Research Board, Ireland
- International Development Research Centre (IDRC)
- Open Research Funders Group (ORFG)
- Dutch Research Council (NWO)
- U.S. National Institutes of Health
- U.S. National Science Foundation
- Wellcome Trust.

Generally, though, a recent 2019 survey by the European University Association (EUA),[79] consisting of 260 valid responses from universities in 32 European countries, concludes that Open Science practices are still considered of low importance for most universities in their assessment of researchers.

Most responding institutions indicated that they rely on a limited set of evaluation practices, mostly geared towards assessing research publications. Quantitative publication metrics, notably the Journal Impact Factor and H-index, and qualitative peer review are the most important practices for evaluating researchers and their output. Other methods are less widespread and often also less developed as part of individual-level incentive and reward structures. For

[78] See https://sfdora.org/good-practices/funders/

[79] See Research Assessment in the Transition to Open Science 2019 EUA Open Science and Access Survey Results: https://eua.eu/resources/publications/888:research-assessment-in-the-transition-to-open-science.html

example, Open Science and Access indicators are often only monitored at institutional level.

As regards the situation in Malta, research assessment was not included in the background report. However, during the qualitative interviews conducted as part of the second country visit, we have not found any evidence for alternative assessment practices in Malta.

5.2 Scenarios and Recommendations

Changing the evaluation and assessment of researchers is complex, and this complexity is also the key barrier towards change identified by the EUA survey (see above). While most European countries currently do not adequately reflect Open Science in their research assessment, this is an issue that is rapidly gaining in prominence and should therefore also be addressed in the Maltese context.

In line with the general approach of this report we therefore propose to **phase in, through pilot actions, a more nuanced assessment of researchers, which takes Open Science practices into account (potentially based on DORA and/or OS-CAM)**. In the case of Open Research Data this may require infrastructure which is yet to be developed; for Open Access to publication more stringent (self) monitoring would also be needed.

6 Awareness raising, skills and training, and support

High-level ambition: We envisage that by 2025 Malta systematically integrates training on Open Access in its Ph.D. training as well as systematically building up skills, competencies and training, and support mechanisms for research data management, including Open/FAIR Data. The launch of the policy should be accompanied by a broad awareness-raising campaign.

6.1 Baseline

When all researchers are aware of Open Science, and are trained, supported and guided at all career stages to practice Open Science, the potential is there to fundamentally change the way research is performed and disseminated, fostering a scientific ecosystem in which research gains increased visibility, is shared more efficiently, and is performed with enhanced research integrity.

However, in 2017 the European Commission's Steering Group on Human Resources and Mobility (SGHRM) Working Group (WG) on 'Education & Skills' found that three out of four researchers indicate that they had not yet participated in any Open Access or Open Data course but would like to.[80] What is most known is Open Access publishing, and there is a very high interest in Open Access data management practices. Researchers indicate that training opportunities for Open Access and Open Data are not yet widely offered.

The group's report[81] focuses not only on First Stage Researchers (R1 – up to the point of PhD) and Recognised Researchers (R2 – PhD holders or equivalent who are not yet fully independent), but also Established Researchers (R3 – researchers who have developed a level of independence) and Leading Researchers (R4 – researchers leading their research area and field), in identifying the following needs:

- Researchers R1/R2 – the need for these skills as part of their learning process, as well as the need to link to recognition/rewards and the impact of acquiring and using OS skills.

- Researchers R3/R4 – the need to take leadership and ensure that their mentees acquire the skills, as well as the need to demonstrate to them the positive effects of sharing data and information.

The report also mentions the importance of engaging with funding agencies and the employers of researchers. The group proposes that:

Open Science mandates from funders and institutions include explicit requirements for Open Science skills training for researchers and that Open

[80] Out of a sample of 1277 respondents.

[81] See https://ec.europa.eu/research/openscience/pdf/os_skills_wgreport_final.pdf#view=fit&pagemode=none

Science skills training is designed to be aligned, coordinated, embedded, standardised, iterative, scalable, transferable, open, adaptable, rewarded and above all, mandatory.

It is also proposed that Open Science mandates are monitored and reinforced and rewarded, accompanied by the highest degree of professional visibility, and supported by Open Science skills training

Within the FAIR4S[82] skills and capability framework, developed as part of the European Open Science Cloud (EOSC) pilot project, the following skill profiles for **research data management** have been defined and, for some of them, linked to the professional groups identified above:[83]

- Plan stewardship and sharing of FAIR outputs
- Reuse data from existing sources
- Use or develop open research tools/services
- Prepare and document for FAIR outputs
- Publish FAIR outputs on recommended repositories
- Recognise, cite and acknowledge contributions
- Develop open research strategy and vision
- Apply policies to comply legal requirements, ethical and FAIR principles
- Secure funding for Open Science / support
- Lead good practice by example.

Addressing these skills and groups requires investment in building up competencies and skills. This could be done at the University of Malta, in cooperation with other relevant actors, such as MCAST, but also the national archives. This also requires exchange of best practice with libraries that are already taking on such research data management tasks[84] (see the example

[82] FAIR4S aims to help research communities and research institutions implement Research Data Management and FAIR stewardship in the Open Science and data science context.

[83] Currently only available for the first three listed skills, see https://eosc-fair4s.github.io/skills-profiles

[84] There is significant amount of literature available on the role of libraries in research data management, see *inter alia* http://eprints.whiterose.ac.uk/76107/7/WRRO_76107.pdf https://www.sciencedirect.com/science/article/pii/S0740818814000255 https://goedoc.uni-goettingen.de/bitstream/handle/1/14249/10180-22089-1-PB.pdf?sequence=1&isAllowed=y

below of the University of Vienna) as well as associations/representatives such as LIBER who are working on this issue.[85]

Box 7: Research data management support at the University of Vienna

Research data management at the University of Vienna is closely linked to the establishment of a digital repository (PHAIDRA, 2008). At the beginning of PHAIDRA, the main focus was on questions of secure archiving. Over the course of time, however, this offer developed into a comprehensive service package that covers questions about research data along the entire research data cycle, but also, for example, about data management plans that are different for each subject. Due to the required data management plans, interest in University of Vienna library training courses on this issue has risen sharply. Research data management at the University Library is anchored in the department "Repository Management PHAIDRA Services", embedded in the research support services. Together with the Central Informatics Service, assistance is offered for various questions before, during and after the implementation of a research project.

The University of Vienna library provides support in technical matters, in the selection of the most favourable formats, in questions concerning metadata, in preparing the data for possible reuse in accordance with FAIR principles, in medium- or long-term archiving and in visualisation. They also share basic legal knowledge and, if desired, establish contact with a lawyer. The close cooperation between library and technology enables them to offer a wide range of services. Normally, the department holds several individual discussions with project managers, preferably during the project application phase. In addition, they also offer training courses on data management and the creation of data management plans, which are widely promoted and actively used throughout the University of Vienna.

In addition, in their "code4research" network, there is an exchange between scientists who need sustainable software solutions. The network "datamanagement4researchers" is aimed at researchers from all disciplines who are interested in an exchange on research data management. RepManNet was set up especially for repository managers. There, an Austria-wide exchange between persons responsible for repositories from different institutions takes place. Working groups can work on specific topics. Workshops and conferences on research data management are also being organised.

As regards the situation in Malta, the University of Malta provides information and training on Open Access to scientific publications. They have created a department on Open Science, which runs a website with information about Open Science,[86] which hosts a variety of sections on Open Access, the repository OAR@UM, copyright and licenses, and Open Access journals. The university of Malta library has also organised a variety of OA-related activities, such as talks,

[85] https://libereurope.eu/strategy/research-infrastructures/rdm/

[86] https://www.um.edu.mt/library/openscience

workshops and courses.[87] However, a 2017 paper concluded that the results – as measured in number of depositions in the repository – were rather limited.[88] Currently, there seem to be no specific training actions being undertaken as regards research data management, including FAIR data and Open Data. There is no specific repository for research data, with Zenodo being used as the default. However, MCST operates a Moodle-based repository for its data.

6.2 Scenarios and recommendations

The 2017 paper, as well as our own findings during the country visits, reinforce the need for actions related to skills and training but also more generally to awareness raising and support for researchers.

Firstly, we recommend **a broad awareness-raising campaign** (communication campaign) on Open Access to publications and research data management (RDM) as well as Open/FAIR Research Data. We propose that this is done either before or at the launch of the new national policy, for which this report is providing recommendations, coordinated by MCST. Creating awareness and thus commitment is an important framework condition outlined in Section 2.

Secondly, for **Open Access to publications** we recommend building on and further developing the actions already being undertaken by the University of Malta Library, in cooperation with MCAST. In particular, we recommend that **information on and training in Open Access becomes an obligatory part of Ph.D. training and education**, i.e. a module within the Ph.D. curricula. This would ensure that all Ph.D.-level researchers are aware of Open Access, while in the current optional system only those that express an explicit interest are reached.

Thirdly, we recommend **a "phase-in" approach for building up a skills, competencies and training centre for RDM and Open/FAIR Data** at all levels, to be implemented in all relevant institutions dealing with research data by 2025:

a. Skills and training for researchers – ensure open and digital science skills via a coordinated effort which includes a set of webinars, short courses for researchers (at under/post-graduate levels, and in both research and vocational organisations).

b. Skills and training for support personnel – ensure certified open and digital science skills for technical, legal, ethical and business aspects for all supporting staff.

c. Helpdesk – organise a decentralised but coordinated helpdesk which offers support via a knowledge base (with accompanying material, e.g. FAQs and Guides) on various issues like RDM, legal (IPR, licenses, data protection, privacy), and ethics.

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[87] See for example: https://libereurope.eu/events/open-access-impact-research-scholarship/

[88] See http://library.ifla.org/1887/1/S12-2017-scicluna-en.pdf

7 Governance and sustainability

High-level ambition: After an initial policy formulation phase where exchange of information in a working group is sufficient, we envisage Malta setting up a three-layered governance structure for policy implementation, consisting of a politically responsible steering committee, an executive committee for implementation, and expert groups (as needed) so that the policy can be implemented by the end of 2025. The representation of the key stakeholders in the governance structure is vital. We also recommend to explore regional cooperation possibilities on Open Access.

7.1 Baseline

Given the variety in research practices and publication cultures in different disciplines, Open Access and Open Science have **no one-size-fits-all solution**. Rather, from the earliest initiatives 20 years ago to more recent developments, it has become clear that Open Access and Open Science **are multi-actor challenges**. In other words, many stakeholders have a responsibility and role to fulfil:

- **Governments** have a variety of roles. Formally, it could be argued that all EU Member States have an Open Access and Open Science policy since the 2016 Competitiveness Council conclusions.[89] In recent years, an increasing number of Member States align their national policy with the European standard. In some Member States, governments are directly involved in Open Access negotiations, either through funding or policy (for instance Hungary, the Czech Republic or France). In other Member States, governments financially support national Open Science programmes (for instance, Germany and the Netherlands). It is therefore not only the European Commission that has a policy on Open Access and Open Science. Furthermore, cOAlition S and OA2020[90] are initiatives that build international support to accelerate the transition to Open Access.

- **Research performing organisations,** such as universities and research institutions, also have a central role to play. In particular, their **leadership** is important in driving change. At the same time, **individual researchers'** choices of publication and data management venues are very important as well. However, researchers are bound to an ecosystem of competition and rewards that too often keeps them from making decisions in the interest of Open Access and Open Science (see Section 5).

- Traditionally, **research funders** take an active role in setting conditions for research grants. Research funders in many countries have adopted

[89] Council of the European Union, Towards an Open Science system – council conclusions, 9526/16 RECH208 TELECOM 100, 27 May 2016).

[90] https://oa2020.org/

mandatory policies for Open Access publishing.[91] With regard to research data many funders require data management plans, for instance.

At this point one may ask how the described roles of stakeholders and international trends can contribute to the governance in Malta. First of all, the expert group considers it important to have **many stakeholders actively involved.** In many Member States, universities would not have achieved a better negotiating position towards publishers without clear political support, without supportive university leadership and without research funders pushing towards mandatory Open Access conditions.

Secondly, in Member States with successful Open Access or Open Science policies there is a **well-balanced coordination mechanism**. Lessons learned internationally (e.g. the German Council for Scientific Information Infrastructures paper)[92] showcase the importance of top-down policy initiation and a bottom-up buy-in by researchers to guarantee sustainable solutions. National funding is an important condition, but not the only one to safeguard sustainability.

Box 8: Flemish Open Science Board

Soon after the Belgian declaration on Open Access in 2012 the Flemish department of economy and higher education initiated a working group. Expert representatives from universities (of applied sciences), research institutes and governmental agencies assembled to discuss strategy and policies. When FAIR and Open Data gained traction, new challenges of concerted action and governance were posed. In early 2020, a new Flemish Open Science Board was established with the aim of nationally coordinating implementation of an annual EUR 5 million budget. Key stakeholders are joining forces to optimise policy and infrastructure for maximum benefit of the European Open Science Cloud.

7.1.1 Comparison with similar countries

The transition to Open Access of publications and FAIR (open) data / RDM must be seen in a European context. Policy alignment such as the 2016 Competitiveness Council conclusions on Open Access and Open Science contribute to a better position for individual Member States. The European Open Science Cloud and Plan S are recent examples of large-scale initiatives to start implementation. Even though there are uncertainties around these large-scale initiatives, one cannot ignore them without risking to lose position in research. The question remains how to organise governance and funding in order to reinforce Open Access and FAIR data. Before answering this question, it is helpful to learn Malta's status quo in governance and funding in an international comparison comparable with countries in Europe. In the table below, Malta, Iceland and Luxembourg are described in terms of university landscape, Open Access policy, research funders, central coordination and consortia.

[91] sometimes but not always in response to national policies – for details see the baseline discussion in the section on Open Access.

[92] (RfII (2017) - German Council for Scientific Information Infrastructures: An International Comparison of the Development of Research Data Infrastructure. Report and suggestionss

Table 2: International Open Access policies and structures comparison

	Malta	Iceland	Luxembourg
GDP	€12,319 M (2018)	€21,706 M (2017)	€58,869 M (2018)
Inhabitants	~ 475,000 (2018)	~ 385,000 (2017)	~ 600,000 (2018)
Public universities	1	3	1
National OA policy	No	No, but endorsement	Yes
Research funder OA policy	No	Yes, mandatory Organisation: Rannis	Yes, mandatory Organisation: FNR
OA fund	No	Yes	Yes
OA repositories	1	5 (2 reg. in DOAR)	2 (1 reg. in DOAR)
PlanS signatory	No	No	Yes
Central (national) coordination	No	Yes National Librarian Steering committee OA	Yes FNR Working group OS
International cooperation (policy focus)	N/A	Nordic Council of Ministries (Open Science)	Universities of Luxembourg & Liege (Green Open Access)
Main type of publisher contract	Subscriptions	Subscriptions	Subscriptions
Consortium entity	No	Yes (hvar.is)	Yes (consortium.lu)
Consortium participants	N/A	~ 200 academic, school, public, government	18 academic, school, public, government

Consortium staff	N/A	1.0	4.0

Sources:

Anders O. Jaunsen (2018), The state of Open Science in the Nordic countries, Enabling data-driven science in the Nordic countries, NEIC

Rannis (2019), Scientific Publication: Policy on Open Access, Reykjavik, https://en.rannis.is/activities/open-access/

Ministry of Education, Science and Culture (2017), Policy and action plan 2017-2019, The Science and Technology Policy Council, Reykjavik, www.government.is/ministries/ministry-of-education-science-and-culture/

ICOLC (2019), Overview of consortia, https://ICOLC.net/consortia

Luxembourg National Research Fund (2019), FNR Open Access Fund: Launch of Call, Luxembourg https://www.fnr.lu/fnr-open-access-fund-launch-of-call/

Luxembourg National Research Fund (2015), National Policy on Open Access, Luxembourg, https://storage.fnr.lu/index.php/s/O4DDe2SgEL0N9J5#pdfviewer

Iceland has been mentioned as a comparable country by Maltese interviewees during the field work for this report. Although the number of higher education institutions in Iceland is larger, there are only a few public universities. Open access policies have been developed over the last two decades by individual institutions, with the help of a library network. A national steering committee (chaired by the national librarian) oversees coordination and building expertise. There is no national Open Access policy, but it has been stressed from different sources that Iceland's government explicitly endorses Open Access. This active government position is also reflected in its formal cooperation in the Nordic Council of Ministries. The position paper of the Nordic Ministries on Open Science (2018) and the national policy plan of the Higher Education Ministry (2017) clearly indicate government support for Open Access and research data policy and funding. Even though the number of public universities is relatively low, Iceland operates a consortium for scholarly publisher contracts. The value added of operating a consortium is represented by its participants in terms of quantity and type. In other words, the fact that there are 200 participants in the Icelandic consortium shows the clear interest of many stakeholders (not only universities).

Luxembourg has the largest economy of the three countries in this comparison. Nevertheless, the higher education landscape resembles that of Malta. Luxembourg university has been known for its Green Open Access policy, developed in close international collaboration with Liege University (Belgium). Luxembourg's research funder, FNR, has taken up the role of national coordination. The first national Open Access policy, coordinated by FNR, was published in 2015. Recently the development of a national Open Science policy was announced, to be implemented by 2020. FNR has signed Plan S and has an Open Access fund to support its mandatory policy. Luxembourg has one national repository for publications.

This comparison of relatively small-scale countries gives an idea of what governance can look like in a national approach to Open Science. Indeed, coordination is an important driver for national policy implementation. Coordination does not necessarily require a new entity; the key success factor is to build bridges for a national structure.

7.2 Scenarios and Recommendations

7.2.1 Phase 1: Working group for knowledge exchange for policy formulation

In the preparation of the Maltese Open Access policy (for which we are providing the recommendations in this report) the expert group recommends setting up a **national working group** of higher education and research institutions (UM, MCAST, national library), industry and government institutions (e.g. national archive). The main role of the group would be to **safeguard knowledge exchange on Open Science topics, to encourage Open Science initiatives, and to ensure more coordination and wider networking** than in the current Maltese practice. The information exchange organised during the second country visit workshop could serve as a good practice model to follow in this phase. With its current remit it would suit MCST to coordinate such a working group in this phase. We presume that this Working Group would be set up as soon as possible after the launch of this report and would remain in place until the end of 2020.

7.2.2 Phase 2: three-layered governance structure for policy implementation

Once the policy has been officially launched, which in our timeline we assume will be the case in the beginning of 2021 (see figure 3), implementation necessitates a more sophisticated governance structure. It is highly recommended to form a **three-layered governance structure**. The top layer is a **steering committee**, responsible for an Open Access and Open Science strategy. It provides the link to the responsible ministry of education and the other key players in higher education. Funding needs to be prioritised according to a roadmap that requires decision making and coordination at this administrative level. The steering committee is headed by a chair, formally appointed by the responsible minister. MCST will operate the secretariat of the steering committee. The steering committee must have a limited number of high administrative members representing key stakeholders. In the absence of an independent research funder there is no obvious Maltese stakeholder for the chairing position of the steering committee. However, with the opportunity and responsibility to make significant steps, such as establishing a consortium for publisher procurement and a national plan for Open Access and Data, it would be fitting to have a chair of the steering committee with the following profile:

- broad governing experience
- extensive national network
- capable of unifying stakeholders and acting on behalf of national interest
- understanding of Open Science, higher education, and research and development.

The second layer consists of an **executive (coordinating) committee**, accountable for executing the roadmap objectives. Directors of all stakeholders join the executive committee. This committee also has an important role to translate and communicate the roadmap into actions for each stakeholder. Coordination on this executive level is particularly important for the shared or

national services for Open Access of publications and data addressed in previous chapters of this report.

The executive committee would be supported by a third layer of **experts in working groups,** set up as needed and based on the content of the enacted policy. This layer of working groups provides the necessary expertise and advice on roadmap actions and milestones; in previous sections we have already outlined several topics for which working groups could be set up.

To summarise the suggested governance as of 2021 and up to 2025 (and potentially afterwards):

1. responsible – steering committee

2. accountable – executive committee

3. consulted – expert working groups.

The recommended governance for Open Access is not like the three-layered governance set out in the PSF Peer Review – Maltese Research and Innovation (pages 35-39). Research and Innovation involves several ministries (and not just education), a broader agenda than Open Access and a plan with different aims than the Open Access timeline. Despite these differences, there will be overlap between the two governance systems. It is therefore recommended to connect the steering committee on Open Access with the core group on R&I because their organisational composition is likely to be very similar.

The financial conditionality for an effective steering committee governance directly refers to the previously mentioned **need for additional funding[93] for Open Access and Open Science**.

7.2.3 Phase 3: connect regionally

Finally, we recommend further cooperation with actors in the region to exchange knowledge, experience and best practice. The FP7 funded MEDOANET[94] project successfully built up a Mediterranean Open Access Network, but unfortunately this does not seem to be active after the end of the funding. In order to take this forward, several options exist:

- re-activating MEDOANET: this would build on previous knowledge and could potentially be considered good practice on following up on EU funding (sustainability). However, a "MEDOANET 2.0." would require new funding,

[93] See Annex I on economic model to estimate Open Access and Data funding in Malta.

[94] http://www.medoanet.eu/home

which could be achieved *inter alia* through an ERA-NET[95] or a Horizon Europe partnership.

- Intergovernmental cooperation in the context of the National Points of Reference set up to monitor and report on the implementation of the Recommendation on Access to and Preservation of Scientific Information. A small group of like-minded countries could form a regional sub-grouping. Furthermore, Malta could propose to turn the current Recommendations into a harder policy tool, such as a Directive or Regulation.

- Potentially, consider cooperation within the Union for the Mediterranean and/or the Southern Neighbourhood (in the framework of the European Neighbourhood Policy, which would also allow the integration of non-EU countries in the region.

[95] a Horizon 2020 funding instrument designed to support public-public partnerships

LIST OF ABBREVIATIONS

APC – Article Processing Charge

API – Application program interface (a set of routines, protocols, and tools for building software applications.)

CC – Creative Commons

COST – European Cooperation in Science and Technology

CWTS – Centre for Science and Technology Studies – Leiden

DFG – Deutsche Forschungsgesellschaft

DMP – Data Management Plan

DOAJ – Directory of Open Access Journals

DOAR – Directory of Open Access Repositories

DORA – Declaration on Research Assessment (also referred to as "San Francisco Declaration")

DP – Data Protection

DSM – Digital Single Market

EC – European Commission

ECI – European Cloud Initiative

EOSC – European Open Science Cloud

FAIR – Findable, accessible, interoperable, re-usable

FTE – Full-time equivalent

HEIs – Higher Education Institutions

IP – Intellectual Property

LIBER – Ligue des Bibliothèques Européennes de Recherche / Association of European Research Libraries

MCAST – The Malta College of Arts, Science & Technology

MCST – Malta Council for Science and Technology

MEAE – Ministry for European Affairs and Equality

MEDE – Ministry for Education and Employment

MITA – Malta Information Technology Agency

MS – Member States (of the EU)

MT – Malta

NOAD – National Open Access Desks (part of OpenAIRE)

OA – Open Access

ORD – Open Research Data

ORCID – Open Researcher and Contributor ID (a non-proprietary alphanumeric code to uniquely identify scientific and other academic authors and contributors).

OS – Open Science

OS-CAM – Open Science Career Assessment Matrix

PID – A persistent identifier (a long-lasting reference to a document, file, web page, or other object)

RDM – Research Data Management

R&D – Research and Development

R&I – Research and Innovation

SSH – Social Sciences and Humanities

UM – University of Malta

ANNEX I: ECONOMIC MODEL TO ESTIMATE OPEN ACCESS AND DATA FUNDING IN MALTA

Introduction

What are the costs and benefits of Open Access and Data? This is a simple question which, however, is difficult to answer. In higher education one is accustomed to explain benefits qualitatively. Open Access and Data are essentially the way forward for science. One simply does not speak about it in terms of economic benefits and costs. However, for good reasons policy makers require guidance on costs and funding associated with Open Access and Data. Over the past few years only a few significant reports answered to policy makers. The first High-level Group on the EOSC reported up to 5 % of the annual research budget to be spent on FAIR data.[96] Sadly the report does not contain the method and data used for the estimated 5 %. Secondly, the Science Business Consulting Group reviewed the 5 % and concluded that only initiating an EOSC might cost up to 5 %. An operational EOSC would cost around 1-2 %.[97] Other than these two aforementioned documents, there are no reports on how to estimate the necessary funding for national Open Access and Data policies. There is however one study about the transition costs of Open Science in the Netherlands.[98] A basic economic model, part of this study, has been applied to Malta.

Stepped model approach

To indicate necessary funding for an Open Access and Data policy one must first have consensus on the aim and goals. Without this consensus it is not possible to identify required facilities and activities to reach the policy aim and goals. The main PSF report serves as reference for the policy aim and recommended activities and facilities in Malta. In the economic model below, nine key facilities and activities for Open Access and Data are distinguished.

The main conclusion of the model is that the **estimated annual necessary funding** is:

- ~ EUR 760,000 and ~ 12 full-time equivalent (FTE) for the UM
- ~ EUR 200,000 and ~ 4 FTE for MCAST

The estimated funding is the result of a three-stepped economic model:

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[96] HLG EOSC (2016) Realising the European Open Science Cloud: First report and recommendations of the Commission High-Level Expert Group on the European Open Science Cloud

[97] Science Business Consulting Group (2018): The European science cloud: Who will pay?

[98] Robert Consultancy and Technopolis (2019): Transition Costs for Open Science in the Netherlands, https://www.openscience.nl/projecten/project-a-transitiekosten-open-science

1. A survey to determine the level of facilities and activities today

2. An expert opinion (based on PSF report recommendations) of the required level of facilities and activities to reach the policy aim

3. A calculation of funding in terms of FTE or money.

The survey for the first step has been developed in cooperation with Open Science experts in the Netherlands. Its aim was to capture the most directly accountable (quantitative) Open Access and Data activities or facilities. The Dutch survey results are an important source and reference in step 2 of the approach: to identify the required levels for Malta. For instance, the FTE number of central research support staff in the Netherlands serves as a good practice to identify the necessary level in Malta. Other examples are FTE data stewards. Obviously, an average Dutch university is likely different from UM and MCAST. To make the Dutch model results applicable to Malta it is crucial in step 3 to determine the ratio 'average Dutch university': UM: MCAST. Based on information about number of FTE staff, number of students and number of faculties, the ratio for UM is 0.75 and for MCAST 0.25. In step 3 of the model these ratios work as follows. A good practice level of data stewards is one (1) data steward for each faculty. For UM with 14 faculties and a ratio of 0.75 the required level of data stewards is 10.5 FTE. MCAST with 8 (research) institutes and a ratio of 0.25 requires a level of 2.0 FTE data stewards.

Annex: Economic model to estimate annual funding for open access and data in Malta

Activity/facility **Estimated annual costs / funding**	*Survey* UM	 MCAST	*Report recommendation* UM	 MCAST	*Required extra funding* UM	 MCAST
	fte or #	*fte or #*	*fte or #*	*fte or #*	*fte or EUR*	*fte or EUR*
1. Datastewards (fte)	0,0	0,0	10,5	2,0	10,5	2,0
2. Central research supporters (fte)	8,0	0,0	9,2	2,0	1,2	2,0
3. Central Research Information System	0	0	1	1	€ 225.000	€ 75.000
4. Data storage facilities	0	1	14	6	€ 280.000	€ 100.000
5. Training	2	1	3	2	€ 33.750	€ 11.250
6. Repositories (CRIS excluded)	1	2	1	2	€ -	€ -
7. APC funding	0	0	1	1	€ 210.000	(share with UM)
8. Publishing support facility	1	1	1	1	€ -	€ -
9. DataCite, ORCID	0	1	2	2	€ 11.000	€ 11.000

Comments

1. Recommended # datastewards: good practice Dutch 2020 default 1 DS per faculty (NPOS 2019 report, p. 6)
2. Recommended # fte central support: good practice, average in Dutch universities 12,25 (NPOS 2019 report, p. 6)
3. Central Research Information System and an article repository are two complementary systems. Recommended: 1 each organisation
4. Recommended #: Dataverse kind of solution for every faculty (UM) or institute (MCAST).
5. Training: UM is recommended to start PhD specific training and MCAST is recommended to start open science specific training.
7. Recommended APC funding: background report "620 articles in 2014-2018", ~ 150 annually. Multiplied by APC 1.400 EUR.
   There is no background report breakdown of the 620 between UM and MCAST. In the funding model all assigned to UM.

Ratio's for recommended heads or EUR are based on comparison with Dutch universities (baseline numbers below):

a. Ratio UM: 0,75. Staff and students 50% compared to Dutch, but 14 faculties above Dutch -> estimated ratio 0,75
b. Ratio MCAST: 0,25. Number of research institutes and students 50% of UM and less research intensive -> estimated ratio 0,25

Baseline numbers UM

- # 14 faculties: 2 medical, 4 beta, 8 alpha (research in 18 institutes and 13 centres)
- # fte research staff: ~ 1.100
- # students: ~ 11.500

Baseline numbers MCAST

- # 8 (research)institutes
- # fte academic staff: no data available
- # students: ~ 6.000

Baseline numbers Dutch universities

- # 13 universities, fte academic staff ~ 30.000 and # students ~ 300.000
- average per university: # fte 2.300 and # 23.000 students

ANNEX II: WORKSHOP ON OPEN ACCESS POLICY IN MALTA

PART I – High Level Workshop, 9:00-10:30

	PROGRAMME
09:00-09:10	Welcome and introduction to the project and the programme (*Niels Stern*)
09:10-09:15	Tour de table
09:15-09:45	Presentation of high-level recommendations incl. Q&A (*Daniel Spichtinger, Natalia Manola, Robert van der Vooren*)
09:45-10:05	Pre-mortem exercise part I (*Niels Stern*)
10:05-10:25	Pre-mortem exercise part II (*Niels Stern*)
10:25-10:30	Wrap-up and next steps (*Niels Stern*)

Pre-mortem technique

The pre-mortem technique can be seen as a deep risk analysis but played in a way that forces the participants to be more imaginative than in usual. The pre-mortem – as opposed to the post-mortem – identifies and analyses the potential critical problems of a given project before it's too late. The core of the pre-mortem in our context is to imagine a situation one year after the Maltese national policy on Open Access was launched. We play that it turned out to be a disaster. Why did it become a disaster? That is the essence of this exercise.

Pre-mortem references

i. Pre-mortem technique presentation by Nobel laureate Daniel Kahneman https://youtu.be/MzTNMalfyhM

ii. Description of the pre-mortem technique by its inventor Dr. Gary Klein, in Harvard Business Review:

https://hbr.org/2007/09/performing-a-project-premortem

The pre-mortem exercise falls in three steps:

I. Brainstorm.

The first part of the exercise is to brainstorm all imaginable reasons for the failure. The point is to get as many explanations as possible. No matter their probability and without thinking about solutions. The brainstorm input is prepared individually (per institution represented). Institutions are recommended to prepare this in advance, but time will be given during the workshop for this exercise.

II. Categorisation

All the results of the brainstorm are written on a large screen for everyone to see. In step II the brainstorm input is categorised into two groups: A) Things we can do something about and B) things we cannot influence or do anything about. This exercise is performed as a plenary session.

III. Solutions

At the end – not before – we search for solutions to the issues that are placed in category A. This exercise will be performed in the expert's workshop.

Part II – Expert Workshop, 11:00-16:30

	PROGRAMME
11:00-11:05	Welcome and introduction to the programme (*Niels Stern*)
11:05-11:20	**Open Access to publications** Presentation of baseline, scenarios, and draft recommendations (*Daniel Spichtinger*)
11:20-11:40	Group work on draft recommendations based on the following questions: 1. How could the recommendations be implemented? 2. What resources would be required? 3. Input into road map
11:40-11:55	Plenary presentation of group work
11:55-12:00	Wrap-up of draft recommendations for Open Access to publications (*Daniel Spichtinger*)
12:00-13:00	**LUNCH**

	PROGRAMME
13:00- 13:15	**Open Research Data and relevant infrastructures** Presentation of baseline, scenarios, and draft recommendations (*Natalia Manola*)
13:15- 13:35	Group work on draft recommendations for based on the following questions: 1. How could the recommendations be implemented? 2. What resources would be required? 3. Input into road map
13:35- 13:55	Plenary presentation of group work
13:55- 14:00	Wrap-up of draft recommendations for Open Research Data and relevant infrastructures (*Natalia Manola*)
14:00- 14:05	**Assessment practices** Presentation of baseline, scenarios, and draft recommendations (*Daniel Spichtinger*)
14:05- 14:20	Group work on draft recommendations based on the following questions: 1. How could the recommendations be implemented? 2. What resources would be required? 3. Input into road map
14:20- 14:30	Plenary presentation of group work
14:30- 14:35	Wrap-up of draft recommendations for assessment practices (*Daniel Spichtinger*)
14:35- 14:50	**COFFEE BREAK**
14:50- 14:55	**Skills and training** Presentation of baseline, scenarios, and draft recommendations (*Daniel Spichtinger*)
14:55- 15:05	Group work on draft recommendations based on the following questions:

	PROGRAMME
	1. How could the recommendations be implemented? 2. What resources would be required? 3. Input into road map
15:05- 15:15	Plenary presentation of group work
15:15- 15:20	Wrap-up of draft recommendations for skills and training (*Daniel Spichtinger*)
15:20- 15:30	**Governance and sustainability** Presentation of baseline, scenarios, and draft recommendations (*Robert van der Vooren*)
15:30- 15:45	Group work on draft recommendations for governance and sustainability based on the following questions: 1. How could the recommendations be implemented? 2. What resources would be required? 3. Input into road map
15:45- 16:00	Plenary presentation of group work
16:00- 16:05	Wrap-up of draft recommendations for governance and sustainability (*Robert van der Vooren*)
16:05- 16:20	Road map and milestones (*Niels Stern*)
16:20- 16:30	Wrap-up and next steps (*Niels Stern*)

Disclaimer

This session will be held under the Chatham House Rule which means that participants are free to use the information received, but neither the identity nor the affiliation of the person who gave the information may be revealed. In other words, we will not be distributing or archiving any input given during the brainstorm part of the pre-mortem. The purpose of the exercise is to strengthen our work with the national Open Access policy and to give input to the expert workshop.

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"Open Access: an opportunity for Malta" - Recommendations for the Development of a National Policy for Open Access to publications, research data and related issues for Malta is a report which was carried out between October 2019 and April 2020 by a dedicated PSF panel, consisting of four independent experts.

The PSF Specific Support to Malta aims to provide external advice and operational recommendations on an Open Access policy to the country's authorities. The objective is to enable Malta to adopt a timely and effective path towards achieving European goals related to Open Access and bridging the gap with other leading Member States in this area.

Studies and reports

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