SOPs4RI

D4.2: First version of the SOPs and guidelines

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1. Introduction

1.1 Abbreviations

RI – Research Integrity

SOP – Standard operating procedure

RPO – Research performing organisation

RFO – Research funding organisation

RIPP – Research Integrity Promotion Plan

ECoC – European Code of Conduct

CBA – Cost Benefit Analysis

1.2 Terminology

Code: a document guiding the members of an organisation on ethical standards and how to achieve them.

Ethics/integrity codes are formal documents sending a message about moral standards guiding professional behaviour by providing principles, values, standards, or rules of behaviour.

Guideline: a statement of principles or issues to consider when performing a task, aimed to guide courses of action.

Guidelines give direction and help users make decisions. They are often created based on the consensus of experts after detailed evaluation and assessment of available scientific evidence. They may include checklists.

Standard Operating Procedure (SOP): a detailed, written instruction, aimed to achieve uniform action step-by-step.

SOPs prescribe specific actions; they liberate users from decision-taking by ensuring that the procedure is followed. They may come in the shape of a 'decision-tree'/flow-diagram, similar to what is referred to as an algorithm in clinical contexts.

Toolbox: a structured collection of easy-to-use SOPs and guidelines that RPOs and RFOs can use when developing their own Research Integrity Promotion Plans.

Research Integrity Promotion Plan (RIPP): a document describing how a specific institution will ensure, foster and promote responsible research practices, avoid detrimental practices, and handle misconduct.

It is the intention that RPOs and RFOs should form their own RIPPs in order for them to take disciplinary, organisational and national differences into account.

1.3 About SOPs4RI

The Standard Operating Procedures for Research Integrity (SOPs4RI) project aims to contribute to the promotion of excellent research and a strong research integrity culture aligned with the principles and norms of the European Code of Conduct for Research Integrity. The overall objective is to create a toolbox to support and guide research performing organisations (RPOs) and research funding organisations (RFOs) in fostering research integrity and consequently preventing, detecting and handling research misconduct. The project focuses on providing Standard Operating Procedures (SOPs) and guidelines that enable RPOs and RFOs to create and implement Research Integrity Promotion Plans (RIPPs). SOPs4RI will thus stimulate European organisations involved in performing and funding research to foster responsible conduct of research by organizational measures and policies. SOPs4RI takes a mixed-method, co-creative approach to the identification, development and empirical validation of SOPs and guidelines.

The expected end-users of the tools provided by SOPs4RI are decision makers within RPOs and RFOs, e.g. university senior management (vice chancellors, deans, heads of administration), university academic councils, boards and directors of funding agencies, and their extended administrations. The identification and development of SOPs and guidelines will take national, epistemic, and organisational differences into account, and the final toolbox will enable RFOs and RPOs to create Research Integrity Promotion Plans in accordance with the needs of their organisation.

1.4 About WP4 – Taking the necessary steps with a mixed method approach to streamline the process of identifying and developing SOPs and guidelines for RFOs and RPOs

Work Package 4 (WP4) serves as the backbone of the project. WP4 creates, improves, sharpens and finalizes the content of the toolbox with SOPs and guidelines designed to support RPOs and RFOs.

WP4 builds on WP3 and uses the inputs from the literature review, expert interviews and Delphi procedure to identify the themes to be tailored to different disciplines and the needs of RPOs and RFOs. The first version of the toolbox with the SOPs and guidelines, version 1.0, will be used in the focus groups (WP5). With the feedback from the focus groups (researchers, research integrity officers, policy makers, funding agency officers, etc.) WP4 creates the second version of the toolbox (version 2.0) with SOPs and guidelines. In the co-creation workshops with stakeholders this version is further improved to version 3.0.

Version 3.0 of the toolbox with SOPs and guidelines will then be tested in an international survey (WP6) among researchers. The survey will check and evaluate the content of the toolbox and create further knowledge on national and organisational differences. The survey will identify barriers to implementation of the toolbox, and will apply cost-benefit analysis (CBA) to assess likely costs and benefits related to specific SOPs and guidelines. The implementation of version 4.0 of the toolbox will be piloted in a sample of RPOs and RFOs in WP7.

The final output of WP4 will be a ready-to-use toolbox with SOPs and guidelines for RPOs and RFOs (version 5.0).

The following components are part of WP4:

- Creating the first, second, third, fourth and fifth version of the SOPs and guidelines to be included in the toolbox.
- Conducting and reporting the co-creation workshops.
- Continuous communication and consultation with WP1 (coordination) and partners in SOPs4RI.

1.5 About this deliverable

Deliverable 4.2 provides the first version of the toolbox with SOPs and guidelines. It contains the first selection of topics and subtopics that will be part of our toolbox and maps the topics and subtopics that need more attention in our toolbox. As such, deliverable 4.2 sets the scene for the other deliverables of WP4:

D.4.3 Second version of SOPs and guidelines (VUmc, M21)
D.4.4 Report on the co-creation workshops (KUL, M28)
D.4.5 Third version of SOPs and guidelines (VUmc, M26)
D.4.6 Fourth version of SOPs and guidelines (VUmc, M34)
D.4.7. Final toolbox with SOPs and guidelines (version 5.0) (VUmc, M48)

2. The first version of the toolbox with SOPs and guidelines

2.1 Introduction

WP4 creates the new versions of the SOPs and guidelines after every empirical step (reviews, Delphi, interviews, focus groups, survey and pilot testing). Furthermore, it creates content for the SOPs and guidelines by conducting the co-creation workshops and it is interacting with the other WPs throughout the project.

WP4 will frequently seek advice from the Executive Board and the Advisory Board to steer the process of forming and testing the SOPs and guidelines.

WP 4 bridges the empirical phases of the project and structures the content and form of the SOPs and guidelines that is going to be created. The aim is to identify existing, draft new, test, improve, and finalize the SOPs and guidelines that together will form the toolbox for Research Integrity Promotion Plans for RPOs and RFOs.

2.2 Work package 4 objectives

The main aim:

To identify existing, draft new, test, improve, and finalize the SOPs and guidelines for the toolbox with input from the literature review, interviews, Delphi procedure (WP3), focus groups (WP5), survey (WP6) and pilot testing (WP7).

To achieve this, the following objectives have been formulated:

1. To develop a toolbox with research integrity Standard Operating Procedures (SOPs) and guidelines for RPOs and RFOs, which reflect the principles and norms of the European Code of Conduct for Research Integrity (ALLEA 2017).

2. To streamline the process of all the steps in the project (in close collaboration with WP1) within the 4 years of the project with the ultimate goal to deliver the toolbox.

3. To work with SOPs and guideline experts to construct specific SOPs and guidelines.

4. To ensure that the principles and norms of the European Code of Conduct for Research Integrity (ALLEA 2017) are translated into the drafts and final version of the toolbox.

5. To organise co-creation workshops with diverse stakeholders and incorporate their thoughts and ideas in the toolbox.

6. To help WP6 to validate and implement a procedure for a CBA (Cost Benefit Analysis) of the implementation of SOPs and guidelines.

7. To create the first, second, third, fourth and fifth version of the toolbox.

2.3 Methodology towards the first version of the toolbox

Introduction:

The knowledge output of WP3 (literature reviews, expert interviews, Delphi procedure) is translated into a first draft of the toolbox with SOPs and guidelines (version 1.0). The consensus from the Delphi process provides the starting point, but is supplemented with other relevant topics and subtopics identified in the other parts of WP3. This first draft of the toolbox will be discussed and improved in the focus group interviews (WP5).

Specific activities:

1) Map the landscape of the most important issues that need to be covered in the toolbox, based on the knowledge acquired by WP3.

2) Identify and prepare SOPs and guidelines that can be discussed in the focus group interviews.

3) Flag important questions that need to be addressed in the focus groups.

4) Review round of discussion of the next draft (2.0) of the SOPs and guidelines with WP3 (back loop review to see if the content is interpreted correctly by WP4).

Aim:

The aim of task 4.1 is to map the 'landscape' of topics, subtopics and examples of SOPs and guidelines based on the results of WP3 (Delphi, expert-interviews, scoping reviews on best practices of research integrity promotion and on factors influencing the promotion of research integrity). This map will be created on the basis of the topics from the Delphi with additional information from the reviews and interviews. After creating this map of the landscape, we attach already existing SOPs and guidelines (examples), found in the empirical work, to the topics we want to create content for. Subsequently, we identify topics for which we need to develop new or modify existing SOPs or guidelines.

Methods and procedure:

The first step in this process was the selection of topics to include in the toolbox, based on the results of the Delphi, the interviews and the scoping reviews. We combined the output from the reviews and the interviews with the 'consensus list' of topics that was the result

of the Delphi study. This selection was done on the basis of the consensus results from the Delphi and through discussions with the AB and Work Package leaders. The selection was also guided by considerations about what is realistic, feasible and practical to include in the toolbox. For a considerable number of topics and subtopics, good examples of SOPs and guidelines already exist, while we will need to create SOPs and guidelines for others.

In a second step, we used the knowledge gained from the scoping reviews on best practices of research integrity promotion and factors influencing the promotion of research integrity, together with the interviews with experts, to supplement the topic list. Based on this knowledge, we chose the topics and subtopics for which SOPs or guidelines are needed. In the selection process, we used three key elements to guide our decision on selection: 1) We used the definition of RI in the ALLEA Code of conduct for research integrity to assess the relevance of topics. This is the guiding document for the EU and for our consortium and we used the good research practices described in this code to guide our selection process. 2) We assessed whether it was practically feasible to create SOPs and guidelines for the different topics and subtopics by discussing them one by one in the consortium. 3) We assessed the salience, i.e. the importance of the topics for a Research Integrity Promotion Plan (RIPP) for the practitioner/user of the SOP/guideline for this specific topic. Here, we used the prioritization of the topics from the Delphi as a guiding factor together with the advice given in the expert interviews.

These three steps guided our decision on whether or not a topic should be included in the toolbox. Since we have limited time and resources, we cannot include all topics. The definition of RI can guide and inform us in the decision process, but also the prioritization of the topics in the Delphi study can direct us in choosing which topics should be addressed first. In this process, we also identified existing examples of SOPs and guidelines for the selected topics. These examples will be used in the development of the first draft of the SOPs and guidelines.

The third step was to examine if there are multiple SOPs or guidelines for the same (sub)topics and to make a decision about which SOPs or guidelines are most suitable for the single topics. We did this by thoroughly assessing all the documents found in WP3. These documents were assessed on a 5-point scale to assess the quality of the documents. See below for more details on this process.

The fourth step was to determine which (sub)topics so far have no examples of SOPs and guidelines available and where new SOPs or guidelines therefore needed to be created. These topics should be flagged to the focus groups as topics that need special attention.

The fifth step was to create a preliminary picture/map of the landscape of the SOPs or guidelines per (sub)topic and use the content of the reviews, interviews and best practices to further shape and create the overall structure per topic. Furthermore, we collaborated

with WP5 to assure that we created a map of the landscape of topics for which SOPs and guidelines are needed.

The sixth step was the finalizing of the first draft of the SOPs and guidelines. We did this by mapping out the (sub)topics that have no or few existing SOPs and guidelines and assessed which topic/subtopic needed further analysis and creation. By going through the topics and the available documents, we could sketch the landscape and identify where the main gaps of knowledge are. We made a first preliminary sketch of the toolbox and collaborated closely with WP5 to make the first draft useful and practical for the focus group interviews.

2.4 Results

Step 1: List of topics and subtopics for RPOs and RFOs.

We used the consensus list of topics from the Delphi study to guide us in the first (preliminary) selection of topics to be included in the toolbox (For extensive results of the Delphi, please see deliverable D.3.2). The selection of topics to include in the toolbox is based on the results of the Delphi, the interviews and the scoping reviews. We combined the output from the reviews and the interviews (step 2 below) with the 'consensus list' of topics from the Delphi (see table 1 and 2 below). This selection was done based on the consensus results and arguments from the Delphi and through discussion with the AB and Work Package leaders. In this selection process, we took feasibility and practical issues into account. Hence, some topics and subtopics may need a new SOP or guideline, while others already have many good examples.

Table 1. Prioritized (preliminary) list of topics for RPOs from the Delphi study

Rank	Topic	Subtopics
1	Education and training in RI	a. pre-doctorate b. post-doctorate c. training of RI personnel & teachers d. RI counselling and advice
2	Responsible supervision and mentoring	a. PhD guidelines b. supervision requirements & guidelines c. building and leading an effective team
3	Dealing with breaches of RI	a. RI bodies in the organisation b. protection of whistleblowers c. protection of those accused of misconduct

		d. procedures for investigating allegations e. sanctions f. other actions
4	Supporting a responsible research process	a. research requirements b. transparency c. quality assurance
5	Research ethics issues	a. set-up and tasks of ethics committees b. ethics review procedures
6	Data management	a. guidance and support b. secure data storage infrastructure c. FAIR principles
7	Conflicts of interest	a. in peer review b. in the conduct of research c. in appointments and promotions d. in research evaluations e. in consultancy
8	Research culture	a. fair procedures for appointments, promotions and remuneration b. adequate education and skills training c. culture building d. managing competition & publication pressure e. conflict management f. diversity issues
9	Publication and communication	a. publication statement b. authorship c. open science d. use of reporting guidelines e. peer review f. predatory publishing g. communicating with the public
10	Updating and implementing the RI policy	*NONE*
11	Intellectual property issues	a. policies ensuring compliance with IP regulations b. interaction of IP and open science requirements
12	Collaborative research among RPOs	a. among RPOs inside/outside the EU b. with countries with different R&D infrastructures

		c. between public and private RPOs

For a description of the topics/subtopics, see appendix A.

Table 2. Prioritized (preliminary) list of topics for RFOs from the Delphi study

Rank	Topic	Subtopic
1	Dealing with breaches of RI	a. RI bodies in the organization b. by funded researchers c. by review committee members d. by reviewers e. by staff members f. protection of whistleblowers and the accused
2	Conflicts of interest	a. among review committee members b. among reviewers c. among staff members
3	Funders' expectations of RPOs	a. Codes of Conduct b. assessment of researchers c. education and training for RI d. processes for investigating allegations of research misconduct
4	Selection & evaluation of proposals	a. RI plan b. methodological requirements c. plagiarism d. diversity issues
5	Research ethics issues	a. research ethics requirements b. ethics reporting requirements
6	Collaboration	a. expectations on collaborative research b. research that is co-financed by multiple funders
7	Monitoring of funded applications	a. financial monitoring b. monitoring of execution of research grant c. monitoring of compliance with RI requirements
8	Updating and implementing the RI policy	*NONE*
9	Independence	a. What counts as an unjustifiable interference?

		b. preventing unjustifiable interference by the funder c. preventing unjustifiable interference by political or other external influences d. preventing unjustifiable interference by commercial influences
10	Publication	a. publication requirements b. expectations on authorship c. open science
11	Intellectual property issues	*NONE*

For a description of the topics/subtopics for RFOs, see appendix B.

Step 2: Using the knowledge from the scoping review and interviews

In a **second step,** we used the knowledge gained from the scoping reviews on best practices of research integrity promotion and factors influencing the promotion of research integrity from WP3, together with the interviews with experts to supplement the topic list. Based on this knowledge, we chose the topics and subtopics for which SOPs or guidelines are needed.

In the selection process, we used three key elements that guided our decisions on the selections of topics to be included in our final toolbox.

1) We assessed whether the topic aligns with our broad definition of RI (see here for elaboration) which is based on the ALLEA code for Research Integrity; good research practices are based fundamental principles of Research Integrity; namely Reliability, Honesty, Respect and Accountability.

2) We assessed practical issues and feasibility for the different topics (e.g. "Is it possible to make a SOP for a better research culture?") We did this assessment in WP4 and during a project meeting in December 2019.

3) We assessed the degree of salience for the users of the SOP/guideline for this specific topic? (See above for more info on how we did this).

Results:

These three steps guided our decision on whether or not a topic should be included in the toolbox. To ensure that the toolbox is operational and manageable from the perspective of RPOs and RFOs, only a restricted number of topics can be covered. The definition of RI guided and informed us in the decision process. We also made a review of the themes that were discussed in the interviews and concluded that, although the interviews gave new perspectives and ideas, we were able to classify the 'best practices' that are highlighted in

the ALLEA-code. In one of the consortium meetings in December 2019, we made decisions on the wording of the topics. Since the ALLEA code is the main reference for our project, we changed the names of the topics to align them with the ALLEA-code. We also removed 3 topics. Firstly, we decided to handle the topic on 'updating and implementing the RI policy' as a separate concern, as the nature of this topic stands apart from the more substantive issues on the list. The final toolbox will contain relevant advice and information about how to develop, implement, and monitor a Research Integrity Promotion Plan, but this content will be developed in a separate track under the involvement of stakeholders with expertise in these issues. Secondly, we removed the 'supporting a responsible research process' topic and decided to let it be part of the topic 'research environment'. Thirdly, we removed the 'intellectual property issues' topic because of its low prioritization-score in the Delphi. Also, in our group discussions we concluded that this was not considered important enough for all disciplines.

For the topics of the RFOs, we will make decisions on which topics to include/exclude in the next version of the toolbox (version 2.0). For this version, we will also critically go through the selection made for the first version of the toolbox, based on the results from the focus group interviews.

See table 3 and 4 for the final selection of topics for the first version of the toolbox (consensus). In this table we have also compared the topics with the 'good research practices' from the ALLEA European Code of Conduct:

Table 3. Prioritized list of topics for RPOs

Rank	Topic	Topics of good research practices in the ALLEA-code	Subtopics
1	Education and training in RI	Training, Supervision And Mentoring	a. pre-doctorate b. post-doctorate c. training of RI personnel & teachers d. RI counselling and advice
2	Responsible supervision and mentoring	Training, Supervision And Mentoring	a. PhD guidelines b. supervision requirements & guidelines c. building and leading an effective team
3	Dealing with breaches of RI		a. RI bodies in the organization b. protection of whistleblowers

		Violations of Research Integrity	c. protection of those accused of misconduct d. procedures for investigating allegations e. sanctions f. other actions (including mobility issues)
4	Research ethics structures	-	a. set-up and tasks of ethics committees b. ethics review procedures
5	Data practices and management	Data practices and Management	a. guidance and support b. secure data storage infrastructure c. FAIR principles
6	Declaration of competing interests	Reviewing, Evaluating and Editing	a. in peer review b. in the conduct of research c. in appointments and promotions d. in research evaluations e. in consultancy
7	Research environment	Research Environment	a. fair procedures for appointments, promotions and numeration b. adequate education and skills training c. culture building d. managing competition & publication pressure e. conflict management f. diversity issues g. supporting a responsible research process (transparency, quality assurance, requirements)
8	Publication and communication	Publication and Dissemination	a. publication statement b. authorship c. open science d. use of reporting guidelines e. peer review f. predatory publishing g. communicating with the public
9	Collaborative research among RPOs	Collaborative Working	a. among RPOs inside/outside the EU b. with countries with different R&D infrastructures c. between public and private RPOs

Table 4. Prioritized list of topics for RFOs

Rank	Topic	Subtopic
1	Dealing with breaches of RI	a. RI bodies in the organization b. procedures for breaches by funded researchers c. by review committee members d. by reviewers e. by staff members f. protection of whistleblowers and the accused g. sanctions/other actions h. communicating with the public
2	Declaration of competing interests	a. among review committee members b. among reviewers c. among staff members
3	Funders' expectations of RPOs	a. Codes of Conduct b. assessment of researchers c. education and training for RI d. processes for investigating allegations of research misconduct
4	Selection & evaluation of proposals	a. RI plan b. methodological requirements c. plagiarism d. diversity issues
5	Research ethics structures	a. research ethics requirements b. ethics reporting requirements
6	Collaboration within funded projects	a. expectations on collaborative research b. research that is co-financed by multiple funders
7	Monitoring of funded applications	a. financial monitoring b. monitoring of execution of research grant c. monitoring of compliance with RI requirements
8	Updating and implementing the RI policy	*NONE*
9	Independence	a. What counts as an unjustifiable interference? b. preventing unjustifiable interference by the funder

		c. preventing unjustifiable interference by political or other external influences d. preventing unjustifiable interference by commercial influences
10	Publication and communication	a. publication requirements b. expectations on authorship c. open science (open access, open data, transparency)
11	Intellectual property issues	*NONE*

After this selection, we assessed the current SOPs and guidelines that are available from the reviews, interviews and Delphi study and identified existing examples of SOPs and guidelines that fall under the selected topics. The identified examples were used in the development of the first draft of the toolbox with SOPs and guidelines and will guide (to a certain extent) WP5 (the focus groups), the Co-creation Workshops and the next versions of the toolbox.

In this assessment process of existing documents and available examples, we first did an extensive analysis of the documents, best practices and suggestions that came from the best practices reviews, the interviews and the Delphi procedure in WP3. For a complete list of the suggested documents from the reviews, see appendix D. For a complete list of the suggested documents from the interviews and Delphi, see appendix E. We did a thorough analysis of the proposed documents from these sources and made a preliminary assessment of them by ranking them on a scale from 1-5 (see below for more elaborative details of this scoring system). We assessed to what extent the document could serve as a potential source for a best practice document for the toolbox with SOPs and guidelines. The analysis consisted of an extensive read of the documents and an assessment of the details of the SOP or guideline (in terms of authors, organisations that support the guideline, outline, level of details, content, logic of steps and readability). This assessment was based on the judgement of the assessor. After the initial assessment by JT, we asked a second member of the VUmc team to analyse the same documents and give them a score on the 1-5 scale. We did this because we wanted to have a more valid assessment and compare the differences between two assessors to increase validity. We used the following description: Score/level 1: Not existing/no information or very scarce and not useful. Score/level 2: Some guidance on the topic, but of low quality. Score/level 3 (*medium level*): There is guidance and some information on the topic, but not very structured or complete. Score/level 4: The guidance is detailed and helps the reader through a specific topic, but information is not complete or sufficient and it is not always clear. Score/level 5: detailed

and clear guidance on a specific topic. This 1-5 scale was used as a practical tool for us in our assessment of the content of the documents identified in WP3.
After this assessment, we compared the differences and similarities per document. Despite using a 5-point scale and certain criteria that we took in mind (see above), it is not a methodological rigorous method. We want to highlight that there are numerous (methodological) limitations (i.e. evaluators' bias, lack of interrater reliability, not validated scale etc.). However, doing this assessment with 2 different assessors can improve the value of the assessment.

Initially, we made the assessment for 2 different categories; a SOP quality assessment and a guideline-quality assessment as we thought that this types of documents would feed our toolbox. After the first analysis of 25 documents, we concluded that this dichotomization falls short. As described in D3.2 there are numerous sorts of documents identified (guidelines, laws, flowcharts, etc.) and this dichotomization does not reflect the differences in documents. Since the nature of these documents is diverse (as the quality of these documents) we are thinking of a continuum/map in which all types of documents would fit. This 'continuum' therefore has to be taken into account in future work in SOPs4RI and in the next versions of the toolbox.
We thus have assessed all the documents and choose the topic or subtopic from our Delphi consensus list. Furthermore, we have screened the interviews and the Delphi study for additional suggestions of documents/sources of knowledge. By assessing all documents identified in WP3, we were able to map the topics and subtopics for which good SOPs and guidelines already exists as well as the ones that lack SOPs and guidelines.

Final result:
A total of 26 codes, 65 guidelines, 3 flowcharts and 7 laws were selected from the reviews. All of them are included in the first version of the toolbox. The interviews generated another 29 suggestions (hereof 14 duplicates) and the Delphi procedure identified another 34 documents. In the descriptions below we provide an overview of the topics and subtopics for RPOs and RFOs and the number of examples of SOPs and guidelines that are available per topic. It gives a detailed overview of the documents that were identified and assessed per topic and subtopic. We also performed a third step in this analysis were we identified existing examples and best practices per subtopics. We present this below in section 2.5.

2.5 Mapping existing examples of SOPs and guidelines

Topic 1: Education and training in RI

a. Predoctorate

We found 3 documents (link1, link2 and link3) that can give some guidance. The infographic from ORI (link3) especially serves its purpose well and is considered the best practice for this subtopic.

b. Post-doctorate

We found 1 document of low quality for promoting RI at a post-doctorate level. See here.

c. Training of RI personnel and teachers

For this subtopic we found 6 documents (link1, link2, link3, link4, link5 and link6) that can be of help. 2 documents are especially worth mentioning. The ENERI has a helpful website for online postgraduate training options that gives good guidance (see here). And the RI forum in Ireland gives a lot of information for RPOs on this type of training (see here). Epigeum has many different sorts of education programmes available as well (see here) which is not a guideline, but helpful information and a tool in the toolbox.

d. RI counselling and advice

There is no official document that discusses how to do RI counselling and advice. However, the Dutch Royal academy of Sciences and Arts do have resources that present case studies and dilemmas (see here).

Topic 2: Responsible supervision and mentoring

a. PhD Guidelines

There were no formal PhD guidelines found in the reviews, the interviews and the Delphi study

b. Supervision requirements & guidelines

We assessed 9 different documents (link1, link2, link3, link4, link5, link6, link7, link8 and link9) that highlighted supervision requirements/guidelines. We would like to highlight the training in mentoring; how to become a better mentor that provides an OK guideline (see here). In addition, the infographic from ORI is a great source to help a RPO to support supervisors with hands-on tips (see here). Link6 and link7 are medium quality documents. The rest of the documents have low quality.

c. Building and leading an effective team

No guiding documents are found for this subtopic.

Topic 3: Dealing with breaches of RI

a. RI bodies in the organisation

We found 5 documents that guide us towards RI bodies in an organisation (link1, link2, link3, link4, link5). Two documents were of high quality and very useful for RPOs; the ENRIO documents (link1) and the UKRIO document (link2) both stand out and are useful guidelines to guide RI bodies in a RPO.

b. Protection of whistle-blowers

2 documents were found that guide institutions towards protection of whistleblowers of research misbehaviors (link1, link2, page 33-35) Specifically the first document, the ORI guideline, is very useful, although one potential limitation is that the document is focused on the US and its legal system.

c. Protection of those accused of misconduct

We found one infographic that is helpful in protecting the accused person. See here.

d. Procedures for investigating allegations

This is the subtopic with most guidance. A total of 15 documents were found in the reviews, interviews and Delphi. (See the links here: link1, link2, link3, link4, link5, link6, link7, link8, link9, link10, link11, link12, link13, link14, link15). The UKRIO procedure is a very helpful document (link) that can lead any RPO towards a fair procedure of handling research misconduct allegations. We would like to highlight two documents, link4 and link11. These two documents are assessed as high quality guidelines that can help institutions forming and improving their procedures on how to investigate allegations and potential breaches of RI.

e. Sanctions

For sanctions there are 4 documents available (link1, link2, link3, link4). However, this is vulnerable documents as every country, also within Europe, has different juridical systems with different sanctions that apply to research misconduct. These documents can serve as inspiration for institutions on how to shape their individual sanctions and processes. Again, the UKRIO and the ENRIO documents are of good quality and serve as best practices (link2 and link3).

f. Other actions (including mobility issues)

We found 7 other documents (link1, link2, link3, link4, link5, link6 and link7) that are related to breaches of RI and that can help institutions create a policy. 2 documents are worth highlighting. The UKRIO has a guideline with a communication strategy for misconduct cases in your institution (see link2). Moreover, the Canada Research Integrity Committee has a useful guideline for how to train your staff for analyzing breaches of RI (see here).

Topic 4: Research Ethics structures

a. Set-up and tasks of ethics committees

To set up an ethics committee in your institution there are several documents (6) that can be of help (link1, link2, link3, link4, link5 and link6). One guideline is assessed as a good

quality guideline that elaborates on the requirements for establishing Research Ethics committees (see here).

b. Ethics review procedures

We found many documents and guidelines that highlight the ethical review procedures, how they are used in institutions and which also give useful recommendations. We found a total of 8 documents (link1, link2, link3, link4, link5, link6, link7 and link8). The last document on the list is a link to the SATORI project that provide some good information on ethics assessment. The Nepalese national committee has provided a very detailed and high-quality SOP on how to practices ethical reviews. (See here).

Topic 5: Data practices and management

a. Guidance and support

We found 7 documents that give guidance and support for good data management procedures at institutions. Most documents focus on data policies or researcher guidance on how to create a Data Management Plan. The question is whether these documents serve individual researchers best or could help form a RIPP. These are the 7 links to the documents (link1, link2, link3, link4, link5, link6 and link7). The Research Data Management plan from the University of Pittsburgh (the 6th link and another link to the more extensive guideline) is considered as a guideline of good quality.

b. Secure data storage infrastructure

The same goes for the secure data storage infrastructure subtopic. We found 3 documents, mainly focusing on individual researchers, which can be of help to streamline these processes in RPOs. See here the links for the 3 documents (link1, link2 and link3). The second guideline is considered the best in terms of quality assessment.

c. FAIR principles (Findable, Accessible, Interoperable and Reusable)

The Open Science movement is an important issue to flag. We found 8 document that touch upon the 4 principles. See the links here (link1, link2, link3, link4, link5, link6, link7 and link8). The policy guideline from Stanford that guide the retention of and access to research data at Stanford University is considered a good quality document.

Topic 6: Declaration of competing interests

a. In peer review

We found 4 documents that can help institutions to deal with competing interests in peer review processes. The documents mainly focus on the publication practices and most documents are produced by journals or COPE (link1, link2, link3, link4). The high quality flowchart from Wiley is worth mentioning (see here).

b. In the conduct of research

We found several documents that helps to determine potential competing interests in the conduct of research (link1, link2, link3, link4, link5, link6, link7 and link8). The last document is assessed as the best document for this subtopic, although it solely focusses on the individual researcher and health professional.

c. In appointments and promotions

There were no documents that guide potential competing interests in appointments and promotions.

d. In research evaluations

There was one document of medium quality that focusses on research evaluation (see here).

e. In consultancy

And there was one medium quality document that focusses on competing interests on the consultancy level (see here).

Topic 7: Research environment

a. Fair procedures for appointments, promotions and numeration

For this subtopics we found 4 documents worth mentioning (link1, link2, link3 and link4). Specifically the last one, the Hong Kong Manifesto (link4) is a detailed guideline that suggests 6 principles that can guide institutions for better practices.

b. Adequate education and skills training

We could not find any documents that discuss education and skill training for research environment.

c. Culture building

We identified 2 documents with low quality (link1 and link2). Even though the quality is poor, they can help inspire future documents and guidelines.

d. Managing competition & Publication pressure

No documents were identified that could guide institutions to manage this subtopic.

e. Conflict management

There are 3 documents that give guidance on how to deal with conflicts. However, conflicts are still not very descriptive and could entail several things. The three documents are

treating different types of conflicts; bullying guidance, conflicts in medical research and authorship disputes (link1, link2, link3). The last document is of good quality.

f. Diversity issues

We found 1 document that discussed the potential consequences when women are research subjects. The quality is not good, but it can give some guidance (link1).

g. Supporting a responsible research process (transparency, quality assurance, requirements)

We found numerous documents that can be of help for institution in fostering a responsible research process. 5 documents (link1, link2, link3, link4, link5) discuss research requirements. In this subtopic, the UKRIO has made a clear checklist for the empirical process (see here). 5 documents zoom in on transparency (link1, link2, link3, link4, link5), and 5 other documents focus on quality assurance (link1, link2, link3, link4, link5). Specifically the third document (link3) is practical and gives clear guidance.

Topic 8: Publication and communication

a. Publication statement

In the reviews and interviews, the respondents pointed out 4 documents that can be of help (link1, link2, link3 and link4). Logically, the publishers take the lead on this issue. Elsevier has 2 documents (link2 and link4) that are helpful and foster and help the researcher towards responsible publication practices.

b. Authorship

We have found 15 documents and the majority of them are very useful and of high quality (link1, link2, link3, link4, link5, link6, link7, link8, link9, link10, link11, link12, link13, link14 and link15). Specifically the flowchart from COPE (see here), the guideline from the ICMJE (see here) and the guideline from UKRIO.org (see here) are very detailed and useful for institutions.

c. Open science

Interestingly, we only found 3 documents that talk about open science. As the open science movement is big, there are numerous themes that could be considered as open science (link1, link2, link3). The one on Data Sharing by the ICMJE is of great quality.

d. Use of reporting guidelines

We included 4 documents out of our mapping initiatives that give guidance on how to use reporting guidelines (link1, link2, link3, link4). The ARRIVE guidelines (see here) are a good example for reporting animal research.

e. Peer review

There were also several documents available that help us with guidance for the peer review process (see link1, link2, link3, link4, link5 and link6). Most of these documents are written by publishers or publishers' organizations. The ICMJE guidelines (link) are of high quality and give high quality guidance.

f. Predatory publishing

We could not find any documents that help us determine whether a journal is reliable.

g. Communicating with the public

There are two documents that give some guidance on how to communicate with the public. Again, the ICMJE recommendations guide an institution well (link1 and link2) to improve communicating with the public.

Topic 9: Collaborative research among RPOs

a. Among RPOs inside/outside the EU

We did not find any documents that discuss this in detail.

b. With countries with different R&D infrastructures

The resources here are limited and we only found 2 documents (link1, link2). The second document from the interacademies.org (see here) is a report on responsible conduct in global research and gives clear recommendations.

c. Between public and private RPOs

This subtopic has some documents that can be of help for RPOs in improving the collaboration between industry and other parties (link1, link2, link3, link4). The third document from the RACP in Australia is guiding how to collaborate as an RPO in the biomedical field with industry (see here).

Table 5: Overview of topics (and potential overlap) for RPOs and RFOs.

Topics	RPOs	RFOs
1. Education and training for RI	√	
2. Responsible supervision and mentoring	√	
3. Dealing with breaches of RI	√	√
4. Declaration of competing interests	√	√
5. Funders' expectations of RPOs		√
6. Research ethics structures and requirements	√	√
7. Research environment	√	
8. Selection and evaluation of proposals		√
9. Publication and communication	√	√
10. Collaboration	√	√
11. Monitoring of funded applications		√
12. Independence		√

RFO

For the RFOs, the reviews, interviews and Delphi were far less productive (in terms of available documents). We did not find many documents that could be assessed and used for the selected topics. However, some of the topics that are similar to the topics selected for the RPOs can be of help to select documents for the RFOs, as best practices or examples for inspiration in the next steps of the process. See Table 5 above for an overview of the topics in both RPOs and RFOs.

Below, we have listed the documents that have been selected as best practices or examples.

Topic 1: Dealing with breaches of RI

a. RI bodies in the organization

We have analyzed 2 documents that can be of help (link1 and link2). The document from the Wellcome Trust (see link) gives some guidance on forming a RI-body in an RFO.

b. Procedures for breaches by funded researchers

Many of the documents that are selected by this subtopic in the RPO list can be of use. We found 1 document of medium quality (link) that is specifically addressing the problem of allegations.

For the rest of the subtopics below we did not find any relevant documents that are specifically addressing this issue in RFOs.

c. By review committee members
d. By reviewers
e. By staff members
f. Protection of whistleblowers and the accused
g. Sanctions/other actions
h. Communicating with the public

Topic 2: Declaration of competing interests

a. Among review committee members

We found 1 high-quality (5 out of 5 quality score) document (link) from the Netherlands organization of Health Research and Development (ZonMw) that can be of guidance to give committee members when reviewing proposals.

b. Among reviewers

For reviewers of proposals, the interacademies.org have created guidance (link) for reviewers of proposals that address RI-issues.

c. Among staff members

We could not find guidance on how to deal with declarations of competing interests for staff members of RFOs.

Topic 3: Funders' expectations of RPOs

a. Codes of conduct

Although we have an extensive list of Codes of Conduct from the systematic reviews (See Appendix G), we found no documents that help RFOs to check whether RPOs and proposals are compliant with relevant codes of conduct.

b. Assessment of researchers

We found no specific guidelines that address the assessment of researchers towards responsible research practices and RI.

c. Education and training for RI

We did not find documents that describe what funders expect from RPOs regarding training and education for RI.

d. Processes for investigating allegations of research misconduct the Wellcome Trust gives some guidance for this subtopic.. See here for this document.

Topic 4: Selection and evaluation of proposals
We found no documents for this topic. It could be that most RFOs have these documents and policy in place, but these documents are not open and thus it is not easy to access them.

a. RI plan
b. Methodological requirements
c. Plagiarism
d. Diversity issues

Topic 5: Research ethics structures

a. Research ethics requirements

The Wellcome Trust has one ethical policy in place that guides research that involves human participants. See here.

b. Ethics reporting requirements

We found no documents that guides RFOs on what to expect from RPOs how ethics issues should be reported in proposals and reports to the RFO.

Topic 6: Collaboration within funded projects
Also for this topic, we did not find any relevant documents. The question will be whether this topic is feasible and important for the toolbox to be included in our set of tools for RFOs to create their Research Integrity Promotion Plan. However, since this topic is part of the RPO toolbox as well, found documents in that section can be of inspiration here.

a. Expectations on collaborative research

We did not find any documents that describe what RFOs expect from funded projects on how collaboration should be conducted and checked for RI issues.

b. Research that is co-financed by multiple funders

We found no documents that can help RFOs to deal with RI issues for projects that are financed by multiple funders.

Topic 7: Monitoring of funded applications
Also for this topic, we did not find any relevant documents. The question is whether this topic is feasible and important for the toolbox to be included in our set of tools for RFOs to create their Research Integrity Promotion Plan. This will be decided in the second version of the toolbox.

a. Financial monitoring

b. Monitoring of execution of research grant
c. Monitoring of compliance with RI requirements

Topic 8: Updating and implementing the RI policy
We found no documents for this topic. However, since we are going to create a guideline for RPOs on how to update and implement a RIPP in their institution, it is expected that we can use a modified version of this guideline for the RPOs.

Topic 9: Independence
Also for this topic, we did not find any relevant documents. Since we are not sure how important this topic is (low prioritization score), we will decide this in the second version of the toolbox.

a. What counts as an unjustifiable interference?
b. Preventing unjustifiable interference by the funder
c. Preventing unjustifiable interference by political or other external influences
d. Preventing unjustifiable interference by commercial influences

Topic 10: Publication and communication
a. Publication requirements

We did not find any relevant documents on how to tackle publication bias for RFOs. Potentially, there are documents that address what requirement the funder set regarding publishing research findings, but we could not find them. However, we think that most documents identified for RPOs can help us create guidelines for this subtopic.

b. Expectations on authorship

We did not find any RFO specific documents. We expect that the authorship criteria for RPOs can be used here.

c. Open science (open access, open data, transparency)

We found 1 document that guides open access to manuscripts and publications, and to open data. The Wellcome trust has one high quality policy in place (see here) that guides RFOs on how to promote an open environment related to data sharing and open access.

Topic 11: Intellectual property issues
For this topic, we found no documents aimed at funding institutions that can help them tackle intellectual property issues.

2.6 The fourth and fifth steps: mapping the knowledge and main gaps of knowledge.

The fourth step determined which (sub)topics that so far had have no examples of SOPs and guidelines available and where new SOPs or guidelines therefore need to be created. These topics are flagged to the focus groups and co-creation workshops as topics that need special attention. The fifth step was to create a preliminary sketch of potential (sub)topics that needed further exploration in the next steps of the SOPs4RI project (the focus groups and the co-creation workshops).

We operate with 3 categories. *Category 1* covers the topics where we have a rich material available and where we at the most need to know more about disciplinary differences. *Category 2* covers topics where some knowledge is available, but where more knowledge is needed. *Category 3* covers the group of subtopics with no examples of SOPs and guidelines and no information on best practices.

In an additional sixth step we made a prioritisation of subtopics that need new knowledge and guidance. Since we expect that there will be too many subtopics that need new guidelines/SOPs (in terms of feasibility), we follow the prioritized list from the Delphi-study.

2.7 Categorisation of topics and subtopics

Research Performing Organisations landscape

For topic 1, Education and training in RI, several documents are available. The main gap of knowledge for this topic is the lack of information on education/training in RI of *postdoctorate researchers* (category 3 subtopic). The information in the above mentioned documents (step 2 and 3) can serve as inspiration for the co-creation workshop to further discuss this knowledge gap and make practical recommendations for institutions.

The other gap of knowledge for topic 1 was the lack of guiding documents for *RI counselling and advice* (category 3). We consider this an important document and we know that most institutions have an Ombudsperson in place to deal with these issues. More guidance is needed and the co-creation workshop could be of great help to create such guidance.

For topic 2, responsible supervision and mentoring, we found several useful documents on requirements of supervision. However, there are no formal *PhD guidelines* (category 3) on what PhD students can expect from their supervisor. The other knowledge gap is the '*building and leading an effective team*' subtopic (category 3). Although this subtopic is considered important, we question whether this is something that can be covered by a guideline. The focusgroups and the cocreation workshops can explore this further.

For topic 3 (dealing with breaches of RI), most subtopics are covered (all subtopics are classified as category 1) by all the medium-to-high quality documents that we found. Potentially, the *protection of those accused* (subtopic c, category 2) may warrant some further exploration, although the infographic is guiding this. The co-creation workshops can further investigate this.

Topic 4 deals with the research ethics structures and these are well covered and do not necessarily warrant further exploration in the next steps of the project. All subtopics are considered category 1 subtopics.

Topic 5 is also a topic (Data management) that is covered by multiple high-quality documents that can serve RPOs as tools for their RIPPs. All subtopics are considered category 1 subtopics.

The Declarations of competing interests topic (topic 6) contain several gaps of knowledge and need further exploration. The subtopics *competing interests in peer review* (category 1) and *in the conduct of research* (category 1) are well covered. The other subtopics need more knowledge. The *competing interests in appointments and promotions* need further exploration and the co-creation workshops might explore this in more detail (Category 3). The *competing interests in research evaluation* (category 2) and *the competing interests in consultancy* (Category 2) have 2 documents of medium quality and warrant further investigation and creation.

The seventh topic entitled research environment has many subtopics. The subtopics *Fair procedures for appointments, promotions and numeration*, *Conflict management,* and *Supporting a responsible research process (transparency, quality assurance, requirements)* are classified as category 1 subtopics and have enough documents in place that can help institutions. The subtopics *Culture building and diversity issues* have some documents, but since the quality of these documents is low, we suggest that there is more knowledge needed to provide guidance on these subtopics (Category 2). The subtopics *Adequate education and skills training and Managing competition and publication pressure* lack any information/documents and are classified in Category 3 and thus need to be dealt with in the co-creation workshops.

The eighth topic is the publication and communication topic. Most subtopics are covered by high quality documents that do not necessarily need more knowledge creation. The subtopics *publication statement, authorship, open science, use of reporting guidelines, peer review* and *communicating with the public* are all considered category 1 subtopics. However, there were no guiding documents on the *predatory publishing* subtopic (category 3) and that warrant further exploration in the co-creation workshops.

The last topic is Collaborative research among RPOs. The two subtopics *with countries with different R&D infrastructures* and *Between public and private RPOs* have documents that can guide RPOs (Category 1). Only the subtopic Collaboration among RPOs inside/outside the EU needs knowledge creation (Category 3). With the future perspective of Brexit, this can be an important subtopic that needs more knowledge creation in the co-creation workshops.

Research Funding Organisations landscape

For the RFOs there is a different landscape with more lacunas of knowledge and less sources of available knowledge. This is worrisome as the Delphi study provided us with a list of 11 topics that are prioritized by consensus. The SOPs4RI project aims to create a toolbox with tools that helps RPOs as well as RFOs to implement RI-policy in their institution. Potentially, these documents do exist but are less visible and harder to find and accessed online. Despite the lack of directly useable documents, we can use documents with SOPs and guidelines from RPO-topics as a starting point for creating SOPs and guidelines on similar topics for the RFOs. However, we also have to be practica, as we cannot create guidelines and SOPs for all topics. In coming versions of the toolbox, we will potentially have to shorten the list of topics to be addressed. Here, we will be guided by the prioritisation from the Delphi as well as the results of the focus group study.

We use the same categorization for the RFOs as for the RPOs. Below we describe all the topics and we consequently decide that this subtopic falls in one of the 3 categories. We start with the RPO list of topics and subtopics.

Topic 1 is Dealing with breaches of RI. The first subtopic *RI bodies in the organisation* has one document that can serve as best practice and can be used in RFOs (Category 1). The second subtopic *Procedures for breaches by funded researchers* has 1 document of medium quality (Category 2) and thus needs further workout in the next steps of the project. For the subtopics by review committee members, by reviewers and by staff members we found no suitable documents and new SOPs/guidelines need to be created (Category 3). For the other 3 subtopics; Protection *of whistle-blowers and the accused, sanctions/other actions* and *communicating with the public* we can use the documents from the RPO to form guidelines/SOPs and thus do not need further exploration.

Topic 2 is Declaration of competing interests. This is also a topic that is discussed and explored extensively for RPOs, and we can use material from these guidelines to form the guidelines for RFOs. We also found several documents that can be of help. Subtopic a: *Among review committee members* has 1 document of high quality that can serve as best example for this subtopic (Category 1). The second subtopic *Among reviewers* provides 1 document that needs some further analysis and exploration to become a practical guideline. Therefore, we classified this subtopic as Category 2. The last subtopic is *Among*

Staff Members. We could not find guidance on how to deal with this and thus warrant further exploration in the co-creation workshops (Category 3).

The topic Funders expectations of RPOs (Topic 3) has not been provided with many documents. Since this topic lacks clear guidance, we suggest that we create new content for this topic with its subtopics *Codes of conduct; Assessment of researchers and Education and training for RI* in the cocreation workshops (Category 3). The only subtopic that is covered by one document is the *Processes for investigation allegations of research misconduct (*Category 2). Since this document is not of high quality, we recommend that there will be some additional exploration of this subtopic to create a sustainable and complete guideline/SOP.

The fourth topic Selection and evaluation of proposals has no guidance from documents found in the reviews, interviews and Delphi. We suggest that we create new content for this topic in the co-creation workshops (Category 3) for all subtopics; *RI plan; Methodological requirements; Plagiarism* and *Diversity issues.*

The topic Research ethics structures (Topic 5) consists of two subtopics. For the first Research ethics requirements we found 1 document that guides RFOs to check the ethical requirements for research that involves human participants (Category 2). For the other subtopic, *Ethics reporting requirements,* there were no documents available and we thus need further analysis on this subtopic in the co-creation workshops.

In Collaboration with funded projects (Topic 6) consists of 2 subtopics (*Expectations on collaborative research* and *Research that is co-financed by multiple funders)* and there was a clear lack of knowledge and information on these topics. This is also a topic that is discussed and explored extensively for RPOs, and we can use material from these guidelines to form the guidelines for RFOs. Therefore, we suggest that we use these guidelines and if necessary, we have to create new content for both subtopics in the co-creation workshops (Category 3).

The seventh topic is the Monitoring of funded applications. This topic has no guidance from documents found in the reviews, interviews and Delphi. We suggest that we create new content for this topic in the co-creation workshops (Category 3), covering all subtopics: *Financial monitoring; monitoring of execution of research grant* and *monitoring of compliance with RI-requirements.*

Topic 8 is Updating and implementing the RI policy and is also lacking SOPs and guidelines. Since we are going to create a guideline for RPOs on how to update and implement RI-

policy in their institutions, it is expected that we use a modified version of that guideline for the RFOs as well (potentially with slight alterations, to make it eligible for RFOs)

The topic Independence (topic 9) consists of 4 subtopics (Category 3). Since we did not find any suitable documents, we suggest that, taking into consideration that this is not the topic that is prioritized highly, we will make decisions in the next version of the toolbox whether we will create new content for this topic and its four subtopics; *What counts as an unjustifiable interference?; Preventing unjustifiable interference by the funder; Preventing unjustifiable interference by political or other external influences;* and *Preventing unjustifiable interference by commercial influences.*

For the penultimate topic Publication and communication (Topic 10) we could not find any available documents that specifically address RFOs. However, since the RPO-landscape consists of several documents for the subtopics *Publication requirements; Expectations on authorship* and *Open Science practices*, we think that most documents that tackle these issues from an RPO perspective could be used as inspiration for RFO targeted SOPs and guidelines as well.

The topic Intellectual property issues (topic 11) has no subtopic and no documents. If we are going to include this topic in the final toolbox we have to create SOPs and guidelines for it in the co-creation workshops (Category 3).

Step 6: finalizing the first version of the toolbox with topics, examples and best practices

In the final step of the creation of the first toolbox with SOPs and guidelines, we mapped out the topics that have gaps or limited resources. Above we have made a preliminary sketch of the toolbox with topics and best practices. Below we present a summary of our classification of topics and subtopics. We base this classification on the first 5 steps that are described above. In these steps, we assessed the material that came out of WP3 and used this material for the overall sketch and description of the landscape of topics and subtopics that will be part of our toolbox. We have assessed all the documents that came out of the review from WP3, analysed these documents, decided under which subtopic this document belonged, scored these documents on a 5 point scale and identified the knowledge gaps of all topics and subtopics.

In table 5 and 6, we provide an overview of the mapping of topics and existing material for the first version of the toolbox.

Table 6. Mapping and categorizing RPO-topics and subtopics

Rank	Topic	Subtopics	Cat.1	Cat.2	Cat.3
1	Education and training in RI	a. pre-doctorate	X		
		b. post-doctorate			X
		c. training of RI personnel & teachers	X		
		d. RI counselling and advice			X
2	Responsible supervision and mentoring	a. PhD guidelines			X
		b. supervision requirements & guidelines	X		
		c. building and leading an effective team			X
3	Dealing with breaches of RI	a. RI bodies in the organisation	X		
		b. protection of whistleblowers	X		
		c. protection of those accused of misconduct		X	
		d. procedures for investigating allegations	X		
		e. sanctions	X		
		f. other actions (including mobility issues)	X		
4	Research ethics structures	a. set-up and tasks of ethics committees	X		
		b. ethics review procedures	X		
5	Data practices and management	a. guidance and support	X		
		b. secure data storage infrastructure	X		
		c. FAIR principles	X		
6	Declaration of competing interests	a. in peer review	X		
		b. in the conduct of research	X		
		c. in appointments and promotions			X
		d. in research evaluations		X	
		e. in consultancy		X	
7	Research environment	a. fair procedures for appointments, promotions and numeration	X		
		b. adequate education and skills training			X
		c. culture building		X	
		d. managing competition & publication pressure			X
		e. conflict management	X		
		f. diversity issues		X	

		g. supporting a responsible research process (transparency, quality assurance, requirements)	X		
8	Publication and communication	a. publication statement b. authorship c. open science d. use of reporting guidelines e. peer review f. predatory publishing g. communicating with the public	X X X X X X		 X
9	Collaborative research among RPOs	a. among RPOs inside/outside the EU b. with countries with different R&D infrastructures c. between public and private RPOs	 X X		X

For a description of the topics/subtopics, click here.

Table 7. Mapping and categorizing RFO-topics and subtopics (Please note, when reading table 6, that for some RFO-topics, the RPO-landscape of topics is similar and can provide specific documents that only need some alterations to make them applicable for RFOs. We have marked these topics and subtopics with an Asterix*.)

Rank	Topic	Subtopic	Cat.1	Cat.2	Cat.3
1	Dealing with breaches of RI	a. RI bodies in the organisation	X		
		b. procedures for breaches by funded researchers		X	
		c. by review committee members			X
		d. by reviewers			X
		e. by staff members			X
		f. protection of whistleblowers and the accused	X		
		g. sanctions/other actions	X		
		h. communicating with the public	X		

2	Declaration of competing interests	a. among review committee members	X	
		b. among reviewers		X
		c. among staff members		X
3	Funders' expectations of RPOs	a. Codes of Conduct		X
		b. assessment of researchers		X
		c. education and training for RI		X
		d. processes for investigating allegations of research misconduct	X	
4	Selection & evaluation of proposals	a. RI plan		X
		b. methodological requirements		X
		c. plagiarism		X
		d. diversity issues		X
5	Research ethics structures	a. research ethics requirements	X	
		b. ethics reporting requirements		X
6	Collaboration within funded projects	a. expectations on collaborative research		X
		b. research that is co-financed by multiple funders		X
7	Monitoring of funded applications	a. financial monitoring		X
		b. monitoring of execution of research grant		X
		c. monitoring of compliance with RI requirements		X
8	Updating and implementing the RI policy	*NONE*	*X*	
9	Independence	a. What counts as an unjustifiable interference?		X
		b. preventing unjustifiable interference by the funder		X
		c. preventing unjustifiable interference by political or other external influences		X
		d. preventing unjustifiable interference by commercial influences		X

10	Publication and communication	a. publication requirements b. expectations on authorship c. open science (open access, open data, transparency)	X X X
11	Intellectual property issues	*NONE*	*X*

To summarize, for RPOs we have identified 9 subtopics that have no information or documents. A total of 5 subtopics need additional creation of material and merging on the existing documents (of low-to-medium quality) to create guidance for these subtopics.
For 26 subtopics, we already have documents and best practices in place that can be used in our toolbox.

For RFOs, the result of the mapping exercise is that we have no information/knowledge on 18 of the subtopics. For another 3 subtopics, we need to elaborate on the existing material in order to make it useful for the RFOs. For 9 subtopics, we have documents/best practices in place that can be useful as guidance for RFOs.

2.8 Next steps for SOPs4RI

The mapping and categorisation of the topics for RPOs and RFOs help us to determine which topics and subtopics need attention in the next parts of the project. With material and results from the Focus Groups (FG) and the Co-creation workshops, we will be able to address many of the blind spots on the map (category 2 and 3). The selection of topics to be discussed in the focus group interviews (see D. 5.1. for details) will make it possible for us to shed light on some of the blind spots on the map – and the co-creation workshops will help us create concrete examples of SOPs and guidelines. Below we have listed the category 2 and 3 topics and noted where we expect to get additional material that can help us in developing SOPs and guidelines for these topics. It should finally be noted, that since the main aim of the Focus Group study is to explore disciplinary differences, we might also discover the need for some additional disciplinary specific SOPs and guidelines for some of the Category 1 topics. We will make decisions on this after the results of the FGs are known.

Category 2 topics and subtopics for RPOs:

Topic 3 Dealing with breaches of RI

subtopic The protection of those accused (FG)
Topic 6 Declarations of competing interests
subtopic Competing interests in research evaluation (CCW)
subtopic Competing interests in consultancy (CCW)
Topic 7 Research environment
subtopic Culture building (FG)
subtopic Diversity issues (FG)

Category 3 topics and subtopics for RPOs:
Topic 1 Education and training in RI;
subtopic Postdoctorate (FG)
subtopic RI counselling and advice (FG)
Topic 2 Responsible Supervision and mentoring
subtopic PhD guidelines (FG)
subtopic Building and leading an effective team (FG)
Topic 6 Declaration of competing interests
subtopic Competing interests in appointments and promotions (CCW)
Topic 7 Research environment;
subtopic Adequate education and skills training (CCW)
subtopic Managing competition and publication pressure (FG)
Topic 8 Publication and communication
subtopic predatory publishing (CCW)
Topic 9 Collaborative research among RPOs
subtopic Collaboration among RPOs inside/outside the EU (CCW)

For RFOs:
Category 2 topics and subtopics for RFOs:
Topic 2 Declaration of competing interests
subtopic Competing interests among reviewers (FG)
Topic 3 Funders expectations of RPOs
subtopic Processes for investigation allegations of research misconduct (FG)
Topic 5 Research ethics structures
Subtopic Research ethics requirements (FG)

Category 3 topics and subtopics for RFOs:
Topic 2 Declaration of competing interests
subtopic Competing interests among staff members (FG)
Topic 3 Funders expectations of RPOs

- Subtopic Codes of conduct (CCW)
- subtopic Assessment of researchers (CCW)
- subtopic Education and training for RI (FG)

Topic 4 Selection and evaluation of proposals

- subtopic RI plan (FG)
- subtopic Methodological requirements (FG)
- subtopic Plagiarism (FG)
- subtopic Diversity issues (FG)

Topic 5 Research ethics structures

- Subtopic Ethics reporting requirements (FG)

Topic 6 Collaboration with funded projects

- subtopic Expectations on collaborative research (CCW)
- subtopic Research that is co-financed by multiple funders (CCW)

Topic 7 Monitoring of funded applications

- subtopic Financial monitoring (FG)
- subtopic monitoring of execution of research grant (FG)
- subtopic monitoring of compliance with RI-requirements (FG)

Topic 9 Independence

- subtopic What counts as an unjustifiable interference? (FG)
- subtopic Preventing unjustifiable interference by the funder (CCW)
- subtopic Preventing unjustifiable interference by political or other external influences (CCW)
- subtopic Preventing unjustifiable interference by commercial influences (FG)

Topic 11 Intellectual property issues (CCW)

Appendix A: list of preliminary topics for RI with descriptions from the 1st round of the Delphi study for RPOs

1. Education and training in research integrity

Research integrity education and training are needed to promote responsible research behaviours. Research performing organisations have the responsibility to provide such education. The organisation should make a plan on how to deliver research integrity education. Different types of training may be needed for different stakeholders (e.g. researchers, teachers, administrators).

Subtopics:

a. Pre-doctorate research integrity training
   Research integrity education for Bachelor, Master, PhD students and junior researchers can be planned early on. For example, research performing organisations could require PhD students to complete a research integrity course in the first year of their research.

b. Post-doctorate research integrity training
   Senior researchers may require a specific approach to research integrity education. For instance, requirements to complete research integrity training to become a supervisor could be effective. Also, continous training may be needed (e.g. every 5 years).

c. Training of research integrity personnel and teachers
   Research integrity personnel need training on how to effectively promote research integrity among researchers. Additionally, research integrity teachers need training on how to train others to do responsible research.

d. Research integrity counselling and advice
Researchers should be able to get advice on research integrity concerns from the research performing organisation. This could be done using face-to-face systems (e.g. advisors). Online support systems could also help (e.g. platforms/websites with more information).

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2. Responsible supervision and mentoring

Requirements should be in place for supervising researchers. For instance, there could be restrictions on who can become a supervisor or on how many mentees a supervisor can have.

Subtopics:

a. PhD guidelines: Informing students about good supervision
The organisation should ensure that students know what to expect from their supervisors. Requirements for supervision should be specified to PhD students (e.g. how many supervisors are needed; how many supervision hours are required, etc.). Additionally, there should be procedures in place to help students optimise their supervision. For instance, the organisation can ask students to provide periodic feedback to supervisors.

b. Supervision requirements and guidelines
The organisation should specify its requirements for becoming a supervisor (e.g. needing a license to supervise, which can be obtained by following a supervision course). Guidelines are also needed to clarify what is expected of supervisors (e.g. how many supervision hours they should put in).

c. Building and leading an effective team
Specific requirements could be set up for becoming a research team leader (e.g. following a course on good leadership skills). Additionally, guidelines on being a research team leader can help to set clear expectations on the tasks that team leaders are responsible for.

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3. Dealing with breaches of research integrity

This topic covers the structures necessary to deal with research integrity breaches. Additionally, it addresses procedures to follow in case of breaches.

Subtopics:

a. Research integrity bodies in the organisation: The people and committees responsible for research integrity
There are a variety of research integrity bodies that can be helpful. Examples are research integrity officers, ombudsmen, research integrity committees, confidential counsellors, etc. The organisation needs a plan on which bodies to set up.

b. Protection of whistleblowers
Whistleblowers, people who make allegations of research misconduct, are vulnerable to reprisal and retaliation. The organisation should produce a policy to protect their careers and privacy.

c. Protection of those accused of research misconduct
Accused researchers are vulnerable to reputation damage and possible other negative consequences. Organisations should protect them up to the point that the accused is found guilty of misconduct.

d. Procedures for investigating allegations of misconduct
This includes all procedures for investigating misconduct. This will involve making an initial assessment of whether an investigation is warranted; the steps of the

official investigation; as well as appeal procedures. This subtopic also concerns mobility issues and investigations in collaborative research: what should be done when the accused researcher does not work at the research performing organisation where the accusation has been made?

e. Sanctions: Penalties for research misconduct

There should be consequences for research misconduct. Possible consequences include being dismissed from employment, losing supervision privileges, having to attend specific trainings on research/supervision, etc.

f. **Other actions to take in case of proven research misconduct** (e.g. correcting the literature, sharing names of guilty researchers, etc.)

When research misconduct is discovered in the organisation, there should be steps to correct the affected literature. This may involve collaboration with journals. Additionally, the research performing organisation may want to share the names of guilty researchers with other research performing organisations and funding agencies.

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4. SUPPORTING A RESPONSIBLE RESEARCH PROCESS: Requirements, services and monitoring

What are the requirements that researchers should fulfil to do research (e.g. obtaining ethics approval)? How should the organisation monitor the progress of ongoing research?

Subtopics:

a. Research requirements: Necessary steps researchers should take (e.g. obtaining ethics approval)

Examples of ethics requirements include obtaining ethics approval for each study, preregistering research, etc.

b. Transparency: Guidelines and services on open data, preregistration, etc.
These guidelines could address organisational expectations and infrastructures related to study preregistration, image processing, open data, etc.

c. Quality assurance: Monitoring research and assuring its quality
The organisation could plan periodic (e.g. yearly) assessments of the state of research at the organisation/department by external or internal peer reviewers. The assessments should take into account research integrity issues.

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5. Research ethics issues: Ensuring that research is conducted ethically

This topic is about procedures and structures necessary to ensure compliance with research ethics requirements (e.g. ethics review processes).

Subtopics:

a. Set-up and tasks of ethics committees
The organisation may need different research ethics committees (e.g. animal ethics committee, research ethics committee for medical research with humans, research ethics committee for non-medical human research, etc.). The responsibilities of each committee should be clearly specified. Organisations should also decide which members to include in each committee.

b. Ethics review procedures
This subtopic addresses procedures relevant for conducting ethics review of research protocols. What kinds of forms should be submitted for ethics review? How long should the ethics review process take? What are the appeal procedures?

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6. Data management: Guidance and support

The research performing organisation should provide guidance and support to researchers on data management. Additionally, they should provide tools such as data backup and data sharing systems to researchers.

Subtopics:

a. Data protection and privacy: GDPR & privacy policies
   This subtopic addresses how to help researchers comply with the GDPR (The EU's General Data Protection Regulation). Researchers need support in creating and adhering to good privacy policies.

b. Secure data collection, storage, retention, archiving and sharing infrastructure
   There should be infrastructure that allows for safe data collection, storage, retention, archiving and sharing. For instance, network drives that have clear versioning, regular backups, and are secure to breaches should be available.

c. FAIR principles: Making data findable, accessible, interoperable & reusable
   The research performing organisation should encourage researchers to abide by the FAIR principles. This could involve training on FAIR principles, providing support on licensing data, etc. For more information on the FAIR principles, click here: https://www.nature.com/articles/sdata201618.

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7. Conflicts of interest: Identifying and handling them

What are conflicts of interest and how can they be identified? What steps should be taken once conflicts of interest are detected?

Subtopics:

a. Conflicts of interest in peer review
   The organisation should outline what it considers as a 'conflict of interest' in the context of peer review. Procedures for handling conflicts of interest should also be

specified, including 1) how to report conflicts of interest and 2) when a conflict of interest necessitates refusing to partake in peer review of an article/proposal.

b. Conflicts of interest in the conduct of research
The organisation should outline what it considers as a 'conflict of interest' during the research process. Should only financial types of conflicts of interest be considered, or also intellectual types (e.g. when a researcher is studying the effectiveness of an intervention they developed, patents, etc.)? Additionally, procedures for handling conflicts of interest should also be specified, including 1) how to report conflicts of interest and 2) when a conflict of interest necessitates withdrawing, or partially withdrawing, from an activity.

c. Conflicts of interest in appointments and promotions
The organisation should outline what it considers as a 'conflict of interest' in the process of deliberating on appointments and promotions. Procedures for handling conflicts of interest should also be specified, including 1) how to report conflicts of interest and 2) when a conflict of interest necessitates withdrawing, or partially withdrawing, from an activity.

d. Conflicts of interest in research evaluations
The organisation should outline what it considers as a 'conflict of interest' in the context of research evaluations. Procedures for handling conflicts of interest should also be specified, including 1) how to report conflicts of interest and 2) when a conflict of interest necessitates withdrawing, or partially withdrawing, from an activity.

e. Conflicts of interest in consultancy work
The organisation should set clear expectations on how researchers should identify and handle posisble conflicts of interest when taking part in consultancy work (e.g. with industry or other types of organisations). The organisation should outline what it considers as a 'conflict of interest' in the context of consultancy. Procedures for

handling conflicts of interest should also be specified, including 1) how to report conflicts of interest and 2) when a conflict of interest necessitates withdrawing, or partially withdrawing, from an activity.

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8. Research culture: Creating an open and responsible research culture

An open and responsible research culture is needed to foster research integrity. There should be a plan for creating such a culture in the organisation. The plan could include institutional/department events/activities on research integrity issues (seminars, workshops, etc.).

Subtopics:

a. Fair procedures for appointments, promotions and remuneration
   How to ensure that researchers are hired, promoted and paid according to fair procedures and assessment criteria? Promotions could, for instance, be based on different types of impact (e.g. engagement with stakeholders; high quality research) and not just the number of high impact publications.

b. Adequate education and skills training of researchers
   Supporting researchers in developing themeselves professionally may help to create a responsible workforce. Both researchers who want to stay and leave academia should be supported. Support can include helping researchers develop both hard and soft skills, providing PhD courses about work outside of academia, etc.

c. Culture building: Building openness, fostering reflection and responsibility attribution
   Culture building could include preparing events where researchers can discuss research integrity dilemmas. Another possibility is to organise informal gatherings that are important for team-building in research departments/groups.

d. Managing competition and publication pressure: Supporting researchers to cope with competitive working environments
Organisations should find measures to help researchers cope with the high level of competition and publication pressure in academia. This could involve forums where researchers can openly share concerns they have about competition and publication pressures among colleagues.

e. Conflict management: Procedures for handling conflicts
There should be organisational procedures for managing conflicts (e.g. between supervisors and junior researchers or between senior academic staff). For instance, advisors to whom researchers can turn when unable to manage conflicts on their own should be available.

f. Diversity issues: Promoting diversity to make research valuable for all
To do high quality research, it is important to include different research perspectives to ensure that research findings are meaningful and valid for different groups in the population. Policies are needed to create a more inclusive resaerch environment. This could involve appointing diversity officers who will strategize about how to promote diversity in the organisation. It may also help to have confidential counsellors to approach in case of discrimination.

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9. Publication and communication: Ensuring responsible communication of research findings

The research performing organisation should specify its expectations about the communication of research (e.g. that all research findings should be published). Additionally, it should support and guide researchers to meet these expectations (e.g. provide support for resolving authorship disputes).

Subtopics:

a. Publication statement: A statement outlining the organisation's expectations on research publication
This is a statement about the organisation's stance on publication, rather than a guideline for researchers. The statement should mention that all research should be published, at least on an online repository or the project's own website. The statement could also encourage publishing preregistrations and preprints.

b. Authorship: Guidelines and handling disputes
The organisation should specify what types of contributions qualify researchers to be manuscript authors. The ICMJE or APA authorship criteria can be followed here. The subtopic also addresses organising a system for handling authorship disputes (e.g. having an advisory figure for this).
These are the ICMJE criteria: http://www.icmje.org/recommendations/browse/roles-and-responsibilities/defining-the-role-of-authors-and-contributors.html.
These are the APA criteria: https://www.apa.org/research/responsible/publication/.

c. Open science: Fostering open access and open data
The organisation should have a plan for promoting open access publication and open data. This will include the tools and support it will provide researchers to enable open science (e.g. making deals with open access journals).

d. **The use of reporting guidelines:** Expectations on how research should be reported
Research performing organisations should specify expectations for the reporting of research findings. Certain types of research should follow specific reporting guidelines. For instance, systematic reviews have to follow the PRISMA guidelines.

e. Peer review: Setting expectations and advice on peer review
Research institutions could clarify what their expectations are on peer review by researchers (e.g. that researchers only peer review work that is on a topic they are competent in). Additionally, they could provide researchers with resources on good peer review.

f. Predatory publishing: Helping researchers avoid predatory publishing
Researchers could intentionally or unintentionally fall prey to predatory journals/congresses. Research institutions should provide researchers with the awareness and tools necessary to avoid predatory publishing (e.g. guidelines on how to identify a predatory publisher).

g. Communicating with the public: Ensuring responsible communication of research findings with the public
The research performing organisation should clarify its expectations on how researchers can communicate with the public about their research. For instance, they could state that researchers should not overstate research findings.

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10. Updating and implementing the organisational research integrity policy

The research integrity policies of the organisation should be improved and updated over time. Also, implementation strategies should be developed to translate these policies into practice. For example, a meeting could be set up every two years, dedicated to evaluating and updating the existing policy.

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11. Intellectual property issues: Institutional policy on patents, licensing, copyrights & intellectual property

Organisational policies on patents, licensing and intellectual property issues are needed. This includes, for instance, clear statements on who owns intellectual property rights from research performed in the organisation.

Subtopics:

a. Policies ensuring compliance with intellectual property regulations
   To help researchers navigate existing intellectual property regulations, the research organisation should define and communicate clear policies on intellectual property issues (e.g. policies on data sharing ensuring that data sharing is in line with intellectual property regulations).

b. Interaction of intellectual property and open science requirements
   In some cases, intellectual property issues may conflict with the ideals of open science. For instance, researchers may not have permission from the people who own the rights of the research to publish data openly. Research organisations should provide researchers with support on handling such conflicts (e.g. providing researchers with guidelines).

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12. Collaborative research among research performing organisations

What organisational policies and procedures are necessary to ensure that collaborative research between researchers in different institutions is conducted responsibly? Examples of issues to consider here include data management agreements, ethics review procedures, benefit sharing, etc.

Subtopics:

a. Collaborating with research performing organisations inside/outside the EU
   What are the differences that should be taken into account when collaborating with institutions within or outside the EU? For instance, data management procedures and privacy policies should be carefully planned when collaborating with non-EU institutions, which do not have to comply with the EU's General Data Protection Regulation (GDPR).

b. Collaboration between countries with different R&D (research and development) infrastructures
   There are additional issues to consider when doing research together with organisations from countries that have different R&D systems. Some of these issues overlap with research ethics considerations. For instance, some countries may not have appropriate ethics review procedures for some types of research. What should be done in such a case? Also, how can benefit sharing be ensured when conducting research with organisations in low and middle income countries?

c. Collaboration between public and private research performing organisations
   Collaboration between public research organisations and commercial research companies may require specific policies. For instance, transparency and open access publishing/data may be more challenging to agree on. Intellectual property issues may also arise. The collaborating institutions should set out clear expectations and standard agreements on these issues. Think of agreements on open access data, for example.

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Appendix B: list of preliminary topics for RI with descriptions from the 1st round of the Delphi study for RFOs

1. Dealing with breaches of research integrity

This topic covers the structures and procedures necessary to deal with research integrity breaches.

Subtopics:

a. Research integrity bodies in the organisation: The people and committees responsible for research integrity

   There are a variety of research integrity bodies that can be helpful. Examples are research integrity officers, ombudsmen, research integrity committees, confidential counsellors, etc. The funder needs a plan on which bodies to set up or consult.

b. Breaches by funded researchers: Investigations and sanctions

   This is about how the funder will respond to allegations of research misconduct by researchers. The funder will need to cooperate with research performing organisations here. Not every funder will do investigations, as some will rely entirely on research performing organisations for this. However, even for funders with such policies, it is important to have some procedures in place in case the research performing organisation fails to properly address allegations of misconduct. Procedures for investigating the allegations should be outlined. Sanctions, consequences for research misconduct, should also be mentioned. Sanctions may be targeted at the researcher (e.g. deeming researcher no longer eligible for funding) and/or at research performing organisations (e.g. demanding reimbursement of the award funding, or deeming any research from the institution no longer eligible for funding in case the institution does not take its research integrity responsibilities seriously).

c. Breaches by review committee members (i.e. members of the committees that weigh external reviewers' judgments to provide advice on funding decision): Investigations and sanctions

This is about how the funder will respond to allegations of research misconduct made against committee members. The funder should specify what kinds of actions by review committee members constitute research misconduct (e.g. breaching the confidentiality of a grant proposal). Procedures for investigating misconduct allegations should be outlined. Sanctions, consequences for research misconduct, should also be mentioned.

d. Breaches by reviewers (when external reviewers evaluate proposals): Investigations and sanctions

This is about how the funder will respond to allegations of research misconduct made against reviewers. The funder should specify what kinds of actions by reviewers constitute research misconduct (e.g. breaching the confidentiality of a grant proposal). Procedures for investigating misconduct allegations should be outlined. Sanctions, consequences for research misconduct, should also be mentioned.

e. Breaches by staff members: Investigations and sanctions

This is about how the funder will respond to allegations of research misconduct made against staff members. The funder should specify what kinds of actions by staff members constitute research misconduct (e.g. breaching the confidentiality of a grant proposal). Procedures for investigating misconduct allegations should be outlined. Sanctions, consequences for research misconduct, should also be mentioned.

f. Protection of whistleblowers and those accused of research misconduct

Whistleblowers, people who report research misconduct, are vulnerable to reprisal and retaliation. Similarly, accused researchers/committee members/staff members/reviewers are also vulnerable to reputation damage and possible other

negative consequences. The organisation should produce a policy to protect these people's careers and privacy, unless they are found guilty of maliciously accusing someone of misconduct or taking part in misconduct themselves.

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2. Conflicts of interest: Identifying and handling them

What are conflicts of interest and how can they be identified? What steps should be taken once conflicts of interest are detected?

Subtopics:

a. Conflicts of interest among review committee members (i.e. members of the committees that weigh external peer reviewers' judgments to provide advice on funding decisions)

   The research funding organisation should have a policy in place that outlines what it considers to be a 'conflict of interest', concerning tasks of committee members. Additionally, there should be procedures for reporting and handling conflicts of interest. For instance, how will it be judged when a conflict of interest necessitates withdrawing, or partially withdrawing, from an activity?

b. Conflicts of interest among reviewers (when external reviewers evaluate proposals)

   The research funding organisation should have a policy in place that outlines what it considers to be a 'conflict of interest', concerning tasks of reviewers. Additionally, there should be procedures for reporting and handling conflicts of interest. For instance, how will it be judged when a conflict of interest necessitates withdrawing, or partially withdrawing, from the review process?

c. Conflicts of interest among staff members

   The research funding organisation should have a policy in place that outlines what it considers to be a 'conflict of interest', concerning tasks of staff members. Additionally, there should be procedures for reporting and handling conflicts of interest. For instance, how will it be judged when a conflict of interest necessitates withdrawing, or partially withdrawing, from an activity?

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3. Funders' expectations of research performing organisations regarding research integrity

Funders should be clear on what they expect from research performing organisations regarding research integrity. Policies on conducting audits may also be helpful to ensure that these expectations are met.

Subtopics:

a. Codes of Conduct: Compliance with official research integrity standards
   Funders should require research performing organisations to follow relevant national and international codes of conduct for research integrity, in order to be eligible to receive funding.

b. Assessment of researchers: Fair assessment based on responsible indicators
   Research funding organisations should clearly articulate how they expect research performing organisations to assess researchers. For instance, they could state that assessment should be based on responsible indicators, rather than on metrics which produce perverse incentives (e.g. number of high impact publications).

c. Educating and training for research integrity
   Funders should specify what they expect from research performing organisations regarding training and education for research integrity. Additionally, funders could allocate a part of the study budget specifically for research integrity trainings.

d. Processes for investigating allegations of research misconduct
   Funders could specify that research performing organisations are responsible for investigating allegations of research misconduct. Funders should also be clear about the information that they expect to receive from research performing organisations regarding investigations on their funded projects. It may also be helpful to set policies on the course of action in cases where research performing organisations do not appropriately handle allegations of misconduct.

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4. Selection and evaluation of proposals: How to select for responsible research

Funders should select for projects that meet research integrity standards or plan to do so. The funder should specify criteria related to research integrity to be assessed during the selection and evaluation process. Proposals will have to meet these criteria to be eligible to receive funding. For instance, funders could decide to only fund projects that include plans on writing a data management plan.

Subtopics:

a. Research integrity plan: Requiring researchers to submit a research integrity plan
   Funders could require researchers to submit a research integrity plan when applying for a grant. Examples of what could be included in such a plan could include researchers' training, writing a data management plan, publishing all research, publishing data/publications in an openly accessible way, complying with the EU's General Data Protection Regulation, etc.

b. Establishing need for research: Ensuring that research is relevant rather than wasteful
   Research funding organisations could ask researchers to provide evidence (e.g. a systematic review on their research topic) that there is a gap in knowledge and/or a problem in society that their proposed research addresses. This is important to prevent research waste.

c. Methodological requirements: **Ensuring that the research meets high methodological standards**
   Funders should ensure that only grant proposals that meet high methodological standards are eligible to receive funding. Things to look out for include using the right statistical analyses, using appropriate sample sizes, and obtaining representative samples, etc. Requiring that junior researchers receive appropriate

research methodology training as part of the research integrity plan would contribute to this requirement.

d. Plagiarism
   The funding organisation needs a software solution to identify plagiarism in submitted proposals. Additionally, it should provide guidelines to researchers and funders about what constitutes plagiarism and how to tackle cases of plagiarism.

e. Diversity issues: Promoting inclusive research
   To ensure that research findings are relevant for the whole population of interest, rather than for a small group, funding agencies should take into account diversity issues when assessing proposals (i.e. are funded study samples and teams inclusive in terms of gender, sex, ethnicity, sexuality, age, etc.?).

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5. Research ethics issues: Ensuring that research benefits are proportionate to the risks

The funder can set ethics requirements that researchers should fulfil.

Subtopics:

a. Research ethics requirements:
   This subtopic is about research ethics requirements that the funding agency sets for researchers (e.g. obtaining ethics approval from an ethics committee). There should be a clear plan for how to assess whether the requirements have been met.

b. Ethics reporting requirements
   This subtopic is about the standards the funding agency sets on how ethics issues should be reported in proposals and reports to the funding agency. For instance, funders may require biomedical researchers to report on issues such as adverse events and incidental findings.

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6. Collaboration

The funding agency should clarify expectations on collaborative research (e.g. producing data transfer agreements).

Subtopics:

a. Expectations on collaborative research (e.g. data management & transfer, collaboration agreements, benefit sharing, etc.)

   The funding organisation should clarify its expectations on how projects should be conducted when involving multiple research performing organisations. For instance, a collaboration agreement which includes issues such as data management and transfer, and complies with the EU's General data protection regulation (GDPR) should be required. The funder may also want to produce a template for the collaboration agreement.

b. Research that is co-financed by multiple funders: expectations and communication

   Funders should have a plan on how research integrity issues should be handled for projects that are financed by multiple funders. For instance, there may be a need to harmonize research integrity requirements with other funders (e.g. formats/requirements for data management plans). Written agreements should be written at the start of the research process to ensure that all financing funders have clear expectations on how to approach research integrity issues in the project.

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7. Monitoring of funded applications

This topic addresses the policies and processes the funder will use to monitor that the research they fund is consistent with research integrity principles.

Subtopic:

a. Financial monitoring
   If researchers are not using their funds appropriately, this may be indicative of breaches of research integrity (e.g. if researchers falsely claim to be actively involved in the funded project solely to receive funding). Therefore, research funding organisations should check that the funds they give to researches are used appropriately. For instance, periodic (e.g. yearly) financial reports from researchers could be demanded. Additionally, good communication is required between the financial department of the funding agency responsible for financial monitoring and other departments that are involved in scientific monitoring.

b. Monitoring of the execution of the research grant
   The research funding organisation should ensure that researchers adhere to the research grant agreement signed. This could be done by asking researchers to provide periodic (e.g. yearly) reports of the research progress.

c. Monitoring of compliance with research integrity requirements
   The research funding organisation should check that the research integrity requirements (e.g. open data/open access, good data management practices, GDPR, etc.) are being met. For instance, it could ask researchers to report on these activities as part of their progress reporting. It could also audit data management systems that researchers are using or the relevant policies and processes of the research performing organisations.

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8. Updating and implementing the organisational research integrity policy

The research integrity policies of the organisation should be improved and updated over time. Also, implementation strategies should be developed to translate these policies into

practice. For example, a meeting could be set up every two years, dedicated to evaluating and updating the existing policy.

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9. Independence: Preventing unjustifiable interference in the research process

The funding agency should not impose non-scientific considerations on the research process and should strive to prevent such impositions by other external influences, so that researchers can maintain independence.

Subtopic:

a. What counts as 'unjustifiable' interference?
   There should be guidelines that funders can use to determine whether a specific type of interference is unjustifiable or not.

b. Preventing unjustifiable interference by the funding agency
   This subtopic is about how the research funding organisation will ensure that the funders' political, commercial or intellectual allegiances, or other biases, do not interfere with research that does not align with the same views. A clear policy should be developed on how to achieve this. For instance, establishing agreements at the start of the research could help to avoid unjustifiable interference later.

c. Preventing unjustifiable interference by political or other external influences
   This subtopic applies to external political or other influences. The funder should have a policy to ensure that its funded research is not unjustifiably interfered with by political, religious or other external influences.

d. Preventing unjustifiable interference by commercial influences
   This subtopic applies to commercial influences. The funder should have a policy to ensure that commercial interests do not interfere with the research process unjustifiably.

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10. Publication: Requirements and guidelines for funded research

The funder should specify its expectations regarding the publication and dissemination of funded projects (e.g. that all research findings should be published). Should research output, for instance, be made publicly available?

Subtopics:

a. Publication requirements: Tackling publication bias
   This subtopic addresses what requirements the funder will set regarding publishing research findings. The funder should require all research to be published, at least on an online repository or the project's own website.

b. Expectations on authorship:
   The organisation should specify what types of contributions qualify researchers to be manuscript authors. The COPE, ICMJE or APA authorship criteria can be followed here.
   COPE authorship guidelines can be found here: https://publicationethics.org/files/u7141/Authorship_DiscussionDocument_0_0.pdf

   The ICMJE criteria can be found here: http://www.icmje.org/recommendations/browse/roles-and-responsibilities/defining-the-role-of-authors-and-contributors.html.
   These are the APA criteria: https://www.apa.org/research/responsible/publication/.

c. Open science: Requirements on publishing open access data/manuscripts
In line with the European Commission's promotion of Plan S, funders should take steps to promote a transition to an open access environment. For instance, in reviewing applications for funding they can require that only papers published in an open access manner will be considered. They should also consider when it is justified to not publish data in an open access way (e.g. if the data are sensitive). In line with Plan S, funders should encourage publishing of research outputs in Open Access journals only and discourage the subscription-based model of publishing.
For more information on Plan S, click here: https://www.coalition-s.org/

Click here to go to page 1.

11. INTELLECTUAL PROPERTY ISSUES

This topic would address the research funding organisation's policies on tackling intellectual property issues. For example, funders should provide clear statements on their expectations of who should own intellectual property rights from funded research. These expectations should be in line with national regulations.

Click here to go to page 1.

Appendix C: List of guidelines and other documents that were compiled during the reviews

GUIDELINES	Website	Topics discussed
Science Europe - Briefing Paper; Research Integrity: What it means, Why it is Important and how we might protect it	https://www.scienceeurope.org/media/dnwbwaux/briefing_paper_research_integrity_web.pdf	• RI and research misconduct, questionable research practices • Responses to misconduct • Self-regulation • Efforts to ensure RI (promotion, training, culture) • Publication practices
Fostering Integrity in research	https://www.nap.edu/catalog/21896/fostering-integrity-in-research	Book with various best practices and recommendations for RI, research misconduct and detrimental research practices.
The Next Generation of Biomedical and Behavioral Sciences Researchers	https://www.nap.edu/catalog/25008/the-next-generation-of-biomedical-and-behavioral-sciences-researchers-breaking	Recommendation for biomedical research.
Reproducibility and Replicability in Science	https://www.nap.edu/catalog/25303/reproducibility-and-replicability-in-science	Recommendations to researchers, institutions, journals and funders for improving reproducibility and replicability in science.

Open Science by Design	https://www.nap.edu/catalog/25116/open-science-by-design-realizing-a-vision-for-21st-century	Challenges of open science from the stakeholders perspective. Recommendations for building strategies for opens science.
Ensuring the Integrity, Accessibility, and Stewardship of Research Data in the Digital Age	https://www.nap.edu/catalog/12615/ensuring-the-integrity-accessibility-and-stewardship-of-research-data-in-the-digital-age Comment: FAIR principles	Design and management of research projects; recommendations for training in data management; stewardship of research data.
On Being a Scientist	https://www.nap.edu/catalog/12192/on-being-a-scientist-a-guide-to-responsible-conduct-in	Ethical foundations of scientific practices.
ENRIO Handbook – Recommendations for the investigation of research misconduct	http://www.enrio.eu/wp-content/uploads/2019/03/INV-Handbook_ENRIO_web_final.pdf Comment: Great document on sanctions, investigations, guidelines	• Misconduct and other irresponsible practices • Committees for investigations of misconduct
Ethical Guidelines for the Use of Animals in Research	https://www.etikkom.no/en/ethical-guidelines-for-research/ethical-guidelines-for-the-use-of-animals-in-research/	• Principles: respect, responsibility, proportionality, minimising the risk, openness, data sharing

Guidelines for research ethics on human remains	https://www.etikkom.no/en/ethical-guidelines-for-research/guidelines-for-research--ethics-on-human-remains/	• Principles: respect, consideration, compliance with law and regulations
UKRIO - Procedure for the investigation of misconduct in research	https://ukrio.org/wp-content/uploads/UKRIO-Procedure-for-the-Investigation-of-Misconduct-in-Research.pdf	• Investigations of misconduct step by step: preparatory steps, procedure (preliminary, pre-screening, screening, formal investigation, actions to consider) • Principles: fairness, confidentiality, integrity, prevention of detriment, balance) • Definitions
Swiss Academies of Arts and Sciences – Authorship in scientific publications, Analysis and recommendations	http://www.akademien-schweiz.ch/en/index/Publikationen/Archiv/Richtlinien-Empfehlungen.html	• requirements for authorship • order of listing • authors' responsibilities: first author, last author, corresponding author, others • recommendations on authorship: basic principles, professional editors/medical writers,

		ghost-writing, honorary authorship
Recommendations of the Swiss Academies of Arts and Sciences for researchers	http://www.akademien-schweiz.ch/en/index/Publikationen/Archiv/Richtlinien-Empfehlungen.html	• clarification, quality, communication, independence, transparency, openness
Collaboration between the medical profession and industry Guidelines issued by the Swiss Academy of Medical Sciences (SAMS)	http://www.akademien-schweiz.ch/en/index/Publikationen/Archiv/Richtlinien-Empfehlungen.html	• clinical research, consultancy, payments
Integrity in scientific research Principles and procedures	http://www.akademien-schweiz.ch/en/index/Publikationen/Archiv/Richtlinien-Empfehlungen.html	• principles: veracity and transparency, exemplary behaviour and fairness • research planning: integrity and quality, CoI, patenting • realisation of research projects: data and materials, publications • misconduct: infringement of relevant legal procedures, dishonesty • handling misconduct: integrity protection,

		ombudsperson, integrity protection commissioner, fact-finding panel, decision-making panel; conditions for the procedure, course of the procedure
Guidelines for Research Ethics in the Social Sciences, Humanities, Law and Theology	https://www.etikkom.no/en/ethical-guidelines-for-research/guidelines-for-research-ethics-in-the-social-sciences--humanities-law-and-theology/	• norms and values of research • institutional responsibilities • authorship, good citation practice • plagiarism • data sharing • impartiality, supervision and mentoring • CoI, transparency, funding • Dissemination of research
Responsible research publication: international standards for authors	https://www.elsevier.com/__data/promis_misc/JACS-Ethics_in_Publishing_Statement.pdf	• Principles: soundness and reliability, honesty, balance, originality, transparency, accountability and responsibility • Authorship and acknowledgments • Peer review and publication conventions

Recommendations for the Conduct, Reporting, Editing, and Publication of Scholarly Work in Medical Journals	http://www.icmje.org/recommendations/	• Roles and responsibilities of authors, contributors, reviewers, editors, publishers • CoI • Peer-review • Journals' responsibilities • Data sharing
Cooperation between research institutions and journals on research integrity cases: guidance from the Committee on Publication Ethics (COPE)	https://publicationethics.org/resources/guidelines-new/cooperation-between-research-institutions-and-journals-research-integrity	• Institutional responsibilities • Research misconduct
Responsible Conduct in the Global Research Enterprise a Policy Report	https://www.interacademies.org/33362/Responsible-Conduct-in-the-Global-Research-Enterprise	• RI awareness • Research values: honesty, fairness, objectivity, reliability, scepticism, accountability, openness • Research plan • Irresponsible practices in research • Handling irresponsible research practices • Reporting research results • Peer review • Authorship • Institutional responsibilities • Journals

CSIC Manual of Conflict of Interest	https://www.csic.es/sites/default/files/manual_de_conflictos_de_intereses_del_csic_version_espanol_ingles.pdf	• Conflict of interest • Training • Publication • Evaluation
Responsible conduct of research and procedures for handling allegations of misconduct in Finland	https://www.tenk.fi/sites/tenk.fi/files/HTK_ohje_2012.pdf	• RCR • Violations of RCR • Handling alleged cases of misconduct
Austrian Agency for Research Integrity Guidelines for Good Scientific Practice	https://oeawi.at/wp-content/uploads/2018/09/OeAWI_Brosch%C3%BCre_Web_2019.pdf	• RI- institutional and individual responsibilities • Standards of good scientific practice • Misconduct; involvement in research misconduct
Guidelines for Institutions and Whistle-blowers: Responding to Possible Retaliation Against Whistle-blowers in Extramural Research	https://ori.hhs.gov/sites/default/files/2017-12/guidelines_whistle.pdf	• Processing whistle-blower retaliation complaints • Resolution of complaints
RIOs: Reminders for Handling Allegations of Research Misconduct in PHS-Funded Research	https://ori.hhs.gov/infographics	Different infographics
WHO Handbook for good clinical research practice	https://www.who.int/medicines/areas/quality_safety/safety_efficacy/gcp1.pdf	• Ethical conduct, ethics committee review, informed consent, confidentiality, privacy
Implementation Guidance for Executive Office of the President, Office of	https://ori.hhs.gov/federal-research-misconduct-policy	• Research misconduct • Findings of research misconduct

Science and Technology Policy Federal Policy on Research Misconduct		• Institutional responsibilities
Environmental protection Agency - Policy and procedures for addressing research misconduct	https://www.epa.gov/sites/production/files/2014-04/documents/epapolicy.pdf	• Definitions • Findings of research misconduct; investigation
A Guidebook for Teaching Selected Responsible Conduct of Research Topics to a Culturally Diverse Trainee Group	https://ori.hhs.gov/images/ddblock/Alexander.RCR%20Guidebook.BW_.pdf	• Mentoring • Training
Guidelines for responsible data management in scientific research	https://ori.hhs.gov/images/ddblock/data.pdf	• concepts of data management • data ownership • data collection • data storage • data protection • data retention • data analysis • data sharing • research team responsibilities • communication
National Institute of Health - Data Sharing Policy	https://www.nlm.nih.gov/NIHbmic/nih_data_sharing_policies.html	Different policies on data sharing
Nature – Editorial policies	https://www.nature.com/nature-research/editorial-policies	• authorship • competing interest • confidentiality

		• plagiarism • image integrity and standards • preprints and conference proceedings • peer-review • reporting standards • retraction policy
Tips for Sequestration of Physical Evidence in Research Misconduct Cases	https://ori.hhs.gov/tips-for-sequestration	• investigation of misconduct
Tips for Handling Physical Evidence in Research Misconduct Cases	https://ori.hhs.gov/tips-handling-phys-evidence	• investigation of misconduct
Policy Recommendations for Open Access to Research Data in Europe (RECODE)	https://www.openaire.eu/recode	• open access
Wellcome Trust Guidelines on Good Research Practice	https://wellcome.ac.uk/funding/guidance/good-research-practice-guidelines	• misconduct • legal and ethical requirements • research with humans • research with animals • conflict of interest
Centre for Enquiry into Health and Allied Themes – Ethical Guidelines for	http://www.cehat.org/go/uploads/EthicalGuidelines/ethicalguidelines.pdf	• ethical principles • institutional and researchers' responsibilities

Social Science Research in Health		• peer review • editors/publishers • funders and sponsors
ALLEA Memorandum on Scientific Integrity	https://allea.org/wp-content/uploads/2016/02/Memorandum_Scientific_Integrity.pdf	• professional scientific conduct • infringements • prevention • responsibilities • committee • sanctions
European Commission – The European Charter for Researchers	https://euraxess.ec.europa.eu/jobs/charter/european-charter Document too general to be helpful	• ethical principles • good research practice • dissemination of results • supervision
National Ethical Guidelines for Health Research in Nepal and Standard Operating Procedures	http://nhrc.gov.np/wp-content/uploads/2017/02/National_Ethical_Guidelines.pdf	• ethical principles (respect, autonomy, beneficence, non-malfeasance, justice, respect for environment) • informed consent • best research practices • basic principles of health research involving human participants • SOPs for Ethical review board
Pharmaceutical Research and Manufacturers of America – Principles on conduct of clinical trials and communication of clinical trial results	https://www.phrma.org/en/Codes-and-guidelines/PhRMA-Principles-on-Conduct-of-Clinical-Trials	• Protecting research participants • Objectivity in research • Conducting clinical trials

The South African Medical Research Council Guidelines on the responsible conduct of research	http://www.samrc.ac.za/sites/default/files/attachments/2018-06-27/ResponsibleConductResearchGuidelines.pdf	• Basic principles • Human research • Animal research • Data management • Data sharing • Authorship • Publication and dissemination • Peer review • Collaboration • Mentorship and supervision • Coif
Guidelines for dealing with faculty conflicts of commitment and conflicts of interest in research	https://books.google.hr/books/about/Guidelines_for_dealing_with_faculty_conf.html?id=trRLAQAAIAAJ&redir_esc=y	
AUR Ad Hoc Committee on Standards for the Responsible Conduct of Research	https://www.ajronline.org/doi/pdfplus/10.2214/ajr.161.4.8372784	• authorship
Guideline for agreements at the initiation of research projects	https://forskerportalen.dk/en/agreements-on-research-collaborations/	• collaboration and cooperation
Guidelines relating to rights and duties concerning storage and use of research data	https://libguides.ioe.ac.uk/c.php?g=482457&p=3298660	• confidentiality • data protection • legal requirements
Med COMM Good Publication Practices	https://www.ismpp.org/gpp3	• authorship, data sharing, ghost writing, guest writing

(MedComm GPP) guidelines		
Guidelines for standardising reporting of authorship in collaborative research	https://www.ncbi.nlm.nih.gov/pubmed/29292217	• authorship
COPE guidelines on good publication practice	https://publicationethics.org/files/u7141/1999pdf13.pdf	• study design and ethical approval • data analysis • authorship • CoI • Peer review • Redundant publication • Plagiarism • Media relations • Dealing with misconduct
International Ethical Guidelines for Health-related Research Involving Humans (CIOMS)	https://cioms.ch/wp-content/uploads/2017/01/WEB-CIOMS-EthicalGuidelines.pdf	• Collaboration • Informed consent • CoI
ICMJE guidelines	http://www.icmje.org/recommendations/browse/roles-and-responsibilities/defining-the-role-of-authors-and-contributors.html	
The Bonn PRINTEGER Consensus Statement: Working with Research Integrity—Guidance for	https://printeger.eu/the-bonn-printeger-statement/	• authorship

research performing organisation		
Good manners in science. A collection of rules and principles	http://www.ken.pan.pl/images/stories/pliki/goodmanners.pdf No guideline: describes the individual scientist and some norms and behaviors	• principles
Best Practice Guidelines on Publishing Ethics	https://authorservices.wiley.com/asset/Best-Practice-Guidelines-on-Publishing-Ethics-2ed.pdf	• misconduct • whistle blowing • FFP • Image manipulation • Duplicate and redundant publication • Sanctions • RE • Reporting guidelines
WHO Guidelines for Good Clinical Practice (GCP) for Trials on Pharmaceutical Products	https://apps.who.int/medicinedocs/pdf/whozip13e/whozip13e.pdf	• Ethical principles • Responsibilities: researcher, institution, sponsor • Handling data
Guidelines for the relationships involving medical practitioners and industry	https://www.racp.edu.au/docs/default-source/default-document-library/guidelines-for-ethical-relationships-between-physicians-and-industry.pdf?sfvrsn=53c6101a_0	• collaboration

Good Publication Practice (GPP3) guidelines for industry-financed medical journal articles	https://www.ismpp.org/gpp3 = Duplication	• collaboration
National Mandate for Clinical Ethics Committees (CEC) in Norwegian Health Trusts guidelines for Ethical Committee composition	https://www.med.uio.no/helsam/english/research/projects/clinical-ethics-committees-in-hospitals/national-mandate-for-cecs.pdf	• ethics committees
Guidelines International Network: Principles for Disclosure of Interests and Management of Conflicts in Guidelines	https://g-i-n.net/library/g-i-n-publications-page	• CoI
CTSA Consortium Consensus Scientific Review Committee (SRC) Working Group guidelines	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4703465/	• Review committee • Evaluation
JSQA Guideline for GCP Auditing	https://onlinelibrary.wiley.com/doi/pdf/10.1002/qaj.403	• good clinical practice auditing
Guidance from the Committee on Publication Ethics (COPE) for research integrity cases	https://publicationethics.org/guidance/Guidelines	Different guidelines

Group Mentoring to Foster the Responsible Conduct of Research	https://www.ncbi.nlm.nih.gov/pubmed/11697010	• RCR • Mentoring
CIOMS guidelines on Research involving Human subjects	https://cioms.ch/shop/product/international-ethical-guidelines-for-biomedical-research-involving-human-subjects-2/	• ethical principles • ethical review • informed consent • sponsors
Digital Curation Centre	http://www.dcc.ac.uk/	• data management
CHECKLISTS		
The MAPS (MApping onto Preference-based measures reporting Standards) statement	http://www.equator-network.org/	Reporting guidelines
UKRIO - Recommended checklist for researchers	https://ukrio.org/publications/checklist-for-researchers/	• research planning • conducting research • after research
UKRIO - Procedure for the investigation of misconduct in research	https://ukrio.org/wp-content/uploads/UKRIO-Procedure-for-the-Investigation-of-Misconduct-in-Research.pdf	• panel procedures
LAWS		
US Common Rule	https://www.hhs.gov/ohrp/regulations-and-	• protection of human research subjects

	policy/regulations/common-rule/index.html	
The Health Insurance Portability and Accountability Act (HIPAA)	https://www.investopedia.com/terms/h/hipaa.asp	• protection of personal data
Tri-Council Policy Statement: Ethical conduct for research involving humans	https://www.homelesshub.ca/resource/tri-council-policy-statement-ethical-conduct-research-involving-humans-tcps2	• human research
National Statement on the Ethical Conduct of Research Involving Humans	https://www.nhmrc.gov.au/about-us/publications/national-statement-ethical-conduct-human-research-2007-updated-2018	• values and principles • research ethics • consents • ethical review • HRECs responsibilities • Handling complaints
Sunshine act	https://www.healthaffairs.org/do/10.1377/hpb20141002.272302/full/	• CoI
National policy statement on Ensuring Research Integrity in Ireland	https://www.iua.ie/publications/national-policy-statement-on-ensuring-research-integrity-in-ireland/	• Standards • Education • Misconduct • collaboration
San Francisco Declaration on Research Assessment	https://sfdora.org/read/	• research evaluation

Appendix D: list of documents that were suggested in the expert interviews

1. ALLEA documents https://allea.org/publications/
2. Open Science Framework https://osf.io/
3. UK research integrity office guidelines https://ukrio.org/publications/
4. APA guidelines https://www.apa.org/about/policy/approved-guidelines
5. ORI guidelines https://ori.hhs.gov/content/handbooks-and-guidelines
6. Vancouver guidelines http://www.icmje.org/recommendations/browse/roles-and-responsibilities/defining-the-role-of-authors-and-contributors.html
7. ARRIVE guidelines https://www.nc3rs.org.uk/arrive-guidelines
8. Allegations of research misconduct SOP https://www.niaid.nih.gov/research/research-misconduct-allegations
9. CHEERS guidelines http://www.equator-network.org/reporting-guidelines/cheers/
10. Code of conduct of ethics for research in the social behavioural sciences involving human participants https://www.utwente.nl/en/bms/research/forms-and-downloads/code-of-ethics-for-research-in-the-social-and-behavioural-sciences-dsw.pdf
11. PRIMR https://www.primr.org/
12. Ethical standards in research (2007) https://www.srcd.org/about-us/ethical-standards-research-children

13. CONSORT guidelines http://www.consort-statement.org/
14. PRISMA guidelines http://www.prisma-statement.org/
15. Society for research in child development https://www.srcd.org/
16. COPE flowcharts https://publicationethics.org/guidance/Flowcharts
17. Singapore statement https://www.jsps.go.jp/english/e-kousei/data/singapore_statement_EN.pdf
18. Guidelines for the archiving of academic research for faculties of Behavioural and social sciences of the Netherlands https://www.uu.nl/sites/default/files/faculty_of_social_and_behavioural_sciences_research_data_storage_archiving_protocol_2016.pdf
19. Declaration of Helsinki https://www.wma.net/policies-post/wma-declaration-of-helsinki-ethical-principles-for-medical-research-involving-human-subjects/
20. STREGA http://www.equator-network.org/reporting-guidelines/strobe-strega/
21. CRediT https://www.casrai.org/credit.html
22. Equator Network http://www.equator-network.org/
23. STROBE http://www.equator-network.org/reporting-guidelines/strobe/
24. Research Data Availability Statements (Springer Nature) https://www.springernature.com/gp/authors/research-data-policy/data-availability-statements/12330880

25. GDPR https://eugdpr.org/

26. The Netherlands Code of Conduct for RI https://www.vsnu.nl/files/documents/Netherlands%20Code%20of%20Conduct%20for%20Research%20Integrity%202018.pdf

27. Journal of Development Economics. Pre-Results Review (Registered Reports). Guidelines for Authors https://www.elsevier.com/__data/promis_misc/JDE_RR_Author_Guidelines.pdf

28. MOOSE guidelines https://www.equator-network.org/reporting-guidelines/meta-analysis-of-observational-studies-in-epidemiology-a-proposal-for-reporting-meta-analysis-of-observational-studies-in-epidemiology-moose-group/

29. TOP guidelines https://cos.io/top/

Appendix E: list of documents that were suggested in the Delphi Study

Canada – Policies on dealing with allegations of misconduct	1. http://www.nserc-crsng.gc.ca/_doc/NSERC-CRSNG/HAL_Report_e.pdf
Colciencias - Documento de Política Nacionalde Ciencia, Tecnología e Innovación	2. https://www.colciencias.gov.co/sites/default/files/pdf_poltica.pdf
CSIC Spain – various guidelines/codes	3. https://www.csic.es/en/csic/scientific-integrity-and-ethics-csic/scientific-integrity-and-good-practises
DFG – Guidelines for Safeguarding Good Scientific Practice	4. https://www.dfg.de/en/research_funding/principles_dfg_funding/good_scientific_practice/index.html
DMP online – various resources on data management	5. https://dmponline.dcc.ac.uk/
EMBO – carious resources	6. https://www.embo.org/science-policy/research-integrity/resources-on-research-integrity
ENERI – list of training options	7. http://eneri.eu/online-available-training-options-for-recs-and-rios/

Epigeum - Training materials	8. https://www.epigeum.com/courses/research/research-integrity/
ERC – various policies	9. https://erc.europa.eu/erc-standing-committees/conflict-interests-scientific-misconduct-and-ethical-issues
European Commission – Research Ethics	10. https://ec.europa.eu/research/swafs/index.cfm?pg=policy&lib=ethics
European Commission – guidance note - research on refugees, asylum seekers & migrants	11. https://ec.europa.eu/research/participants/data/ref/h2020/other/hi/guide_research-refugees-migrants_en.pdf
European Commission – ethics in social science and humanities	12. https://ec.europa.eu/research/participants/data/ref/h2020/other/hi/h2020_ethics-soc-science-humanities_en.pdf
European Commission – how to complete your ethics self-assessment	13. https://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/hi/ethics/h2020_hi_ethics-self-assess_en.pdf
Hugh Kearns – books and various resources	14. https://www.flinders.edu.au/people/hugh.kearns
InterAcademy Partnership – Responsible Conduct in the Global Research Enterprise	15. https://www.interacademies.org/33362/Responsible-Conduct-in-the-Global-Research-Enterprise

InterAcademy Partnership – Doing Global Science: A Guide to Responsible Conduct in the Global Research Enterprise	16. https://www.interacademies.org/33345/Doing-Global-Science-A-Guide-to-Responsible-Conduct-in-the-Global-Research-Enterprise
Irish National Research Integrity Forum – various resources	17. https://www.iua.ie/for-researchers/research-integrity/
KNAW – Scientific Research: Dilemmas and Temptations	18. https://www.knaw.nl/shared/resources/actueel/publicaties/pdf/knawdilemmasandtemptations.pdf
NHMRC Australia – different guidelines	19. https://www.nhmrc.gov.au/research-policy/research-integrity
Northwestern University – various policies	20. https://www.researchintegrity.northwestern.edu/
NTU Singapore – Research Data Policy	21. https://research.ntu.edu.sg/rieo/RI/Pages/Research-Data-Policies.aspx
Nuffield Council on Bioethics	22. http://nuffieldbioethics.org/project/research-culture
NOW – Scientific Integrity Policy	23. https://www.nwo.nl/en/policies/scientific+integrity+policy
RRI tools	24. https://www.rri-tools.eu/
SATORI	25. http://satoriproject.eu/external-resources/

Science Foundation Ireland	26. http://www.sfi.ie/funding/sfi-policies-and-guidance/integrity/
Stanford University – various resources	27. https://doresearch.stanford.edu/research-scholarship/responsible-conduct-research
The Embassy of Good Science	28. https://www.embassy.science/resources
University of Edinburgh – research data management	29. https://www.ed.ac.uk/information-services/research-support/research-data-service
University of Music and Performing Arts Vienna – various resources	30. https://www.mdw.ac.at/aki/
University of Pittsburgh – Research data management	31. https://pitt.libguides.com/managedata
WCRI – The Hong Kong Principles	32. https://wcri2019.org/uploads/files/2019_new/Hong_Kong_Manifesto_0527.pdf
ZonMW – Strengthening impact in the Netherlands	33. https://gallery.mailchimp.com/7fa42547078f2cac7d96896f5/files/54710d19-6a40-4f27-a8c9-c3a15a010a59/Wendy_paper.pdf
ZonMW – codes on conflict of interest	34. https://www.zonmw.nl/en/about-zonmw/integrity-and-conflicts-of-interest/

Appendix F: Investigating the thematic content of Codes of Conduct on usefulness for SOPs4RI

CODES

- Policies and Procedures of the Committee on Professional Ethics of the American Sociological Association; American Sociological Association Code of Ethics
  https://www.asanet.org/sites/default/files/asa_code_of_ethics-june2018.pdf

- 6 general principles (aspirational & serving as a guide)
- ethical standards – norms of professional and scientific conduct enforceable by the ASA
- Part 8. Conflict of interest and commitment
- Part 10.1 Confidentiality in research
- Part 11. Informed consent
- Part 12. Research planning, implementation and dissemination
- Part 19.4. Reporting ethical violations of others

- EECERA ethical code for early childhood researchers
  http://eecera-ext.tandf.co.uk/documents/pdf/organisation/EECERA-Ethical-Code.pdf

- 8 general principles
- responsibilities towards participants – some can be used as specific guidelines (e.g. informed consent)
- Principles related to integrity in research (Part "Rigour and integrity")

- The Romanian Code of Pharmaceutical Deontology

http://www.ceomecmo.eu/sites/default/files/documents/romanian_code_of_medical_deontologypdf.pdf

- Chapter VI, Article 94 – perhaps it can be used as more specific guideline; see also other articles in this chapter (e.g. 110)

➢ AERA Code of Ethics

https://cdn.ymaws.com/www.weraonline.org/resource/resmgr/a_general/aera.pdf

- 5 general principles
- Part 10,11,12,13 – can be useful for developing more specific guidelines

➢ The Australian Code for the Responsible Conduct of Research

https://www.nhmrc.gov.au/sites/default/files/documents/attachments/grant%20documents/The-australian-code-for-the-responsible-conduct-of-research-2018.pdf

- 8 general principles
- Other can be useful but it is too general

➢ The Netherlands Code of Conduct for Scientific Practice

https://www.vsnu.nl/files/documenten/Domeinen/Onderzoek/The_Netherlands_Code_of_Conduct_for_Scientific_Practice_2012.pdf

- 5 general principles

➢ A Code of Ethics for Evidence-Based Research With Ancient Human Remains

http://www.iem.uzh.ch/institute/iemcodeofethics/Code_of_Ethics_IEM_2014.pdf

- "Recommended standards" could be used as more specific guidelines

- ISPOR code of Ethics

  https://www.ispor.org/docs/default-source/addenda-and-errata/codeofethics-guideline_vih_2017.pdf?sfvrsn=92579224_0

  - Chapter 4 – research design considerations
  - Chapter 5 – data considerations
  - Appendices contain additional guidelines

- International Association for Dental Research - Code of Ethics

  https://www.iadr.org/IADR/About-Us/Who-We-Are/Code-of-Ethics

  - Definitions (at the end of the document) can perhaps be used

- Norwegian Institute of Biomedical Science - Ethics for Biomedical Laboratory Scientists

  https://www.nito.no/contentassets/7152ab4936194074b7b10d18500bcfa7/ethics-for-biomedical-laboratory-scientists.pdf

  - not specific enough

- Singapore Psychological Society - Code of Professional Ethics

  https://singaporepsychologicalsociety.org/sps-code-of-ethics/

  - 3 general principles
  - Part 8. Human research

- American Society for Biochemistry and Molecular Biology - Code of Ethics

http://www.asbmb.org/Advocacy/CodeOfEthics/?terms=ethics

- not detailed; too general

➢ American Society of Human Genetics - Code of Ethics

https://www.ashg.org/about/ethics.shtml

- general principles and definitions

➢ Queen's University Belfast - Code of Good Conduct in Research

http://www.qub.ac.uk/home/media/Media,599772,en.pdf

- general principles; but can be used as guidelines

➢ University of Connecticut. Code of Conduct: University of Connecticut

https://policy.uconn.edu/2011/05/17/employee-code-of-conduct/#

- 5 principles
- "Research principles and standards" – questions to ask yourself

➢ Science Council of Japan - Code of Conduct for Scientists

http://www.scj.go.jp/ja/info/kohyo/pdf/kohyo-20-s3e-1.pdf

- Not specific enough
- National Health Research Ethics Committee of Nigeria – National Code of Health Research Ethics

http://www.nhrec.net/nhrec/NCHRE_Aug%2007.pdf

- Section C

- Section D
- Section E
- Section F
- Section K
- Section M

- UKRIO – Code of Practice for Research; Promoting Good Practice and Preventing Misconduct
  https://ukrio.org/wp-content/uploads/UKRIO-Code-of-Practice-for-Research.pdf
- Could be used for development of more specific guidelines

- Global code of conduct for research in resource-poor settings
  http://www.globalcodeofconduct.org/wp-content/uploads/2018/05/Global-Code-of-Conduct-Brochure.pdf
- not detailed enough

➢ Estonian code of conduct for research integrity
https://www.eetika.ee/sites/default/files/www_ut/hea_teadustava_eng_trukis.pdf

- 6 principles/values
- Most of the code can be used to form more specific guidelines
- The articles are not to detailed but also not too general

➢ Danish Code of Conduct for Research Integrity

https://ufm.dk/en/publications/2014/files-2014-1/the-danish-code-of-conduct-for-research-integrity.pdf

- Principles and general guidelines but can be used to make more detailed ones

➢ World Economic Forum - Code of Ethics

http://www3.weforum.org/docs/WEF_Code_of_Ethics.pdf

- Principles and recommendations – more general

➢ A Code of Conduct for Biosecurity - Report by the Biosecurity Working Group

https://www.knaw.nl/en/news/publications/a-code-of-conduct-for-biosecurity

- Rules of conduct – can be used

➢ Responsible research data management and the prevention of scientific misconduct

https://www.knaw.nl/en/news/publications/responsible-research-data-management-and-the-prevention-of-scientific-misconduct

- general

➢ UNESCO – Social Science Code of Conduct

http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/SHS/pdf/Soc_Sci_Code.pdf

- not specific; general

➢ Code of conduct of ethics for research in the social behavioural sciences involving human participants

https://www.utwente.nl/en/bms/research/forms-and-downloads/code-of-ethics-for-research-in-the-social-and-behavioural-sciences-dsw.pdf

- general principles, part D Informed consent could be used

➢ The Netherlands Code of Conduct for RI

https://www.vsnu.nl/files/documents/Netherlands%20Code%20of%20Conduct%20for%20Research%20Integrity%202018.pdf

- general principles and standards

➢ CSIC Spain – various guidelines/codes

https://www.csic.es/en/csic/scientific-integrity-and-ethics-csic/scientific-integrity-and-good-practises

- Code of good Scientific Practice could be used to develop more specific guidelines; it is in the middle; not too general;
- Manual of conflict of interest – *Declaration of CoI* form could be used

➢ EMBO – various resources

https://www.embo.org/science-policy/research-integrity/resources-on-research-integrity

- Advice on how to prevent and address allegations of breaches of research integrity

Appendix G: Analysis of the Embassy of Good Science resources

- Code of Ethics for Scientific Research in Belgium - not detailed
- Code of Ethics for Researchers of the Czech Academy of Sciences – not detailed; contains principles
- Ethical Code of the Board of Ethics in Science and Higher Education, Croatia – not detailed
- The Norwegian National Research Ethics Committees (2014) - general guidelines for research ethics
- German Research Foundation (DFG), Commission on Professional Self-Regulation in Science (2013) – Safeguarding Good Research Practice – in German
- French National Charter for RI – not detailed
- ANR (Agence Nationale de la Récherche) (2018) – Ethics and Scientific Integrity Charter
- Science Ethics Code of the Hungarian Academy of Sciences – not detailed; contains principles
- Commissione per l'Etica della Ricerca e la Bioetica del CNR (2015) - Linee guida per l'integrità nella ricercar – not in English
- Lietuvos mokslu akademija (Lithuanian Academy of Sciences) (2012) - Mokslininko etikos kodeksas (Scientist's Code of Ethics) – not detailed
- Code of Ethics for Research Workers, Polish Academy of Sciences (2016) – APPENDICES could be used: https://www.iopan.pl/Code_of_Ethics_for_Research_Workers.pdf
- The Code of the National Science Centre on Research Integrity and Applying for Research Financing National Science Centre (2016) - Chapter 1. Research

integrity – good practices, Chapter 2. Research integrity – teaching, training and supervision, 3.1. Sanctions: https://ncn.gov.pl/sites/default/files/pliki/Code-of-the-National-Science-Centre-on-Research-Integrity.pdf

- Integridade na Investigação Científica: Recomendação (Integrity in Scientific Research: Recommendation), Conselho Nacional de Ética para as Ciências da Vida (National Council of Ethics for the Life Sciences) – not in English
- Etický kódex SAV (Ethics Code of the Slovak Academy of Sciences), Slovak Academy of Sciences (2015) – not in English
- The RESPECT Code of Practice for Socioeconomic Research, The Institute for Employment Studies (IES) (2004) – not detailed
- NHMRC Research integrity and misconduct policy https://www.nhmrc.gov.au/research-policy/research-integrity

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