ROSiE

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D3.2: Report on Stakeholder Forum activities

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ABSTRACT:	This report summarises stakeholder activities carried out as part of the ROSiE project. It starts with an overview of the role of the Stakeholder Forum, its composition, and the recruitment of its members. Thereafter, the report expounds the activities in which the entire Forum or some of its members were engaged in and points out how their contributions helped to shape project outcomes. This report aims to provide a concise summary rather than an extensive description of all stakeholder engagement activities, as all major activities are elaborated and analysed in detail in other deliverables published by ROSiE. This text therefore contains several references to other ROSiE outputs, where readers interested in a comprehensive analysis of the Stakeholder Forum's activities can find more detailed information. The final section of the report reflects on the strengths and weaknesses of

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	stakeholder engagement through a permanent forum and provides some tentative recommendations for other projects.
Keyword List:	Stakeholders, stakeholder engagement, open science, research ethics, research integrity, citizen science

Consortium:

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2.	Partner	ÖSTERREICHISCHE AGENTUR FÜR WISSENSCHAFTLICHE INTEGRITÄT	OeAWI	Austria
3.	Partner	VEREIN DER EUROPÄISCHEN BÜRGERWISSENSCHAFTEN	ECSA	Germany
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0.4	29 February 2024	Rosemarie de la Cruz Bernabe	Final version approved

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List of abbreviations

ECoC	European Code of Conduct for Research Integrity
EU	European Union
OS	Open science
REC	Research ethics committee
RFO	Research funding organisation
RIO	Research integrity office(r)
RPO	Research performing organisation
WP	Work package

1 Introduction

Stakeholder engagement was a pillar of ROSiE throughout all phases of the project and closely interwoven with the EXPLORE, GUIDE and EQUIP dimensions and objectives. By engaging stakeholders, ROSiE aimed to ensure that project outputs are responsive to the needs and values of all actors in the open science (OS) ecosystem and thus designed in a way to promote and foster responsible OS across and beyond Europe. Together with the Cross SwafS Forum that brought together projects funded by the European Union (EU) addressing OS and citizen science and the advisory board that provided external guidance to the consortium on strategic questions, the ROSiE Stakeholder Forum was a central conduit for several stakeholder engagement activities throughout the entire project.

More precisely, the Forum served a dual role as permanent consulting body for ROSiE and as a pool for participants of specific stakeholder engagement activities, such as workshops, interviews and focus groups. As neither Forum meetings nor workshops focused primarily or exclusively on tasks of WP3, the Forum – as envisaged in the proposal and description of the action – interacted with almost all WPs of ROSiE, especially those addressing the GUIDE and EQUIP phases of the project (WP5, WP6, WP7). In this way, the activities involving the Stakeholder Forum or at least some of its members aimed to ensure that all major project outputs of ROSiE are considered legitimate, relevant, and useful in actual research and research support practice by all key actors whose endorsement and eventual uptake of results is key to create significant and lasting impact.

This report summarises the activities of the Stakeholder Forum. To that end, it gives overview of the composition of the Forum and briefly outlines how members were recruited. Thereafter, the

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report expounds the activities the entire Forum or some of its members were engaged in and points out how their contributions helped to shape project outputs. The present report aims for a concise summary rather than an extensive description of all stakeholder engagement activities because all major activities are elaborated and analysed in detail in other reports published by ROSiE. Therefore, the report contains several references to other ROSiE outputs where readers interested in an extensive analysis of Stakeholder Forum activities can find further information. The final section of the report reflects on the strengths and weaknesses of stakeholder engagement via a permanent forum and offers some tentative advice for other projects.

2 Recruitment and composition

During the first four months of the project (March to June 2021), a stakeholder engagement strategy was developed that guided all subsequent engagement activities (Deliverable D3.1: Report on a strategy to engage stakeholders). Adjustments were made whenever necessary due to, for example, delays in the project caused by changes in consortium composition and repercussions of the COVID-19 pandemic, in particular regarding travel restrictions during the initial phase of ROSiE. Moreover, flexibility was necessary because ROSiE operated in a highly dynamic OS environment so that actions often had to be adjusted to respond to recent developments that were not fully anticipated in the project proposal.

Based on the stakeholder engagement strategy, the Stakeholder Forum was recruited in autumn 2021. Potential members of the Stakeholder Forum were identified through networks and existing contacts of all consortium partners and an internet search of relevant projects, initiatives, and networks. Afterwards, prioritised members were invited via email, paying attention to diversity in terms of, for example, gender, role in the research ecosystem, disciplinary background, geographic location, and career stage. Moreover, an informal online meeting was offered to all invitees to introduce ROSiE in more detail and specify mutual expectations. Most invitees accepted the invitation and used the opportunity to have an informal conversation. While these conversations were informal and thus not systematically analysed, they not only helped getting to know each other but also pointed to some crucial questions that were discussed in greater detail in subsequent stakeholder engagement activities. Few invitees explicitly declined to join the Forum, citing mostly time constraints or involvement in what they perceived to be competing rather than mutually reinforcing projects, yet some did not respond at all to the invitation.

As the Stakeholder Forum aimed to be open and flexible, additional members joined during later phases of the project based either on an explicit expression of interest via the contact email mentioned on the project website, via directly reaching out to consortium members and via

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further recruitment efforts to fill gaps and ensure adequate representation of all important stakeholder groups. Over the course of the project, diversity of the Forum increased because new members brought in hitherto underrepresented perspectives from outside Europe, the research ethics sector more broadly and research ethics and integrity education.

Throughout the lifetime of the project, the Stakeholder Forum grew from initially 30 to ultimately 36 members, with a periodic maximum of 38 members and a total of 39 persons who were members at some point during the project. Three members left the Forum during the project due to job changes. Many members of the Forum are listed in the "Stakeholders" section of the ROSiE website, where also short bios of them are available to inform website visitors of how they relate to the OS ecosystem. Some members, however, preferred not being mentioned on the project website, and ROSiE of course respected that wish.

The degree of participation varied significantly across members, depending primarily on both availability and expertise. As regards the former, especially time zone differences and busy schedules posed obstacles to participation that could not always be overcome completely, despite best efforts from all parties involved. As regards the latter, some members preferred focusing their contributions to those aspects of responsible OS that they are particularly knowledgeable about, whereas others – especially those with a policy perspective – were interested in following and contributing to all project activities. However, all Stakeholder Forum activities were joined by a significant number of diverse members and evaluated as highly valuable by participating members of the ROSiE consortium.

Of the 39 people that were members of the Forum, 21 are female and 18 are male so that the Forum's gender balance was adequate. While most of its members are European and/or based in Europe due to the focus of the ROSiE project, the forum also included members from Africa (one member), Asia (two members) and North America (two members). Especially time zone differences and poor internet connectivity posed noteworthy barriers to including a higher number of non-European actors in stakeholder engagement formats that were primarily conducted online, such as the Stakeholder Forum meetings. Other stakeholder engagement activities that could be more easily designed in a way to allow for participation of actors from outside Europe, such as onsite workshops on policy guidance documents, conference presentations and some interviews, as well as project activities of implemented by a partner based in Central Asia had a more explicit global dimension and specifically sought to give a strong voice to the concerns and perspectives of actors from the global south, and these insights are reflected in all main outputs of ROSiE.

Forum members encompassed all stakeholder categories mentioned in the stakeholder engagement strategy, except for industry associations and the general public. The following stakeholder groups were represented in the Forum (with many members falling into more than

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one category), although it is important to emphasise that each member served in individual capacity and not as a spokesperson for their organisation:

- Researchers from different career stages and disciplinary backgrounds (12 members)
- Research performing organisations (RPOs) (5 members)
- Research ethics committees (RECs) and research integrity offices (RIOs) (4 members)
- Research funding organisations (RFOs) and scientific journals (4 members)
- Research managers (5 members)
- Research policymakers and advisory bodies (8 members)
- Science educators and science journalists (7 members)
- Citizen science associations and civil society associations (2 members)

Indirect connections to researchers working in industry or other commercial settings were established through researchers regularly involved in public-private research collaborations, and links to the general public were created through citizen science associations and civil society associations as well as journalists. While these indirect connections do not fully compensate for direct access to these perspectives, their inclusion was considered optional already in the stakeholder engagement strategy. As anticipated, both groups were difficult to reach and, furthermore, assumed as less important than other groups to the impact of the project as ROSiE. Industry associations were conceptualised as less important than other actors in the research system because ROSiE focused mostly on academic and other publicly funded research where research ethics and especially research integrity challenges tend to differ from industry and other commercial research due to differences in reward and assessment systems. Involving the general public was conceptualised as less important because citizens who are not already part of the other stakeholder groups are not directly related to the research system in a way that would make them direct stakeholders for a project that focused on improving research ethics and research integrity. Therefore, the general public was considered as a target group for communication activities rather than stakeholder engagement.

3 Activities

As already mentioned in the introduction, the Stakeholder Forum served a dual purpose. On the one hand, it was used as a pool for specific stakeholder engagement activities, such as workshops, focus groups and interviews during the EXPLORE phase and co-creation activities during the EQUIP and GUIDE phases. On the other hand, it had a consultative function and provided guidance to the project, especially through online Forum meetings during the EQUIP and GUIDE phases. This section provides an overview of all project activities the Stakeholder

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Forum contributed to, either in its role as contact pool or in its advisory function. In addition, the section shows how the Forum was used as a dissemination catalyst.

To minimise the risk of making interviewees and focus groups participants re-identifiable by combining information from various sources and to ensure confidentiality, information on who was engaged when and how cannot be given in a public deliverable. Because of that, some of the following sections stay at a rather general level.

3.1 Interviews

Between January and April 2022 in the EXPLORE phase of the project, 12 semi-structured interviews were conducted to gather insights on how OS is understood and conceptualised by stakeholders, to identify the most urgent research ethics and research integrity challenges OS creates or exacerbates and to collect good practices that facilitate responsible OS. The interviews lasted between 35 and 60 minutes and were structured according to an interview guide collaboratively developed by multiple consortium partners and adaptable to the expertise of the interviewee. They were recorded, transcribed, and analysed, and recordings were deleted after the transcription. An analysis of nine of these interviews can be found in Deliverable D3.3 ("Report on interviews"), and an analysis of all 12 interviews fed into Deliverable D3.4 ("Recommendations resulting from the analysis of the consultation process").

Several interviewees were recruited through the Stakeholder Forum because they were considered excellently positioned to provide valuable insights due to their position in the OS ecosystem. As D3.3 and D3.4 show in more detail, the interviews yielded crucial insights into what issues stakeholders considered important to address to ensure OS is conducted responsibly as well as insights into good practices ROSiE could help to reinforce. They provided important starting points especially for developing policy guidance and guidelines for research teams, designing the Knowledge Hub in a user-friendly way, and creating training materials that help researchers and students in navigating the OS landscape. Besides, they complemented the analyses on the relationship between OS research ethics and integrity as well as OS and the philosophy of science and the exploration of social, legal, and ethical issues.

3.2 Focus groups

ROSiE conducted three focus groups to deepen discussions on issues identified as highly important during the interviews or mentioned in the informal conversations during the recruitment of the Stakeholder Forum. While the project proposal originally foresaw two onsite focus groups, two smaller online and one onsite focus group were conducted instead because travel restrictions related to the COVID-19 pandemic made organising an onsite focus group in

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early 2022 impossible. In line with relevant guidance which recommends lowering the number of participants in online focus groups compared to onsite ones, two smaller online focus groups were conducted instead of one onsite focus group to explore primarily research integrity questions related to OS. The online focus groups were conducted in February 2022 and are analysed in Milestone Report MS11. The onsite focus group addressed research ethics aspects of OS and was conducted in June 2022 during the annual meeting of the EUREC network. It is summarised and analysed in milestone report MS13. Both milestone reports can be found in the appendix of this report. The insights obtained from the focus groups also fed into Deliverable D3.4 ("Recommendations resulting from the analysis of the consultation process").

The focus groups were structured according to a set of collaboratively developed guiding questions. Like the interviews, the were recorded and transcribed, and the recordings were deleted after the transcription. As described in detail in the milestone reports and Deliverable D3.4, the focus groups explored the following sets of issues:

Focus group 1 (online, 5 participants)

- Explore research ethics and integrity challenges different stakeholders face when aiming to pursue open science practices.
- Identify obstacles that make it difficult to realise the transformative potential of open science.
- Gain insights that might help to develop tools and guidelines to support stakeholders in implementing responsible open science practices.

Focus group 2 (online, 4 participants)

- Validate key topics of the first focus group.
- Explore possible trajectories of open science practices.
- Identify potential pathways for addressing research ethics and integrity challenges in a manner conducive to the responsible conduct of research, as well as to linking science and society.

Focus group 3 (onsite, 9 participants)

1. Explore the relationship between OS and the ethos of science.
2. Discuss whether and to what extent OS poses challenges to research ethics.
3. Explore whether and, if so, how research ethics committees (RECs) can mitigate these challenges and support responsible OS practices.

The Stakeholder Forum served as a pool for recruiting participants because many of its members fit the criteria for inclusion, yet it is important to emphasise that not all participants were also members of the Stakeholder Forum. In the same way as the interviews, the focus groups yielded

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crucial insights that complemented other analyses conducted by ROSiE and highlighted potential priorities for the GUIDE and EQUIP phases that were later taken up in, for example, the policy documents and guidelines.

3.3 Workshops and co-creation activities

The Stakeholder Forum was also used as a pool to recruit participants for workshops and to identify stakeholders well-suited for and interested in collaborating closely with consortium members in co-creation activities. Members of the Stakeholder Forum participated in three ROSiE workshops. However, it is important to emphasise that the Stakeholder Forum was only one among several channels used for recruiting participants so that many participants in these events were not related to the Forum. Stakeholder Forum members participated in the following workshops and co-creation activities:

- An online workshop conducted by WP6 in July 2021 to explore how research infrastructures support responsible OS. Importantly, this workshop was held before the Stakeholder Forum was recruited, yet some participants were invited by WP3 and later joined the Forum. Findings from the workshop are summarised and analysed in Deliverable D6.1 ("Preliminary analysis and mapping of existing European and national Open Science infrastructures with regard to promoting responsible Open Science").
- An onsite workshop in Nøresund, Norway in September 2022 dedicated to the strategic policy guidance document. This onsite workshop was supplemented by online meetings with a group of five Stakeholder Forum members who, along with four international stakeholders, contributed to drafting the strategic policy paper. The paper, including information on the co-creation methodology underpinning it, is available as Deliverable D5.2 ("Strategic Policy Paper on Responsible Open Science"). Other members of the Stakeholder Forum provided feedback to an advanced draft of the policy paper during a Forum meeting (see below).
- An online workshop to introduce the ROSiE training materials for stakeholders interested in pilot-testing the materials in October 2022. Invitations were circulated among Forum members, and several of them – as well as other stakeholders and consortium members – participated in the workshop, pilot-tested the training materials at their institutions and provided feedback on their experiences. Some pilot-testers also participated online in a hybrid workshop on revising the training materials after the pilot-testing phase.
- An online workshop in the form of a final dissemination event organised by WP4 on 23 January 2024. Invitations to this event were sent to all members of the Stakeholder Forum, with external participants and the ROSiE consortium also attending. The workshop served to disseminate the final results of the project, including the ROSiE

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Knowledge Hub and training materials. During a brainstorming session on Deliverable 5.3 ("Policy Document Complementing the ECoC: The ROSiE General Guidelines on Responsible Open Science"), participants shared their views in small groups, discussed the challenges of OS, and had the opportunity to ask questions afterwards.

3.4 Stakeholder Forum meetings

The consulting role of the Stakeholder Forum played a major role in the second half of the project during the EQUIP and GUIDE phases of ROSiE. Each of the meetings focused on critically discussing an advanced draft or a detailed development plan for a key output of ROSiE that was circulated in advance among Forum members. In this way, the Stakeholder Forum contributed to ensuring that main project results are responsive to the needs of stakeholders and thus designed in a way that allows for significant and sustained impact. Every meeting addressed a set of guiding questions jointly developed by WP3 and the authors of the draft output discussed. The general organisation and moderation of meetings was led by representatives of WP3, while thematically specific discussions were led by the authors of the outputs under scrutiny. For each meeting a protocol as well as a short analytical report summarising the main results was written and sent to the consortium as well as the Forum to ensure information is accurately reported and available to all partners involved in the project. The short analytical reports of each meeting can be found in the appendix of this report.

Four meetings of the Stakeholder Forum took place over the course of the project:

- A meeting in December 2022 introduced the first version of the Knowledge Hub and gathered feedback on its design as well as the further development plan that eventually fed into the beta version.
- A meeting in March 2023 introduced and discussed an advanced draft of the strategic policy paper (Deliverable D5.2) and helped revising the content as well as presenting key messages in a more concise and reader-oriented manner.
- A meeting in May 2023 gathered feedback on the strategic policy document supplementing the ECoC and this directly fed into Deliverable D5.3 (“Policy Document Complementing the ECoC: The ROSiE General Guidelines on Responsible Open Science“).

3.5 Written consultation and feedback

The Stakeholder Forum was invited to review and contribute written feedback to some key outputs of ROSiE in addition to participating in workshops and Forum meetings. More precisely, Stakeholder Forum members provided written feedback through online consultations on the following outputs:

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- Parallel to recruiting the Forum, WP3 supported the development of the didactic framework for the training programme by inviting stakeholders to comment on an advanced draft of it in the autumn of 2021. 24 stakeholders with extensive experience in research ethics and research integrity education were invited to provide comments, and nine of them eventually became members of the Forum.
- As mentioned above, the Stakeholder Forum was invited to pilot-test the training materials between October 2022 and March 2023, and several members made use of that opportunity.
- In addition to a Forum meeting on the ROSiE policy document to supplement the ECoC (see below), members of the forum were invited to provide written comments to the draft and asked to share the draft in relevant networks to broaden the reach of the consultation in April and May 2023.
- The Stakeholder Forum was invited to pilot-test and provide feedback on the beta-version of the Knowledge Hub in autumn 2023.
- In addition, in December 2023, five members of the Stakeholder Forum were invited to provide feedback on the draft version of Deliverable 5.4 (Discipline-related guidelines) developed in WP5. One Stakeholder Forum member each reviewed and provided direct feedback on the ROSiE OS guidelines for the Humanities, Social Sciences, and Natural Sciences according to the discipline corresponding to their expertise. Due to its comprehensiveness, two members further reviewed the draft guideline for the Life and Health Sciences.

3.6 Dissemination

Members of the Stakeholder Forum supported many dissemination activities of ROSiE by spreading information about the project in their networks and institutions. Members of the Stakeholder Forum were asked to disseminate invitations to pilot-test the training materials, provide feedback to the ECoC supplement and pilot-test the Knowledge Hub. What is more, they were asked to support collecting cases depicting research ethics and research integrity challenges related to OS. Moreover, they helped spreading information about the final online dissemination workshop and the final STOA event in Brussels and generating attention for the final outputs of the project. In this regard, members of the Stakeholder Forum were invited to take part in the final online and onsite events themselves.

Besides these dissemination activities and networking meetings via the Cross SwafS Forum, members of the Stakeholder Forum helped establishing relationships with similar projects and initiatives:

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- ROSiE was invited to contribute to the webinar series of EURODOC as part of their "ECR Updates over Lunch" series in March 2023. The webinar focused on findings from the conceptual phase of ROSiE as well as the strategic policy paper.
- The DOORS network (Digital Incubator for Museums) organised a short training event (part of a so-called "inspirational talk series") in May 2023 together with ROSiE, where the ROSiE training materials were discussed with a specific focus on responsible citizen science in museums.

4 Concluding remarks

To summarise, this report serves as a concise overview of stakeholder activities within the ROSiE project. It outlines the role of the Stakeholder Forum and describes its composition and membership recruitment process. In addition, the report highlights the various activities in which the members of the Forum were involved and emphasises their considerable contribution to shaping project outcomes. In this sense, it demonstrates not only the legitimacy of establishing and managing a Stakeholder Forum, but also illustrates its effectiveness by emphasising the positive impact of stakeholder engagement in project activities to co-create and shape project outcomes. Therefore, the report indicates to what extend the Stakeholder Forum played a crucial role in the ROSiE project.

However, it is also revealed that challenges such as ambiguity of objectives and difficulties in minimising duplication of effort were encountered. These and other barriers at times resulted in suboptimal foresight planning for stakeholder activities. Considering these challenges, a more detailed plan of scheduled project tasks and associated stakeholder engagement could have helped to give the project a more defined direction and enabled it to better adapt and innovate.

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Appendix

Appendix 1: Milestone report MS 11

Appendix 2: Milestone report MS 13

Appendix 3: Report on Stakeholder Forum meeting 1

Appendix 4: Report on Stakeholder Forum meeting 2

Appendix 5: Report on Stakeholder Forum meeting 3

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MS11: Report on focus groups M12

Authors: Tom Lindemann, Lisa Häberlein, Philipp Hövel

Editor: Dirk Lanzerath

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Reviewer:	Lisa Tambornino
Approved by	

ABSTRACT:	This report summarises key topics and issues that were discussed in two online focus groups conducted in February 2022 with stakeholders from a broad range of categories. The report gives an overview of values that could serve as normative underpinning of responsible open science. Moreover, it outlines challenges exacerbating the envisioned transition to open science and sketches pathways to address them. In this way, the report aims to provide crucial information on stakeholder views on open science to the GUIDE and EQUIP phases of the ROSiE project. The report concludes with methodological and content-related recommendations. The former relate primarily to stakeholder advocacy in favour of a participatory approach, the latter, among other things, focus on making open science a core component of all phases of the research process.
Keyword List:	Stakeholders, stakeholder engagement, focus group interviews, responsible open science, open science values, open science challenges

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Table of contents

List of abbreviations

ALLEA	All European Academies
ECoC	European Code of Conduct for Research Integrity
EU	European Union
FAIR	Findable, accessible, interoperable, reusable
HEI	Higher education institution
IPR	Intellectual property rights
OECD	Organisation for Economic Co-operation and Development
REC	Research ethics committee
RFO	Research funding organisation
RIO	Research integrity office
RPO	Research performing organisation

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1 Introduction

This report provides an overview of key topics and issues that emerged from two focus group discussions conducted in February 2022 as part of Task 3.3 of the ROSiE project. According to the task description, Task 3.3 is supposed to obtain information about preferences and opinions on specific open science scenarios identified in WP1. Due to repercussions of the COVID-19 pandemic, the focus group discussions were conducted online via Zoom. To ensure that content can be presented properly using interactive tools and to facilitate inclusive interaction in a virtual setting, it was decided to keep the number of participants on the low end of typical focus group sizes: The first focus group involved four participants (one interviewee who had originally confirmed to participate was not available on short notice), the second focus group involved five participants. Participants were selected to represent a broad range of stakeholder groups as defined in the stakeholder engagement strategy (see Deliverable D3.1) and various fields of research according to the Frascati Manual (OECD 2015). Furthermore, gender balance was also considered to ensure that ROSiE outputs will support gender equality. The interviewer role was shared by the two first authors of this report, and both focus groups lasted about 90 minutes.

Unlike foreseen in the task description, the focus groups could not discuss scenarios due to delays in work package 1 that were caused by changes in consortium composition. Because of that, an exploratory approach was chosen to obtain information about preferences and opinions on open science from different stakeholders. Consequently, the participant selection strategy explicitly aimed at a high diversity of perspectives included in the focus groups by recruiting discussants from different stakeholder categories and from different segments within categories (for example, researchers from different disciplinary backgrounds and career stages). Nonetheless, focus groups are a qualitative method so that findings cannot be generalised. More specifically, the interviewees represent the following stakeholder categories described in Deliverable D3.1 of the ROSiE project:

Focus group 1

- Two senior researchers from the medical and health sciences
- One representative of a research funding organisation (RFO)
- One data journalist

Focus group 2

- One senior researcher from engineering and technology with ample experience in citizen science
- One mid-career and one junior researcher from the social sciences
- One research manager responsible for research ethics and research integrity at a higher education institution (HEI) / research performing organisation (RPO)
- One policymaker with ample expertise in research integrity and close links to research integrity offices (RIOs) and research ethics committees (RECs)

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The two focus group interviews overlapped thematically, yet they pursued slightly different main objectives. The first focus group interview was primarily designed to identify values and challenges related to open science, whereas the second interview was designed to validate and, if necessary, expand these findings. Its second main objective was to identify pathways and tools to address challenges and remove obstacles that currently stand in the way of a broader adoption of open science practices. The specific goals of the first focus group discussion were as follows:

1. Explore research ethics and integrity challenges different stakeholders face when aiming to pursue open science practices
2. Identify obstacles that make it difficult to realize the transformative potential of open science
3. Gain insights that might help to develop tools and guidelines to support stakeholders in implementing responsible open science practices.

The second focus group interview aimed at the following goals:

1. Validate key topics of the first focus group
2. Explore possible trajectories of open science practices.
3. Identify potential pathways for addressing research ethics and integrity challenges in a manner conducive to the responsible conduct of research as well as to linking science and society.

The remainder of this report is structured in the following way: Firstly, an overview of open science values considered crucial by the interviewees will be given. Secondly, discussed challenges exacerbating the implementation of open science practices will be mapped. Thirdly, some tentative pathways to developing solutions to overcome research ethics and research integrity challenges related to open science will be sketched. Finally, the concluding section will outline some implications of these findings for the key products ROSiE will develop over the further course of the project. As a detailed analysis of the results of the stakeholder engagement processes will be the main topic of a report due by the end of June 2022 and as further focus group interviews will be conducted in summer 2022, the key topics discussed in the two focus group interviews will be summarised rather concisely.

2 Open science values

As mentioned in the previous section, the first focus group specifically sought to identify open science values. Consequently, a significant part of the discussion was spent on addressing this issue. The values identified in the first focus group were presented to the participants of the second focus group, and they were asked whether they agree and/or whether they would like to add values. Even though the first focus group discussed values in more depth, participants of the second focus groups mentioned more potentially relevant values. This perhaps surprising finding might at least to some extent be driven by the explicit question whether they would like to add values and thus should be interpreted with caution.

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Participants in the first focus group agreed that the principles of the European Code of Conduct for Research Integrity (ECoC) are well-suited to guide open science practices. These principles, which also could be termed values or virtues according to one participant, are reliability, honesty, respect and accountability:

> - **Reliability** in ensuring the quality of research, reflected in the design, the methodology, the analysis and the use of resources.
> - **Honesty** in developing, undertaking, reviewing, reporting and communicating research in a transparent, fair, full and unbiased way.
> - **Respect** for colleagues, research participants, society, ecosystems, cultural heritage and the environment.
> - **Accountability** for the research from idea to publication, for its management and organisation, for training, supervision and mentoring, and for its wider impacts. (ALLEA, 2017, 2, emphases in original)

However, participants also agreed that the respect principle could be extended to include respect for data, especially respect for data of others. Broadening the respect principle could potentially help to alleviate concerns about scooping, which might contribute to the reluctance among many researchers to fully embrace open science practices.

While participants of the second focus groups agreed that these values indeed are crucial, they mentioned several additional values that might be equally important:

- Sharing
- Collaboration
- Equity
- Fairness
- Trustworthiness
- Reproducibility

By and large these values seem complementary to the values discussed in the first focus group, and many of them are in one way or another already included in the ECoC, albeit not as principles.

With regard to the proposed value of sharing, especially sharing resources and experiences were discussed, and collaboration was mentioned as a closely related value. The importance of equity was mentioned in relation to the problem of high article processing charges that can effectively prevent especially researchers from the scientific periphery from publishing in open access mode. Fairness was proposed primarily because it is a key value that is also easy to understand for researchers who do not usually reflect on the normative underpinnings of the research endeavour.

Trustworthiness and reproducibility were both mentioned as closely related to the ECoC principle of reliability, yet the discussion also addressed data quality as a key issue. Already participants of the first focus groups pointed out that openness does not necessarily mean quality. Based on considerations related to the importance of high data quality, one participant of the second focus

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group (research manager) elaborated that gate-keeping could actually be considered a value if gate-keepers are conceptualised as stewards of quality who help to credibly signal which data is of high quality and thus reliable and trustworthy and which data is not.

3 Open science challenges

Both focus groups discussed several challenges that currently render implementing open science practices difficult for researchers. In general, challenges mentioned by focus group participants can be categorised as follows:

- Challenges related to specifying values and measuring adherence
- Challenges related to the insufficiency of the existing research environment
- Challenges related to disciplinary differences
- Challenges related to inadequate incentive structures
- Challenges related to research communication

Assessing whether and to what extent values guide conduct presupposes specifying them with a relatively high degree of precision, and this can be challenging. When discussing the value of accountability, it is, for example, important to specify to whom researchers should be accountable. Moreover, measuring adherence to norms that are derived from these values presupposes adequate metrices. Unless such metrices exist, it remains difficult to evaluate whether values are actually guiding researcher conduct. Possible measurements mentioned by one participant (researcher from the engineering and technology field) are the duration of embargo periods and responses to data sharing requests.

On a more practical level, shortcomings of the existing research environment were mentioned as a crucial factor giving rise to many challenges researchers face. Especially participants of the first focus group pointed out that researchers often lack adequate support to follow open science practices and thus understandably sometimes feel overburdened. Participants stressed that often guidance on how to implement open science is missing because, for example, sufficiently granular standards are largely lacking. While the FAIR (findable, accessible, interoperable, reusable) principles provide useful guidance, in their view it often remains less clear to researchers what formats should be used to make data openly available. In other words, the practical implications of existing standards sometimes remain unclear.

By contrast, participants of the second focus group were more sceptical with respect to the desirability and feasibility of creating standards. Their scepticism seemed to emanate from both the difficulty to operationalise values and norms as well as from a concern that sufficiently specific standards would be impossible to create across different fields of research. As one participant put it, FAIR is a reasonable overarching standard, and efforts to promote and support open science should focus on necessary conditions of making data comply with them, without

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putting the threshold so high that it would be difficult to reach for the majority of researchers. From such a perspective, value-based guidelines would seem to be more appropriate than detailed standards.

Another problem related to the research environment discussed in the focus groups is the relative shortage of adequate training and education. Especially participants in the first focus group stressed that open science education should ideally be part of higher education curricula. In their view, understanding as early as possible that open science should be related to the entire research process is highly important. However, such education could be difficult to supply in practice because only rather few lecturers in higher education have the skills to teach about open science on both a conceptual and technical level.

Possible personnel shortages were not only identified as a major issue with respect to training and education, but also with respect to data management in labs. Data managers, akin to quality managers in industry research, could perhaps facilitate open science implementation. In that regard, it was mentioned several times that openness should not be equated with quality and, in a similar vein, that FAIR should not be equated with fully open. Consequently, the term open science sometimes can appear slightly misleading.

An issue presumably also related to training and education as well as to data management are disciplinary differences. As a participant in the second focus group pointed out, open science practices currently vary quite strongly across disciplines. The fear of being scooped when opening up research, an issue mentioned multiple times as a major barrier to endorsing open science, is quite significant in some fields, but remains a more minor concern in others. The same holds true for concerns related to intellectual property rights (IPR) that are very important in some fields of research, whereas they play no key role in others. Thus, efforts to promote and support open science should be aware of these different perspectives.

With respect to opening science also to the public, one participant (researcher from the medical and health sciences) stressed that doing so can be problematic under certain circumstances. If the public is not sufficiently literate about research procedures, opening research that involves, for example, animal studies can actually be detrimental and lead to new obstacles that could ultimately hamper scientific progress. Consequently, disciplinary differences also seem to matter when it comes to available options to strengthen the science-society nexus.

A major issue discussed in both focus groups is the importance of incentive structures. Unless incentives are created that reward open science, other efforts to facilitate the envisioned transition to open science are likely to fall short. Issues mentioned in this context include researcher assessment and adequate funding for open science, not only from the EU, but also from other RFOs. Focusing on a broad spectrum of RFOs would be important according to one participant (researcher from the medical and health sciences) because the majority of research funding, even within the European Union (EU), comes from national schemes. If only large RFOs, such as the EU, would fund open science practices, many researchers, especially in the scientific

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periphery, would not benefit because they have little to no realistic chance to obtain such grants. The participant also stressed that an even transition to open science that includes the scientific periphery to the same extent and at the same speed as the centre seems unrealistic due to the vast differences in resource availability. In a related manner, other participants stressed the importance of targeted funding, otherwise its impact would remain limited.

When discussing incentives, one participant (research manager) in the second focus group pointed out that discussions should not centre exclusively on the question of reusability because an unduly narrow perspective could inadvertently decrease incentives to collect original data and thus hamper scientific progress. The participant also stressed that creating structures conducive to "open washing" should be avoided, pointing out that researchers with malign intentions otherwise would be able to exploit deficiencies of the system in their own favour. Another participant pointed out that currently data management often plays an unduly minor role in grant applications and research project management. Creating work packages specifically on data management could alleviate this concern and signal the importance and seriousness of good data management.

In general, especially participants in the first focus group stressed that the existing research system is at least insufficient if not inadequate to support open science practices because existing incentive systems fail to incentivise open science and support structures are viewed as largely insufficient. Thus, researchers technically often would be able to open up their research because the technical infrastructure is there, yet they often have little to no incentive to actually do so. A participant (social sciences) in the second focus group stated that incentive structures and the corresponding environment have to be built up step by step. Effectively warning against an overly strong focus on incentives, the participant also argued that it is not only about external incentives but also about internal motivation that can be fostered through training in open science and internalisation of the corresponding values. In other words, the internal motivation to promote open science may come from the positive reactions of stakeholders themselves to open science practices themselves.

An issue not always discussed under the umbrella of open science that was explicitly included in the focus group discussions was science communication. It was discussed mainly in the first focus group, which included a data journalist as participant. Participants seemed to agree that science communication is an important issue, independently of efforts to promote open science. A key theme discussed was that "translators" are needed to communicate science to society, a role that science journalists can play, because a) many researchers are not necessarily good public communicators and b) communicating research to the general public is not their primary task. To facilitate science communication and usage of scientific data also in data journalism, it was pointed out that journalists could benefit from explanations of data. Lay person summaries of studies common in the medical and health sciences were mentioned as a good practice example, though they are data-based yet not necessarily data-centric. With respect to quality assurance procedures, regular exchanges between researchers and (data) journalists could be useful and

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help strengthen science communication and perhaps also facilitate the responsible usage of scientific data in data journalism. Interestingly, some parallel developments between increasing the inclusiveness of research and similar efforts in data journalism could be identified that could provide impetus for mutual learning. Data journalists have begun to involve people who are represented in the data in their journalistic reporting and analysis. In a similar way, medical research increasingly involves patients in various roles. Moreover, some RFOs have started to use open peer review procedures that involve interested citizens.

4 Pathways to responsible open science

In general, the majority of focus group participants seemed to agree that the transition to open science is a longer-term process that can only unfold stepwise and ultimately needs to culminate in cultural change to be genuinely successful and sustainable. As a researcher from the social sciences aptly put it, “it is not a sprint, it is a marathon”. Since pathways to responsible open science were discussed largely en passant in both focus groups rather than asked about directly because of the way the discussions unfolded, recommendations were given on multiple levels.

Two general yet presumably very important recommendations concern the process of opening up research. As the policymaker and the RFO representative pointed out repeatedly, it is of utmost importance to include researchers in the development of guidance and support tools because open science needs to be made relevant to them. Otherwise, the transition would be unlikely to succeed. In other words, open science needs to be aligned to incentives and guidance needs to apply to actual research practices rather remain at an abstract normative level unrelated to what most researchers usually do. The precise meaning and the implications of rather abstract values are not typically on the radar of most researchers, and this is unlikely to change.

It was also stressed that incentives should be created in a way that they cannot easily be manipulated to avoid the risk of “open washing”. In a similar vein, a participant explained that a credible accountability mechanism would be desirable based on which, for example, grant money could be revoked if open science is not followed despite contrary commitments (akin to a polluter pays principle). Such a mechanism would also help to create a feedback-loop to not only check whether commitments were adhered to, but also to improve funding mechanisms.

Related to that, a researcher from the social sciences stated that especially researcher evaluation rather than training and education should be the first and primary focus of efforts to promote open science because most obstacles are connected to problematic incentives. In other words, the effects of training and education would presumably remain limited unless preceded or accompanied by a corresponding change in researcher evaluation. Other participants, however, stressed that educating researchers is very important and that competency matters, while also expounding that training should be context-specific, echoing the claim that instruments to promote and support open science should be directly relevant to researchers.

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On a practical level, a participant (researcher from engineering and technology) proposed to organise a three-day workshop in which, based on a scenario, a world of completely open research could be simulated. Such a workshop could help shed light on major issues and challenges that would need to be addressed to ensure that open science is conducted in an ethically and legally responsible manner. Another very precise recommendation was to advocate in favour of including a work package specifically dedicated to data management in every project funded by the EU to signal the importance of and ensure proper data management. Related to opening research more generally, one participant (data journalist) also recommended to think about whether project outputs could be designed in a way that they are useful beyond what is formally considered research.

5 Conclusion and recommendations

Overall, the focus group interviews showed that the envisioned open science transformation needs to overcome significant obstacles. In the opinion of the interviewed stakeholders, significant parts of the public research system are based on incentive structures that are not aligned to open science and insufficiently supportive of researchers who are in principle willing to follow open science practices. Even though the majority of challenges seem to have a strong systemic dimension and therefore are not limited in geographical scope, they seem particularly pronounced in the scientific periphery where research infrastructures are weaker and access to funding more limited. Consequently, concerns about equity and fairness might merit more systematic consideration in efforts to promote open science than it has hitherto received.

Specific recommendations for the key products ROSiE will develop fall into two categories, namely procedural/methodological and substantive/content-oriented. A key recommendation to ensure the materials ROSiE will devise are aligned to the needs of researchers and end-users of research results is to involve them in the development of outputs to make these outputs meaningful for them. This strongly suggests using a co-creation or otherwise participatory methodology in the work packages of the GUIDE and EQUIP phases. As mentioned above, scenario-based workshops could be a possible approach to consider in more detail. This recommendation is largely in line with the planned methodology of ROSiE and corroborates the appropriateness of the overarching methodological approach of the project.

In terms of content, it was recommended to strongly focus on highlighting that open science and good data management should be part of all phases of the research process and be an integral component of all research projects. Consequently, the guidelines, training materials and knowledge hub ROSiE will develop should ideally address questions on how to follow responsible open science practices throughout the entire research process. This echoes tentative findings from several interviews and underlines that practicing open science requires a broad set of both technical and non-technical skills. Training helps researchers develop these skills, although

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educational efforts by themselves are unlikely to be sufficient to bring about a successful transition to open science, unless incentives and reward systems are also changed.

Moreover, it was repeatedly emphasised that guidelines and tools should not adopt a "one-size-fits-all approach" but reflect differences between different fields and types of research because challenges are not uniform across all domains. This should ideally be reflected in the ROSiE guidelines, training materials and knowledge hub. Paying attention to these differences and nuances is an integral part of the approach ROSiE will use so that the project is well-positioned to address these concerns in a constructive manner.

Finally, when it comes to policy recommendations, incentives should be created in a way that following open science practices is rewarded and "open washing" discouraged. This suggests that proposed adaptations of incentive structures should follow institutional design principles that incentivise responsible conduct of research rather than superficial compliance.

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MS13: Report on focus group 3

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ABSTRACT:	This report summarises key themes of an onsite focus group discussion on research ethics aspects of open science and citizen science conducted in June 2022. The focus group discussion addressed the relationship between open science and the ethos of science as well as the relationship between open science and principles of research ethics and the work of research ethics committees. The report provides an overview of the main issues discussed with regard to these topics and analyses their implications for main outputs of the ROSiE project.
Keyword List:	Stakeholders, stakeholder engagement, interviews, focus group, open science, research ethics, citizen science, research ethics committees

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List of abbreviations

ECoC	European Code of Conduct for Research Integrity
EUREC	European Network of Research Ethics Committees
REC	Research ethics committee

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1 Introduction

This report summarises key themes discussed in an on-site focus group conducted in June 2022 as part of Task T3.3 of the ROSiE project. The focus group addressed primarily research ethics aspects of open science and citizen science and complements two online focus groups conducted in February 2022, which addressed mostly research integrity aspects of open science and citizen science. It is part of a broader exploratory stakeholder consultation of the ROSiE project, and its findings will inform the development of key project outputs, such as guidelines for research teams, policy guidance, training materials and a knowledge hub. Overarching recommendations from the stakeholder consultation have been reported in deliverable D3.3.

The focus group involved eight participants and had a duration of approximately 75 minutes. The discussion was audio-recorded and transcribed afterwards. The transcript is available to members of the ROSiE consortium. Five of the participants are members of research ethics committees (RECs) and affiliated to the European Network of Research Ethics Committees (EUREC). The three other discussants are affiliated, respectively, to a research performing organisation in the life sciences (1), a network of academies of sciences and humanities (2), and a network promoting societal engagement with science and technology (3). Unlike the EUREC members, all of them have ample expertise and experience in either open science (1 and 2) or in citizen science (3). Unlike all previous stakeholder engagement activities of ROSiE, the focus group was not gender balanced as it included only one female participant.[1]

The focus group was supposed to discuss open science scenarios according to the description of the action specified in the grant agreement. However, no scenarios were available due to delays in other work packages caused by changes in consortium composition. Because of that, the discussion was more exploratory than originally anticipated and addressed two sets of questions:

- How is open science related to the ethos of science, as defined by adherence to the norms of communism, universalism, disinterestedness, originality and organised scepticism?
    - Can open science also be associated with counter-norms such as secrecy, particularism, interestedness or dogmatism?
    - To what extent can open science strengthen the nexus between science and society?

[1] Gender balance was aimed for in the planning of the event, but could not be realised. Two other female participants were invited, but could not attend. Replacing them on short notice was not possible due to organisational reasons.

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- How is open science related to principles of research ethics, such as autonomy, beneficence, non-maleficence and justice? Does or could the envisaged transition to open science affect the work of RECs and other ethics review bodies and appraisal schemes?
    - How can these principles be challenged or upheld by open science practices?
    - Does the evolving transition to open science affect the ethics review process? If so, how?
    - Are there any tensions between open science and, for example, privacy and data protection? If so, what are the tensions and how could they be addressed? Have you come across any other challenges related to open science in ethics reviews?

The remainder of this report will provide an overview of the main themes discussed and issues raised in the focus group and, thereafter, analyse how these insights could inform the development of main project outputs of ROSiE.

2 Open science and the ethos of science

Robert K. Merton, an eminent sociologist of science, conceptualised science as a distinct social institution governed by a specific ethos. The ethos is based on four core norms (often referred to as Mertonian norms):

- *Communism,* referring to the common ownership of scientific goods by the entire research community. This common ownership enables collective collaboration based on shared knowledge. The communism principle is often seen as a precursor to open science (Lechner 2020).
- *Universalism,* referring to the practice of assessing the scientific validity of claims solely according to scientific criteria. In other words, scientific validity claims should be assessed independently from the socio-political status or other personal attributes of the person making the claim.
- *Disinterestedness,* referring to the common pursuit of a shared research endeavour by all research institutions. Consequently, research institutions should act to benefit this shared endeavour rather than individuals within the research community.
- *Organised scepticism,* referring to the practice of scrutinising the methodology underpinning claims of scientific validity and its conformity to codes of conduct before accepting or rejecting their validity (Merton, 1973).

Other authors have argued in favour of including originality as a fifth core norm of the ethos of science, but there is no consensus among philosophers and sociologists of science whether conceptualising it as on par with the other four norms has merit.

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Ziman (2000) and others have diagnosed the rise of counter norms in industrial and non-academic research, that is research focused on problem-solving and often driven by commercial interests. In Ziman's view, these counter norms (described as proprietary, local, authoritarian, commissioned and expert) also permeate academic science and thereby give rise to a post-academic system. While a short summary of the four Mertonian norms as well as the norm of originality was given before the beginning of the focus group discussion, the counter norms were only briefly expounded during the discussion when participants referred to them in their responses.

Overall, most participants seemed to agree that open science is generally conducive to realising the Mertonian norms in research practice. One participant, for example, referred to open science as a welcome and urgent development that can help to bring about a rejuvenated focus on the ethos of science that, in his view, frequently fails to be endorsed by researchers. However, not all participants were convinced that open science can claim conceptual novelty and transformative potential. One discussant consciously adopted an *advocatus diaboli* role and argued that it rather seems to be a fad and stressed that what nowadays is referred to as open science actually is just science. In other words, all practices deviating from open science are not adhering to core norms and values of science and, therefore, fail to qualify as science. While he agreed that current research practices often do not follow the prescripts of (open) science, he pointed out that adjusting practices implies revitalising long held norms and values rather than endorsing genuinely new ones. In this view, open science in many ways is old wine in new bottles.

In the ensuing discussion other participants disagreed with at least some aspects of this line of argument. One discussant concurred that open science indeed implies a refocus on existing norms and values with regard to the relationship between research and the economy but argued that the same does not hold true for the science-society nexus, where citizen science and other new forms of participation have transformed (or at least the potential to transform) research practices. Other discussants added that widespread data sharing is only possible due to new information and communication technologies so that open science entails elements not thought about just a few decades ago. Moreover, a participant expounded that describing open science as just science as it used to be is insufficiently specific, unless reference to a certain time period is made. Nonetheless, views on the extent to which open science can claim novelty remained somewhat divergent.

In response to the claim that open science is indeed new and transformative because it enables and strengthens citizen science and other forms of participation a lively discussion occurred about how openness and science should be understood to ensure that open science is conducted responsibly. As this issue is clearly related to an important concern in research ethics — namely the question whether open science needs safeguards and, if so, how these safeguards should be

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designed — it will be discussed in the next section before addressing how open science affects the work of RECs.

3 Open science and research ethics

Questions about how openness and science should be conceptualised in open science are essentially questions about whether, where and to what extent responsible open science requires gatekeeping and, by extension, a certain degree of closure. While one participant seemed unconvinced that limiting openness beyond existing legal requirements would be desirable and pointed out that this would violate the spirit of open science and neither necessarily avoid or decrease research misconduct, most other participants seemed to converge on the view that defining and, in one way or another, enforcing a boundary between practices legitimately meriting the label science and practices not doing so would be desirable or even necessary. Drawing this boundary adequately requires, in the words of one discussant, ongoing negotiations among all stakeholders involved in and connected to the research endeavour.

A key argument underpinning the claim that some kind of gatekeeping is a necessary safeguard to ensure research is conducted responsibly is that doing science requires competency, education — especially in scientific methods — and perhaps also embeddedness in governance structures. Thus, delimiting the scope of practices that can legitimately be referred to as science can be seen as a first important step in ensuring that open science is not abused as a carte blanche to engage in irresponsible and unjustifiable practices under the guise of conducting a new form of science. Especially what one participant, citing CRISPR kits as an example, referred to as “do-it-yourself science” and “garage science” might pose significant risks if open science leads to the widespread availability of knowledge and technology to malign (i.e. intentionally irresponsible) or incompetent (i.e unintentionally irresponsible) actors. In response, another participant cautioned that at least currently risks of such do-it-yourself science remain limited because creating harm on a larger scale would presuppose access to research infrastructures, which, however, does not seem to counter the risk that openness can be abused by malignant actors.

Many participants, particularly those connected to RECs, stated that openness should be restricted by privacy concerns, a point to which also the other discussants seemed to agree. Referring to a previous discussion that most participants had attended, one REC member alluded to the significant magnitude of these concerns because information and communication technologies not only enable data sharing for open science, but also render established privacy safeguards ever more precarious. Focusing specifically on the relationship between open science and the work of RECs, several discussants highlighted that questions and issues related to data

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sharing—especially when the data contains personal data—is highly relevant to RECs. In particular, the following questions and issues pose challenges for RECs:

- Enabling data sharing is difficult as long as it should be based on informed consent. While the General Data Protection Regulation (GDPR) includes the option to invoke public interest as a legal basis for processing personal data, this practice is opposed to established research ethics principles (especially autonomy) and thus creates difficulties for RECs.
- Increasingly, broad consent is used to enable reuse of data, and discussions of the interface of informed consent and broad consent has been a major concern for RECs for several years. However, it is unclear where the limits of broad consent should be drawn, for example, with regard to how long it should remain valid and to what types of data it can be applied. Moreover, broad consent might be perceived as ethically less problematic in societies characterised by high levels of trust.
- It is unclear how RECs should ideally review protocols that intend to reuse existing data and argue that obtaining re-consent for data use is impossible. This might happen increasingly often in the future, leaving RECs in a difficult position.
- RECs could potentially support the envisaged open science transition by helping to make research more inclusive. Currently, many research protocols exclude people from participating in research if they do not speak any of the official languages of the country where the study is conducted. This excludes certain groups from participation. RECs could potentially insist on translating participant information sheets and consent forms and on hiring interpreters. Participants agreed that this is an important point hitherto neglected in most REC-related discussions.

Valuable lessons on how to address at least some of these challenges could, according to one discussant, be learned from data sharing models in genomic research, where data are usually shared if a data sharing request is based on a compelling justification, effectively creating a model based on restricted openness. In general, all participants affiliated to EUREC agreed that obtaining some guidance on how RECs could potentially address issues that are relevant from both an open science and research ethics perspective would be helpful, especially as regards how to foster inclusivity. Such guidance would fill a gap because currently open science does not play any role in discussions in RECs, despite the above-mentioned overlaps.

While open science is not usually discussed by RECs, it is already focused on by other ethics appraisal schemes, such as the European Union's project evaluation and ethics appraisal scheme. Consequently, discussions on research ethics aspects of open science could and, presumably, should extend beyond the purview of REC review. Although broader ethics appraisal schemes are obviously capable to address open science commitments, focus group participants from RECs were sceptical that such a practice could be extended to RECs because adherence to ideals—such

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as open science—rather than specific and clearly defined research practices are difficult to review based on existing REC procedures and statutes. One participant explicitly stressed that other actors, such as journals, would be better positioned to do so.

In general, open science and research ethics clearly overlap partially so that building bridges between both communities seems worthwhile and urgent. Ethicists and REC members seem well-positioned to help the open science community in paving the way towards responsible open science, while the open science community can possibly support RECs in strengthening the link between science and society and discuss issues related to the social value of research.

4 Implications for ROSiE outputs

The main outputs of the ROSiE project capable to exert significant impact are guidelines for research teams on how to implement open science responsibly, policy guidance on responsible open science, training materials for researchers and students and a knowledge hub. In the following, a concise overview will be given on how the issues discussed in the focus group could be taken into account in the development of these outputs. The recommendations were derived from a tentative analysis of the implications of the findings of the focus group discussion. Therefore, they do not necessarily reflect the views of the focus group participants. As outlined in more detail in deliverable D3.3, it is recommended to continue engaging stakeholders throughout the remainder of the project and to constantly examine how recommendations and guidelines of ROSiE affect research ethics principles and governance.

The ***guidelines for research teams*** should help researchers who conduct research involving human participants in reconciling open science ideals with data protection legislation and legitimate ethical demands to respect the privacy of research participants. Moreover, they could alert researchers to the fact that legal compliance is a necessary, but not always a sufficient condition for ethical appropriateness (law specifies what must be done, ethics specifies what should be done) because research teams will often be confronted with demands from both the legal data protection regime and the research ethics governance system. Understanding their respective bases and their relationship could help researchers in navigating these demands competently. The guidelines on data protection in information and communication technology research developed by the PANELFIT project could be a useful starting point.[2]

[2] https://guidelines.panelfit.eu (last accessed 21 July, 2022)

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Furthermore, research teams — including those not doing human subject research — could be advised to systematically evaluate the potential risks of opening up their research and assess if additional safeguards are necessary to minimise the potential for abuse by malign actors, including but not limited to data protection risks. This could include guidance on how to implement ethics by design and data protection by design in an open science environment. Echoing recommendations already given in the research integrity realm, this essentially means that the guidelines should operationalise the dictum "as open as possible, as closed as necessary" and point out where safeguards are needed to ensure open science reinforces responsible research and innovation. Since ethics by design seems to be on the way to become a standard approach to research ethics governance in technology research in the European Union, this could help to align open science and ethics by design considerations.

The **policy guidance** documents ROSiE will develop — especially those not focusing specifically on research integrity aspects of open science — could include recommendations on how to define openness and science in a way conducive to ensuring that open science is not abused as a carte blanche to engage in irresponsible and unscientific practices under the guise of doing a new form of science. Without a shared understanding among the broadest possible range of stakeholders of what open science does and does not entail, especially citizen science and other forms of participatory science could be abused by malign actors or inadvertently open the door to science for actors lacking sufficient competencies and thereby undermine the reputation of the envisaged open science transition. As already emphasised by some stakeholders in interviews and previous focus groups, open science should not imply openness without limits, but requires a balancing of openness with other goods. While research integrity considerations tend to focus on a balancing of openness with other aspects? related to good scientific practice *(ethics in scientia),* research ethics considerations focus on rival goods related to the interaction of research with society *(ethics ad scientia).*

What is more, the policy guidance could possibly include ideas and proposals for how RECs and other ethics appraisal schemes could consider open science in their working practices. Proposals and ideas could, for example, be related to reconciling demands for enabling data sharing with legitimate interests in protecting privacy as well as to supporting the inclusivity of research. Proposals should consider the differences between established RECs, especially those in health research, and other ethics appraisal schemes. In this way, ROSiE could contribute to ongoing discussions on how to create and revise research ethics governance schemes in non-health research, where ethical concerns have become ever more prevalent in recent years, especially in research areas developing or using new and emerging technologies (see, for example, results from SIENNA, SHERPA, PANELFIT, TechEthos).

The **training materials** are intended to upskill researchers and students in following responsible open science practices. Accordingly, they will be aligned to the guidelines and other

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recommendations ROSiE will develop. Therefore, their content should reflect research ethics aspects at least to the extent they are covered by the guidelines and other key project outputs. The focus group participants almost unequivocally stressed the importance of education in open science (including for REC members) to ensure the responsible conduct of research and innovation. Thus, there seems to be agreement on the need for training materials that specifically address the responsibility dimension of open science. One participant stressed that usually younger researchers are very interested in open science and adopting related practices, whereas older researchers tend to be more difficult to reach. This point of view, however, was not shared by all stakeholders consulted in interviews and other focus groups.

As the focus group did not address issues related to the presentation and preservation of project results, it has no direct implications on the design, management or maintenance of the **knowledge hub**. However, the focus group showed that open science has an important research ethics dimension, corroborating findings from work packages 1 and 2. Consequently, the knowledge hub should provide guidance not only on research integrity aspects of open science, but also include pertinent research ethics topics.

In the upcoming EQUIP and GUIDE phases of the ROSiE project, recommendations derived from the EXPLORE phase will be transformed into the key project outputs. The stakeholder consultation has shown that continuous stakeholder engagement is important to align project outputs to the needs and demands of the stakeholder community. ROSiE will continue to engage stakeholders and increase the degree of participation by moving to co-creation activities in the next project phases. During these activities, recommendations made so far will be taken into account and concretized. What is more, some further items might be added to the project agenda. Hence, the recommendations given in this report should be regarded as interim.

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ROSiE

Disclaimer: ***This deliverable has not yet been reviewed by the European Commission. Its content might therefore change as a result of the review process.***

D3.1: Report on a strategy to engage stakeholders

Author: Tom Lindemann

Editor: Dirk Lanzerath

Project title: Responsible Open Science in Europe

Project acronym: ROSiE

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ABSTRACT:	This report outlines the stakeholder engagement strategy of the ROSiE project. The report contextualises stakeholder engagement within the overall work of ROSiE, expounds the aims of stakeholder engagement, specifies the types of stakeholder engagement formats, and provides an overview of the stakeholders identified in the stakeholder mapping. The overview section also addresses the relevance of the expertise of the different stakeholders and their assumed willingness to contribute to the activities of ROSiE. Furthermore, the section sketches how the different stakeholders will be engaged. The final section of the report expounds how the stakeholder engagement strategy will be implemented during the project.
Keyword List:	Stakeholders, stakeholder engagement, participation, outreach

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3.	Partner	VEREIN DER EUROPÄISCHEN BÜRGERWISSENSCHAFTEN	ECSA	Germany
4.	Partner	EUREC OFFICE GUG	EUREC	Germany
5.	Partner	TIETEELLISTEN SEURAIN VALTUUSKUNNASTA	TSV	Finland
6.	Partner	HAUT CONSEIL DE L'EVALUATION DE LA RECHERCHE ET DEL'ENSIEGNEMENT SUPERIEUR	HCERES	France
7.	Partner	L'INSTITUT NATIONAL DE RECHERCHE POUR L'AGRICULTURE, L'AMINENTATION ET L'ENVIRONMENT	INRAE	France
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List of abbreviations

ALLEA	All European Academies
COPE	Committee on Publication Ethics
EARMA	European Association of Research Managers and Administrators
EC	European Commission
ECoC	European Code of Conduct for Research Integrity
ECSA	European Citizen Science Association
ENERI	European Network of Research Ethics and Research Integrity
ENRIO	European Network of Research Integrity Offices
ERI	Ethics and research integrity
ERION	Ethics and Research Integrity Officer Network

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EU	European Union
EUA	European University Association
EUREC	European Network of Research Ethics Committees
LERU	League of European Research Universities
OECD	Organisation for Economic Co-operation and Development
OS	Open science
REC	Research ethics committee
RFO	Research funding organisation
RIO	Research integrity office
RPO	Research performing organisation
RRI	Responsible research and innovation
STOA	Panel for the Future of Science and Technology
WP	Work package
YERUN	Young European Research University Network

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1 Introduction

Stakeholder engagement is one of the four pathways towards impact of the ROSiE project. Engaging stakeholders gives all those significantly affected by or affecting open science (OS) a say in creating the ROSiE framework for responsible OS in the European Union (EU) and thus ensures that the project is responsive to the needs and demands of crucially important actors and institutions. Stakeholder engagement in ROSiE is based on and contributes to the framework of responsible research and innovation (RRI) that underpins the move from "science for society" to "science with and for society", which seeks to make research and research governance more inclusive and responsive (see Owen, Macnaghten & Stilgoe, 2012 and Stilgoe, Owen & Macnaghten, 2013 for a detailed elaboration of the RRI framework).

This report outlines the stakeholder engagement strategy of ROSiE. It explains the specific aims of stakeholder engagement, describes the engagement activities that will be implemented during the project, identifies the main stakeholders, and outlines how they will be engaged. The present report focuses on the stakeholder engagement activities of work package (WP) 3 *EXPLORE and ENGAGE: Stakeholder Engagement Practices.* The aims of the WP are to collaborate with all relevant stakeholders to identify, analyse, and address gaps of current OS practices in different research disciplines. Therefore, issues related to horizontal coordination with other research projects and issues related to dissemination and communication more broadly are only covered to the extent they are intertwined with WP3. Horizontal coordination is organised by WP4, while dissemination and communication are core tasks of WP8. Their activities will be expounded in greater detail in other project reports and on the ROSiE website.

The report is structured as follows: Section 2 explains why the ROSiE project engages stakeholders and describes the aims of stakeholder engagement in more detail. Section 3 outlines the types of stakeholder engagement implemented by WP3. Section 4 addresses three aspects: Firstly, the positions of the main stakeholders in the wider OS landscape are summarised. Secondly, the relevance of their expertise for the tasks of WP3 as well as their willingness to engage with ROSiE are assessed. Thirdly, an overview of the stakeholder engagement formats to which they will contribute is given. The final section provides important information on how the stakeholder engagement shall be implemented, focusing on the interaction of WP3 with other WPs.

2 Aims of stakeholder engagement in ROSiE

ROSiE utilises four pathways to develop and promote a framework for responsible OS in the EU:

EXPLORE: The *EXPLORE* dimension of the project will provide a systematic inventory of the ethics and research integrity (ERI) dimensions of OS and outline social and legal implications the ROSiE

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framework will have to address. Furthermore, it will also provide a systematic inventory of existing technologies and platforms that promote and safeguard responsible OS.

ENGAGE: Supporting all other pathways, the *ENGAGE* dimension of the project will conduct consultations and stakeholder engagement activities to identify stakeholder needs and facilitate the development of tailored solutions. In addition, it will create an EU-wide community of stakeholders interested in responsible OS and pave the way towards the long-term sustainability of the ROSiE framework.

GUIDE: The *GUIDE* dimension of the project of the project will carry out a strategic policy assessment for promoting responsible OS, propose a policy document to complement the European Code of Conduct for Research Integrity (ECoC),[1] and develop operational guidelines on responsible OS for different scientific disciplines.

EQUIP: The *EQUIP* dimension of the project will improve the infrastructure for responsible OS by creating a sustainable knowledge hub and, moreover, upskill researchers of all career levels by developing training materials for responsible OS.

As part of this general framework, the overall aim of stakeholder engagement in ROSiE is to identify, analyse and address gaps of current OS practices in different research disciplines, and to support the development, use and uptake of the ROSiE framework. To that end, stakeholder engagement seeks to support the development of guidelines, policies, infrastructures, and educational materials by helping to tailor them to the needs and demands of their target groups.

More specifically, stakeholders will be engaged to explore issues and gaps of current OS practices, to obtain feedback during the development of the ROSiE framework, and to facilitate the uptake of project results. In this way, stakeholder engagement will help ROSiE accessing relevant knowledge and expertise, galvanise external support for the project, and facilitate endorsement of crucial project outcomes by key actors and institutions. In the first phase of the project, stakeholder engagement will explore prevalent views and attitudes towards OS and assess existing practices. Subsequently, this enhanced understanding of the current situation, combined with regular feedback on pilot versions of the ROSiE framework, will facilitate the development of guidelines, policies, infrastructures, and educational materials that reflect both highest ethical and legal standards and stakeholder needs. Thus, stakeholder engagement contributes directly to the *EXPLORE* and *ENGAGE* pathways of ROSiE, yet it also affects the *GUIDE* and *EQUIP* pathways through regular feedback loops.

To obtain a comprehensive overview and to maximise potential uptake of the ROSiE framework, assessing differences between scientific disciplines will be a focus of all stakeholder engagement activities. Consequently, a major aim of stakeholder engagement is to ensure that a diversity of

[1] https://allea.org/code-of-conduct/ (last accessed 25 June 2021)

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perspectives is represented in the exploration phase of the project. The results of this broad multi-perspective analysis shall subsequently inform the development of the ROSiE framework, which aims to address all fields of research and the entire scientific community.

3 Types of stakeholder engagement in ROSiE

Stakeholder engagement in research can be defined as "the active involvement and participation of others in some aspect of a research project" (Durham et al., 2014, 11). In general, four different levels of stakeholder engagement can be distinguished:

- *Collaboration:* Stakeholders are partners of the research team and help driving the research direction or contribute resources and perspective.
- *Involvement:* Stakeholders provide resources or data to the research and are engaged in a significant manner.
- *Consultation:* Stakeholders are asked for opinions and information.
- *Information:* Information is shared with stakeholders. (ibid., 11-12)

In the context of ROSiE, information measures are essentially synonymous with dissemination and communication, and therefore not addressed in any detail in this strategy. Hence, all stakeholder engagement activities discussed in this strategy fall either in the category consultation, involvement, or collaboration.

The stakeholder engagement activities will contribute to the development of all components of the ROSiE framework: guidelines for researchers from different scientific disciplines, policy documents, the knowledge hub, training materials, and community building. The following stakeholder engagement formats will be implemented by WP3:

- A focus group with 10 stakeholders of high importance for the project will discuss OS scenarios developed by WP1 to understand the views and attitudes of stakeholders towards OS. The focus group will help set the direction for the gap analysis that will inform the development of the OS guidelines for different scientific disciplines. Because the focus group asks participants to share their perspectives and shall help drive the direction of ROSiE, this format is based on a collaboration approach to stakeholder engagement.
- Interviews with stakeholders of high importance and overall high willingness to engage with ROSiE will be conducted to get a better understanding of the spectrum of challenges related to current OS practices. Like the focus group, the interviews will also ask stakeholders to share perspectives and contribute to setting the direction for the gap analysis that will inform the development of the OS guidelines for different scientific disciplines. Consequently, it is also based a collaboration approach to stakeholder engagement.

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- Stakeholders will participate in workshops related to the development of guidelines and policy-related documents in WP5, the mapping of existing national and European OS infrastructures in WP6, the identification of training needs of students, researchers, and citizen scientists in WP7, and the dissemination and communication of project activities and results in WP8. These workshops will actively engage stakeholders to develop a demand-tailored framework for responsible OS and thus follow an involvement approach to stakeholder engagement.
- A permanent stakeholder forum will be established for the duration of the project. Forum members will be regularly informed about proceedings and interim results of ROSiE and asked to share their opinions and views on them. Whenever consultations with the stakeholder forum are focused on only a sub-set of the overall ROSiE framework, only those members who are stakeholders in the relevant domain will be consulted to ensure focused feedback. Because the stakeholder forum aims to obtain opinions and information, it is based on a consultation approach to stakeholder engagement.

The findings from the engagement process will continuously be analysed according to a reflective equilibrium approach, and the results of the analysis will be fed into the relevant WPs on an ongoing basis. Furthermore, a gap analysis will be conducted to identify gaps related to insufficient awareness about OS or insufficient regulation. Insights from the analysis shall help design the guidance and training tools developed in WPs 5, 6 and 7 in a way that avoids jeopardising the innovative potential of different types of research and helps balancing respect for transparency with rights to intellectual property and appropriate degrees of confidentiality. The analysis will be guided by the ECoC as a major – albeit not the only – reference document.

4 Overview of stakeholders

A stakeholder can be defined as "a person or group who influences or is influenced by the research" (Carney et al., 2009, 4). Thus, stakeholders are not only persons and groups who will be the users of (elements of) the ROSiE framework, but also actors and institutions affected by it. This distinction is captured by the differentiation between direct and indirect stakeholders.

ROSiE will engage 10 types of direct and indirect stakeholders that were identified in deliverable D8.1 (Kavouras, 2021). Of note is that the list of stakeholders has been slightly modified from the one provided in D8.1 because the focus of stakeholder engagement in WP3 differs from the focus of dissemination and communication in WP8. The defining criterion for grouping stakeholders into categories for dissemination is whether they can be reached by a common set of communication tools for a given dissemination aim, whereas the defining criterion for stakeholder engagement is related to the way actors can affect and are affected by project outcomes. Due to these considerations, the category "individual researchers, research ethics committees (RECs) and research integrity offices (RIOs), research managers" was dissolved into

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three separate categories, and the category research performing organisations (RPOs) was added. Furthermore, the category "scientific journals" was added and merged with the category research funding organisations (RFOs). Also, the categories science educators and science journalists were combined to a single category. This results in the following list of stakeholders:

- Researchers
- RPOs
- RECs and RIOs
- RFOs and scientific journals
- Research managers
- Research policymakers and advisory bodies
- Science educators and science journalists
- Industry associations
- Citizen science associations and civil society organisations
- General public

In the following, the position of these 10 types of stakeholders in the OS landscape will be briefly described. In addition, stakeholder types will be further differentiated whenever there are reasons to assume that attitudes towards OS and OS practices vary considerably within a group. For each stakeholder group, the relevance of its expertise for ROSiE and its likely willingness to engage will be assessed. Assessments of relevance of expertise are focused on tasks of WP3, and thus may differ from assessments of WPs that implement other parts of the *ENGAGE* pathway, especially WP4 and WP8. The assessments are based on desk research, and it should be emphasised that they might change during the project. Furthermore, it will be indicated in which of the stakeholder engagement formats each stakeholder group will be included.

An important cross-cutting issue that will guide all stakeholder engagement regardless of stakeholder type and engagement format is the gender dimension. For all stakeholder engagement formats, ROSiE will strive to ensure that the number of female participants is at least 40 per cent.

4.1 Researchers

Researchers, both in their individual capacity and as members of research teams, are very important stakeholders of the ROSiE project because they will be main end-users of the guidelines for different scientific disciplines, the training programme, and the knowledge hub. For that reason, assessing their perspectives and meeting their needs is crucial for the credibility, relevance, and legitimacy of project outcomes and ensuring their widespread uptake.

However, researchers are not a homogenous group, and because of that further differentiation is necessary to get a full view of their attitudes towards open science and existing OS practices. Two lines of differentiation are particularly important: 1) differences between scientific disciplines

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and 2) differences between research infrastructures across countries. The former affect OS because types of data used, predominant modes of publication and dissemination, and common ways of involving the public vary profoundly between scientific disciplines. For example, the natural and biomedical sciences overwhelmingly analyse quantitative data, whereas the humanities usually analyse qualitative data. As regards modes of publication, monographs are a common type of publication in the arts and humanities as well as in some of the social sciences, whereas in the natural and biomedical sciences as well as in engineering almost all research is published in journal articles.

Due to these differences, views and attitudes towards OS and existing OS practices are likely to vary significantly between fields of research. A useful differentiation between scientific disciplines is offered by the Frascati Manual of the Organisation for Economic Co-operation and Development (OECD) (OECD, 2015). It differentiates between six fields of research and development (so-called broad classification), each of which contains several subfields (so-called second-level classification):

1. **Natural sciences**
   i. Mathematics
   ii. Computer and information sciences
   iii. Physical sciences
   iv. Chemical sciences
   v. Earth and related environmental sciences
   vi. Biological sciences
   vii. Other natural sciences
2. **Engineering and technology**
   i. Civil engineering
   ii. Electrical engineering, electronic engineering, information engineering
   iii. Mechanical engineering
   iv. Chemical engineering
   v. Materials engineering
   vi. Medical engineering
   vii. Environmental engineering
   viii. Environmental biotechnology
   ix. Industrial biotechnology
   x. Nanotechnology
   xi. Other engineering and technologies
3. **Medical and health sciences**
   i. Basic medicine
   ii. Clinical medicine
   iii. Health sciences
   iv. Medical biotechnology
   v. Other medical science

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4. **Agricultural and veterinary sciences**
    i. Agriculture, forestry, and fisheries
    ii. Animal and dairy science
    iii. Veterinary science
    iv. Agricultural biotechnology
    v. Other agricultural sciences
5. **Social sciences**
    i. Psychology and cognitive sciences
    ii. Economics and business
    iii. Education
    iv. Sociology
    v. Law
    vi. Political science
    vii. Social and economic geography
    viii. Media and communications
    ix. Other social sciences
6. **Humanities and the arts**
    i. History and archaeology
    ii. Languages and literature
    iii. Philosophy, ethics, and religion
    iv. Arts (arts, history of arts, performing arts, music)
    v. Other humanities

To get a broad perspective on views and attitudes towards OS and existing OS practices in the *EXPLORE* dimension of the project, and to develop a framework that addresses the needs of as many researchers as possible in the *GUIDE* and *EQUIP* dimensions, stakeholder engagement activities will involve researchers representing all six fields of research and development. In case fewer than six researchers can be included in a stakeholder engagement activity, at least one researcher shall come from a field of research and development that is not contiguous to the fields from which the other participants come (e.g., if only three researchers can be included in an engagement format and two of them have a background in the natural sciences and engineering and technology, the third should not come from the medical and health sciences, but from a field farther away), unless the engagement activity primarily is targeted at only a sub-group of researchers. Whenever the format of stakeholder engagement allows for the inclusion of several researchers from each of the six groups, efforts will be made to maximise in-group variation. In that regard, task leaders of the tasks a concrete stakeholder engagement activity supports will be consulted to inquire whether including certain disciplines is particularly important, and it will be jointly assessed if limiting the diversity of scientific disciplines represented would be practically advisable and normatively justifiable.

Involving researchers from a broad range of countries in the stakeholder engagement is important because most research infrastructures are funded, managed, and operated at the

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national or federal level, often embedded in national research strategies (OECD and Science Europe, 2020, 11). The OECD and Science Europe identified four different research infrastructure portfolio management models, namely 1) ministry alone, 2) ministry and agencies, 3) agencies alone, and 4) ministries, agencies and regional authority (the studied EU member states fell in categories 2 and 3) (ibid., 14). Also, national research funding patterns are not uniform across Europe (Reale, 2017).

Accordingly, the extent to which responsible OS practices are structurally supported and incentivised are likely to differ between countries. Because of that, stakeholder engagement activities will involve researchers from different countries. In a similar way to including researchers from a diverse set of disciplinary backgrounds, efforts will be made to include researchers from all regions of Europe and a wide range of research infrastructures. Task leaders of supported tasks will be consulted to inquire whether inclusion of certain research infrastructures is particularly important.

As researchers will be the main end-users of many components of the ROSiE framework, involving them throughout all phases of the project is very important. Their willingness to participate in stakeholder engagement and to contribute to the ROSiE project is likely to vary, depending on their disciplinary backgrounds and the research infrastructure they are embedded in. Especially researchers from disciplines where OS practices already are relatively common, like several of the natural sciences, are more likely to be willing to contribute because the benefit of a common framework for responsible OS will presumably be more obvious to them than to researchers from disciplines where OS is currently less common. For that reason, outlining the benefits of OS will be crucial for successfully engaging researchers from disciplines that hitherto have been on the margins of OS, like significant parts of the arts and humanities and some of the social sciences. It will be important to stress that the ROSiE framework will be tailored to the needs of different fields of research.

The same will likely hold true for differences between research infrastructures, which might co-vary to an extent with disciplinary differences (i.e., it seems likely that research infrastructures not only vary between countries but also between scientific disciplines). Researchers embedded in research infrastructures that do not reward OS might be less inclined to engage with ROSiE than researchers embedded in research infrastructures that already incentivise OS.

Researchers	
Relevance of expertise	High
Willingness to engage	Medium – high

Table 1: Stakeholder assessment researchers

Due to the high relevance of their expertise, researchers will be involved in all stakeholder engagement activities of the ROSiE project. Access points to invite researchers to stakeholder engagement activities will be provided by researcher associations, networks of RPOs, and

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networks of ROSiE consortium partners. Moreover, dissemination and communication measures of ROSiE will invite interested researchers to express their interest in participating in stakeholder events via a suitable web interface.

Engagement format	Involvement
Focus group	Yes
Interviews	Yes
Workshops	Yes
Stakeholder forum	Yes

Table 2: Stakeholder engagement formats researchers

4.2 Research performing organisations

RPOs will not only facilitate involving researchers in stakeholder engagement and be a crucial target group of many dissemination and communication measures, but also are important stakeholders themselves. RPOs are crucial transmission belts for the implementation of research and innovation policy because they provide the local research infrastructures and thus influence whether, for example, training programmes are offered, platforms are supported, or policies are endorsed and reflected in organisational culture (see Mejlgaard et al., 2020). Moreover, they play an important role in the assessment of researchers, an issue area recognised as highly relevant for promoting research integrity in the Hong Kong Principles for assessing researchers that were developed as part of the sixth World Conference on Research Integrity (Moher et al., 2020). Thus, RPOs shall be included in stakeholder engagement activities, particularly those related to the exploring and developing policies and practices conducive to responsible OS.

There are various kinds of RPOs. A useful way to differentiate them is by the focus of their research (basic research vs. applied research) and the primary source of their funding (public funding vs. private funding). Most universities (at least in the EU), for example, are publicly funded and often pursue both basic and applied research. Several research institutes (e.g., Max-Planck-Institutes and Helmholtz-Institutes in Germany) are mainly publicly funded and conduct a lot of basic research. By contrast, industrial research is usually primarily privately funded and tends to focus on applied research. Applied research often has an intellectual property dimension and might at some point even blur into product development. Consequently, RPOs are likely to view OS differently, not least depending on the focus of their research and their primary source of funding. Because of that, stakeholder engagement activities of ROSiE will strive to ensure that different RPO perspectives are represented.

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As OS has become an increasingly important topic in research policy, the willingness of RPOs to engage with ROSiE is likely to be high among RPOs seeking to advance OS, whereas it might be lower among RPOs that regard OS as incompatible with their organisational interests.

Research performing organisations	
Relevance of expertise	Medium – high
Willingness to engage	Likely to vary among RPOs, depending on their organisational interests

Table 3: Stakeholder assessment research performing organisations

RPOs will be represented in the stakeholder forum and will be engaged in workshops that focus on the policy dimension of ROSiE. Whether a workshop has a significant policy dimension will be assessed jointly by WP3 and the other WPs involved in its organisation. Access points to RPOs will sought via networks such as the European University Association (EUA),[2] the League of European Research Universities (LERU),[3] the Young European Research University Network (YERUN),[4] All European Academies (ALLEA),[5] Science Europe,[6] and associations of research-intensive industries.

Engagement format	Involvement
Focus group	No
Interviews	No
Workshops	Yes
Stakeholder forum	Yes

Table 4: Stakeholder engagement formats research performing organisations

[2] https://eua.eu (last accessed 25 June 2021)
[3] https://www.leru.org (last accessed 25 June 2021)
[4] https://www.yerun.eu (last accessed 25 June 2021)
[5] https://allea.org (last accessed 25 June 2021)
[6] https://www.scienceeurope.org (last accessed 25 June 2021)

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4.3 Research ethics committees and research integrity offices

RECs and RIOs are crucial intermediaries between the scientific community and society that help promoting and safeguarding responsible research and good scientific practice. Although RECs and RIOs have different mandates, a considerable amount of their activities overlap because *ethics ad scientia* (research ethics) and *ethics in scientia* (research integrity) often cannot be strictly delineated in practice. The European Network of Research Ethics and Research Integrity (ENERI[7]) conceptualises the relationship of RECs and RIOs as shown in Figure 1.

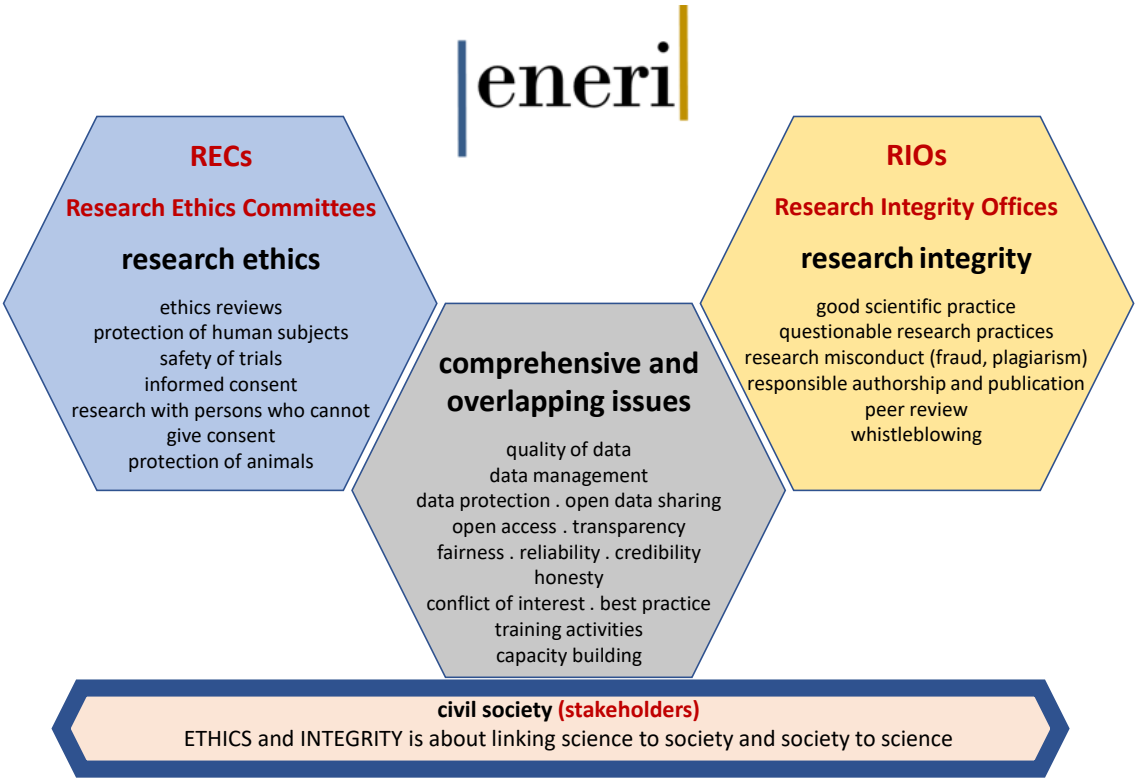

Figure 1: The relationship between research ethics committees, research integrity offices and society

As the figure illustrates, most of the ERI issues related to OS fall in the category "comprehensive and overlapping issues", for example, data management, data protection, open data sharing, open access, and transparency. Thus, RECs and RIOs belong to the same stakeholder group within the ROSiE project.

Because support from RECs and RIOs is crucial to ensure widespread uptake of the ROSiE framework, they will be included in many stakeholder engagement activities. RECs and RIOs have ample experience and vast expertise in the development and application of guidelines, and thus

[7] https://eneri.eu (last accessed 25 June 2021)

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are excellently positioned to support the ROSiE project in developing a framework that is ethically and legally sound, and that builds on and strengthens existing infrastructures.

Access to RECs and RIOs will be provided via consortium partner EUREC[8] that together with the European Network of Research Integrity Offices (ENRIO[9]) and ALLEA forms the core of ENERI. ENRIO has expressed its formal support of ROSiE. Moreover, ROSiE partner OeAWI[10] is a member of ENRIO and ROSiE partner NTUA is closely tied to it via the Greek network member EARTHnet.[11] Using these European infrastructures as access points will ensure that perspectives from different RECs and RIOs will be represented. To ensure that also ethics review bodies other than RECs will be included in stakeholder engagement activities, ethics review experts from the European Commission (EC) will be invited to some engagement activities.

Since promoting responsible research and safeguarding legal and ethical standards are core activities of both RECs and RIOs and since the ROSiE consortium has strong ties to relevant networks, the willingness of RECs and RIOs to support the project is expected to be high.

Research ethics committees and research integrity offices	
Relevance of expertise	High
Willingness to engage	High

Table 5: Stakeholder assessment research ethics committees and research integrity offices

Members of RECs and RIOs will be invited to participate all stakeholder engagement activities of ROSiE because their comprehensive expertise will be valuable throughout all phases and for all components of the project.

Engagement format	Involvement
Focus group	Yes
Interviews	Yes
Workshops	Yes
Stakeholder forum	Yes

Table 6: Stakeholder engagement formats research ethics committees and research integrity offices

[8] http://www.eurecnet.org/index.html (last accessed 25 June 2021)
[9] http://www.enrio.eu (last accessed 25 June 2021)
[10] https://oeawi.at/en/ (last accessed 25 June 2021)
[11] http://earthnet.ntua.gr/?lang=en (last accessed 25 June 2021)

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4.4 Research funding organisations and scientific journals

Although the roles of RFOs and scientific journals in the research endeavour differ in many regards, they are grouped in the same stakeholder category because both significantly influence incentives and opportunities for responsible OS. RFOs, for example, can decide whether to include open access fees in research grants and specify which open access model, if any, grantees are obliged to follow. In a similar vein, scientific journals can facilitate responsible OS by providing supportive infrastructures. On the negative side, the rise of so-called predatory journals is a detrimental side-effect related to the OS movement that needs to be addressed lest OS risks losing some of its legitimacy and academic publishing part of its credibility as a quality safeguard of science.

Therefore, RFOs and scientific journals are important actors in the OS landscape and pivotal stakeholders of ROSiE. Since OS has numerous direct repercussions on how they operate (especially in the case of scientific journals) and since the ROSiE framework can help them implement and promote responsible OS (e.g., by demanding adherence to the guidelines from grantees and mandating or recommending participation in responsible OS training), their willingness to participate in engagement formats is expected to be rather high and their expertise is regarded as very valuable

Research funding organisations and scientific journals	
Relevance of expertise	High
Willingness to engage	High

Table 7: Stakeholder assessment research funding organisations and scientific journals

Access to RFOs and scientific journals will be facilitated by contacts and networks of the ROSiE consortium as the partners are strongly connected in the OS and ERI communities. Among others, the Committee on Publication Ethics (COPE[12]) and projects (partly) focused on the role of RFOs in RRI (e.g., PRO-Ethics[13] and ETHNA-System[14]) will serve as contact points.

Due to their important role in enabling, promoting, and incentivising responsible OS and the importance of their support of the ROSiE framework to ensure its widespread uptake and embedding on the research governance level, representatives of RFOs and scientific journals will be invited to participate in all stakeholder engagement formats.

[12] https://publicationethics.org (last accessed 25 June 2021)
[13] https://pro-ethics.eu (last accessed 25 June 2021)
[14] https://ethnasystem.eu (last accessed 25 June 2021)

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Engagement format	Involvement
Focus group	Yes
Interviews	Yes
Workshops	Yes
Stakeholder forum	Yes

Table 8: Stakeholder enagement formats research funding organisations and scientific journals

4.5 Research managers

Research managers often serve as intermediaries between the upper echelons of organisational governance in RPOs and researchers. They are, for example, involved in grant applications and grant management, support researchers in meeting ethical and legal requirements, and assist RECs and RIOs in their daily work. Because of that, research managers often are acutely aware of the challenges both RPO leaders and researchers face.

Especially ERI managers are among the most important stakeholders of ROSiE because they are well-positioned to provide insights about the challenges of current OS practices and can help assessing whether proposed guidance materials are practically useful. Their willingness to participate in stakeholder engagement is expected to be high because the ROSiE framework can support them in developing or adjusting management procedures to seize the opportunities OS offers while also addressing challenges in an adequate manner.

Research managers	
Relevance of expertise	High
Willingness to engage	High

Table 9: Stakeholder assessment research managers

Access to research managers, especially ERI managers, will be sought via the Ethics and Research Integrity Officer Network (ERION[15]) of the European Association of Research Managers and Administrators (EARMA). As research managers can add a vitally important perspective on many of the issues ROSiE addresses, they will be invited to participate in all stakeholder engagement formats.

[15] https://www.earma.org/about/governance/thematic-groups/ethics-and-research-integrity-officer-network-erion/ (last accessed 25 June 2021)

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Engagement format	Involvement
Focus group	Yes
Interviews	Yes
Workshops	Yes
Stakeholder forum	Yes

Table 10: Stakeholder engagement formats research managers

4.6 Research policymakers and advisory bodies

Research policymakers are, for example, officials from the EC as well as politicians from various levels of government (European, national, local). The term advisory in this context refers to legal advisers who help interpreting law and who provide guidance in fields related to research and innovation. The perhaps most well-known and influential body for such legal guidance on the EU level is the Panel for the Future of Science and Technology[16] (STOA). Both research policymakers and legal advisers are direct stakeholders with regard to the policy dimension of ROSiE. By contrast, they are indirect stakeholders with regard to those elements of the ROSiE framework that have researchers, RPOs, RECs, RIOs, and research managers as their main target groups. While they play an important role in enabling, promoting, and incentivising the uptake and embedding of the ROSiE framework, especially policymakers operate at some distance from concrete research practice.

Due this relative distance from concrete challenges researchers face, research policymakers and legal advisers are overall less well positioned than the previously discussed actors when it comes to exploring current practices and obstacles to OS. Besides, policymakers and – albeit presumably to a lesser extent – legal advisers might overall be less willing to participate in many stakeholder engagement activities of ROSiE because OS is only one of many issues on their agendas.

Research policymakers and legal experts	
Relevance of expertise	Medium
Willingness to engage	Medium

Table 11: Stakeholder assessment research policymakers and legal experts

[16] https://www.europarl.europa.eu/stoa/en/home/highlights (last accessed 25 June 2021)

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As a result, policymakers and legal advisers will only be invited to stakeholder engagement activities with policy implications. This will maximise benefits from their expertise and reduce the risk of stakeholder fatigue. They will be accessed directly through their offices.

Engagement format	Involvement
Focus group	No
Interviews	No
Workshops	Yes
Stakeholder forum	Yes

Table 12: Stakeholder engagement formats research policymakers and legal experts

4.7 Science educators and science journalists

Both science educators and science journalists are intermediaries between the scientific community and the public. Science journalists communicate research to the public usually in a unidirectional mode of interaction, whereas science educators educate the wider public or students about how to understand, interpret, or conduct research in interactive settings. They are grouped in the same stakeholder category because they are similarly positioned towards the ROSiE framework which can help them to access research more easily and to communicate research findings more transparently. In addition, science journalists are potentially important conduits to raise awareness about proceedings and results of ROSiE, while science educators are part of the target group of the training programme.

Consequently, science educators and science journalists are well-positioned to bolster the impact of ROSiE within and beyond the scientific community. However, it should also be emphasised that the importance of their expertise is high only for with respect to some aspects of ROSiE, unless they are also researchers (many educators at universities are also – often even primarily – researchers). Willingness to participate in stakeholder engagement among science educators is expected to resemble willingness among researchers. Science educators who teach subjects that already tend to recognise the importance and promises of OS will presumably have a higher baseline interest in the project than science educators who teach subjects that hitherto have remained on the margins of the OS movement. Achieving an adequately balanced representation of different science educators thus will be a priority in stakeholder engagement activities that address this target group. By contrast, willingness to engage with ROSiE is expected to be rather high among science journalists because the project contributes to an important issue on the research policy agenda and because the ROSiE framework, most notably the knowledge hub, can support science journalism by facilitating and standardising access to information.

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Science educators and science journalists	
Relevance of expertise	Medium
Willingness to engage	Medium – high

Table 13: Stakeholder assessment science educators and science journalists

Science educators and science journalists will be invited to participate in stakeholder engagement activities related to the development of the training programme (science educators) and to events aimed at maximising the uptake of the ROSiE framework. Hence, they will participate in dedicated workshops and be given the opportunity to join the stakeholder forum. Access to science educators will be sought via suitable networks of higher education institutions (e.g., EUA Council for Doctoral Education[17]) and existing educator networks (e.g., the VIRT2UE research integrity trainer network currently build on the Embassy of Good Science[18] and the Path2Integrity community network[19]).

Engagement format	Involvement
Focus group	No
Interviews	No
Workshops	Yes
Stakeholder forum	Yes

Table 14: Stakeholder engagement formats science educators and science journalists

4.8 Industry associations

Industry associations are primarily relevant for promoting the results of ROSiE among their members that have large research and development departments. Hence, they are by and large indirect stakeholders of the project that serve as potential multipliers regarding the dissemination of results. Researchers and innovators working in these departments will be engaged through activities aimed at researchers.

Industry associations usually have a broad mandate of which OS is at best a small part, not least because industrial research conducted with the goal to eventually be converted into product development often requires relative secrecy and a high degree of confidentiality. Therefore, their

[17] https://eua-cde.org (last accessed 25 June 2021)
[18] https://embassy.science/wiki/AboutCertifiedTrainers (last accessed 25 June 2021)
[19] https://www.path2integrity.eu/community_network (last accessed 25 June 2021)

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overall interest in and their willingness to actively engage with ROSiE is expected to be rather low. Also, their expertise is not as relevant as the expertise of most other stakeholders because they are not part of the direct target groups of the ROSiE framework.

Because WP3 does not implement general dissemination measures but instead focuses on gathering and analysing information about positions towards OS, challenges related to current OS practices, and the practical usefulness and normative appropriateness of proposed solutions, engagement measures specifically targeted at industry associations will not be part of the WP. Nonetheless, industry associations will be made aware of ROSiE by dissemination and communication measures implemented by WP8. If due to these measures representatives of industry associations express an interest in engaging with ROSiE more actively, they will have the opportunity to apply for membership in the stakeholder forum. Whether their involvement in workshops could yield mutual benefits would be assessed on a case-by-case basis.

Industry associations	
Relevance of expertise	Low
Willingness to engage	Low

Table 15: Stakeholder assessment industry associations

As mentioned above, outreach to industry associations will be channelled through WP8. However, opportunities for engagement will extend to industry associations in case they actively seek involvement in the project.

Engagement format	Involvement
Focus group	No
Interviews	No
Workshops	Possible
Stakeholder forum	Possible

Table 16: Stakeholder engagement formats industry associations

4.9 Citizen science associations and civil society organisations

Citizen science associations as well as civil society organisations are important stakeholders of the ROSiE project, especially as regards fostering the widespread dissemination of the project's findings and mobilising support for the promotion and incentivisation of responsible OS in the policy area. A major benefit of OS is that it greatly facilitates the active involvement of citizens in all aspects of research. Hence, engaging civil society to tailor the responsible OS framework ROSiE shall develop also to their needs is crucial for maximising the impact of the project.

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As citizen scientists are already committed to getting actively involved in research, their willingness to participate in stakeholder engagement activities of ROSiE is expected to be high. Willingness might be somewhat lower among civil society organisation with a broader mandate, yet it seems likely that it will be high overall because part of their mission is making the voices of civil society heard. Concerning the relevance of their expertise, citizen science associations are more relevant than civil society organisations. Unlike civil society organisations, citizen science associations and their members not only can help galvanising support for responsible OS, but also will be end-users of the guidelines, knowledge hub, and training programme. Thus, more stakeholder engagement activities will include citizen science associations than civil society associations.

Citizen science associations and civil society organisations	
Relevance of expertise	Medium - high
Willingness to engage	High

Table 17: Stakeholder assessment citizen science associations and civil society organisations

Citizen scientists will be invited to participate in all stakeholder engagement formats of ROSiE, whereas outreach to civil society organisations will focus on events aimed at the policy dimension and maximising the impact of ROSiE. Moreover, citizen science associations and citizen science projects will be involved prominently in the horizontal coordination and community-building activities of WP4. ROSiE consortium partner European Citizen Science Association (ECSA)[20] will be a major access point to engage both citizen science associations and civil society organisations.

Engagement activity	Involvement
Focus group	Yes (only citizen science associations)
Interviews	Yes (only citizen science associations)
Workshops	Yes
Stakeholder forum	Yes

Table 18: Stakeholder engagement formats citizen science associations and civil society organisations

4.10 General public

Addressing the general public in outreach activities will help ROSiE raise awareness about its findings and outcomes, as well as increase knowledge about OS in general. However, the general

[20] https://ecsa.citizen-science.net (last accessed 25 June 2021)

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public is too diffuse and heterogenous to be meaningfully included in stakeholder engagement activities of WP3 which are specifically targeted at tailoring project outcomes to the concrete needs of clearly defined stakeholders. Besides that, members of the general public are unlikely to possess OS expertise of significant relevance, and their willingness to get engaged is expected to be low because the salience of OS in the general public discourse is rather limited.

General public	
Relevance of expertise	Low
Willingness to engage	Low

Table 19: Stakeholder assessment general public

The general public's views on OS will partly be gauged through the engagement of civil society organisations, although these are not necessarily representative of all segments of society. Overall, though, engagement of the general public will not exceed disseminating information and thus be confined to measures implemented by WP8. As in the case of industry associations, interested citizens will have the opportunity to register for the stakeholder forum should they wish to contribute to ROSiE.

Engagement format	Involvement
Focus group	No
Interviews	No
Workshops	No
Stakeholder forum	Possible

Table 20: Stakeholder engagement formats general public

5 Implementing the stakeholder engagement strategy

The stakeholder engagement strategy will be implemented by WP3 in close cooperation with WP4 and WP8. As mentioned above, WP4 focuses on horizontal coordination with other projects and, moreover, seeks to build a community of practice, while WP8 focuses on disseminating and communicating the proceedings and results of ROSiE to various audiences, including all above-mentioned stakeholders. To maximise synergies between these WPs and to avoid duplications of work, monthly meetings of WP representatives have been scheduled for the duration of the project.

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Several stakeholder engagement activities, especially workshops, will be co-organised with other WPs, usually with the latter taking the lead regarding overall workshop design and organisation. Thus, WP3 will regularly consult the relevant partners in other WPs (primarily WPs 5, 6, and 7) to discuss workshop formats and specific goals. In this way, the stakeholder engagement strategy will continuously evolve towards a finer level of granularity during the implementation of the project.

As the results from the stakeholder engagement process are intended to provide crucial insights to all WPs, WP3 will regularly update all consortium partners about interim results from the stakeholder engagement process. Furthermore, WP3 will ensure that relevant project proceedings will be communicated to the stakeholder forum. This will be facilitated by the involvement of WP3 leader EUREC in all WPs of ROSiE. In addition, leaders of all WPs will be consulted regularly to inquire whether they would like to report interim results from their WP to the stakeholder forum to obtain external feedback.

The regular communication with other WPs will also be used to monitor whether the stakeholder engagement strategy yields the intended results. Based on this informal formative evaluation, WP3 will continuously assess whether the strategy needs to be modified. In case an update is considered necessary, the consortium will be involved in making the necessary adaptations and be informed about all relevant changes in due time.

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ROSiE

Disclaimer: *This deliverable has not yet been reviewed by the European Commission. Its content might therefore change as a result of the review process.*

D3.3: Report on interviews

Authors: Tom Lindemann, Lisa Häberlein, Philipp Hövel

Editor: Dirk Lanzerath

Project title: Responsible Open Science in Europe

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Approved by	Søren Holm

ABSTRACT:	This report summarises preliminary findings and key insights derived from interviews with stakeholders. The report describes how the interviewed stakeholders conceptualise open science and which ethical, legal and policy issues they consider important. Furthermore, the report discusses the tentative implications of these findings on the key products ROSiE will develop.
Keyword List:	Stakeholders, stakeholder engagement, interviews

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Consortium:

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2.	Partner	ÖSTERREICHISCHE AGENTUR FÜR WISSENSCHAFTLICHE INTEGRITÄT	OeAWI	Austria
3.	Partner	VEREIN DER EUROPÄISCHEN BÜRGERWISSENSCHAFTEN	ECSA	Germany
4.	Partner	EUREC OFFICE GUG	EUREC	Germany
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7.	Partner	L'INSTITUT NATIONAL DE RECHERCHE POUR L'AGRICULTURE, L'AMINENTATION ET L'ENVIRONMENT	INRAE	France
8.	Partner	NATIONAL TECHNICAL UNIVERSITY OF ATHENS	NTUA	Greece
9.	Partner	UNIVERSIDADE CATOLICA PORTUGUESA	UCP	Portugal
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			Lanzerath, Søren Holm
1.0		Tom Lindemann, Lisa Häberlein, Philipp Hövel	Final version

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List of abbreviations

ECoC	European Code of Conduct for Research Integrity
EIGE	European Institute for Gender Equality
ENERI	European Network of Research Ethics and Research Integrity
EOSC	European Open Science Cloud

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ERIC	European Research Infrastructure Consortium
EU	European Union
FAIR	Findable, accessible, interoperable, reusable
GDPR	General Data Protection Regulation
REC	Research ethics committee
RFO	Research funding organisation
RIO	Research integrity office
RPO	Research performing organisation

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1 Introduction

This report summarises preliminary findings and insights from stakeholder interviews conducted in January and February 2022 to identify promises and challenges related to responsible open science practices. Together with additional interviews that will be conducted between March and June 2022, focus groups and workshops, the findings will be a key ingredient to an in-depth analysis of the stakeholder consultation process that will eventually result in a report on recommendations on how to support, promote and safeguard responsible open science. Thus, the report is part of the explore and engage phases of the ROSiE project and builds on the overall stakeholder engagement strategy.

The report is based on nine semi-structured qualitative in-depth interviews with different types of stakeholders. All interviews were conducted online, and an interview guide was used to structure them. The guide was developed by the authors of this report and revised in light of comments by other consortium partners. Further adjustments were made after two pre-tests. The guide divided the interviews into four main sections: 1) background information, 2) open science – conceptions and tasks, 3) open science, ethics and integrity and 4) towards responsible open science. The complete guide can be found in the appendix.

Stakeholders from the following categories described in the stakeholder engagement strategy were interviewed: three researchers (fields covered: medical and health sciences, social sciences, humanities and the arts), three research managers (one from a public university, one from a national research support infrastructure, one from a research performing organisation (RPO)), one research integrity officer, one policymaker and one science educator. The academic backgrounds of the research managers are in natural sciences, engineering and technology and arts and humanities. The other three interviewees who are not primarily researchers are from the medical and health sciences, the social sciences and the arts and humanities. Based on the Frascati Manual of the OECD (see OECD, 2015), the only field of research and development not covered by the interviews is agricultural and veterinary sciences.

Interviewees were selected primarily based on their expertise related to different aspects of open science. Due to this selection strategy, all interviewees had ample experience in the open science field, which should be considered in the analysis of the findings. In other words, the interviewees are not representative of the wider scientific community, where open science is not necessarily a major issue among all actors. Their expertise, however, enables them provide insights particularly valuable to ROSiE.

Eight of the interviewees are female, one interviewee is male. From March to June 2022, further interviews will be conducted to increase the diversity of perspectives by interviewing researchers from hitherto less covered disciplines, members of research ethics committees (RECs) and research integrity offices (RIOs) and representatives of research funding organisations (RFOs) and scientific journals. Consequently, the findings of this report are preliminary and only one of several building-blocks of the overall analysis of the stakeholder engagement process.

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The remainder of this report describes how the interviewees understand and conceptualise open science and what ethical, legal, integrity-related and policy and governance challenges they consider most relevant. Furthermore, the report discusses the tentative implications of these findings on the key products ROSiE will develop and briefly outlines how they will be analysed in more depth based on additional interviews, focus groups and workshops in the upcoming months.

2 Open science: conceptions and understandings

The eventual impact of ROSiE and other projects and initiatives to support and promote open science is crucially dependent on producing outputs aligned to the needs of stakeholders and end-users. This requires understanding how relevant communities perceive open science. To learn more about how stakeholders conceptualise and understand open science, interviewees were thus asked to describe what they associate with the expression. Moreover, several probes during the interviews helped shed light on how they view open science generally. This section summarises prevalent conceptualisations and understandings. Taking them into consideration during the guide and equip phases will help ROSiE to develop products customised to stakeholder needs.

Overall, interviewees view open science favourably, not least because many of them not only are open science experts but also advocates in favour it . Many emphasised that they share many or all of the values underpinning open science, such as availability and transparency:

> Well, for me open science has to do with many values that I share, like making science available globally for many people without the typical barriers (...), so [it is] more accessible science for everybody. (Researcher R1)

> When I hear open science, I am happy because I like transparency, I like openness (...). (Researcher R2)

This positive view was also echoed when asked whether open science is rather a promise or a problem. All interviewees viewed open science mostly as a promise, some initially even saw only few challenges. However, with one exception all interviewees identified significant challenges created by the transition to open science over the course of the interview. The following quotes illustrate the perspective most interviewees seemed to share:

> As a promise. I mean, it's a difficult promise to fulfil at times. And because it is difficult to fulfil on several levels. It's a cultural change aspect, it requires effectiveness, it requires resources (...). (...) But open science in and of itself for me is a non-brainer. It's something that, going forwards, I personally do not see how we can argue for not practicing open science. So I fully believe in open science. It's more a question of making sure that we provide the researchers with an environment in which they can practice open science. (Research manager RM2)

> My first associations are of course about all the benefits and problems regarding open science (...), but I would not work in this field if I would not agree to this paradigm. (Research manager RM1)

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The interviewee who did not name any major challenges often seemingly referred to how open science could elevate research quality once fully implemented. In other words, she focused mostly on benefits on the system level, and she repeatedly stressed that in her view open science is by and large a solution to many problems of the current research system. Yet even she pointed out that a move to open science requires effort from researchers, and that this indeed might be perceived as challenging by some.

In general, many answers to the question what open science means to them centred around the notion that open science means open access to knowledge for everybody, although some interviewees also emphasised that openness should not necessarily mean access without any restrictions in case restrictions are justified and access mechanisms transparently described. When asked about who benefits most from open science, several interviewees stated that researchers are the ones who potentially gain the most. Two interviewees explicitly mentioned researchers from the global south in this regard, a view illustrated by the following quote:

> But sometimes we do not see the benefits for the whole world, like for [researchers from] developing countries who can access open access articles freely and can download the data and go on from this starting point. Previously everything was behind paywalls, and they couldn't even read the results that other researchers had. (Research manager RM1)

With respect to topics covered, all interviews focused on open access to publications and research data. Some interviewees also mentioned citizen science as a core component of and laudable development related to open science, and some discussed explicitly if and how research processes could and should be made more transparent and open. Perhaps interestingly, no interviewee explicitly mentioned open educational resources as a core component of open science, yet all agreed that training is crucial to support the transition to open science.

Interviewees favouring restrictions under certain conditions pointed out that data curation is costly, and that data effectively has become a currency enormously valuable to, for example, several tech companies and insurers. Consequently, the relationship between open science and data commercialisation might merit closer scrutiny. Besides, one interviewee explained that in his view decisions whether to open data should also be informed by considerations whether the data is potentially useful for other researchers. If this is not the case (as, for example, in some small exploratory studies), the costs related to opening data are not outweighed by the potential benefits. Also, concerns about intellectual property rights and patents often enter the equation when weighing whether data or results can be made open.

> From a biomedical science perspective, I definitely see open science as a goal that lies in the future because the science conducted is not open, at least to a certain extent (...). And it's a goal to do this, but it's a goal that has to be negotiated with other goods that speak against open science. (Researcher R3)

On the whole, it seemed that researchers and research managers who closely interact with researchers on a frequent basis are most prone to identify major barriers imposed by the current

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research system that exacerbate the transition to open science, although the small number of interviewees of course does not allow any firm conclusions on whether this pattern holds true in general.

A more general challenge in efforts to support and promote open science was highlighted by a policymaker from the arts and humanities, who stressed that many concepts of open science are not easily transferable to these fields of research. It is, for example, not immediately obvious what the specific meaning of, for example, reproducibility would be for historians and other researchers from other disciplines that employ primarily interpretive methodologies. Even the term open science can be perceived as excluding the arts and humanities because they, strictly speaking, are not considered sciences in the anglophone world. Even though the interviewee did not delve into more inclusive framings in greater depth, open research and open scholarship were mentioned as possible alternatives. This challenge might be exacerbated by the fact that especially scholars from the arts and humanities are very aware that language cannot be fully neutral. As a result, framing open science appropriately matters, perhaps to a larger extent than often recognised.

However, framing was not only mentioned as an important issue by stakeholders from the arts and humanities. Also an interviewee from the life sciences stated that he would recommend to rather use responsible science than open science as umbrella term, and to conceptualise openness as conducive to responsibility and trustworthiness (without, however, being a sine qua non). He expounded that in his experience the expression open science is viewed negatively by many researchers because they incorrectly assume that it suggests openness without limits. Along similar lines, several interviewees as well as other stakeholders in informal conversations mentioned that speaking of fair (or FAIR) rather than open data could help researchers and other stakeholders understand that open science means "as open as possible, as closed as necessary" rather than openness no matter what.

3 Responsible open science: issues and challenges

Many of the issues mentioned so far give rise to specific research ethical, legal and governance challenges that need to be solved or mitigated to support the transition to responsible open science. Even though research ethics (ethics *ad scientia*) and research integrity (ethics *in scientia*) overlap to a significant extent,[1] the following section differentiates between them because important governance mechanisms and bodies (such as RECs and RIOs) crucial to promote and safeguard responsibility in research focus primarily either on one or the other.

[1] See: https://eneri.eu/overlaps-between-re-and-ri/ (accessed 23 February, 2022)

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3.1 Research ethics, law and open science

A core assumption underpinning many efforts to promote and support open science is that it helps strengthening the link between science and society by increasing transparency, facilitating engagement and enhancing trustworthiness. In this way, open science can help prevent, solve or at least mitigate some research ethics problems, that is, moral problems that are associated with or emerge while conducting research.[2] However, some interviewees pointed out that open science also creates new and exacerbates existing research ethical challenges, especially in the realms of data protection, intellectual property rights and societal engagement with research. All these challenges are related to finding the right balance between promoting trust in research through openness and transparency on the one hand and safeguarding privacy rights as well as legitimate interests of innovators on the other hand.

As data protection in the European Union (EU) is governed primarily through the General Data Protection Regulation (GDPR) and attendant national data protection legislation, the ethics of privacy protection in research are inherently intertwined with law. Nonetheless, it should be emphasised that following all relevant legal requirements is not necessarily sufficient to also ensure ethical adequacy of research.

Several interviewees stressed that a major challenge researchers face is to translate the implications of the "as open as possible, as closed as necessary" approach to their own work, not least because some provisions of the GDPR are written in a terminology somewhat opaque to many of them. One interviewee who regularly trains researchers in open science depicted the following experience as exemplary of the problems many researchers face:

> [T]here is this slogan "the data should be as open as possible and as closed as necessary". Then [the researchers in training] always, always start to bring forward examples from their own field where data cannot be opened. They have lots off problems with personal data that they even do not know, whether they can open these data or not. (Research manager RM1)

Due to this uncertainty among at least some researchers, there is a risk that either data is opened up in violation of data protection legislation or that data is not made open because of perceived legal concerns that actually are unwarranted. In the first case, the right to privacy is violated, in the latter case potential benefits of open science are not realised. Perhaps because not respecting privacy rights violates the law, some interviewees suggested that researchers usually prefer to err on the side of caution and thus tend to refrain from opening data. Based on the

[2] See Steneck (2006) for further information on ethical aspects of research and a possible way to differentiate between research ethics and research integrity. See, for example, Penders *et al.* (2018) for a detailed analysis of research ethics and research integrity.

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experiences of two interviewees, this tendency might be particularly acute in countries where personal data processing also for research purposes is only allowed if consent is invoked as applicable legal basis for data processing in accordance with the GDPR.[3]

Aside from the GDPR also intellectual property law and patent requirements create challenges for open science. As one interviewee from the biomedical sciences elaborated, significant parts of research are dependent on the support of sponsors that have a strong interest in patenting innovations and to exploit them commercially. Patents, however, sometimes cannot be granted if the mechanism underlying the patent was openly published before, even if only in a conference paper. Thus, research conducted with the ambition to apply for patents cannot easily be made open without significant strings attached, a challenge that seems particularly relevant in privately funded and industry research. Short of a fundamental overhaul of the entire research and innovation system, such research would not be conducted at all if intellectual property protection and commercial exploitation were not feasible.

Yet not all research ethical challenges of open science have a strong legal dimension. As stated above, a key promise of open science is its alleged potential to strengthen the science-society nexus. Nonetheless, most stakeholders stressed that in their view researchers can benefit most from the transition to open science. While some interviewees explicitly mentioned that also society as a whole can benefit significantly, others expressed more caution. The former suggested that open science can help citizens detect which news are trustworthy and which news are not credible, whereas the latter rather emphasised that reading openly accessible publications and data competently requires training. The following quotes illustrate the slightly divergent (though not necessarily contradictory) viewpoints:

> (…) [D]uring this course [the students] discovered for themselves how open science and research integrity are interconnected, and how it's important for society, for them as citizens, for them as future professionals, as consumers of information, also for their everyday tasks (…). (Researcher R2)

> To my consideration, the linkage of science and society is about asking society what the issues are they want science to solve. How they want it to be solved, if they have some ideas, to involve them entirely in research and to keep communication and engagement all the way. (Research integrity officer RIO1)

> So I think, you know, open science definitely has a broader societal promise. But for that to happen, for that to come to fruition, there has to be much more knowledge generation also on the receivers' side. Because you cannot ask a politician to go and look at an open dataset and make anything

[3] Importantly, the ethical requirement to obtain consent is unrelated to consent as legal basis for personal data processing under the GDPR. Consequently, researchers should always obtain informed consent for participation in research, even if the legal basis for personal data processing is not consent. In such cases, consent to participate in research is a safeguard from a GDPR perspective.

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> useful with it, because they just don't have the tools to interpret it, or to even understand it. Or the same with an open access research paper. (...) [Y]ou have to be trained to be able to read a research paper and understand the implications of a research paper. Just putting something out there, it doesn't mean that it's useful. But I think the promise of open science is already here for researchers. They (...) can immediately benefit from it. (Research manager RM2)

Consequently, it might merit further investigation to assess how and under what conditions open science can yield direct benefits to society at large to understand more fully to what extent and via which pathways it can facilitate and deepen societal engagement with research and innovation.

Interestingly, potential tensions between established informed consent models and open science were not mentioned as major issues in the interviews conducted so far. Even though this might be an encouraging sign that constructive ways to solve such challenges have already been found, it is an issue that will be addressed more explicitly in upcoming stakeholder engagement activities of ROSiE. More generally, readers of this report should keep in mind that the list of research ethical challenges discussed above is not exhaustive. The same is true for the list of research integrity and research policy and governance challenges that will be expounded in the next two chapters.

3.2 Research integrity and open science

The European Code of Conduct for Research Integrity (ECoC) is the most important guidance document on the EU level in the research integrity realm. It outlines four fundamental principles of research integrity – reliability, honesty, respect and accountability – and describes good research practices in eight contexts: 1) research environment, 2) training, supervision and mentoring, 3) research procedures, 4) safeguards, 5) data practices and management, 6) collaborative working, 7) publication and dissemination and 8) reviewing, evaluating and editing.[4] Since the transition to open science affects the entire research system, each of the eight contexts deserves closer scrutiny. In the interviews conducted so far, many issues directly and indirectly related to research integrity were addressed, although in general interviewees consider open science mostly, if not entirely, conducive to research integrity because it increases transparency and has the potential to mitigate the reproducibility crisis experienced by several fields of research in recent years.

Changes in the research environment were mentioned as a crucial precondition for a successful transition to open science by most interviewees. Throughout many interviews various references were made to the necessity to establish a research culture that endorses and rewards open

[4] https://allea.org/code-of-conduct/ (accessed 23 February, 2022)

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science. Interviewees strongly emphasised that incentives to follow open science practices need to be created, for example in research and researcher assessment and funding schemes. This clearly shows that in their view the transition to open science will only succeed if open science is aligned to incentives. Moreover, several interviewees underlined the need to create proper infrastructures for data management, although in general technical aspects of infrastructure development were not named as a major concern because existing infrastructural developments tare perceived to be on the right track. Also, several interviewees anticipate that technological progress and investments in platforms such as the European Open Science Cloud (EOSC) will decrease technological barriers further.

All interviewees consider training in responsible open science desirable. Several explicitly argued that in their view open science should be integrated in trainings in responsible research and good scientific practice. Two interviewees suggested that integrating open science into such trainings also could potentially decrease reluctance among researchers to participate in trainings and endorse open science practices because responsible research and good scientific practice are less contested terms than open science. Furthermore, interviewees largely agreed that open science trainings should be hands-on and practice-oriented rather than theoretical and general.

Major challenges related to mentoring one interviewee brought up are potentially detrimental socialisation effects. In his experience, especially older supervisors who are less aware or more critical towards open science often maintain cultures of closed science in their settings (such as their labs, for example). Thus, their younger mentees are socialised with research practices that hamper the transition to open science. Giving an example from biomedical research, the interviewee described that some researchers are unwilling to share all information on how some new technologies have been developed if they assume that this knowledge gives them a competitive edge yet cannot be patented.

With regard to research procedures, the most important tensions mentioned in the interviews related to interests in intellectual property protection already discussed in the previous chapter and the fear of being scooped if research procedures are opened up before studies have been completed and results published. The latter issue was also extensively discussed in focus groups that are analysed in a separate report. A further challenge related to opening research procedures is that doing so requires significant effort and thus presupposes the availability of sufficient resources. In lab-based disciplines electronic lab notebooks were identified as a potentially helpful by an interviewee who, however, also cautioned that implementing them on a broader scale would be a long-term development rather than something that could easily be established over a short time-period.

Issues listed under safeguards in the ECoC fall mostly in the research ethics category as defined in this report and therefore were outlined above in chapter 3.1.

As expected, data practices and management were discussed extensively in all interviews, and many discussions centred on the necessity to create research environments that reward good

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data practices and management. Consequently, in the open science transition research environment and data practices and management are closely related and cannot easily be analysed separately. Essentially all aspects of open science related to open data are inherently linked to data practices. A major specific challenge related to data management some interviewees hinted to and strongly emphasised by a policymaker is that clear guidance is necessary to ensure that research data management becomes an integral component of the entire research processes because "opening data retrospectively is close to impossible" (policymaker PM1).

Another crucial aspect related to responsible data management extensively discussed by one interviewee is the question under what conditions access restrictions are justified and how access to data could be managed. He outlined that curating data is costly and that data is highly valuable to, for example, tech companies and insurers. Therefore, he argued restricting access is justifiable if access conditions are clearly specified and transparent. In such instances access could, for example, be controlled by a data access committee, and waivers could be granted if, for example, patient organisations would like to access data. In this way, open science in his view can also mean creating legitimate yet transparent access restrictions that recognise the value of data. By extension, this also implies that open science should mean transparency about why some data is not or cannot be made open.

Implementing open science practices can create challenges in research collaborations, particularly in multi-centre research projects with partners from different countries. As an interviewee elaborated, the extent to which data can actually be opened still differs between countries, even in the EU. Thus, researchers moving from one country to another sometimes are surprised about regulatory heterogeneity, while international consortia often need advice on which infrastructure to use for storing publications and data in a manner both compliant with pertinent regulation and conducive to open science.

The move to open science also has created new challenges when it comes to publishing and disseminating research, albeit seemingly with some notable differences between different disciplines. A first major challenge identified by an interviewee is that following open science practices sometimes is not possible, even if authors of a publication would generally like to make it openly accessible. She illustrated this point by citing an example where she was invited by a publisher to contribute a chapter to a large edited volume. Accepting the invitation was only possible by agreeing to the publisher's terms on access. This challenge might be particularly acute in disciplines where books are a major type of publication, even though high open access fees could presumably have similar effects on journal publications, unless such fees can be covered by grants or otherwise reimbursed. Another issue particularly relevant to disciplines where book publications are common is related to the problematic effects creative commons licences, such as CC-BY, can have. Publications licenced under CC-BY, as a policymaker from arts and humanities field explained, can be republished in inadequate formats without the consent of authors or original publishers, as long as the text corpus remains unchanged.

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A third issue related to publication and dissemination brought up in the interviews is related to the rise of pre-prints. In general, all interviewees who referred to pre-prints view them by and large favourably, and none of them argued that their negative effects pre-prints outweigh their benefits. Nonetheless, two major challenges related to pre-prints were discussed in the interviews: Firstly, pre-print servers, by facilitating access to research, inadvertently also decrease the barriers to publishing bad research on visible platforms. At least under certain circumstances this becomes a problem because, secondly, not all readers of papers published on pre-print platforms are aware that pre-prints have not been subjected to formal quality control, such as peer review, and thus should be read carefully, especially by non-experts.

Interestingly, an issue generally considered a major challenge in the open science transition was only briefly touched upon in the interviews, but not expounded in greater length by any interviewee, namely high open access fees. While largely omitting discussions of high open access fees might reflect the view shared by several interviewees that RFOs rather than journals should be regarded as the engines of the open science transition, this issue will be addressed in more depth in upcoming stakeholder engagement activities to get a clearer understanding about prevalent opinions.

Reviewing, evaluating and editing was a major issue in many interviews inasmuch the necessity to develop incentive compatible performance assessment systems that reward open science was discussed. Beyond that, two interviewees with a background in research management mentioned that in their view guidelines and trainings also for reviewers (one interviewee referred to ethics reviewers, the other to grant reviewers) would be desirable to ensure they have the necessary understanding and awareness of open science issues.

3.3 Research policy, research governance and open science

Despite not focused explicitly on research policy and research governance, the interviews yield some tentative insights that might merit further consideration. In addition to developing performance assessment schemes that reward open science, which obviously has an important policy component but was already outlined in the previous sub-chapter, interviewees mentioned several issues that could be addressed through policy changes and governance adaptations on different levels. This section summarises the most important issues raised.

Some interviewees pointed out that their countries lack a national open science policy, which they consider a problem. In their view, this tends to make efforts to promote open science more difficult because the lack of explicit guidance on the national level tends to obfuscate the value and importance of open science to researchers. Thus, national open science policies could be helpful to signal to researchers that political commitments to support and promote open science are credible.

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Moreover, interviewees agreed that funding open science practices is crucial, an issue closely related to aligning open science practices to incentive structures. However, opinions on current RFO performances varied to at least a certain extent. Some interviewees view current RFOs policies as exemplary, whereas others rather pointed to the heterogeneity of RFO approaches and policies, as the following quotes illustrate:

> (...) [F]unders, they are doing their own job. Like I said in the beginning, it's like a parallel world. So they have their own code of ethics and they just don't care about [insufficient national policies]. (...) So the funders are doing their job really well. (Researcher R2)

> Now we see with funders that we work with, some of them require for example data management plans already in proposal stage, some of them require it later, the templates are all different. (Research manager RM2)

Yet in general the viewpoints of interviewees who explicitly elaborated on the role of RFOs seemed to converge on the argument that open science should be rewarded financially rather than (only) mandated by, for example, grant requirements. Consequently, interviewees consider RFOs key actors in the open science transition and overall expressed a preference of rewards over conditionality.

Another issue two interviewees mentioned that potentially affects the effectiveness of governance arrangements is the training of reviewers. If open science should be considered in reviews, reviewers need to have the necessary competences to assess whether commitments of research teams and consortia are in line with standards of good practice. One touched upon this issue when discussing competences of grant reviewers, while the other interviewee referred to ethics advisers on the institutional level (somewhat similar to a REC).

When it comes to how institutional governance schemes could help to support researchers in implementing responsible open science practices, several interviewees stated that data stewards on the institute or faculty level could be effective advisers. Unlike advisers on the general institutional level, interviewees see data stewards as better positioned to offer specific advice because of their familiarity with disciplinary cultures and challenges. Furthermore, they are usually more accessible than advisers located on a higher and thus more distant level. The system implemented by the Technical University of Delft was highlighted as a good practice example in two interviews. More generally, various interviewees alluded to the importance of offering guidance on the appropriate level and emphasised the importance of meeting the needs of target groups.

On a more general level, one interviewee pointed out that at least in her country (located in Central Europe) efforts to promote responsible open science are somewhat hampered by the fact that the research ethics and integrity community and the open science community are largely separated. In her view, creating and strengthening linkages between these communities could help to increase synergies between ethics, integrity and open science.

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Finally, interviewees from all stakeholder groups perceive citizen science positively and believe that it can make an important contribution to the open science transition. Several interviewees mentioned citizen science either when asked about what they associate with open science or when asked about good practices they would recommend ROSiE to include among the tools the project will develop. As ROSiE is built around the assumption that citizen science and open science are closely related, this might be counted as tentative evidence that this view is shared in the research community.

4 Implications for ROSiE products

In addition to addressing the challenges described in the previous section, some specific implications regarding the content and design of the products ROSiE will develop can be drawn from the interviews. This section concisely summarises them. The implications are derived from challenges expounded by interviewees and good practice examples shared by them. Informal conversations with several stakeholders provided valuable additional insights.

4.1 Guidelines

Ideally many of the challenges discussed above should be addressed in the ROSiE guidelines, at least if they can be addressed on the level of research conduct. Nevertheless, some more specific recommendations can be given as well. A number of interviewees pointed out that the guidelines for researchers and research teams should be on the appropriate level of granularity to be practically useful. Guidance phrased in overly general terms is considered less useful because it usually is insufficiently operational. While some interviewees agreed that differentiating by disciplines could indeed be useful to ensure practical usefulness, others recommended to rather focus on the types of data used, types of methods employed or research scenarios. Those rather sceptical of disciplinary guidelines tended to emphasise that differences within disciplines are significant and not necessarily smaller than differences between them. It was also pointed out that an increasing amount of research is conducted by interdisciplinary teams and consortia.

Several interviewees recommended to refer to fair (or FAIR) rather than open data and to responsible science or good scientific practice rather than open science. In their view, such a phrasing could help decrease reluctance to engage in open science practices because it would signal that openness is meant to promote and safeguard responsibility and quality as well as that openness can, should and under certain circumstances must have legitimate limits. This recommendation shows that the expression “open science” might be viewed less favourably by some in the research community than is often apparently assumed by open science enthusiasts.

Interviewees mentioned some good practices that could be referred to in the guidelines, namely tools to create data management plans, guidance on GDPR compliance created by European

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Research Infrastructure Consortia (ERICs) and guidance on the importance of gender equality in research developed by, for example, the European Institute for Gender Equality (EIGE).

4.2 Supplement to the European Code of Conduct for Research Integrity

While the focus groups analysed in a separate report partly focused on how the ECoC could support and promote open science, this topic was not explicitly discussed in the stakeholder interviews. Generally, the interviews do not seem to suggest that stakeholders consider fundamental changes to the ECoC necessary because none of the major challenges identified seems to be in obvious tension with its provisions and recommendations. One interviewee suggested that adding a section to the ECoC that specifically focuses on open science and considers recent developments could potentially have added value.

4.3 Strategic policy paper

All challenges described in chapter 3.3 could be taken in the strategic policy paper. This also applies to the policy-related aspects of the challenges outlined in chapters 3.1 and 3.2. Thus, main issues strongly emphasised in the majority of interviews relate to aligning open science to the incentives researchers face, ideally via creating (positive) reward schemes rather than (potentially punitive) mandates. In particular, good practices of some RFOs, such as the Wellcome Trust, could provide useful starting points. One interviewee also recommended to focus initial policy changes especially on the potentially most useful data rather than on advocating for a general opening of all data regardless of the likely cost-benefit ratio.

Moreover, the need to develop and maintain support infrastructures on the institutional level was repeatedly highlighted in the interviews. One interviewee explained that open science mandates and policies of, for example, RFOs gave a crucial impetus to organisational changes at the RPO she is working for. Therefore, analysing interplays between different policy levels might be advisable to identify potentials for synergies and opportunities for aligning agendas.

A further crucial issue policymakers should consider is ensuring open science is inclusive. Currently, open science policy and guidance, due to the terminology and concepts it uses, often risks to inadvertently exclude the arts and humanities where, for instance, the practical meaning of concepts such as reproducibility is not immediately obvious. Consequently, sensitivity to disciplinary differences is crucial to accomplish a full and genuine transition to open science.

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4.4 Training materials

Most interviewees emphasised that training for a variety of target groups is very important to successfully complete the envisaged transition to open science. According to the view of the majority of interviewed stakeholders, training materials should whenever possible be hands-on and action-focused to help researchers develop crucial problem-solving skills. Moreover, the training materials should be linked to the guidelines and reflect the needs of learners. The recommendation to consider framing open science as responsible science, good scientific practice and fair or FAIR research mentioned with regard to the guidelines also applies to the training materials.

4.5 Knowledge hub

When asked about how the ROSiE knowledge should ideally be designed to yield significant added value, many stakeholders specifically emphasised the importance to ensure sustainability after the end of the project, for example though continued funding from interested institutions. In this respect, it seems particularly important to either create an updating mechanism or to develop materials that have a high chance of long-term relevance even if their content remains unchanged. One interviewee explicitly pointed out that based on her experiences the latter strategy might have a higher chance of success, even though it might at first sight appear slightly less attractive than the former.

A further somewhat general issue referred to by many interviewees is the risk that a new platform fails to create unique value added. Interviewees largely seemed to agree that there is no shortage of platforms in the current open science landscape. Therefore, as a new platform the ROSiE knowledge hub should have novel features that do not already exist elsewhere. Also, it should be considered if and how elements of the ROSiE knowledge hub could be integrated into existing platforms to maximise chances of wide uptake. In the same way, the ROSiE knowledge hub should be linked to existing tools that support responsible open science, such as tools to create proper data management plans or data anonymisation tools, such as Amnesia (developed by the OpenAIRE project).

With respect to the general design of the knowledge hub, an interviewee with extensive experience in platform development stressed that user-friendliness is essential. She views especially easy findability of information and easy navigation are critical for success. Because of that, several tests with pilot-users could help identify strengths and weaknesses. Besides, in her experience interactive elements, such as a helpdesk function, are valuable. A helpdesk both creates some degree of collaboration and provides insights about stakeholder needs. Another interviewee stated that a decision-tree that incorporates different disciplinary perspectives could be a user-friendly way to provide guidance.

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5 Next steps

From March to June 2022 further interviews will be conducted to increase the diversity of perspectives taken into account by the ROSiE project. Interviewee selection will be guided by the stakeholder engagement strategy. Furthermore, the interview guide will be adapted based on experiences from the interviews conducted so far and findings from other stakeholder engagement activities, especially two focus groups. Adaptations will be made to maximise access to information on how ROSiE can support stakeholders in promoting and implementing responsible open science practices. In this way, the connection between the explore, engage, guide and equip dimensions of the project will be strengthened.

Interview findings, together with findings from focus groups and other stakeholder engagement activities, will feed into a comprehensive analysis of the stakeholder engagement process based on which recommendations on how to support, promote and safeguard good open science practices will be developed. The ensuing report will become part of the groundwork underpinning the guide and equip phases of ROSiE.

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Appendix

Interview guide

Section 1: Background information and building rapport

- **Can you please tell me about the institution (or company, if interviewee is working in industry or journalism) you're working for? What are the main objectives and activities of the institution/company?**

Probes:

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- When was the institution (or company) founded?
- Have the objectives of the organization shifted over time?

- **What is your current position and what are your main tasks?**

Probes:

- Is that position primarily academic or more related to (research) management?
- What is your (academic) background?

Interviewer notes

Section 2: Open science – conceptions and tasks

- **What does open science mean to you?**

Probes:

- Do you view open science rather as a promise or rather as a problem?
- Who do you think will benefit most from open science? *(if open science is viewed as a promise)*
- Who do you think faces the biggest challenges? *(if open science is viewed as a problem)*

- **What, if any, role does open science play for your institution?**

Probes:

- Does your institution promote open science and, if yes, how?
- Does your organization promote open science also with technological solutions / normative instruments, like policies and guidelines?

- **Are any of your tasks related to open science and, if yes, what are these tasks?**

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Probes:

- Which open science issues are most relevant in your work?
- How often do you work on these tasks, and for how long?
- If answer to initial questions is "no": Did you have any contact with open science so far? If yes, what kind of contact?
- Do you have colleagues who work on open science-related tasks? If yes, do you know what they're working on?

- **In your view, has open science improved the work of your institution or has it rather created problems and challenges? / In your view, could open science help improve the performance of institution or do you think it would rather create new challenges?**

Probes:

- Which aspects of open science have helped/will help the most?
- Which aspects of open science have created/will most likely create problems and challenges?
- If issues discussed are technical or legal only, ask about ethical challenges
- Does open science facilitate engaging stakeholders in research? Is stakeholder engagement beneficial to research (outcomes)?

Interviewer notes

Section 3: Open science, ethics and integrity

- **Are any of your tasks related to research ethics or research integrity and, if yes, what are these tasks?** *(only ask this question if it was not already de facto answered before)*

Probes:

- Can you describe these tasks in more detail?

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- Does open science play any role in these tasks? Is open science discussed in your ethics committee/research integrity office/etc.?

- **How would you describe the relationship between open science and responsible conduct of research?**

Probes:

- Overall, do you think research ethics, research integrity and open science are mutually supportive or do you see more pitfalls than promises?
- Can you anticipate new challenges for research ethics and research integrity that are either created or reinforced in an open science context?
- How would you address these challenges?
- How could the promises be realized?
- Do you see ways how open science could support the work of RECs and RIOs?

Interviewer notes

Section 4: Towards responsible open science

- **What are the main ethical challenges of open science?**

Probes:

- Are these challenges primarily technical or normative? Or both?
- Are challenges also related to policy, education etc.?

- **What strategies are you aware of that could mitigate these challenges?**

Probes:

- Do you think trainings in open science should explicitly cover ethical issues? If yes, which? If not, why?

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- What added value could training in responsible open science have? Are there any preconditions that need to be in place for training to be successful?

- **What tools could facilitate the move towards open science for you and your institution?**

Probes:

- Could you also benefit from technological /normative tools (e.g. open science ethics guidelines)? If yes, which and how? If no, why not? Do you know if any of these tools already exist?
- If core tools ROSiE will produce are not mentioned: Could you imagine XY being useful for you and your institution?
- How should these tools ideally be made accessible? How could a knowledge sharing platform ideally look like?

- **Are there any examples of good open science practices you would like to share with us?**

Probes:

- Can you explain what it is that makes this practice good? Why has it been so successful?

Interviewer notes

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ROSiE

Disclaimer: *This deliverable has not yet been reviewed by the European Commission. Its content might therefore change as a result of the review process.*

D3.4: Recommendations resulting from the analysis of the consultation process

Author: Tom Lindemann (EUREC), Lisa Häberlein (EUREC), Philipp Hövel (EUREC), François Jost (ECSA)

Editor: Dirk Lanzerath (EUREC)

Project title: Responsible Open Science in Europe

Project acronym: ROSiE

Grant Agreement no.: 101006430
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This project has received funding from the European Union's Horizon 2020 research and innovation programme under GA No 101006430

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Reviewer:	Rosemarie Bernabe
Approved by	

ABSTRACT:	This report summarises key insights and recommendations from the stakeholder consultation conducted during the exploratory phase of the ROSiE project. It briefly describes the consulted stakeholder groups and how they were engaged during the first 16 months of the project through interviews and focus groups. Thereafter, insights are mapped on the relationships between open science and, respectively, the ethos of science, research ethics, research integrity and citizen science, before specific recommendations regarding the development methodology, content and design of key outputs ROSiE will create are given. The report concludes with a short outlook on the next project phases and how stakeholders will be involved during the remainder of the project.

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Keyword List:	Stakeholders, stakeholder engagement, open science, research ethics, research integrity, citizen science, ethos of science, recommendations, interviews, focus groups

Consortium:

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4.	Partner	EUREC OFFICE GUG	EUREC	Germany
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8.	Partner	NATIONAL TECHNICAL UNIVERSITY OF ATHENS	NTUA	Greece
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List of abbreviations

ALLEA	All European Academies
ECoC	European Code of Conduct for Research Integrity
ECSA	European Citizen Science Association
ENERI	European Network of Research Ethics and Research Integrity
EU	European Union
EUREC	European Network of Research Ethics Committees
GDPR	General Data Protection Regulation
REC	Research ethics committee
RFO	Research funding organisation
RIO	Research integrity office(r)
WP	Work package

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1 Introduction

Fostering responsible open science and realizing its promises presupposes widespread uptake of practices that support a legally compliant and ethically appropriate opening of research processes reflective of the "as open as possible, as closed as necessary" approach. Unfortunately, the implications of this seemingly simple and straightforward principle currently often remain opaque to researchers and other actors in the research ecosystem, pointing to practical difficulties in balancing data protection requirements, legitimate interests related to the exploitation of research results and open science mandates and recommendations. Thus, promoting the transition to open science while simultaneously reinforcing compliance with data protection requirements, ethical rigour and research integrity requires operational guidance and practical tools capable to facilitate behavioural change.

Supplementing high level guidance on research ethics, research integrity and open science, the ROSiE project will develop a set of operational guidelines, tools and platforms to facilitate the translation of legal requirements and general ethics, integrity and open science recommendations into responsible practices that increase the transparency of research and innovation, while also protecting data subject rights and other legitimate interests. In this way, ROSiE ultimately aims to help strengthening the nexus between science and society by facilitating engagement with and, where possible, societal participation in research as well as by promoting transparent and reliable research. Consequently, the project aims to align research ethics and integrity with open science and vice versa to strengthen research governance, improve research conduct and enhance trust in research and innovation.

Accomplishing this ambitious set of objectives requires endorsement, uptake and embedding of project outputs by various actors and institutions in the wider research ecosystem. To that end, ROSiE engages stakeholders throughout all phases of the project to ensure that all outputs the project will develop are responsive to the needs of stakeholders and aligned to societal values. During the first 16 months of the project, several exploratory stakeholder engagement processes were implemented to chart the research ethics and integrity and open science territory from a multi-stakeholder perspective. This report summarizes key recommendations for the upcoming EQUIP and GUIDE phases of the ROSiE project derived from an analysis of the findings of stakeholder engagement activities conducted so far. Moreover, the report will provide guidance on stakeholder engagement activities in the next phases of the project, which will focus on co-creating outputs with key stakeholders and continuously gathering their feedback and advice in a systematic and structured manner. Consequently, this report is not a complete summary of all stakeholder engagement results ROSiE will generate, but rather an outline of interim results at the stage of the project where stakeholder engagement will transition from an exploratory to an output-oriented phase.

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The report strongly focuses on translating findings from the consultation into actionable recommendations for the next phases of the project rather than on describing every facet of the engagement formats in detail. Interested readers may find further information on the formats in deliverable D3.3 (interviews) and milestone reports MS11 (online focus groups in February 2022) and MS13 (in-person focus group in June 2022). Reflective of this focus, the report is structured as follows: In a first step, the stakeholder consultation methodology underpinning the report will be described concisely. Thereafter, an overview of major issues and challenges related to research ethics and integrity and open science as characterised by stakeholders will be given to summarise overarching key findings from the interviews and focus groups. Subsequently, an outline of recommendations for each key output ROSiE will develop is provided that differentiates between substantive/content-related and methodological/procedural recommendations.

2 Stakeholder consultation methodology

The report is based on an analysis of findings from semi-structured interviews, focus groups and written feedback on draft project outputs. Unlike foreseen in the description of the action of the project, the focus groups could not be based on scenarios due to delays in other work packages caused by changes in the composition of the consortium.

12 semi-structured interviews lasting between 30 and 60 minutes were conducted between January and April 2022. All interviews were based on an interview guide that the interviewers adjusted to the expertise of the interviewees and transcribed afterwards. Eight interviewees are female, four are male. Key insights from nine of these interviews are summarized in detail in deliverable D3.3. Three further interviews were conducted after the due date of that deliverable to broaden the scope of stakeholder categories covered and to include non-European perspectives, supplementing efforts of WP2. Unlike originally planned (see deliverable D3.1), members of research ethics committees (RECs) were not engaged through interviews, but via a dedicated focus group.

Stakeholder categories covered by the interviews are researchers, research integrity officers (RIOs), research managers, research funding organisations (RFOs), research policymakers and science educators. According to the Frascati manual, the disciplinary backgrounds of the researchers are in medical and health science, social sciences and the arts and humanities. The research managers have a background in natural sciences, engineering and technology and the arts and humanities, while the other interviewees are from the medical and health sciences, the social sciences and the arts and humanities. When using the Frascati manual to differentiate between disciplines, the only field of research not covered by the interviews is agricultural and

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veterinary sciences. However, it is worth mentioning that non-researchers are not necessarily speaking from a disciplinary perspective as their jobs often have a transdisciplinary character.

The interviews explored the following topics in depth:

- Conceptions of open science
- Open science related tasks of interviewees
- The relationship between open science and research integrity
- The relationship between open science and research ethics
- Main ethical challenges related to open science and strategies to address them

The basic version of the interview guide can be found in the appendix of this report.

In addition to the interviews, three focus groups were organized in February and June 2022. More precisely, two online focus groups were held in February, reaching nine participants in total, while an in-person focus group was conducted in June, reaching eight participants. As described in more detail in milestone report MS11, the online focus groups pursued partially overlapping, yet complementary objectives:

Focus group 1

1. Explore research ethics and integrity challenges different stakeholders face when aiming to pursue open science practices
2. Identify obstacles that make it difficult to realise the transformative potential of open science
3. Gain insights that might help to develop tools and guidelines to support stakeholders in implementing responsible open science practices

Focus group 2

1. Validate key topics of the first focus group
2. Explore possible trajectories of open science practices.
3. Identify potential pathways for addressing research ethics and integrity challenges in a manner conducive to the responsible conduct of research, as well as to linking science and society.

The in-person focus group zoomed in more explicitly on research ethical challenges of open science, in particular as they relate to the ethos of science and the work of RECs.

The 17 focus group participants fall into the following stakeholder categories:

- Five researchers of varying career stages and from different disciplinary backgrounds:
    - Two senior researchers from the medical and health sciences
    - One mid-career and one junior researcher from the social sciences

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    - One senior researcher from engineering and technology with ample experience in citizen science
- One representative of an RFO
- One research manager responsible for research ethics and research integrity at a higher education and research performing organisation
- Two policymakers with ample expertise in research integrity and close links to RIOs and RECs
- One data journalist
- One science educator with ample expertise in open science
- One representative of a science engagement organisation, with ample expertise in research ethics
- Six members of RECs linked to the European Network of Research Ethics Committees (EUREC)

The following tables summarise core information on the focus groups.

FOCUS GROUP 1 (ONLINE)	
PARTICIPANTS	2 senior researchers from the biomedical and health sciences, 1 representative of an RFO, 1 data journalist
OBJECTIVES	• Explore research ethics and integrity challenges different stakeholders face when aiming to pursue open science practices • Identify obstacles that make it difficult to realise the transformative potential of open science • Gain insights that might help to develop tools and guidelines to support stakeholders in implementing responsible open science practices

Table 1: Overview focus group 1

FOCUS GROUP 2 (ONLINE)	
PARTICIPANTS	2 researchers from the social sciences, 1 senior researcher from engineering and technology with ample experience in citizen science, 1 research manager, 1 research policymaker
OBJECTIVES	• Validate key topics of the first focus group • Explore possible trajectories of open science practices. • Identify potential pathways for addressing research ethics and integrity challenges in a manner conducive to the

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	responsible conduct of research as well as to linking science and society.

Table 2: Overview focus group 2

FOCUS GROUP 3 (IN-PERSON)	
PARTICIPANTS	6 members of RECs, 1 research policymaker, 1 science educator, 1 representative of a science engagement organisation
OBJECTIVES	• Analyse the relationship between open science and the ethos of science • Analyse the relationship between research ethics and open science, especially from a REC perspective • Identify gaps and issues related to the work of RECs and open science

Table 3: Overview focus group 3

Moreover, a set of stakeholders was invited to provide written comments to a draft of the didactical framework for the ROSiE training materials. 16 stakeholders provided comments and suggestions between October and November 2021. All reviewers have significant expertise in the realm of either research ethics and integrity education or citizen science support.

To systematically include a citizen science perspective, the European Citizen Science Association (ECSA), which is part of the ROSiE consortium, was invited to contribute a perspective on the relationship of open science and citizen science as well as issues and challenges pertaining to the interaction of research ethics, research integrity, open science and citizen science.

Thus, the following stakeholders from the following categories mentioned in the stakeholder engagement strategy (deliverable D3.1) have been systematically consulted so far:

Stakeholder category	**Consulted yes/no**
Researchers	yes
Research performing organisations	indirectly through researchers and research managers
RECs and RIOs	yes
Research funding organisations and scientific journals	yes

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Research managers	yes
Research policymakers and advisory bodies	yes
Science educators and science journalists	yes
Industry associations	no
Citizen science associations and civil society organisations	yes
General public	no

Table 4: Overview of stakeholders engaged so far

3 Open science and research ethics and integrity

This chapter provides an overview of how the envisioned transition to open science affects research ethics and integrity from the point of view of the consulted stakeholders. Although precisely delineating a boundary between research ethics and research integrity is neither possible nor necessarily desirable, we will heuristically differentiate between them by conceptualising research ethics as *ethics ad scientia* and research integrity as *ethics in scientia.* According to this distinction, research ethics primarily refers to how research and researchers should relate to actors and institutions outside the research system, whereas research integrity primarily refers to how research should be conducted within the research system.

Even though open science as well as citizen science and general increases in the frequency and density of science-society interactions enabled by new and emerging technologies tend to blur the distinction between research ethics and integrity ever further, the two continue to be governed by somewhat different regimes. While the research ethics system is built around various ethics review and appraisal schemes that historically were shaped by the evolution of ethics safeguards in the life sciences, the research integrity system is based on nowadays mostly codified professional norms and formalised research misconduct investigation schemes. As a result, RECs and other ethics review bodies and schemes occupy a central position in the research ethics regime, whereas RIOs and organisations and networks codifying norms on good scientific practice and investigating allegations of research misconduct are main actors in the research integrity regime. However, both regimes overlap in many ways, as the following figure developed by the ENERI project illustrates:[1]

[1] https://eneri.eu/overlaps-between-re-and-ri/ (last accessed 30 June, 2022)

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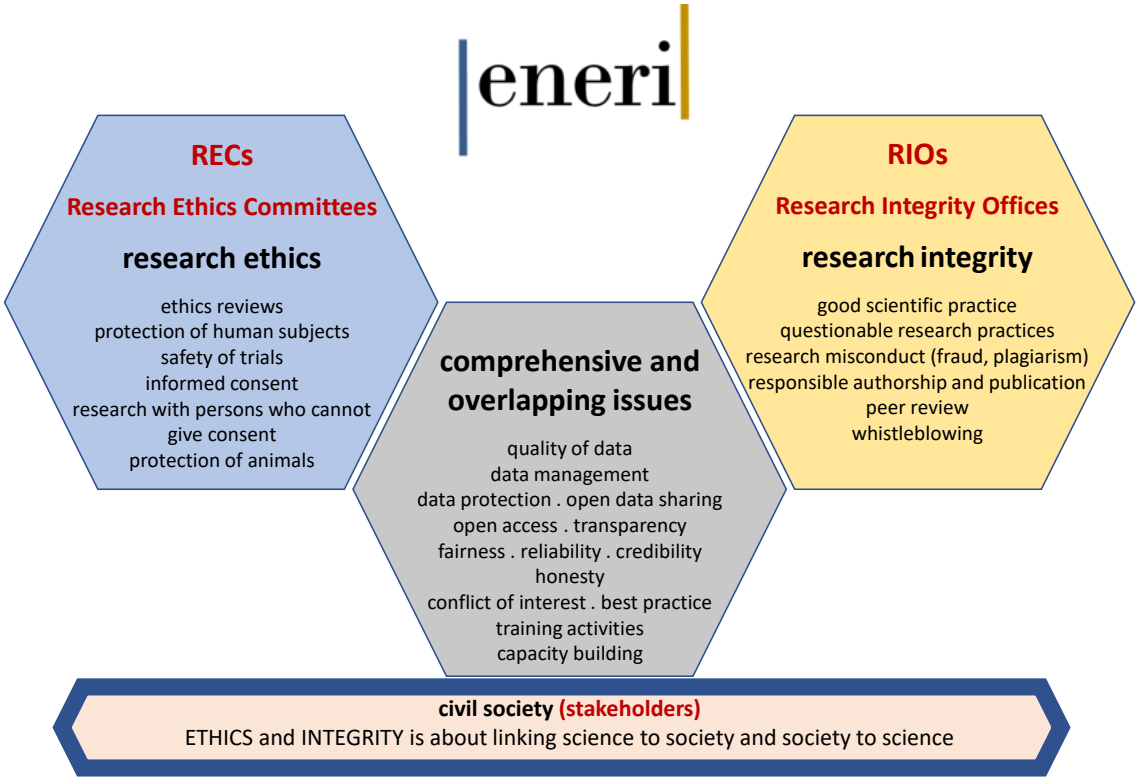

Figure 1: Relationship between research ethics and research integrity

Therefore, the following analysis will not only focus on research ethics and research integrity narrowly conceived, but also address comprehensive and overlapping issues that affect both regimes. More precisely, we will, on the one hand, elaborate how open science affects key research ethics principles and ethics review practices to address the relationship between open science and research ethics and, on the other hand, expound how open science affects the principles and good practices outlined in the European Code of Conduct for Research Integrity (ECoC) to address the relationship between open science and research integrity. Before that, we will tentatively analyse how, according to discussions with stakeholders, open science affects the ethos of science to get a better understanding of how it relates to the responsible conduct of research and the normative foundations of research more generally.

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3.1 Open science and the ethos of science

In a nutshell, what is meant by the ethos of science is adherence to four sets of institutional imperatives, namely communism (often also referred to as communalism, see Ziman, 2000), universalism, disinterestedness and organised scepticism. Sometimes originality is added as a fourth norm, yet there is no consensus on whether its inclusion has actual merit. The institutional imperatives, often referred to as norms, were first outlined by the eminent sociologist Robert K. Merton, who conceptualised science as a distinct and largely autonomous social institution governed by a specific ethos (internalised to different degrees by individual researchers):

- *Communism:* common ownership of scientific goods by the entire research community to enable collective collaboration based on shared knowledge
- *Universalism:* claims of scientific validity are assessed solely according to scientific criteria, the socio-political status or other personal attributes of the person making the claim are irrelevant
- *Disinterestedness:* research institutions pursue a common research endeavour and act for its benefit, rather than for personal gains of individuals within the research community
- *Organised scepticism:* the methodology underpinning claims of scientific validity and its conformity to codes of conduct is scrutinised before claims are accepted (Merton, 1973)

Ziman has argued that the Mertonian norms do not adequately characterise non-academic science, which encompasses a significant part of the research endeavour. In other words, he points out that the research enterprise, if understood to also include non-academic research, is not governed by adherence to a common ethos. Instead, Ziman argues that industrial and post-industrial science, focused on problem-solving and driven by commercial research and development, follow a different set of norms, which he refers to as proprietary, local, authoritarian, commissioned and expert. According to Ziman, these norms also permeate academic science, giving rise to a post-academic system (Ziman, 2000).

As Ziman postulated the rise of a post-academic system around the turn of the millennium, his diagnosis roughly coincides with the ascent of information and communication technologies that enable the transition to open science. Due to that, it seems a plausible starting point of normative analyses of open science to ask how it relates to the ethos of science and to assess whether the envisaged transition can counteract post-academic tendencies, not least because they overtly contradict open science. To supplement the systematic philosophy of science analysis conducted by work package (WP) 1 of the ROSiE project with a stakeholder perspective, the relationship between the ethos of science and open science was discussed explicitly in the third focus group and addressed implicitly in several other consultation formats investigating the normative basis of open science. In the following, key points of these discussions will be summarised.

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While all discussants of the third focus group agreed that open science and the ethos of science are at least complementary and potentially mutually reinforcing, one participant (REC member) — in response to a statement from a policymaker that open science, despite risks that require proper safeguards, is the only way forward if done right and the only way to fully adhere to the Mertonian norms — argued that open science could also be seen as a fad. Deliberately adopting an *advocatus diaboli* position, he elaborated that not following open science practices actually is not doing science in the sense of the ethos of science. As a result, open science cannot claim novelty but might be better understood as science without adjective, unless one conceptualises science conducted in what he referred to as "a right economic environment" where research and education are not funded publicly and where free conduct of science is replaced by a competition-centred approach not as a derogation from what science should be, but as a normatively acceptable state of affairs. From that perspective, open science seems to reinvent the wheel, while it actually just refocuses on what science once was understood to be. Some other participants tended to disagree and stressed that changes in the research environment and technological break-throughs enable a new kind of openness and give rise to new challenges that go beyond changes in science-business or science-economy relations and that include new modes of science-society interactions, such as citizen science. Also, a participant stressed that arguing that open science is just science as it used to be is problematic because it leaves open to what time period the statement refers and disregards the several challenges researchers nowadays face that are different from typical challenges in the past. From this broader perspective, claims alleging a transition to something new seem indeed justified.

Besides, a participant (REC member) pointed out that the Mertonian norms also in the past referred primarily to an ideal to be realised by the research community rather than a description of actual research practices of individual researchers. He elaborated that due to this intersubjective community-focus, open science in a way always had existed, yet added that elements (such as data sharing) are new because they presuppose the existence of an enabling technological infrastructure. Another participant (REC member) bolstered Ziman's claim that post-academic norms permeate also what is institutionally academic research by stressing that many of his students as well as their supervisors seem driven by norms contradicting the ethos of science (especially the norms of interestedness and particularism) and, by extension, also open science, which he understands as reinforcing the ethos of science (a point of view shared by most discussants). He views open science as an important and urgent development that can help strengthen adherence to the scientific ethos if appropriate safeguards are defined and implemented that allow a proper balancing of goods (*e.g.,* privacy and openness). Furthermore, it was pointed out by another REC member that structural problems (such as the strong competitive pressures many researchers currently are confronted with) create obstacles to change and therefore need to be addressed if the envisaged transition should succeed. Important questions in that regard that should be addressed, raised by the participant doubting

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the genuine novelty of open science, include who funds science; how legitimate rewards are created in the scientific system; how the relationship between funders, researchers and rewards should be structured; and how research should be made available and accessible. In this way, open science raises questions linked to benefit-sharing (*i.e.,* questions related to how the community accesses benefits from science) and, ultimately, dignity in the science-society relationship as well as in the science community itself.

3.2 Open science and research ethics

Although key principles of research ethics, such as beneficence, non-maleficence, autonomy and justice (see Beauchamp and Childress, 2019), seem by and large compatible with open science, at least in Europe interactions among the open science movement and the research ethics system have been rather limited. According to consulted REC members, open science considerations hardly play any explicit role in ethics reviews, although pressing issues in open science and research ethics overlap in several ways. Consequently, developing guidance on how open science could potentially be considered in ethics reviews and appraisals would be welcomed by the consulted REC members.

In general, RECs support researchers in conducting research in an ethically sound way by safeguarding the autonomy, rights and dignity of research participants, including their right to privacy and data protection. Thus, RECs due to their mandate are inevitably concerned with the "as closed as necessary" side of the "as open as possible, as closed as necessary" approach and seem well-positioned to inform the drafting of guidance on how this approach can be translated into practice, which several consulted stakeholders identified as a major problem for researchers that currently hampers widespread adoption of open science practices. Even though the precise role of RECs in ensuring legal compliance with data protection law is an issue of debate where multiple *modi operandi* are possible in principle (Lekstutiene *et al.,* 2021, chapter 4.3), privacy also is an ethical concern and therefore a perennial issue on their agenda. Unsurprisingly, pertinent issues of relevance to both RECs and the open science movement discussed during the stakeholder consultation are primarily related to how to ensure proper data protection in changing research environments. Especially discussions on appropriate legal bases for the processing of personal data for research purposes under data protection law (informed consent or public interest) and informed consent models suitable to govern the use of participant data in future research projects in a legally compliant and ethically sound manner were mentioned in the third focus group. While public interest might often offer a better basis to enable data sharing, it also give rise to tensions with key research ethics principles based on autonomy and informed consent. Whether this is perceived as threatening might also depend on the societies where the research is implemented. As a REC member stated, safe societies with high degrees of trust tend

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to have fewer problems with a move towards public interest as a basis for data processing than societies characterised by less trust. Another discussant elaborated that in that way political developments might have repercussions on enabling or disabling certain kinds of research, at least as regards degrees of ethical acceptance by stakeholders.

Besides, data access management models and data curation approaches that decrease privacy risks were mentioned as important topics of interest to RECs. What is more, when assessing whether broad or specific consent should be obtained, the type of data to be processed affects whether a broad consent model could be ethically justifiable or not. A practical issue for RECs could become how to deal with requests to review protocols that consider obtaining re-consent impossible and would like to proceed on a different basis for data processing (*i.e.,* how RECs should deal with such protocols is a question likely to become more urgent to address).

As pointed out by one discussant (REC member), on a higher level many of these questions are related to reflecting on what the purpose of RECs is, namely safeguarding the legitimate interests of research participants, and analysing what follows from this purpose. In his review, this requires a substantive notion of science that respects human rights and assesses the veracity of claims as scientifically valid (creating a bridge between research ethics and questions related to how peer review should function). This presumably requires a constant negotiation within communities engaging in and affected by research. In a similar vein, it was briefly discussed whether at least in principle RECs could potentially review whether projects follow open science (an issue they currently do not focus on at all), which, however, would be difficult as long as open science — similar to the Mertonian norms — is an ideal rather than a concrete set of clearly discernible practices and requirements. And even if this would be the case, it would be questionable if RECs – rather than, for example, RFOs or journals – would the most suitable actors to conduct such a review.[2]

In addition to protecting research participants from violations of their rights, RECs also have the task to facilitate research of high social value, although the extent to which RECs should focus on such questions of is an issue of contention among REC members, as several discussions in the EUREC network have shown.[3] Yet it seems appropriate to state that to the degree open science facilitates research of high social value, the production of desired common goods and benefit sharing with research participants, RECs also are concerned with the ”as open as possible” side

[2] In the stakeholder interviews a preference to focus on RFOs rather than journals as engines of open science was communicated because of their better ability to shape incentives and to avoid overburdening journals.

[3] See Penders *et al.,* 2018, chapter 2 and https://eneri.mobali.com/research-ethics-committees-main-tasks-and-challenges (last accessed 30 June, 2022) for an overview of the mandate and task of RECs.

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of the equation.[4] In particular, the research ethical governance of biobanks is an important topic in this regard as biobanks can facilitate research of high social value, but also create new data protection concerns and challenges to established informed consent procedures.

Moreover, research ethics and open science share a concern for inclusivity and non-discrimination, both of which in many ways are related to wider questions of justice. In the third focus group a REC member brought up the question whether participation in a study conducted in country X should indeed only be open to participants fluent in the official language(s) of that country. Currently, in many protocols insufficient mastery of the language is an exclusion criterion. He asked whether RECs should rather ask researchers to translate participant information sheets and informed consent forms into multiple languages to avoid restricting the study population and increase inclusivity. This issue might merit further investigation by ROSiE if the project intends to explore how openness and inclusivity can strengthen the science-society nexus. This would, however, presuppose a broad understanding of open science that goes beyond open access and open data and subsumes all inclusivity-related issues under its label. As one interviewed research manager put it, a narrower conception of open science makes it primarily beneficial for researchers, as utilising openly accessible publications and datasets requires expertise and skills. In that view, the relevance of open science to the general public is more tangential and primarily related to the question if and how open science can contribute to increasing the trustworthiness and reliability of research.

However, also critical questions about the ethical desirability of open science were raised. During the third focus group, a REC member expressed concern that a move to "do-it-yourself science", not regulated by codified norms, could lead to irresponsible or incompetent usage of research procedures and results. For example, in the area of gene editing malignant actors with access to sophisticated research infrastructures could abuse open research so that safeguards are necessary to ensure open science is conducted responsibly and to avoid problems similar to dual use concerns. Somewhat ironically, several participants stated that to be responsible open science requires a certain degree of closure, highlighting that openness is a good that needs to be balanced against other goods, as one interviewed researcher put it. The issue of gatekeeping and that it can be desirable to at least a certain extent was also mentioned by a research manager in the second focus group, who suggested that gatekeeping could also be conceptualised as a value underpinning responsible open science. Thus, assessing the potential value of gatekeeping as a mechanism to safeguard responsibility in open science and identifying where complete

[4] See London, 2022 for a comprehensive perspective on research ethics that focuses on the common good and questions of justice. While his discussion is focused on the American research ethics system, the wider questions he addresses arguably are of global relevance.

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openness could create undue risks is an issue ROSiE and other projects and initiatives should consider investigating further.

Broader social questions with high ethical relevance are particularly pressing in fields of research where ethics review systems and appraisal schemes are less well-developed than in the health and life sciences. Especially research on and with new and emerging technologies gives rise to many novel ethical challenges that tend to differ significantly from ethical challenges in biomedical research. Unlike the latter, technology research often does not involve human research participants, but nonetheless can have significant impacts on humans and their autonomy, privacy and safety once used on a broader scale (Brey *et al.,* 2021, 78). While such questions were only touched upon briefly in the stakeholder consultation so far, they unquestionably are urgent and central loci of attention of several other projects, with which ROSiE liaises under the auspices of WP4.

In contrast to most biomedical research, an *ex-ante* model of ethics review (that is, a research protocol is reviewed before its implementation, whereas monitoring during and after the end of the project is rather weak) often is not feasible in technology research because of high degrees of uncertainty, for example in relation to data protection (see Lekstutiene *et al.* 2021, chapter 4.1.2). A prominent family of models to govern technology research ethically is commonly referred to as ethics by design. In ethics by design models, stakeholders are involved in various phases in the progression from basic research to product development and deployment (see Brey *et al.,* 2021), and open science could potentially facilitate and strengthen stakeholder engagement in participatory ethics governance schemes.

Usually, stakeholders are invited to participate in a project activity based on a prior stakeholder mapping. While such mappings typically strive to be inclusive and utilise methods that are intended to support inclusivity (see Häberlein, Mönig and Hövel 2021), such mappings inevitably rely partly on a top-down approach because they are at least initially driven by the research team. If research processes are opened up and accessible to stakeholders without prior invitation, stakeholders would be empowered to reach out to projects on their own initiative and add a bottom-up component to the stakeholder mapping process, thereby potentially enhancing its inclusivity and reducing the likelihood of inadvertently failing to engage important groups. Consequently, examining the relationship between open science and ethics by design seems recommendable.

3.3 Open science and research integrity

In Europe, the ECoC has become the key reference document for questions related to research integrity, although variation in how national codes of conduct are framed interestingly persist

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(see Desmond *et al.,* 2020 for an overview) The ECoC is based on four principles, which, as stated by a senior researcher from the health and life sciences participating in the first focus group, also could be referred to as values or virtues, and eight concise chapters on good practices. In the following, it will be expounded how open science relates to the principles and good practices of the ECoC from the point of view of the consulted stakeholders. As the consultation process was exploratory and as the ECoC was not used as an explicit guidance in the engagement formats with the exception of the first focus group, it should be kept in mind that the following analysis is not necessarily exhaustive of all potentially relevant issues related to open science and research integrity.

3.3.1 Principles

The ECoC is based on the following principles:

- **Reliability** in ensuring the quality of research, reflected in the design, the methodology, the analysis and the use of resources.
- **Honesty** in developing, undertaking, reviewing, reporting and communicating research in a transparent, fair, full and unbiased way.
- **Respect** for colleagues, research participants, society, ecosystems, cultural heritage and the environment.
- **Accountability** for the research from idea to publication, for its management and organisation, for training, supervision and mentoring, and for its wider impacts.

(ALLEA, 2017, 2, emphases in original)

The two online focus groups explicitly addressed which values stakeholders believe should underpin open science to ensure it is implemented responsibly and with integrity. The question was asked openly in the first focus group, whereas the second focus group was presented with the values identified by the first group and asked whether they agree and/or would like to add further values.

Participants in the first focus group expounded that from their points of view the principles of the ECoC also apply to open science and suggested that the respect principle could be broadened to explicitly include respect for data, especially data of others. Putting increased emphasis on the importance of respect for data could potentially help alleviate concerns about scooping that might contribute to the reluctance of many researchers to share data already early in the research process. Scooping refers to “having someone else claim priority, usually through publishing, to a research idea or result” another researcher or research team has been working on (Laine, 2017, 2). In an open science context, “the discussion turns to illegitimate scooping; taking someone’s work and presenting it as your own” and thus is linked to misappropriation and plagiarism (Laine, 2017,3).

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As a senior researcher elaborated in the first focus group, especially researchers from the scientific periphery, who often need more time to move from research idea to actual implementation due to limited access to resources and infrastructures, might be reluctant to open up their research because of such fears, even though the stakeholder consultation suggests that such fears also exist outside the periphery, albeit perhaps to a lesser extent.

Participants of the second focus group agreed that the principles of the ECoC also apply to open science, yet mentioned several further values that might also merit consideration as principles of responsible open science:

- Sharing
- Collaboration
- Equity
- Fairness
- Trustworthiness
- Reproducibility

The following quote from milestone report MS11 summarises the contexts in which these values were discussed:

> With regard to the proposed value of sharing, especially sharing resources and experiences were discussed, and collaboration was mentioned as a closely related value. The importance of equity was mentioned in relation to the problem of high article processing charges that can effectively prevent especially researchers from the scientific periphery from publishing in open access mode. Fairness was proposed primarily because it is a key value that is also easy to understand for researchers who do not usually reflect on the normative underpinnings of the research endeavour.
>
> Trustworthiness and reproducibility were both mentioned as closely related to the ECoC principle of reliability, yet the discussion also addressed data quality as a key issue. Already participants of the first focus groups pointed out that openness does not necessarily mean quality. Based on considerations related to the importance of high data quality, one participant of the second focus group (research manager) elaborated that gate-keeping could actually be considered a value if gate-keepers are conceptualised as stewards of quality who help signal credibly which data is credible and which data is not.
>
> (Lindemann, Häberlein and Hövel, 2022, 7)

As pointed out in milestone report MS11, many of these values are already reflected in the ECoC, without, however, being explicit principles. One participant of the second focus group (senior researcher in engineering and technology with ample experience in citizen science) cautioned against inflating the number of core values or principles. Therefore, it would be plausible to

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proceed in the next phases of the ROSiE project with decomposing the principles of the ECoC and assess whether the other mentioned values are implicit in the extant ones. Based on such a decomposition, it could be decided whether to propose an expansion of the list of key research integrity principles.

3.3.2 Research environment

Stakeholders strongly emphasised that a successful transition to open science presupposes a research culture and environments that endorse and promote open science practices and that existing research environments are insufficiently supportive. One senior researcher even referred to the current research system as failing with regard to the provision of incentives to reward open science practices.

Thus, a crucial pathway towards fostering a culture and environment supportive of open science would be the widespread adoption of research assessment and funding schemes that enable and reward researchers who act in accordance with good open science practices. Most current assessment systems were perceived as inadequate by stakeholders, for example because opening up research processes early increases risks of being scooped. In other words, researchers who share ideas and/or data early in the research process, risk that their ideas and/or data are used by other researchers who could potentially generate and publish results faster. Unless performance assessment systems stop prioritising results and the number of publications over transparency, fears of being scooped are likely to create barriers to open science, especially in the scientific periphery where researchers often need more time to move from idea to result due to limited access to infrastructures and equipment. Whether platforms that time-stamp publications of ideas and data could alleviate concerns about scooping remained unclear to stakeholders because the actual worth of a time stamp seemed hard to assess.

While stakeholders almost unanimously agreed that open science practices require funding because especially data management can be costly, views on existing research funding schemes varied. Some stakeholders stated that RFOs are currently the engines of the transition to open science, especially in countries where open science has not yet been recognised as an important issue in national research policy (statement from a policymaker in an interview). Others, however, were far more sceptical. The sceptics pointed out that a full transition to open science would not only require open science mandates and support by flagship RFOs, such as the EU, but also endorsement and support from smaller national RFOs because they actually fund the majority of research in Europe. In their view, the picture of RFO support of open science is more heterogenous. Also, an interview with a representative from a national RFO showed that open science, despite being viewed positively in general, is not a major theme in all funding schemes.

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Interestingly, no consulted stakeholder based in the EU referred to inadequate technological infrastructures as a major problem. While some issues might still exist, the following quote illustrates the view stakeholders seemed to share:

> Yes, there are technical challenges, but I think these will be resolved within the next five to ten years. So, the EU is pushing forward the open science cloud, the institutions now are installing large scale servers for data because they see that there is money in the data that they have. So, they are supporting with more and more infrastructure. I think, we should push this of course but I think this is a problem that is already solved, but now the implementation needs to come.
>
> (Researcher from the health and life sciences, interview)

In light of results from stakeholder consultations conducted by UNESCO (2020), this finding is likely specific to high-income countries, where access to technical infrastructure, such as the European Open Science Cloud, and technical equipment is mostly given. ROSiE explicitly addressed open science challenges in low and middle income countries in analyses conducted by WP1. To provide an additional perspective from low and middle income countries on open science, two interviews were also conducted as part of the stakeholder consultation of WP3. While these interviews not only focused on issues related to the research environment but also on other research ethics and integrity issues of open science in low and middle income countries, their main themes are summarised and contextualised here.

At the 7th World Conference on Research Integrity, which took place in Cape Town, South Africa, the topic of open science was addressed from a low- and middle-income country perspective and raised the question of how to end exploitative research practices and how to dismantle systematic exclusion, which have been common research practice for decades.

In ROSIE, these issues raise the question of what role open science can play in embedding ethical and responsible research behaviour and fostering a culture of research integrity, for example by adhering to local data protection standards, adapting informed consent forms to local requirements, or feeding back research results to local communities so that citizens in lower-income settings see benefits from research that has often been conducted with their data or in collaboration with local researchers.

In many of our interviews, it was emphasised that open science plays a particularly significant role for low- and middle-income countries and that this is where most of the benefits can be gained. Interviews conducted with stakeholders from Africa and Asia showed that open science is still an unknown concept.

Nevertheless, related topics from the areas of research ethics and integrity, such as the need for ethics approval, informed consent, or the prevention of plagiarism, were raised during the

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interviews. In addition, the interviews revealed a strong awareness of the importance of promoting open science, especially where access is limited. Lack of resources for conducting research is a frequently mentioned problem. This includes lack of access to literature, since full text is usually locked behind paywalls. An interviewee from Thailand (researcher) emphasised that without freely accessible online resources, he would not be able to conduct research, as he often has no other way to benefit from and build on the knowledge of others: "Well, this is really necessary for me, because buying a book is not easy. But it is easy to get information on the internet". However, as more information are made available online, it is becoming easier and faster for our interviewee to get the information he needs.

One interviewee from Zimbabwe (junior researcher) points to the unfulfilled promise of open science:

> I really appreciate open science, but my concern is that we call it open and yet it is closed. But if it achieves its goal, which is to disseminate research results around the world so that they reach everyone, then that's brilliant. That's very brilliant. I would endorse that.

He suggested that journals or publishers could introduce two distinct categories of publications. One that is open and one that requires payment of an affordable amount. This should be based on the target audience and their background.

This idea is right in line with the spirit of the time: The publisher of the medical journal *The Lancet* recently acknowledged that pricing is a crucial factor in the choice of publisher for many researchers from low- and middle-income countries. For this reason, *The Lancet* now charges different prices for different regions. This was done in recognition that the journal focuses strictly on the quality of the work done when evaluating manuscripts but had not previously considered criteria such as equity and diversity, which play a key role when it comes to research in different regions of the world. The journal now rejects papers with data from Africa that do not mention African collaborators. This was done in response to so-called helicopter research, in which privileged researchers, conduct studies in lower-income settings or with marginalised groups, with little or no involvement from those communities or local researchers. Now, the WCRI, prepares to publish a statement urging action on journals to call out inequity and unfair practices in research collaborations as a matter of research integrity. This example shows that the research community and its institutions all bear the responsibility for realising the promise of open science (*Nature,* 2022)

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3.3.3 Training, supervision and mentoring

Several stakeholders emphasised the importance of training in open science, research ethics and integrity, yet interestingly no references to open educational resources as a key component of open science were made. The stakeholder consultation identified three potentially important issues training initiatives should consider:

- Trainings in open science should focus on the entire research process and start early-on. Turning open science into a structural component of the scientific endeavour requires integrating skill development in relevant practices into higher education and perhaps even high school curricula. In other words, education in open science should not be viewed as a small add-on to doctoral training only.
- Researchers who do not view open science favourably are less likely to participate in open science trainings than researchers who welcome initiatives to support open science. A major problem some open science sceptics perceive is that efforts to promote open science are insufficiently attentive to competing goods, such as intellectual property rights. To respond to this criticism, one stakeholder (researcher from the health and life sciences) recommended to frame open science as a component of responsible research as this could help show that openness needs to be balanced with other goods. In a different context, the need to balance openness with competing goods was also mentioned in the third focus group in the context of the need to create some safeguards to avoid misuse and abuse of fully open research.
- Implementing high-quality trainings in open science presupposes the availability of adequately qualified educators. The assumption that such educators are available, however, is by no means trivial. Competent open science trainers need significant expertise in research ethics and integrity as well as data management and technology. According to some consulted stakeholders with experience in designing and implementing training programmes for researchers and students, this might be a rare combination, especially because older educators are not digital natives and thus often not well-versed in the use of information and communication technology. Consequently, a train-the-trainer programme could perhaps help to increase the pool of adequately skilled educators. Alternatively, teaching open science in teams could be a way to address the skill-problem, which, however, would strain often already scarce teaching resources.

As regards mentoring and supervision, it was mentioned that currently many research groups are based on a culture not conducive to open science. When young researchers are socialised into such cultures, they are likely to perceive relatively closed science as the normal mode of conducting research and thus are likely to eventually help perpetuate practices that hamper the open science transition by inadvertently becoming negative role-models for the next cohorts of young researchers themselves. Thus, open science education should also consider the potential

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effects of informal education though, for example, role-modelling and education and create awareness for the benefits of open science conducted responsibly among supervisors and mentors.

However, an open science educator as well as a research manager pointed out that there also are different experiences. They stressed that often younger researchers already are aware of a cultural turn to open science, whereas views and practices of senior researchers are more diverse. In this view, the result is rather friction of research practices within some research teams along generational lines, rather than a continued socialisation into practices not conducive to open science. In this view, an eventual cascade to widespread endorsement of open science seems possible even if efforts to mobilise senior researchers in favour of open science fail, whereas the aforementioned view is more sceptical in this regard and suggests a need to turn them into change agents.

3.3.4 Research procedures

Overall, stakeholders stated that open science supports researchers in taking into account the state-of-the-art in developing research ideas because it removes access restrictions to the existing stock of knowledge. Moreover, it increases the importance of well-considered and transparent data management, which requires sufficient funding for data storage infrastructures and, especially, data management specialists who curate the data and manage access. This presupposes targeted funding for data management infrastructures and eligibility of data management costs in projects.

Challenges were mentioned by some stakeholders (especially in the first focus group) with regard to the absence of agreed-upon standards on how to actually open up science and share data, although other stakeholders (especially in the second focus group) were sceptical that general actionable standards can be developed across different fields of research. In their view, overarching guidance on open science should be on a level of granularity above standards, not least to avoid inadvertently creating opportunities for open washing through exploiting ambiguities.

An even bigger challenge many stakeholders referred to is that researchers often do not know how to reconcile open science with data protection and intellectual property rights. Faced with what is perceived as a choice between a “should” (open science) and a legal “must” (data protection and other legal obligations), researchers tend to refrain from following open science practices whenever they are unsure what to do. Adequate support structures, such as data stewards on the institutional level, could perhaps mitigate these concerns and help researchers translate “as open as possible, as closed as necessary” into practice. The stakeholder consultation

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suggests that a mere statement is insufficiently operational unless enriched by more specific guidance. This should be a major consideration in the development of the ROSiE guidelines.

3.3.5 Safeguards

As ensuring privacy and protecting data of research participants is a key principle of research ethics and a legal requirement under data protection law, the difficulties in balancing open science and data protection appropriately described above not only affect research procedures, but also safeguards. An important issue is that the distribution of benefits and risks related to open science requires careful analysis to get a better grasp of how it affects the equity and justice concerns discussed in the previous chapter on open science and research ethics. As safeguards generally refer to research ethics rather than research integrity, the relevant issues are discussed in chapter 3.2 of this deliverable and are not repeated here.

3.3.6 Data practices and management

In many ways, data practices and data management are a cross-cutting issue so that many of the points already mentioned could also be addressed in this sub-chapter. For the sake brevity, issues already discussed at some length above will not be repeated here.

Open science depends on good data practices and management to ensure that shared data are compliant with the FAIR principles to the maximum extent possible and of high quality. This requires turning data management into an integral component of the entire research process as opening data retroactively is, in the words of an interviewed policymaker “close to impossible”. As stated above, this not only presupposes the availability of data management infrastructures, but also competent data managers because otherwise following open science practices would increase the already significant workload most researchers have to shoulder and presumably decrease support for the envisaged open science transition. In other words, data management needs to be funded, ideally on a permanent rather than a project basis to facilitate the development and cultivation of pertinent skills and to reap gains from specialisation.

In addition, it would be helpful to concretise what the FAIR principles mean in actual scientific practice in jargon-free guidance documents researchers from all fields of research can understand. In the view of a researcher from the health and life sciences it would be especially helpful to also specify under what conditions data access can remain limited or be subject to payment of a fee to ensure data curation costs are effectively reimbursed. As elaborated in deliverable D3.3:

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> Another crucial aspect related to responsible data management extensively discussed by one interviewee is the question under what conditions access restrictions are justified and how access to data could be managed. He outlined that curating data is costly and that data is highly valuable to, for example, tech companies and insurers. Therefore, he argued restricting access is justifiable if access conditions are clearly specified and transparent. In such instances access could, for example, be controlled by a data access committee, and waivers could be granted if, for example, patient organisations would like to access data. In this way, open science in his view can also mean creating legitimate yet transparent access restrictions that recognise the value of data. By extension, this also implies that open science should mean transparency about why some data is not or cannot be made open.
>
> (Lindemann, Häberlein and Hövel, 2022, 14)

3.3.7 Collaborative working

In general, it can be expected that open science facilitates collaborative working as it enhances transparency and facilitates access to and sharing of knowledge and data. However, the stakeholder consultation also showed that some legal frictions created by differences in data protection legislation and its national application even within the EU can exacerbate opening research processes because there are cross-national differences on which data actually can be opened. These frictions are even more pronounced in international consortia that include partners from outside the EU. Because of that, "international consortia often need advice on which infrastructure to use for storing publications and data in a manner both compliant with pertinent regulation and conducive to open science" (Lindemann, Häberlein and Hövel, 2022, 14). Legal aspects related to open science are addressed in more detail by WP2 of the ROSiE project so that readers interested in these topics are advised to consult reports published by WP2. Also, disciplinary differences in open science practices can pose new challenges to collaborative working because many open science policies were developed with a view towards the sciences and are not easily applicable to, for example, the arts and humanities.

3.3.8 Publication and dissemination

In addition to the fear of being scooped that is also related to publication and dissemination, several issues related to publication and dissemination were mentioned in the stakeholder interviews. These were summarised as follows in deliverable D3.3:

> The move to open science also has created new challenges when it comes to publishing and disseminating research, albeit seemingly with some notable differences between different disciplines. A first major challenge identified by an

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> interviewee is that following open science practices sometimes is not possible, even if authors of a publication would generally like to make it openly accessible. She illustrated this point by citing an example where she was invited by a publisher to contribute a chapter to a large edited volume. Accepting the invitation was only possible by agreeing to the publisher's terms on access. This challenge might be particularly acute in disciplines where books are a major type of publication, even though high open access fees could presumably have similar effects on journal publications, unless such fees can be covered by grants or otherwise reimbursed. Another issue particularly relevant to disciplines where book publications are common is related to the problematic effects creative commons licences, such as CC-BY, can have. Publications licenced under CC-BY, as a policymaker from arts and humanities field explained, can be republished in inadequate formats without the consent of authors or original publishers, as long as the text corpus remains unchanged.
>
> A third issue related to publication and dissemination brought up in the interviews is related to the rise of pre-prints. In general, all interviewees who referred to pre-prints view them by and large favourably, and none of them argued that their negative effects pre-prints outweigh their benefits. Nonetheless, two major challenges related to pre-prints were discussed in the interviews: Firstly, pre-print servers, by facilitating access to research, inadvertently also decrease the barriers to publishing bad research on visible platforms. At least under certain circumstances this becomes a problem because, secondly, not all readers of papers published on pre-print platforms are aware that pre-prints have not been subjected to formal quality control, such as peer review, and thus should be read carefully, especially by non-experts.
>
> Interestingly, an issue generally considered a major challenge in the open science transition was only briefly touched upon in the interviews, but not expounded in greater length by any interviewee, namely high open access fees. While largely omitting discussions of high open access fees might reflect the view shared by several interviewees that RFOs rather than journals should be regarded as the engines of the open science transition, this issue will be addressed in more depth in upcoming stakeholder engagement activities to get a clearer understanding about prevalent opinions.
>
> (Lindemann, Häberlein and Hövel, 2022, 14-15)

Another presumably relevant issue that was not mentioned in the stakeholder interviews and focus groups is how the contributions of citizen scientists can be acknowledged adequately. Therefore, we consulted the European Citizen Science Association (ECSA) to provide a citizen science perspective on open science that is described in section 3.4 below.

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3.3.9 Reviewing, evaluating and editing

The topic reviewing, evaluating and editing was prominently yet mostly indirectly mentioned by stakeholders because all issues related to creating research environments that reward open science have repercussions also on performance assessment schemes and research and researcher evaluation. In addition, as stated in deliverable D3.3, "two interviewees with a background in research management mentioned that in their view guidelines and trainings also for reviewers (one interviewee referred to ethics reviewers, the other to grant reviewers) would be desirable to ensure they have the necessary understanding and awareness of open science issues" (Lindemann, Häberlein and Hövel, 2022, 15).

3.4 Open science and citizen science

When asked for positive examples of good open science practices, several of interviewees pointed to citizen science, especially because of its enormous potential for social innovation. For example, one interviewee (research manager) referred to collaborative work between researchers and citizen scientists who, inspired by the citizen scientists' pre-existing interest in programming language, shared programming skills on research datasets. She also stressed that interest in citizen science according to her experience is often associated with applied research projects and close collaboration with end-users or industry. This might be taken as an indication that the shift from traditional models of public engagement, where dialogue between science and society is limited, to intensive and influential exchange, as described for example by Rask, Matschoss and Kaarakainen (2017, 19), is evident in practice.

Nevertheless, there seems to be a deficit in terms of awareness of citizen science and the acquisition of appropriate methods. The research manager already referred to in the previous paragraph explained that educational needs analyses at her institution (a research performing organisation) indicate a high demand for training in citizen science approaches. In addition, more coordination work would be needed to ensure that existing knowledge about citizen science approaches is shared so that researchers can learn from each other and exchange ideas and experiences.

However, another interviewee views the current understanding of citizen science as problematic. In that view, there seems to be a misunderstanding about the relationship between science and society based on the assumption that science already provides a link to society by researching something that is in some way related to society. Citizen science, though, is about doing science with and for society, so that society is fully involved in finding solutions to problems that science could help to address.

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Maintaining communication in this process appears to be of particular importance; an aspect that is discussed, for example, by Schütz, Heidingsfelder and Schraudner who argue for a two-way exchange between science and society to ensure that different perspectives are considered (Schütz, Heidingsfelder and Schraudner, 2019). Ravn and Mejlgaard, in turn, emphasise that such a dialogue allows for careful consideration of alignment with societal values, needs and expectations (Ravn and Mejlgaard, 2015, 132 and 146). Nevertheless, two interviewees (research integrity officer and policymaker) pointed out that in their view citizen science approaches and their potential often remain unnoticed, as exemplified by the following quote from an interview with a research integrity officer, "Somehow we are not able to move forward".

As explained with a slightly different focus in chapter 3.3 above, sceptical voices about engaging non-professional researchers in research processes were also raised in the third focus group discussion. Concern was expressed about the danger of do-it-yourself or so-called garage research, perceived as a risky outcome of open science if implemented irresponsibly or incompetently. It was emphasised in the discussion that people need to be qualified to use data and a difference between institutionalised and non-institutionalised research was highlighted insofar as institutional researchers know the relevant methods and standards or at least are obliged to do so, whereas non-professional researchers have no such obligation. However, from the perspective of an experienced citizen science researcher, citizen scientists usually are interested in existing norms and cautious in their actions, so that the risks might be overstated.

In view of these diverse perspectives, it seems particularly significant for ROSiE to take a closer look at the connection between citizen science and responsible open science. Therefore, ECSA provided an analysis of the relationship between open science and citizen science with a particular emphasis on issues related to the responsible conduct of research, which is outlined in the remainder of this chapter.

With a shift from curiosity-driven research to applied research (Lave, 2017) where private funding constitutes more than half of the total expenditure within the EU (Eurostat, 2018), research and innovation is being increasingly influenced by market forces (*e.g.,* with private and public cooperation agreements guiding research topics and priorities; Vohland, Weißpflug and Pettibone, 2019). Thereafter, by scientific developments and innovations responding to a limited subset of the needs of society (*e.g.,* nanotechnologies and genetically modified organisms) citizens are being affected in a daily basis by research that is partially funded by their taxes (Ruphy, 2019). Which is why it is natural to question why they shouldn't have a greater say, so that research is more aligned with the needs of the people.

A more inclusive deliberation (involving relevant stakeholders including the public) on the direction of research and innovation is therefore advisable to take place from the outset of a project (Molla, Line and Harald, 2019). Citizens' engagement increases the significance of research

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agendas for the broader society, thus enhancing the societal relevance of science (Göbel *et al.,* 2017), which, in turn, increases the possible impact of its outcomes (Lamy Committee, 2017).

Citizen science is of particular significance for the growing open science movement, as it takes, for example, open science activities beyond the purview of professional scientists' circles by exploring the involvement of citizens in scientific research (Knack *et al.,* 2017). Besides potential improvements to the scope, speed, quality and resource efficiency of their research activities, one of the principal advantages of citizen science for academic researchers is seen to be the opportunity to widen dissemination and impact of their work (democratising science), while also encouraging appreciation of science in future generations by building trust in science (Knack *et al.,* 2017).

However, in order to reap these advantages a number of aspects need to be considered, namely: the design and adoption of indicators to measure the above-mentioned outcomes; the development of infrastructures and platforms to support these activities (i.e., cross European initiatives); international mutual learning activities; training and capacity building; and finally, promotion of career and incentive systems embedding these approaches within research institutions (Warin and Delaney, 2020).

Among the key incentives and barriers for citizen engagement, Wehn and Almomani (2019) identified the topic of interest, fun and recognition as supporting factors, and the neglect of privacy concerns and inadequate use of data as hindering factors. On the other hand, for scientists, data quality together with their limited resources (time, staff, funding) play a key role (Balázs *et al.,* 2021).

Citizen science research may thus have a different set of incentives to those typically related with more academic reward systems. While academic researchers tend to focus on individual attribution and ownership of information, citizen science is more associated with the free flow of information and a collective sense of achievement, in line with the principles of open science (Haklay *et al.,* 2020; Knack *et al.,* 2017).

Academic researchers, research institutions and their funding are more often than not subjected to the "rat race" of publication metrics, the so-called publish-or-perish culture. This creates a challenge for the advancement of citizen science and a reluctance among scientists to make use of this research approach as it often requires more time and effort and financial resources to carry out to come up with similar publishable outcomes. Moreover, as part of their main principles and similar to open science (ECSA, 2015), citizen science outcomes are published in an open access format, where possible, which are still perceived by many researchers to have a lower prestige and a lower impact, thus further affecting their publications in journals with high journal impact factor.

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To overcome this, the current academic reputation systems ought to be expanded, including alternative metrics and incentives for scientific curricula that recognise social impact and engagement (Göbel *et al.,* 2017). For this purpose, and supporting the above aspects to be considered, there is a need for measurement indicators and metrics that assess public engagement activities and the impacts achieved.

On the other hand, and in addition to the sense of accomplishment citizens experience from contributing to a project, scientists should offer them a fair share of the benefits to avoid exploitation, for example: authorship or ownership of intellectual property (if appropriate; Haklay *et al.,* 2020), formal recognition (certificate or a letter of gratitude), education related to the research being conducted, or money (Resnik, Elliott and Miller, 2015).

In addition, open access to academic publication plays an important role for citizen science for two reasons: for participants to see the outcome of their contribution and to support their learning process (Haklay, 2015). In this sense, citizens become providers and users of data. This openness enhances citizens' and citizen groups' capacity to participate in evidence-based policy and decision-making and therefore supporting the policy of open access to publications and data (Lamy Committee, 2017). Scientific data and research findings can also be communicated to participants through projects newsletters or blogs, forums, and social media channels, serving also as a space for participants to discuss their findings and interact with scientists (Golumbic *et al.,* 2017).

Conflict of interests raise ethical issues for investigators as they can bias research and/or undermine trust in science (Elliott and Resnik, 2015). Some citizens or citizen groups may have relationships with private, non-profit, or political organizations, for example they might receive funding from or advise an environmental group or might be involved in a lawsuit related to the research (Resnik, Elliott and Miller, 2015). What is more, some participants volunteer to help collect data to advance their political agenda (Riesch and Potter, 2014). To counter these conflicts of interests, a common strategy used is disclosure, embodying the virtues of openness and transparency (Resnik, Elliott and Miller, 2015). Open science practices are another strategy for responding to conflicts of interests in citizen science, by making data publicly available after publication so that data processing, analysis and interpretation can be independently evaluated (Soranno *et al.,* 2015).

Openness and transparency are also important to safeguard the research methodology employed, taking into consideration the potential bias (unintended or not) during the implementation of engagement activities, such as to avoid enrolling participants that support the perspective of powerful or particular groups (Mejlgaard *et al.,* 2018).

Like in open science, data ownership and intellectual property (*e.g.,* patenting) issues may arise in citizen science as participants or citizen groups may claim ownership over the data gathered

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and expect to have some control over how it is shared and used (Riesch and Potter, 2014). In that sense, policymakers at the European level should debate on the use of open data by private companies for products or services subject to copyrights or patents. The fact that companies make profit out of the voluntary participation of citizens and from the findings and data made publicly available (without having to pay anything) is a clear concern — related to citizen science and open science — for the research community (Resnik, Elliott and Miller, 2015).

Open data policies need to be sensitive and allow citizen scientists control and judgment over the information that should be released for which specific incentives might be needed to encourage them to share their data (Haklay, 2015). Researchers should set clear expectations in this regard by informing participants about rules and procedures for sharing data, including whom data may be shared with, when, and why (Riesch and Potter, 2014). Organisations within the EU are legally required to uphold privacy rights safeguarding personal data that has been collected or processed data by following the General Data Protection Regulation (GDPR). While this is seen positively by citizen scientists and users in general, the implementation of GDPR in large-scale citizen science projects has created a big challenge mainly for small organisations that struggle with higher costs and implementation issues including short deadlines, too much effort, and lack of knowledge or non-clarity of the legislation (Mangini, Tal and Moldovan, 2020).

Regarding data quality, although difficulties can occur in any type of research (Shamoo and Resnik, 2015), citizen science projects may have more challenges as participants probably lack training in scientific data management or research integrity, and therefore may not understand how to collect, record, or manage data properly. Data might be prone to unintended systematic errors or even falsified in an attempt to sway particular outcomes or meet deadlines **(**Resnik, Elliott and Miller, 2015). On the other hand, citizen science projects can have a positive impact not only on participants' research skills (*e.g.,* data collection or assessing variables) increasing their scientific knowledge, but also for project leaders, since the previous also increases project data quality.

Moreover, to enhance research integrity and data quality in citizen science, an effective approach is to make research as transparent as possible to others, creating thus opportunities to independently assess questionable or poor-quality data (Rasmussen, 2019).

To have a genuine and impactful citizen engagement, researchers should try not merely to increase the diversity of participants through the inclusion of women, indigenous people and other underrepresented groups, but actually to capture the diversity of the target population (Brouwer and Hessels, 2019). These measures will help reverse the skewed representation in the production of knowledge and thereby increase both the quality and legitimacy of research (Bäckstrand, 2003).

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Nonetheless, challenges remain concerning the empirical configuration of the inclusion of citizens and citizen groups in open science (Owen, von Schomberg and Macnaghten, 2021), for example, in defining who constitutes the public in a specific context and how to account for biases of social norms and values in the production of knowledge (Molla, Line and Harald, 2019). However, in fairness, these concerns have also been raised for the overall public engagement with science and technology from the outset (Owen, von Schomberg and Macnaghten., 2021). Moreover, the level of inclusiveness in citizen science is also influenced by the projects' limited resources such as time. Researchers should anticipate these issues when designing the research, as the presence of supporting structural elements (*e.g.,* legislative prerequisites such as gender quotas) are time demanding for researchers and, as previously mentioned, this conflicts with the (publicly funded) research projects' limited duration (Molla, Line and Harald, 2019).

There is a lack of regulatory oversight for a number of citizen science research areas. This poses a challenge considering that allowing as many groups as possible to contribute to citizen science research and making it available to the public are among the most important values of citizen science. Thereafter, inevitably, some less rigorous or even fraudulent research will be disseminated (Rasmussen, 2019). Conversely, limiting the number of groups being able to contribute (or increasing the participation prerequisites) by making more stringent gatekeeping decisions, researchers would start reproducing the very structure of professionalism in science that citizen science research tries to circumvent (Rasmussen, 2019).

In order to foster a culture of research integrity and commitment to ethics in citizen science, researchers and participants ought to be sensitised to ethical issues, removing obstacles and educating them about solutions. The more emphasis on making ethics explicit, the more participants are reminded to consider ethical issues in their research. Through greater collaboration between citizen science researchers and scholars in the field of research ethics, the former will ensure their knowledge on ethical challenges and standards so that they can emphasize the importance of those issues with their collaborators. One of the 10 key principles of citizen science is that leaders of citizen science projects "take into consideration legal and ethical issues surrounding copyright, intellectual property, data sharing agreements, confidentiality, attribution, and the environmental impact of any activities" (ECSA, 2015).

Henceforth, it is strongly suggested that researchers, research institutions and other stakeholders elaborate guidelines for the participation of citizens in citizen science projects, explicitly state their roles and responsibilities from the outset, provide them with appropriate training on data collection and analysis, and provide education on the responsible conduct of research. Besides the above, Resnik, Elliot and Miller (2015) describe a number of strategies that researchers can use to address this issue including inquiring citizens about their data collection, recording, and data management methods to ensure that guidelines are being followed, or overseeing the collected data, making sure that it meets scientific standards, among other things.

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All in all, if people cannot be confident in citizen science research findings, their outcomes will not be used, which is why citizen science ought to commit itself to rigorous standards of practice ensuring the integrity of research (Rasmussen, 2019).

4 Recommendations

The analyses in this chapter extend the recommendations outlined in deliverable D3.3 and the milestone reports on focus groups by describing options ROSiE could utilise to ensure major project outputs are responsive to the needs and values of important stakeholders. To provide advice on an actionable level of granularity for the next project phases, specific recommendations will be given for each major output, partly enriched by illustrative quotes from interviews and focus groups.

More precisely, this chapter translates the insights obtained during the stakeholder consultation into specific recommendations on key outputs ROSiE will develop. It supplements and extends the general recommendations outlined in chapter 3. The general recommendations outlined above primarily have implications for the guidelines, the ECoC supplement and the strategic policy paper, whereas this applies to a lesser extent to the knowledge hub and the training materials. Because of that, the sub-chapters on the knowledge hub and the training materials add several contextual arguments. By contrast, the other sub-chapters give rather concise overviews of key recommendations directly derived from the previous analysis.

However, before addressing the key outputs of the ROSiE project in more detail, it should be noted that several stakeholders, especially during the focus groups, gave an overarching methodological recommendation they consider crucial for the success of ROSiE in actually guiding research conduct and shaping researcher behaviour, namely: involve researchers in formulating guidelines and developing support materials and infrastructures. In other words, these stakeholders essentially recommended that forms of stakeholder engagement during the next phases of ROSiE should extend beyond the formats of information and consultation to also include involvement and collaboration. As described in more detail in deliverable D3.1, stakeholder engagement can take the following forms:

FORM OF ENGAGEMENT	STATUS OF STAKEHOLDERS
Collaboration	Stakeholders are partners of the research team and help driving the research direction or contribute resources and perspective.

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Involvement	Stakeholders provide resources or data to the research and are engaged in a significant manner.
Consultation	Stakeholders are asked for opinions and information.
Information	Information is shared with stakeholders.

Figure 2: Forms of stakeholder engagement

During the EXPLORE and ENGAGE phases of the project, ROSiE – in line with the stakeholder engagement strategy – engaged stakeholders by consulting them through interviews, focus groups and asking for their written feedback and informing them about current and future project activities. The stakeholder engagement strategy foresees several involvement- and collaboration-based activities during the second half of the project, especially in the form of co-creation workshops. The stakeholder consultation confirmed the adequacy of this strategy and emphasised its importance.

The main reason why stakeholders consider involving researchers crucially important is that researchers know best what the actual barriers to implementing responsible open science practices are and how guidance should be structured and designed to be operationally useful. Limiting their involvement could have the inadvertent effect of developing guidelines and tools on an inadequate level of granularity or full of jargon that researchers from outside the research ethics and integrity community cannot easily comprehend. Therefore, ROSiE should increase the degree of participation in the GUIDE and EQUIP phases of the project.

4.1 Recommendations on guidelines

In addition to the general issues outlined in chapter 3, the following more specific recommendations can be derived from the stakeholder consultation conducted so far:

- The scope of the guidelines should be clearly delineated. It should become clear which aspects of research ethics and integrity are covered by the guidelines and which, if any, are not.
- The guidelines should be practically useful and operational. To that end, researchers should be involved in their creation and they should have an appropriate degree of granularity. In other words, the guidelines should give practical guidance in a way intelligible for researchers from all disciplines rather than address overarching philosophical questions detached from most actual research processes.
- Stakeholders agreed that guidelines need to be differentiated to be practically useful, that is, there is no one-size-fits all approach. Yet their views differed whether a differentiation along disciplinary lines would be most useful. Some argued that the type of data used

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could actually be a more suitable criterion since many practices are specific to data types rather than disciplines. Moreover, it was emphasised that ever more research is conducted by interdisciplinary teams so that it might in some instances remain unclear which guideline should be used.

- The guidelines should help researchers translate "as open as possible, as closed as necessary" and the implications of the FAIR principles for data management into practice. This should ideally include guidance on how to balance open science and data protection and open science and intellectual property rights and similar concerns.
- Guidelines should be formulated in a way that makes open-washing (formal compliance without actually engaging in the desired conduct) difficult. They also should guide researchers in following open science practices from the very beginning of a research project as opening up data retrospectively tends to be difficult.
- If guidelines refer to data standards, they should do so clearly and on an appropriate level of field-specific or data-specific differentiation. Overall, the importance of defining standards for data management and sharing was viewed differently by stakeholders, with some considering it very important, while others expressed scepticism that generally applicable standards can be found.
- It should be considered to frame open data primarily in terms of fair (or FAIR) data to avoid misleading connotations. As explained in deliverable D3.3:

> Several interviewees recommended to refer to fair (or FAIR) rather than open data and to responsible science or good scientific practice rather than open science. In their view, such a phrasing could help decrease reluctance to engage in open science practices because it would signal that openness is meant to promote and safeguard responsibility and quality as well as that openness can, should and under certain circumstances must have legitimate limits. This recommendation shows that the expression "open science" might be viewed less favourably by some in the research community than is often apparently assumed by open science enthusiasts.
>
> (Lindemann, Häberlein and Hövel, 2022, 16)

In addition, stakeholders referred to several good practices that could be mentioned in the guidelines, such as tools to create data management plans, existing guidance on how to comply with the GDPR created by, for example some European Research Infrastructure Consortia and the PANELFIT project and guidance on the importance of gender equality in research developed by the European Institute for Gender Equality. Moreover, it was recommended to consider, if and where possible, addressing issues that go beyond what is formally defined as research, for example the interaction between research and data journalism, which, in a way somewhat akin to research, also draws on data to derive and substantiate journalistic claims.

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4.2 Recommendations on the ECoC supplement

The ECoC is the focal research integrity guidance document in the EU and is intended to serve as a term of reference for codes of conduct on the national, institutional or disciplinary level. Because of that, it is a fairly short and rather general document that by design in many ways is aspirational rather than procedural. In addition to four principles, it contains eight short chapters on good practices and two chapters on violations of research integrity.

Considering the design of the document, an open science supplement could be integrated horizontally or vertically. A horizontal integration would mean adding guidance on open science to existing chapters wherever relevant, whereas a vertical integration would mean adding a specific chapter on open science. Only one interviewee suggested adding a specific chapter on open science to the ECoC, whereas others — especially focus group participants — emphasised that the ECoC is largely adequate to also provide guidance on how to conduct open science responsibly.

However, participants of the second focus group suggested that the list of principles could be extended as described in chapter 3.3.2. There it was also already mentioned that a decomposition of the principles of the ECoC could be a plausible starting point for a more systematic analysis whether the number of principles should be extended to adequately govern open science. In that regard, the approach described by Brey *et al.* could be used as a starting point (Brey *et al.,* 2021). Insights from the analysis of the good practices listed in the ECoC and their relationship to open science could serve as a starting for co-creation activities to develop a proposal for an ECoC supplement.

4.3 Recommendations on policy advice

A recurrent topic strongly emphasised in all stakeholder engagement processes is the importance of creating a culture that promotes, supports and rewards open science. Research policy can play an important role in fostering such a culture. The following issues discussed in the stakeholder consultation seem particularly relevant to research policy:

- A policy environment conducive to responsible open science requires aligned action on the European, national and institutional level. While the EU is largely perceived as a forerunner in creating much-needed open science infrastructures, the picture is more heterogenous on the national level. For example, not all EU member states have an open science policy. While such policies are perhaps not strictly necessary, a stakeholder from a central European country without such a policy emphasised that such policies are seen as signals of what is considered important by many researchers. Thus, adopting such a policy shows commitment to open science also on the national level.

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The same heterogeneity applies to the institutional level, where the availability of support structures for researchers varies considerably. A good practice example mentioned by several stakeholders to help researchers adopt open science practices and good data management is the appointment of data stewards on the faculty or institute level. Unlike advisers based in libraries or other institution-wide bodies, data stewards often can give more specific advice because of their more detailed knowledge of research procedures. Furthermore, institutional policymakers at higher education institutions should consider integrating open science education into curricula from at least the undergraduate level onwards. As elaborated in the previous chapter, this also requires creating a sufficiently large pool of adequately qualified educators.

- Following open science practices can be mandated or incentivised. In general, most stakeholders seemed to favour a largely incentive-driven approach due to its better ability to motivate researchers to genuinely endorse and internalise open science norms. However, some stakeholders also pointed to open science mandates of some RFOs as seemingly effective, at least if sufficient funding for opening up research is provided.
- The importance of the role of RFOs was emphasised by many of the consulted stakeholders, and their current performance was viewed differently. While some stakeholders lauded RFOs as major engines of open science, others pointed out that RFO practices vary considerably. In their view, especially RFOs on the national level (unlike the EU) often do not yet focus on open science, a point corroborated in an interview with an RFO representative.
- Open science policy should consider that transitions are likely to follow uneven trajectories. Especially countries in the scientific periphery, where research environments are less well-developed and where less funding for research is available, will require more time to move to open science. Especially research not funded from flagship schemes, such as the Horizon Europe programme or the European Research Council, will take longer to open up. Thus, aims and benchmarks should be set at a realistic level and take into account that the barriers to implementing open science are higher in some settings than in others.
- Open science policy should aim to be inclusive and avoid framings that could evoke the impression to exclude the social sciences and the arts and humanities. As explained in deliverable D3.3:

  A further crucial issue policymakers should consider is ensuring open science is inclusive. Currently, open science policy and guidance, due to the terminology and concepts it uses, often risks to inadvertently exclude the arts and humanities where, for instance, the practical meaning of concepts such as reproducibility is not immediately obvious. Consequently, sensitivity to disciplinary differences is crucial to accomplish a full and genuine transition to open science.

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(Lindemann, Häberlein and Hövel, 2022, 17)

4.4 Recommendations on the knowledge hub

Knowledge hubs can be understood as local innovation systems that serve as nodes for knowledge production and exchange in existing networks. As gathering places for knowledge and stakeholder communities, a knowledge hub functions to generate knowledge, transfer it to implementation sites and pass it on to third parties (see Evers *et al.,* 2010). Knowledge hubs can thus also be seen as enablers of knowledge transfer, the importance of which was highlighted by several of the consulted stakeholders.

One interviewee (representative of an RFO) highlighted that the knowledge hub could become a crucial platform for building an open science infrastructure, with its potential explicitly identified in its usability for an innovation and technology consultancy agency. On the condition that the knowledge hub will continue to exist after the end of the project, new projects could be encouraged to use the platform, as they can benefit from an already existing and operational knowledge infrastructure.

Another interviewee with ample experience in platform development from the very conception to their long-term curation shared her experiences, and thus provided valuable insights for the development of the ROSIE knowledge hub. In the interview, the importance of sharing best practices, useful guidelines and research results with the scientific community by creating spaces of exchange was stressed, to avoid having to start from scratch. This refers to one of the most important promises of open science, namely that existing knowledge is open to all and thus links to a definition stating that knowledge hubs are places with a knowledge architecture offering a high degree of internal and external networking and knowledge-sharing capabilities. In this sense, the innovative capacity of knowledge hubs depends on the fact that knowledge is needed to use and create more knowledge. (see Evers *et al.,* 2010). But even though the research community can be described as a knowledge intensive environment, it should be kept in mind that knowledge hubs cannot provide answers to all questions.

For the development of a knowledge hub in the ROSiE project, it is important to learn from best practices. In an interview, the learning process in developing a somewhat similar platform in a different area of research was described as very difficult, yet characterised by a high learning curve, mainly through trial and error. The interviewee recommended the involvement of skilled science communicators in the development process to really understand what end users want, for example in terms of user-friendliness, getting answers to questions by just a few clicks and not having to navigate a cumbersome series of links. This seems particularly important as another interviewee (librarian) emphasised that science communication is often neglected when

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it comes to promoting open science. According to the interviewee experienced in platform development, test users who can make statements about user-friendliness are therefore indispensable. Ultimately, the information to be found in the knowledge hub should be organised in such a way that it is easy to find for the end users and useful to them in overcoming challenges in their daily work.

Therefore, an appealing presentation of the project results is recommended to achieve this goal. In this sense, ROSiE could, for instance, structure the knowledge hub around general open science topics and related challenges, as well as guidelines to overcome these challenges, thus creating a knowledge repository with a user-friendly structure that enables an easy and intuitive flow of knowledge. This was echoed in the interview with the librarian who also pointed out that the knowledge hub developed by ROSiE must be easy to use, in the sense that it must have a simple structure and make relevant topics visible at a glance.

Moreover, to address the concrete needs of knowledge hub users, a combination of knowledge hub and helpdesk could be a promising option, considering that knowledge production is always a social process that requires interaction (see Evers *et al.,* 2010). The experienced platform developer explained that they help to facilitate the transfer of knowledge by fostering a collaborative spirit and a high level of internal and external networking and knowledge sharing:

> We meet every three months and find out about the issues that are important and interesting in the national hubs, and then we calibrate together. [...] I learn from the [...] helpdesk, I choose the topics that are interesting for our community.

By contrast, a policymaker was more sceptical regarding the potential use of a helpdesk, not least because it would be difficult to maintain after the end of the project. She expounded that creating a map of the venues, forums, institutions and organisations that offer support would be "super useful" and significantly easier to maintain also in the longer term. Based on her experiences, she strongly advised ROSiE to start thinking about how the knowledge hub should look like and how it can be maintained after the end of the project as early as possible: "You need to start these conversations now".

Another possible solution to maintain interaction with the end-user community and ensure updating suggested by an interviewee would be the appointment of a knowledge hub curator. In her experience, a curator is needed to constantly reassess what the platform needs to look like to be useful for an extended period of time, how it needs to be structured and what content continues to stay relevant for users. Otherwise, it cannot be guaranteed that knowledge flows and knowledge repositories, as a crucial determinant of innovative capacity, create a sustainable knowledge architecture (see Evers *et al.,* 2010).

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4.5 Recommendations on training materials

Many recommendations were already given through direct comments on a draft of the didactic framework. These have already been considered in the work of WP7 and will not be repeated in greater detail here. However, especially the interviews yielded some interesting findings potentially relevant to the development of the ROSiE training materials.

An important point raised by an interviewee (research manager) relates to the fact that the open science discourse often uses a very specific terminology that tends to exclude researchers from certain fields, especially the social sciences and the arts and humanities. As a result, researchers from these fields sometimes do not consider themselves part of the open science discourse because they do not understand its language. In her view, the discourse on open science focuses mainly on the natural sciences and, to a certain extent, on the biomedical and computer sciences. Making this discourse more inclusive would be important because challenges, including ethics and integrity challenges, also exist in other fields of research.

Especially in the social sciences and perhaps also in the humanities, many ethical issues with a connection to open science arise with increasing frequency so that their inadvertent exclusion from at least parts of the discourse is particularly unfortunate, not least because it might result in limited awareness of the contours of problems and potentially available solutions. According to an interviewed research manager, in the past, methodological differences between disciplines were relatively strong and rather clearly demarcated, whereas nowadays the push towards interdisciplinarity tends to lead to an adaptation of methods of field A by researchers from field B, even though they were not trained in that field. This can give rise to research ethical problems when, for example, research with human participants is conducted by researchers without sufficient knowledge about how to obtain informed consent in a legally compliant and ethically appropriate manner. As succinctly pointed out by a research manager:

> Until relatively recently, and I think in many disciplines to this day, researchers have received incredibly little training in research ethics. So it's a problem for us as a [research performing] organisation to put trust in researchers who are not trained properly.

With respect to training, this concern can be related to the aspect of organisational socialisation, which refers to the scope and process by which regulations, norms, values and behaviours are learned that enable individuals to function in and become members of an organisation (Löfström 2012, 350 referring to van Maanen, 1976).

Besides differences in awareness of research ethics and integrity as well as open science questions across disciplines, the interviews with stakeholders suggest that awareness also differs between countries, not least depending on the focality of relevant topics in overall research policy. An interviewee (policymaker who also teaches) pointed out that ethics is a familiar topic

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for most PhD students, whereas open science is not. However, she stressed that in her experience, awareness of what open science is, how it works and why it is important as well as its relationship to research ethics and integrity can successfully be created via training, for example by discussing institutional guidelines or cases of research misconduct or detrimental research practice related to data management. Discussions on what "as open as possible, as closed as necessary" means in practice were particularly engaging, which concurs with recent findings from the Path2Integrity project where learning materials on FAIR data management also proved particularly successful in accomplishing ambitious learning objectives (Hermeking and Prieß-Buchheit, forthcoming). Moreover, classroom discussions on why research integrity is also important for citizens, who rely on the trustworthiness and reliability of research results in their daily life, have proven useful according to the experiences of the aforementioned interviewee. The pedagogical value of such lively exchange is systematically elaborated in existing literature that considers successful ethics training to require opportunities for students to engage with moral issues (Löfström 2012, 359, referring to Clarkeburn 2002). Also, the value of contextualising ethical questions has been discussed in the literature and it has been shown that contextualisation helps to decrease effects of prior research experience on addressing ethical questions (Löfström, 2012, 358). Thus, linking open science issues contextually to research ethics and integrity questions seems potentially promising.

Furthermore, according to the experience of a research manager, the most difficult issue in the move towards responsible open science is not primarily related to conveying knowledge as such, but to facilitate its actual implementation, especially with regard to participatory approaches:

> I think it's much easier for them [the researchers] to understand open access publishing, it's much easier for researchers to understand FAIR data, but then when we get to adopting open innovation, collaboration, participatory approaches – I think that's something that's harder. And I see a great need for training for that.

This assessment is bolstered by a survey on training needs conducted by the research performing organisation the research manager works for, which according to her indicates that researchers are interested in open science, but also see a clear need when it comes to learning how to practice it responsibly.

In the third focus group, a participant stated that according to her experience, the older generation of researchers often is doing business as usual, while the younger generation is already engaged in a cultural change that embraces open science. This impression, however, was not shared by all stakeholders. A research manager mentioned in an interview that at her institution, it tends to be the older researchers who are best trained in open science and most likely to move it forward. As regards education, assuming that the attitude and behaviour of educators convey as much as formal ethics training about what ethical standards and acceptable behaviours are (Löfström 2012, 350, following Kitchener 1992), senior researchers with in-depth

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knowledge and experience in open science practices might be suitable role models to promote a responsible open science culture. This might help to include training in research ethics, research integrity and responsible open science in the curricula at an early stage of education and to start sensitising students to ethical issues.

In the literature, reference is made, for example, to ethical sensitivity as a prerequisite for following an analytical approach to research ethics questions, which is based on skills that can be taught and learned (Löfström 2012, 350). In this context, ethical sensitivity describes the process of interpreting a situation that potentially raises ethical questions in conducting research, thereby providing the prerequisite for the ethical analysis that follows. This can be considered relevant to the extent that it seems reasonable that students are more likely to reflect on ethical issues and develop sensitivity if they can connect to the underlying questions and issues. Responses of stakeholders for preconditions for successful open science trainings overall tended to emphasise the necessity to adapt the training materials to the target group, as the following quote from an interview with a research manager illustrates:

> I think the trainings have to be well targeted. Because, I mean, just as an example, it doesn't make sense to do a training on research data management with a group of people who think that they don't process data in their work.

Consequently, knowing and understanding the needs of training participants usually is a pre-condition for successful educational interventions. As a result, creating a toolbox of materials that includes materials for a variety of different target groups seems particularly valuable. Topics stakeholders recommended to cover include examples of what responsible open science means and how research ethics and integrity and open science are linked. Some materials could, for example, focus in implementing an “as open as possible, as closed as necessary” approach in cases where doing so seems particularly challenging, for example because of the involvement of human participants in the research or the collection and processing of personal data.

When asked about how training materials should be designed and disseminated, many interviewees pointed out that several other projects already have produced materials of high quality, yet at least some suffered from the problem that the materials ended up in repositories, but largely failed to reach a significant number of educators. As a result, they recommended that ROSiE should analyse what has worked and what has not worked in other projects in order to ensure that the training materials reach educators and are put to use rather. Another question presumably meriting further analysis is assessing the extent to which users of the training materials can serve as multipliers and facilitators of institutional embedding.

In the third focus group discussion, a participant (REC member) suggested that perhaps organising open science cafés could be an unusual but innovative method to promote education in and exchange good and responsible open science practices. Guidance and training for

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members of RECs and other ethics review and appraisal bodies also was considered potentially beneficial by discussants.

5 Conclusion and next steps

This deliverable has summarised insights and recommendations from the stakeholder consultation conducted during the EXPLORE and ENGAGE phases of the ROSiE project. Unlike other stakeholder consultations on open science, for example the UNESCO consultation on the same topic, the ROSiE stakeholder consultation focuses specifically on issues related to research ethics and integrity in open science and citizen science and thus is narrower in scope. In the next phases of the project, the forms of stakeholder engagement will be expanded to also include strong co-creation elements, while consultations will continue through ugh the stakeholder forum. In these processes, the recommendations put forward will be assessed in more detail and transformed into various guidance documents, training materials and access points for a large community of stakeholders. Thus, the recommendations in many ways are an interim result that will evolve further over the course of the ROSiE project.

Overall, the stakeholder consultation has shown that open science and research ethics and integrity are largely compatible and often even share similar agendas, although some tensions persist and need to be resolved, especially in the research ethics domain where appropriate safeguards need to be defined to harness the benefits of open science without creating undue risks for research participants and the wider society. ROSiE is well-positioned to help building bridges between the relevant communities and develop proposals to support stakeholders in concretising what responsible open science means in practice and how it can reinforce ethical research conduct marked by high degrees of integrity.

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Appendix

Interview guide

Section 1: Background information and building rapport

- **Can you please tell me about the institution (or company, if interviewee is working in industry or journalism) you're working for? What are the main objectives and activities of the institution/company?**

Probes:

- When was the institution (or company) founded?
- Have the objectives of the organization shifted over time?

- **What is your current position and what are your main tasks?**

Probes:

- Is that position primarily academic or more related to (research) management?
- What is your (academic) background?

Interviewer notes

Section 2: Open science – conceptions and tasks

- **What does open science mean to you?**

Probes:

- Do you view open science rather as a promise or rather as a problem?

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- Who do you think will benefit most from open science? *(if open science is viewed as a promise)*
- Who do you think faces the biggest challenges? *(if open science is viewed as a problem)*

- **What, if any, role does open science play for your institution?**

Probes:

- Does your institution promote open science and, if yes, how?
- Does your organization promote open science also with technological solutions / normative instruments, like policies and guidelines?

- **Are any of your tasks related to open science and, if yes, what are these tasks?**

Probes:

- Which open science issues are most relevant in your work?
- How often do you work on these tasks, and for how long?
- If answer to initial questions is "no": Did you have any contact with open science so far? If yes, what kind of contact?
- Do you have colleagues who work on open science-related tasks? If yes, do you know what they're working on?

- **In your view, has open science improved the work of your institution or has it rather created problems and challenges? / In your view, could open science help improve the performance of institution or do you think it would rather create new challenges?**

Probes:

- Which aspects of open science have helped/will help the most?
- Which aspects of open science have created/will most likely create problems and challenges?
- If issues discussed are technical or legal only, ask about ethical challenges
- Does open science facilitate engaging stakeholders in research? Is stakeholder engagement beneficial to research (outcomes)?

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Interviewer notes

Section 3: Open science, ethics and integrity

- **Are any of your tasks related to research ethics or research integrity and, if yes, what are these tasks?** *(only ask this question if it was not already de facto answered before)*

Probes:

- Can you describe these tasks in more detail?
- Does open science play any role in these tasks? Is open science discussed in your ethics committee/research integrity office/etc.?

- **How would you describe the relationship between open science and responsible conduct of research?**

Probes:

- Overall, do you think research ethics, research integrity and open science are mutually supportive or do you see more pitfalls than promises?
- Can you anticipate new challenges for research ethics and research integrity that are either created or reinforced in an open science context?
- How would you address these challenges?
- How could the promises be realized?
- Do you see ways how open science could support the work of RECs and RIOs?

Interviewer notes

Section 4: Towards responsible open science

- **What are the main ethical challenges of open science?**

Probes:

- Are these challenges primarily technical or normative? Or both?

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- Are challenges also related to policy, education etc.?

- **What strategies are you aware of that could mitigate these challenges?**

Probes:

- Do you think trainings in open science should explicitly cover ethical issues? If yes, which? If not, why?
- What added value could training in responsible open science have? Are there any preconditions that need to be in place for training to be successful?

- **What tools could facilitate the move towards open science for you and your institution?**

Probes:

- Could you also benefit from technological /normative tools (e.g. open science ethics guidelines)? If yes, which and how? If no, why not? Do you know if any of these tools already exist?
- If core tools ROSiE will produce are not mentioned: Could you imagine XY being useful for you and your institution?
- How should these tools ideally be made accessible? How could a knowledge sharing platform ideally look like?

- **Are there any examples of good open science practices you would like to share with us?**

Probes:

- Can you explain what it is that makes this practice good? Why has it been so successful?

Interviewer notes

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