# REPORT FROM NATIONAL CASE STUDY

**The Netherlands**

*Deliverable 9.1  
Work Package 9*

<table>
<thead>
<tr>
<th>Project title:</th>
<th>Responsible Research and Innovation in Practice (RRI-Practice)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grant Agreement no:</td>
<td>709637</td>
</tr>
<tr>
<td>Funding Program:</td>
<td>Horizon 2020</td>
</tr>
<tr>
<td>Project Coordinator:</td>
<td>Hogskolen I Oslo Og Akershus (HIOA), Norway</td>
</tr>
<tr>
<td>Project website:</td>
<td><a href="http://www.rri-practice.eu">www.rri-practice.eu</a></td>
</tr>
<tr>
<td>Organisation responsible for the deliverable:</td>
<td>Radboud University Nijmegen</td>
</tr>
</tbody>
</table>
| Author(s):            | Franke van der Molen & Luca Consoli, Radboud University (chapters 1-5, 7-11)  
                       | David Ludwig, Auke Pols, Phil Macnaghten, Wageningen University (Chapter 6) |
| Date of delivery:     | 08-21-2018                                                    |
| Dissemination level:  | PUBLIC                                                        |

**Abstract**

This report contains a national case study on the status and implementation on Responsible Research and Innovation (RRI) in the Netherlands. This case study includes a review of the national research and innovation policy context, and three case studies that focus on the roles of RRI in the following organizations: Wageningen University and Research, Radboud University Nijmegen, and the Netherlands Organization for Scientific Research (NWO).
Contents

1. Executive summary ........................................................................................................................................ 5
2. Introduction: about the report .................................................................................................................. 8
3. Methodology ............................................................................................................................................... 9
   3.1 Analytic approach ................................................................................................................................... 9
   3.2 National mapping .................................................................................................................................. 11
      3.2.1 Document analysis ......................................................................................................................... 11
      3.2.2 Interviews ...................................................................................................................................... 12
      3.2.3 National workshop ......................................................................................................................... 12
   3.3 The organizational studies .................................................................................................................... 12
      3.3.1 Document studies .......................................................................................................................... 12
      3.3.2 Interviews for Reviews (including justification of sampling strategy) ............................................. 13
      3.3.3 Focus group .................................................................................................................................... 14
      3.3.4 Outlook process ............................................................................................................................. 14
4. The context for RRI: the national science policy system ............................................................................. 15
   4.1 General country information .................................................................................................................. 15
   4.2 Legal and other binding normative frameworks .................................................................................... 16
   4.3 Political and cultural values and discussions related to STI ................................................................. 17
5. Aspects of responsibility in national science policy .................................................................................... 20
   5.1 The conceptualizations of responsibility in national science policy ...................................................... 20
      5.1.1 Science and innovation for the public good ...................................................................................... 20
      5.1.2 Trust in inclusive deliberation and collaboration .......................................................................... 20
      5.1.3 Responsibility as an integrated feature of research and innovation .............................................. 21
   5.2 The notion of ‘RRI’ in national science policy discussions .................................................................... 22
   5.3 Ethics in the national science system .................................................................................................... 22
   5.4 Societal engagement strategies in research ............................................................................................ 23
   5.5 Gender equality and diversity strategies in the science system ............................................................. 24
   5.6 Open access and open science strategies in the national science system ............................................. 25
   5.7 Science education as integrated in research ........................................................................................... 26
   5.8 Incorporation of AIRR dimensions into science policy discussions .................................................... 27
   5.9 The integrated or fragmented nature of different responsibility related aspects .................................. 28
6. Organizational reviews and outlooks: Wageningen University and Research ............................................. 29
   6.1 Mapping of the organisation ................................................................................................................ 29
   6.2 Aspects of responsibility in organisational policy and practice ............................................................ 30
      6.2.1 The conceptualizations of responsibility in the organisation ....................................................... 30
      6.2.2 Ethics in the organisation ............................................................................................................. 32
      6.2.3 Societal engagement strategies in organisation ............................................................................. 34
      6.2.4 Gender equality and diversity strategies in the organisation ....................................................... 37
      6.2.5 Open access and open science strategies in the organisation ....................................................... 40
      6.2.6 Science education as integrated in research .................................................................................. 43
      6.2.7 Incorporation of AIRR dimensions into policies ........................................................................ 46
      6.2.8 Other concepts used to characterise responsibility in the organisation ....................................... 51
   6.3. Reflection on Review findings, Outlooks developed and ways forward ............................................ 52
7. Organizational reviews and outlooks: Radboud University Nijmegen ........................................... 55
   7.1 Mapping of the organization ........................................................................................................... 55
   7.2 Aspects of responsibility in organizational policy and practice ..................................................... 56
      7.2.1 The conceptualizations of responsibility in the organization .................................................... 56
      7.2.2 Ethics in the organization .......................................................................................................... 57
      7.2.3 Societal engagement strategies in organization ......................................................................... 60
      7.2.4 Gender equality and diversity strategies in the organization .................................................. 64
      7.2.5 Open access and open science strategies in the organization ................................................. 67
      7.2.6 Science education as integrated in research .............................................................................. 70
      7.2.7 Incorporation of AIRR dimensions into policies ..................................................................... 74
   7.3. Reflection on Review findings, Outlooks developed and ways forward ....................................... 75
      7.3.1 The integrated or fragmented nature of different responsibility related dimensions ............... 75
      7.3.2 Common barriers or drivers ....................................................................................................... 76
      7.3.3 Conclusion and final reflections ................................................................................................. 76
8. Organizational reviews and outlooks: The Netherlands Organization for Scientific Research ..... 78
   8.1 Mapping of the organization ........................................................................................................... 78
   8.2 Aspects of responsibility in organizational policy and practice ..................................................... 80
      8.2.1 The conceptualizations of responsibility in the organization .................................................... 80
      8.2.2 Ethics in the organization .......................................................................................................... 83
      8.2.3 Societal engagement strategies in the organization ......................................................................... 86
      8.2.4 Gender equality and diversity strategies in the organization .................................................. 89
      8.2.5 Open access and open science strategies in the organization ................................................. 92
      8.2.6 Science education as integrated in research .............................................................................. 95
      8.2.7 Incorporation of AIRR dimensions into policies ..................................................................... 95
   8.3. Reflection on Review findings, Outlooks developed and ways forward ....................................... 101
      8.3.1 The integrated or fragmented nature of different responsibility related dimensions ............... 101
      8.3.2 Common barriers or drivers ....................................................................................................... 101
      8.3.3 Conclusion and final reflections ................................................................................................. 102
9. Summary of findings on each responsibility dimension ...................................................................... 103
   9.1 The concept of responsibility ........................................................................................................ 103
   9.2 The notion of ‘RRI’ ......................................................................................................................... 103
   9.3 Ethics ........................................................................................................................................... 103
   9.4 Societal engagement ....................................................................................................................... 104
   9.5 Gender equality and diversity strategies ....................................................................................... 104
   9.6 Open access and open science strategies ..................................................................................... 104
   9.7 The inclusion of science education into research ........................................................................... 105
   9.8 Incorporation of AIRR dimensions ............................................................................................... 105
10. Conclusions ..................................................................................................................................... 106
    10.1 Policy recommendations to national policy makers ...................................................................... 106
    10.2 Recommendations to research conducting and funding organizations ...................................... 106
10.3 Best practices scalable to European or national level .......................................................... 107
Annex 1: List of abbreviations ..................................................................................................... 108
Annex 2: Reviewed documents .................................................................................................... 110
REFERENCES .............................................................................................................................. 115
1. Executive summary

This report contains a national case study on the status and implementation of Responsible Research and Innovation (RRI) in research and innovation policies and organizations in the Netherlands. It is part of a series of national reports that has been produced in the context of the project RRI-Practice, which is a 3-year project under the European Commission’s Horizon 2020 program. RRI-Practice aims to understand the barriers and drivers to the successful implementation of RRI both in European and global contexts, to promote reflection on organizational structures and cultures of research conducting and research funding organizations, and to identify and support best practices to facilitate the uptake of RRI in organizations and research programs. This report contains a review of RRI in the Dutch science and innovation policy system, and reviews of the status and implementation of (aspects of) RRI in three organizations: Wageningen University and Research, Radboud University Nijmegen, and the Netherlands Organization for Scientific Research. The organizational reviews aim to identify barriers, drivers and best practices for implementing RRI, and to provide recommendations for the further promotion of RRI in organizational and policy contexts. The national case study in this report is informed by document studies, interviews with experts and stakeholders, focus group meetings, and a national workshop.

The Netherlands is a densely populated country with high levels of well-being, education and skills, and with a thriving economy that relies heavily on export and foreign trade. It ranks among the most economically competitive nations in the world, and scores high on various science- and innovation-related parameters, including strong linkages between research institutes and industry, and a productive and efficient science system. Dutch society and politics can be argued to provide favorable conditions for several aspects of RRI, such as: the importance of gender equality and diversity, the key role of collaboration and deliberation, the openness of information and decision-making, and the strong tradition in ethical reflection, deliberation, and regulation. Dutch research policies are strongly geared towards enabling societal and economic impacts of research and innovation, and stimulating inclusive deliberation and collaboration in research and innovation processes. Several aspects of RRI are prominently addressed in these policies. Particularly, research integrity, societal engagement, gender equality, and open science have been high on Dutch research and innovation policy agendas in recent years.

Wageningen University and Research (WUR) is a research conducting organization that focuses on life sciences and has a particular strength in agricultural and environmental sciences. While WUR has a long tradition of applied and impact-driven research, its mission has been broadened in recent decades from the Dutch agricultural sector to global life sciences and biotechnology. The review indicates that WUR has adopted “responsibility” as an organizing concept that reflects a strong culture and leadership around some aspects of RRI. Especially where responsibility is entangled with global challenges, WUR is willing to invest substantial resources that have contributed to making WUR an increasingly inclusive and publicly engaged organization. At the same time, there are very clear limitations along dimensions of culture, leadership, and resources. In terms of culture and leadership, a core barrier is the discrepancy between the desire for social value creation and responsible research that many interviewees had, and the formal reward mechanisms that govern their behavior at WUR, that focus on scientific publications and obtained research grants. One of the key recommendations is that these be better aligned through the inclusion of societal value criteria and indicators in those formal reward mechanisms.

Radboud University Nijmegen is a broad, internationally oriented research university that performs research and provides education across nearly all scientific disciplines. RU is connected to the Radboud University Medical Centre (RUMC), which provides patient care and medical research and
education. RU aspires to be an excellent, internationally leading university that performs top-of-the-line scientific research. Societal engagement, reflection, and emancipation are important elements of its organizational mission and identity. In various organizational policies and initiatives, several aspects of RRI are already strongly embedded, or are high on the organization’s strategic agenda. These aspects include research integrity, ethical reflection and regulation, societal engagement, gender equality and diversity, and open science and research data management. However, our review also points to cultural barriers that impede the further implementation of RRI in the organization. These barriers include the perceived lack of appreciation for activities such as societal engagement and science education, and the prioritization of quantitative output indicators and performance rankings in academic publishing and assessment culture above creating societal value. Accordingly, we recommend that responsible research at RU can be further strengthened by introducing more strongly society-oriented assessment criteria and reward systems, emphasizing the importance of participatory forms of agenda-setting and research, and making more concerted efforts to support and build collaborative networks with partners inside and outside the university.

The Netherlands Organization for Scientific Research (NWO) is a key science organization in the Netherlands, with both research performing and funding tasks; our review focuses on the latter. NWO has gone through a major reorganization in the last few years, which has aimed at increasing its flexibility and effectiveness, strengthening its focus on collaboration, and improving its responsiveness with regard to developments in science and society. Furthermore, it recently formulated a new strategy that focuses on increasing connection and coordination in Dutch science, supporting scientific career development and research collaborations, strengthening the Dutch research infrastructure, and knowledge sharing across scientific and societal boundaries. Some of the funding programs of NWO and its partner organization ZonMw (which is also included in our review) are explicitly focused on promoting RRI. These include the Responsible Innovation (MVI) and Fostering Responsible Research Practices programs. Furthermore, several aspects of RRI are firmly embedded in NWO’s and ZonMw’s organizations, programs, and procedures. This notably counts for societal engagement, gender equality, open science, responsiveness, and reflexivity. Our review indicates that a key barrier to the further promotion of RRI lies in conceptions in the broader academic landscape, regarding what (good) science is and how it should be valued. These conceptions include the idea that science should always be new and innovative, linear notions of the relation between knowledge and impact, limited and rigid notions of what a successful scientific career entails, and the importance of journal impact factors and rankings in the assessment of scientists. Our findings suggest that RRI is already strongly incorporated in NWO and ZonMw, and may be further promoted by further mainstreaming already established RRI approaches, strengthening collaborative and informational ties with the broader academic and societal network, and re-thinking science, for instance in terms of career development, excellence, and societal contributions and implications.

We conclude that in Dutch science and innovation policies, as well as in the reviewed organizations, various aspects of Responsible Research and Innovation are already well-incorporated. This particularly counts for societal engagement, gender equality, research integrity, and open science. It is advisable to continue the already strong efforts with respect to these issues. Yet, there is also room for further improvement. The implementation of RRI is hampered by cultural barriers in the Dutch academic system, including gender bias in academic culture, ingrained data management and publishing habits, and research, assessment, and publication cultures that prioritize productivity and high impact and citation rankings over quality and societal contributions. Accordingly, further promoting responsibility in Dutch research and innovation requires concerted actions aimed at instigating cultural change in Dutch academia. One line of action that would contribute to such a
culture change, would be to further intensify the current reflection and debate on how science is and should be valued, how the openness and inclusiveness of science can be promoted, and how public values and the societal contributions of science can be taken into account in the valuation of science. Furthermore, our findings suggest that further promoting RRI requires a change in the formal ways in which researchers and research institutions are assessed and evaluated. Assessment and evaluation criteria should more explicitly incorporate performance and competences regarding various RRI aspects, such as societal engagement, science education, diversity, and open science.

In the context of research performing and conducting organizations, further embedding RRI appears to be a matter of stimulating organizational cultures, discourses, and procedures in which responsibility is internalized. This may be achieved by a combination of strategies, including: organizing reflection and debate on issues such as integrity, inclusion and societal engagement, taking into account RRI-related performance and competences in recruiting and promoting academic staff, and further developing and implementing indicators and assessment and evaluation criteria for researchers and research groups, that incorporate these RRI aspects.
2. Introduction: about the report

This report contains a national case study on Responsible Research and Innovation (RRI) in the Netherlands. It aims to identify barriers, drivers, and best practices for the implementation of RRI in research conducting and funding organizations, from the perspective of the organizations themselves, and the broader political, societal and institutional contexts in which they are embedded. Such contexts for instance include (inter)national research and innovation policies, developments in the national academic landscape, and interactions with stakeholders. The organizations of which this reports provides in-depth organizational studies, are Radboud University Nijmegen (RU), Wageningen University & Research (WUR), and the Netherlands Organization for Scientific Research (NWO).

RRI-Practice is a project that is part of the Science with and for Society program of the European Horizon 2020 framework. The European Commission defines RRI as “an approach that anticipates and assesses potential implications and societal expectations with regard to research and innovation, with the aim to foster the design of inclusive and sustainable research and innovation”; it “implies that societal actors (researchers, citizens, policy makers, business, third sector organizations, etc.) work together during the whole research and innovation process in order to better align both the process and its outcomes with the values, needs and expectations of society”\(^1\). An important aspect of RRI is its focus on taking account of, and collectively giving shape to, desirable futures with respect to research and innovation. Therefore, RRI can also be defined as “taking care of the future through collective stewardship of science and innovation in the present” (Stilgoe et al 2013: 1570).

This report is part of a series of 12 national studies across several continents, that have all been conducted according to the same methodological set-up and protocols, and that all used the same reporting template, in order to render them as comparable as possible. The reader may notice that some sections in this report contain extensive texts, while other parts are (nearly) empty. This is a consequence of the fact that not all of the categories of the template were equally present in our materials and analyses.

The report has multiple objectives. Firstly, it aims to provide in-depth studies of the role, status and implementation of RRI in three organizations (organizational reviews). Secondly, the report aims to inform processes of giving advice to, and working together with the studied organizations, with the aim of further promoting RRI where possible (organizational outlooks). Thirdly, the report aims to inform the identification of best practices and barriers and drivers to RRI, that can be implemented on a larger scale or in other (inter)national contexts. Insight into such more general barriers and drivers, and scalable best practices, is in part to emerge from the comparative analysis of the national case studies. This comparative analysis is the next phase of RRI-Practice, that will follow after the publication of this report.

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\(^1\) https://ec.europa.eu/programs/horizon2020/en/h2020-section/responsible-research-innovation
3. Methodology

3.1 Analytic approach

In order to investigate the implementation and status of RRI in organizational and institutional contexts, RRI-Practice uses an analytical approach that is inspired by organizational institutionalism. Scott (1981) describes the following three perspectives to the study of organizations: seeing the organization as a rational, natural and open system. In RRI-Practice, we have used these perspectives as an analytical framework, with an adapted terminology that is more intuitively understandable, also for readers without a background in organizational science. Both in the organizational studies and the study of the national context, the following aspects have been studied:

A. Structural issues: Legal and binding normative frameworks, formal decision-making structures, key institutions with formal mandates.

B. Cultural issues: Political values and debates as well as cultural values relevant for science and innovation policy.

C. Interchange dynamics: The emergence and dynamics of concepts and approaches to responsibility, including reflections on the influence of stakeholder interests in shaping dialogues.

Furthermore, RRI-Practice focuses on barriers and drivers for of RRI, in order to gain insight into the processes that influence the status and implementation of RRI in organizational contexts. Table 1 summarizes the analytical framework that has been used in the organizational studies and study of the national context.

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<tr>
<th>Aspects of organizations</th>
<th>Structural issues</th>
<th>Cultural issues</th>
<th>Interchange dynamics</th>
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<tr>
<td><strong>Potential drivers for RRI</strong></td>
<td>Mandates, legislative frameworks, formal hierarchies</td>
<td>Culture, informal routines, informal reward systems, focus on management</td>
<td>Policy learning, pressures from key stakeholders (owners, the public, etc.)</td>
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<td></td>
<td>Active ownership (e.g. the state), legislation that includes social responsibility as a core element of the mandate, formal evaluation criteria adapted to RRI goals</td>
<td>RRI dimensions become mainstreamed, managers start seeing RRI dimensions as an obvious part of their responsibilities, no social acceptance for neglect of the RRI dimensions</td>
<td>Pressure from the media, success stories from organizations considered to set ‘gold standards’ in the field</td>
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<td>No formalized pressures to conform to RRI dimensions</td>
<td>Informal incentive systems reward economic output/excellence/etc., effectively marginalizing the RRI dimensions</td>
<td>Important stakeholders reward, for instance, excellence and economic performance to a greater extent than RRI related matters</td>
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<tr>
<td>Methods</td>
<td>Analysis of formal documents</td>
<td>Interviews with employees at different levels in the organizations, focus groups</td>
<td>Media analysis, interviews with top management</td>
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Table 1: analytic framework for organizational studies and national context.

In both the organizational studies and the study of the national context, we have focused on the status and implementation of RRI in terms of various RRI aspects. A first set of aspects on which we
have focused, consists of the RRI policy keys that have been central in the European Commission’s approach to RRI, particularly in the context of the Horizon 2020 program. These keys are: public engagement, open access, gender and diversity, ethics, and science education².

- Societal engagement includes various ways of communicating and engaging with societal stakeholders, such as societal organizations and the broader public. This includes communication activities such as media activities, public relations, publications and websites for a broad public, open days and public lectures. Furthermore, it includes forms of participation in research and innovation, such as citizen science initiatives, collaborations with citizens or societal organizations, and forms of participatory knowledge co-creation and agenda-setting in which societal actors are involved.

- Open access refers to “the practice of providing online access to scientific information that is free of charge to the end-user and reusable”³. In this report, we have focused on the broader notion of open science, which besides open access also includes open data, i.e. ways sharing and making available research data, either to other scientists, or to other interested parties.

- Gender equality is understood as a “three-dimensional construct whereby gender equality is reached when (1) women and men are equally represented in all disciplines and at all hierarchical levels, (2) gendered barriers are abolished so that women and men can develop their potential equally, and (3) when the gender dimension is considered in all research and innovation activities” (MoRRI 2018: 11). In our analysis, we have also focused on the broader notion of diversity, which may pertain to a broader set of social and demographic aspects, such as age and cultural or ethnical background.

- Ethics includes research integrity, ethical regulation and assessment, and ethical reflection. Actions and provisions that are relevant to this RRI aspect include ethical codes and regulations, ethical committees, research integrity training, ethics or integrity officers, and the inclusion of ethical considerations in research and innovation projects or processes.

- Science education refers to “helping all citizens acquire the necessary knowledge of and about science to participate actively and responsibly in, with and for society, successfully throughout their lives” (European Commission, 2015). Concerning this key, we have focused on ways of providing educational programs or activities on science and technology to children in primary and secondary education, citizens, and the employed population. Our definition of science education excludes science communication. The latter for instance involves communicating about science to a broad audience, and in our framework falls under societal engagement.

Besides these five policy keys, the organizational studies and study of the national context have focused on other aspects and concepts of responsibility. These aspects include the dimensions that are included in the AIRR (anticipation, inclusion, reflexivity, responsiveness) framework of responsible innovation, developed by Stilgoe et al. (2013). These dimensions are included, since these dimension resonate with the approach to RRI of the European Commission.

- Anticipation includes various ways in which the future can be taken into account, or given shape, in processes of research and innovation. This includes for instance the exploration of plausible or desirable futures, and processes in which interested actors engage in early stages of agenda-setting, development, and execution of research and innovation.

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² See also www.rri-tools.eu for more information on these RRI keys.
³ http://ec.europa.eu/research/openscience/index.cfm?pg=openaccess
Inclusion concerns the various ways in which broader publics and societal stakeholders, with often diverging concerns and perspectives, can take part in deliberation or dialogue on research and innovation.

Reflexivity, in the context of this study, is understood to be the capacity of a collective or an organization to call into question assumptions, activities, theories, framings, or value systems.

Responsiveness is the capacity to adequately react to unforeseen circumstances and new knowledge, and to adapt research, innovation, or organizational practices accordingly.

Further explanations of these dimensions are provided in Stilgoe et al. (2013).

In the case study of WUR, we added “grand challenges” as a third domain in addition to the RRI Keys and the AIRR dimensions. The reason is the dominant framing of responsibility at WUR in terms of “grand challenges”. Furthermore, we found that this framing strongly affects both opportunities and barriers of RRI at WUR. For example, the focus on “grand challenges” facilitates an emphasis on societal impacts but WUR often avoids critical reflection on the definition of the challenges and the contested character of potential solutions.

3.2 National mapping
3.2.1 Document analysis
For the mapping of the national policy context with respect to research and innovation in the Netherlands, a content analysis of relevant documents and reports has been conducted. The purposes of the mapping of national discourses and practices on RRI were:

- To perform context analysis of institutional structures, legal systems, and policy environments in order to determine accelerating and impeding factors in the decision-making structures with respect to the RRI dimensions.
- To understand the main societal and political discourses of RRI and the ways in which these are framed and have been implemented in different national contexts.

For this document analysis, a document search was conducted in websites and publication overviews of organizations that are involved in policy-making and advice on research and innovation in the Netherlands. We searched for policy documents and reports that were published roughly in the last five years, although some of the reports we included, were published earlier. The search resulted in a set of 23 reports and documents, mainly from organizations that play key roles in research and innovation policy-making and advice in the Netherlands. These organizations include the Advisory Council for Science, Technology and Innovation (AWTI), the Royal Netherlands Academy of Arts and Sciences (KNAW), the Ministry of Education, Culture and Science (MECS), the Scientific Council for Government Policy (WRR), the Ministry of Economic Affairs (MEA), and the Rathenau Institute. The latter is the national technology assessment and science system assessment organization that performs research, stimulates debate, and provides advice to the Dutch Parliament, policy organizations, and other interested parties. The list of analyzed reports is included in Annex 1.

The reports and documents were analyzed with software for qualitative data analysis (Atlas.ti). They were coded, using two coding strategies. Firstly, we used the set of RRI aspects described in 3.1 (the RRI keys and dimensions) as an analytical framework for coding text passages in the reports. Secondly, we used an inductive coding strategy, in which codes were constructed on the basis of themes mentioned in the reports. Subsequently, these codes were grouped in a set of main themes, in order to identify key issues that have played a role in Dutch science and innovation policies in recent years.
3.2.2 Interviews
For the mapping of the national context, 9 interviews were conducted with key experts and policymakers. The interviewees included representatives of the organizations mentioned above, and representatives from other industrial and academic organizations. The interviews focused on key issues and developments in Dutch science and innovation policies, the role and concept of responsibility in these policies, and the status of the RRI keys (see section 3.1). The interviews were transcribed verbatim, and subsequently analyzed by grouping text passages into categories that reflected the main issues that were discussed.

3.2.3 National workshop
In February 2017, a national RRI workshop was organized in Utrecht. This workshop aimed to explore and discuss the role, status, and practice of responsibility in research and innovation in the Netherlands. Participants included representatives of various policy and research organizations and companies that are involved in research and innovation policy, and of the organizations on which our organizational reviews and outlooks focused (WUR, RU, NWO). The workshop discussion focused on the participants’ understandings of responsibility in the context of research and innovation, relevant initiatives with respect to RRI in the Netherlands, and relevant societal and political developments.

Some key findings from the workshop were:

- A discussion of current S&T policies in the Netherlands made clear that there are various initiatives in the Netherlands that aim at promoting responsibility in science and innovation. This discussion showed that there was much common ground in participants’ understandings of current issues, actors, policies and tensions. Moreover, their understandings of responsibility matched the rationale of RRI quite well.
- A main theme in the workshop was how discussions on RRI can be related to issues in the larger social-political landscape, such as exclusion, distrust, the rise of populism, and disputed expert authority. In this regard, the importance of social inclusiveness was strongly stressed.
- The discussion made clear that societal and ethical responsibility are high on the Dutch S&T agendas. At the same time, the concept of RRI was appraised somewhat critically by the participants. It was argued that RRI should not be implemented in a too strictly standardized or formalized manner.

The workshop discussion informed our study of the national RRI-related context. A report of the workshop, as well as of the other national workshops, can be found on the RRI-Practice website 4.

3.3 The organizational studies
3.3.1 Document studies
For the organizational studies on RU, NWO, and WUR, relevant documents, reports, and websites of the studied organizations were collected and studied. For each organizational study, we collected reports and documents such as: strategy reports, organizational policies, annual reports, mission statements, and regulations such as codes of conduct. Furthermore, we collected reports that pertained to one or more of the RRI aspects on which the organizational studies focused, such as ethics, gender, and open access policies. Also, information from the organizations’ websites, for instance on organizational administration, structure, governance, and history, was collected for these studies. The collected information served as background information and input for the organizational studies.

4 https://www.rri-practice.eu/knowledge-repository/national-workshop-reports/
3.3.2 Interviews for Reviews (including justification of sampling strategy)

Interviews were a key source of information for the organizational studies. At NWO, 13 interviews were conducted, with a total of 14 respondents. We tried to cover the entire research funding branch of NWO, by interviewing employees in all three of NWO’s disciplinary domains (Science, Social Sciences and Humanities, and Applied and Engineering Sciences). Furthermore, at the time of the interviews (spring/summer 2017), preparations were made to integrate The Netherlands Organization for Health Research and Development (ZonMw), which is a separate research funding organization, into NWO. Therefore, we treated ZonMw as one of NWO’s domains in the organizational study. However, in 2018, it was decided that NWO and ZonMw will remain two separate research funders, that will work closely together. Consequently, the NWO organizational study (chapter 8) mostly focuses on NWO, but also includes insights from ZonMw. In the three NWO domains and ZonMw, the director and one or two policy officers were interviewed. Furthermore, three policy officers, involved in organization-wide developments in NWO regarding open science, ethics, and gender and diversity, were interviewed.

In our organizational study of RU, we chose to combine a review of university-wide developments with the in-depth study of selected parts of the organization. The latter are the Faculties of Science (FS), the Nijmegen School of Management (NSM), and the Radboud University Medical Centre (RUMC). We made this choice because we felt that an in-depth investigation of all faculties would be unattainable, given the available time. Our motivation for the selection was that we expected that responsible research would be a key issue in all of these departments, while we also expected to find interesting disciplinary differences between RRI-related issues and understandings. Accordingly, our selection aimed to reflect the disciplinary complexity and diversity within a broad, traditional university.

For the university-wide developments and initiatives at RU, 7 interviews were conducted with 9 respondents. These interviews focused on topics such as science education and communication, research integrity, open access and research data management policies, and collaborations with companies and societal organizations. In the two faculties and the RUMC, 13 interviews in total were conducted, with 14 respondents (FS 4, NSM 4, RUMC 5 with 6 respondents). We mostly interviewed senior staff and department heads, of whom we expected both good insight into internal issues and developments, and knowledge of developments in the broader institutional and academic environment.

At WUR, we conducted 25 interviews of which 16 were located in the science groups (Agrotechnology & Food Sciences, Animal Sciences, Environmental Sciences, Plant Sciences, Social Sciences), 7 in corporate departments (e.g. Value Creation, Human Resources, Corporate Communications), and 2 in the WUR Library. While our interviews covered all five science groups, the Social Science Group was more strongly represented (7 interviews) due to its involvement with core RRI components such as the Gender Action Plan, value creation, and ethics committees. Roughly half of the interviews aimed at a general discussion of responsibility at WUR, while the other half aimed at more targeted insights about RRI dimensions and keys such as Open Access specialists of the WUR library and contributors to the WUR Gender Action Plan. Special attention was given to covering and understanding unique characteristics of WUR such as its international orientation and focus on “grand challenges”.

All interviews at RU and NWO were transcribed verbatim and analyzed using software for qualitative data analysis (Atlas.ti). In the analysis, we combined two coding strategies. Firstly, the transcripts were coded, using a set of analytical codes that we partly derived from the analytical framework described in section 3.1. These analytical codes included the RRI aspects (EC policy keys, AIRR
dimensions), barriers, drivers, and conceptualizations of responsibility. Furthermore, we inductively constructed codes, based on the issues that were brought up by the respondents. Subsequently, we used a code co-occurrence analysis to identify the current practices and main barriers and drivers for all RRI aspects. This co-occurrence analysis was combined with information from the collected reports, documents, and webpages, in order to triangulate the findings.

3.3.3 Focus group
The findings from the reviews, and ideas for the outlooks, were discussed in focus group meetings at RU, WUR, and NWO. In the RU focus group, participants included representatives of the three selected organizational units (FS, NSM, RUMC), the Radboud Innovation department, and policy officers involved in gender, ethics, and open science policies. The WUR focus group included senior staff from different science groups, representatives of the corporate structure, the science shop, and specialists for more specific issues like science education and gender diversity. In the NWO focus group, representatives of the Science domain, the Social Sciences and Humanities domain, and ZonMw participated. The focus group discussions have been used in finalizing both the organizational reviews and outlooks.

3.3.4 Outlook process
The findings of the organizational reviews have been used to produce draft outlooks. Key findings from the reviews, and recommendations from the outlooks, have been discussed in the focus groups. Main recommendations are included in the organizational studies in this report, and will be further developed in the outlooks. Final outlooks will be presented to, and discussed with key representatives of the organizations.
4. The context for RRI: the national science policy system

4.1 General country information

The Netherlands, with a population of over 17 million, is one of the most densely populated countries in the world. Dutch society can be characterized as diverse; over 13 million inhabitants have a Dutch background, close to 4 million have a migration background. The level of well-being in the Netherlands is very high. For instance, in 2017, almost 9 out of 10 Dutch adults reported that they were happy; 85% reported satisfaction with their lives. Furthermore, the Netherlands was recently designated as the country with the best work-life balance, according to the OECD better life index.

In international comparison, the Dutch have relatively high levels of education and skills. For instance, over 30% of Dutch 25-64 year-olds held a university degree in 2014, which was above the OECD average of 24%. Furthermore, almost 40% of 15-75 year-olds have attained intermediate education. In 2016, the Dutch government in total spent 38,7 billion Euros on education, which is around 5.3% of the gross domestic product. Of the total government spending in that year, 12.6% went to education.

The Netherlands has a thriving economy, which relies heavily on export and foreign trade. In terms of its GDP (over 50,000 US Dollar per capita in 2016), the Netherlands ranks among the wealthiest countries in the world. This wealth is spread relatively evenly across society, given the relatively high level of income equality. In 2017, the Dutch economy grew by 2.9%; this was the fastest growth of the last 10 years. This can be partly seen as catching up with the economies of the Netherlands’ key trade partners (including Germany, Belgium, France, UK), who recovered quicker from the financial crisis that started around 2007. In 2017, particularly the building, trade, and business service sectors grew fast.

With respect to sustainable development, the Netherlands has been lagging behind for a long time. For instance, in domains such as organic farming, greenhouse gas emissions, and renewable energy, the Netherlands is one of worst-performing countries in the EU. Recently, sustainable development has become a more prominent issue on the Dutch political agenda. For instance, the Dutch government has recently adopted a climate law, which includes ambitious targets for the reduction of greenhouse gas emissions.

In the Global Competitiveness Index of the World Economic Forum, the Netherlands rose to the fourth place on the global ranking in 2017. According to the WEF, this is the result of a solid performance across a variety of domains, including infrastructure, education, technological readiness, business sophistication, and innovation. The Netherlands scores particularly high on science- and innovation-related parameters, including the quality of its scientific research institutes, and the closeness of links between universities and the private sector. Improving the international

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5 https://longreads.cbs.nl/trends18/maatschappij/cijfers/bevolking/
6 https://opendata.cbs.nl/statline/#/CBS/nl/dataset/37713/table
7 https://longreads.cbs.nl/trends18/maatschappij/cijfers/welzijn/
10 https://longreads.cbs.nl/trends18/maatschappij/cijfers/onderwijs/
12 https://data.oecd.org/inequality/income-inequality.htm
13 https://longreads.cbs.nl/trends18/economie/trends/
competitiveness of the economy, particularly by means of strengthening these links between research institutions and industry, has been a main objective of innovation and industrial policies in recent years. The Top Sectors policy (further explained below) is a key example of this.

More than half of R&D activities in the Netherlands take place in companies. Private sector R&D is stimulated through tax incentives; total private R&D investments in 2016 were 8,131 billion Euros. Furthermore, direct government investment in R&D amounts to almost five billion euros, or 0.72% of GNP\textsuperscript{16}. This investment goes to several research institutes, including higher education and public knowledge institutes, and research institutes of the Royal Netherlands Academy of Arts and Sciences (KNAW) and the Netherlands Organization for Scientific Research (NWO).

The Dutch science system is productive in terms of its publication output, and has a high impact in terms of citations of papers (Van Dijck and Van Saarloos 2017). Another indicator of the quality of the Dutch science system is the relatively high number of ERC grants that Dutch researchers secured between 2007 and 2016 (ibid.). This high performance counts for all major disciplinary domains, and is remarkable, given the relatively modest national R&D expenditure (around 2% of GDP in 2015)\textsuperscript{17}. Van Dijck and Van Saarloos (2017) argue that, consequently, the Dutch research and innovation system can be considered as very efficient. At the same time, the relatively low level of government investments in R&D are a permanent matter of concern to many stakeholders in the Dutch knowledge system. Recently, increased investments in scientific research were announced by the Dutch government.

4.2 Legal and other binding normative frameworks

The governance of research and innovation in the Netherlands is for an important part enacted through policies, but partly also by means of legislation. There are several legal frameworks in the Netherlands and the EU, that relate to research and innovation, and to the implementation of particular aspects of RRI.

The governance and administration of some scientific and research organizations is legally established, often in the form of a relationship between the government and the organization on a statutory basis\textsuperscript{18}. This counts for the Dutch universities, and for some other key research organizations. The latter include the Royal Netherlands Academy of Arts and Sciences (KNAW), the Netherlands Organization for Scientific Research (NWO), and the Netherlands Organization for Applied Scientific Research (TNO). The legal provisions concern the tasks and responsibilities of the organizations, and the roles of the government in their decision-making, administration, and management.

Furthermore, research with human subjects and animals falls under strict regulations in the Netherlands. Research that falls under the Medical Research Involving Human Subjects Act (WMO), or the Embryo Act, must be assessed by an accredited (local) medical research committee, or by the (national) Central Committee on Research Involving Human Subjects (CCMO).\textsuperscript{19} Most of the ethical assessments of such research are performed by local assessment committees. One of these committees is established in Nijmegen, at the Radboud University Medical Centre (RUMC) (see chapter 7). Research that falls under these laws can only be executed after the central committee or an accredited local committee has provided a positive ethical assessment.

\textsuperscript{17} https://data.worldbank.org/indicator/GB.XPD.RSDV.GD.ZS?year_high_desc=false
\textsuperscript{19} http://www.ccmo.nl/en/medical-scientific-research-and-the-wmo
Also for experiments with animals, dedicated regulations are in place in the Netherlands. Dutch law for instance prohibits experiments on primates, and the testing of make-up on animals. Research institutes that conduct animal experiments, are legally required to have an institutional permit. Furthermore, research projects that involve animal experiments need to have a project permit. Such permits can be provided by the Central Animal Experiment Committee, only if the use and necessity of the project are proven, if the benefits sufficiently outweigh the harm that is done to the animals, and if suitable alternatives are unavailable. The assessment and decision of the central committee are informed by the advice of an accredited local Animal Ethics Committee. One of these local committees is also hosted by the RUMC (see chapter 7). European directives on animal experiments have been implemented in these Dutch regulations.

With respect to data protection, new legislation has been implemented in 2018. The General Data Protection Regulation (GDPR) aims to protect “all EU citizens from privacy and data breaches in an increasingly data-driven world”. The GDPR introduces some important changes in comparison to the former data protection regulation. It for instance has an extended jurisdiction, applying to all companies that process personal data in the EU. Furthermore, it includes stronger consent conditions, rights of “data subjects” to access data, the right to be forgotten, provisions on “privacy by design”, and penalties for organizations that breach the regulation. The implementation of the GDPR has implications for research organizations such as universities, for instance with respect to privacy regulations and research data management.

4.3 Political and cultural values and discussions related to STI

Freedom, equality, and solidarity are key values of Dutch society, which are also incorporated the Dutch constitution (Ministry for Social Services and Employment 2014). Freedom, as a core value of Dutch society, pertains to freedom of religion, belief, opinion, lifestyle, and association (i.e. joining or forming social groups). Furthermore, the right to self-determination is considered highly significant, and is engrained in Dutch culture and law. The perceived importance of this right corresponds with a relatively progressive stance in Dutch culture and politics towards sensitive medical-ethical issues. For instance, abortion and euthanasia are allowed under legally specified conditions. This does not imply that there is a full consensus on these issues; they are debated on an ongoing basis, for instance between the more progressive and the Christian-conservative groups in society and politics. Finally, the freedom of expression is considered highly important in the Netherlands, which is exemplified by the fact that the Dutch are known for freely speaking their mind. This freedom is only curtailed by some legal provisions, that for instance forbid slander and inciting hatred (ibid.).

Equality refers to the right to equal treatment for people of all sexes, identities, religions and backgrounds. It also refers to equal opportunities for all people, irrespective of for instance age, disability, or pregnancy. An example of the importance of equality in Dutch society, is that the Netherlands was the first country in the world to permit same-sex marriages. Furthermore, discrimination is strictly prohibited.

The value of solidarity for instance relates to the extensive social security system in the Netherlands. This system includes differentiated taxes for high and low incomes, collective unemployment insurance, and regulations for family benefits, disability benefits, and sick leave. The Netherlands has an efficient health care system, that provides high-quality health care to all citizens. Long-term care is covered by compulsory state insurance; regular, short-term medical treatment is covered by mandatory private health insurance. Insurance companies are obliged to accept all people requesting

20 https://www.rijksoverheid.nl/onderwerpen/dierproeven/regs-dierproeven
21 https://www.eugdpr.org/the-regulation.html
insurance. The issue of solidarity also relates to recent political discussions in the Netherlands about curtailing the costs of the welfare state though promoting societal participation. In recent years, these discussions have revolved around the somewhat contested notion of the “participation society”. Champions of this notion argue that a well-functioning and efficient social welfare system require active citizenship; critics argue that the notion is a way of disguising cutbacks.

The Netherlands is a constitutional monarchy, that is governed according to the principle of the separation of (legislative, executive, and judicial) powers (ProDemos 2013). Members or parliament are elected according to a system of proportional representation. The three main political groups are the social democrats, Christian democrats, and liberals. These “have been alternately represented in various governments for many decades” (ibid: 19). Besides these main groups, many new political parties have been founded in the last decade, ranging from eco-oriented left-wing parties, to conservative and nationalist right-wing parties. The proportional representation system enables many parties, also ones with a relatively small constituency, to enter Parliament. In recent elections, this has resulted in a somewhat fragmented political landscape, in which usually government coalitions between at least three political parties had to be formed, in order to achieve a majority in Parliament. Consequently, coalition agreements usually incorporate a consensus between different political orientations. More generally, Dutch society can be characterized as a high-trust society with an open, consensus- and collaboration-oriented political culture. In this political culture, the free flow of information, and inclusive deliberation between policy-makers, experts and representatives of societal organizations, play a key role (Van Dijck and Van Saarloos 2017).

The Netherlands is one of the founders of the European Economic Community, which evolved into the European Union. The attitude of the Dutch towards the EU is somewhat ambiguous. Most large political parties have a fundamentally positive attitude concerning the EU, but several parties are also critical or reserved. The public opinion on the EU appears to have shifted towards the reserved and critical in the last decade, which is exemplified by negative outcomes in the consultative referendum on the Treaty establishing a Constitution for Europe, and in the Ukraine–European Union Association Agreement referendum.

If we look at the Dutch values and political system from the perspective of RRI, it may be argued that Dutch society and politics provide favorable conditions for several aspects of RRI. These conditions for instance include: the importance of gender equality and diversity, the key role of collaboration, citizen participation, and inclusive deliberation, the openness of information, administration, and decision-making, and the strong tradition in ethical reflection, deliberation and regulation.

As argued above, the Netherlands has a strong tradition of upholding the values of open dialogue and free flow of information, both at a political and at a cultural level. This is also reflected at a European level in the EU charter of Fundamental Rights signed in 2000. The fundamental principles expressed in the charter are: sustainability, equality, solidarity, citizen’s rights, justice, dignity, and freedoms. It is clear that a number of these principles have a direct strong bearing on the implementation and perception of RRI and RRI-related practices. For example, the concept of justice, and in particular its subprinciple of ‘distributive justice’ relates to the way in which scientific and technological developments can, will and should affect society in a fair way (i.e. by preventing or diminishing excessive economic inequalities).

Likewise, sustainability and citizen’s rights can be used as a conceptual tool to more clearly specify what falls under the umbrella of RRI. As far as the latter is concerned, issues of usability, usefulness

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and co-creation in science and technology come to mind, with citizen science as a recent development. As far as the former is concerned, it is obvious in political, academic and societal debates that there is a strong overlap between the concepts of sustainability and responsible innovation, where the first is sometimes seen as a necessary condition for the realization of the second one.

In recent years, discussions about tensions and pressures in the Dutch academic system emerged. Accordingly, several initiatives have been started, aimed at bringing about a reform of the university system and its democratic governance. One of these initiatives is Science in Transition, which has argued that science is “in need of fundamental reform”, as it “has become a self-referential system where quality is measured mostly in bibliometric parameters and where societal relevance is undervalued”[23]. The initiators have put forward their ideas in a position paper, which brought about quite some debate in Dutch media, and among academics and policy-makers, about frictions and perverse incentives in the current science system. Another initiative is the Platform Reform Dutch Universities, that has argued that there is a “shared discontent among both scientific and support staff at Dutch universities”, related to “excessive commodification, hierarchy and bureaucratization” at universities[24]. Accordingly, this platform argues for a reform that includes an increased prominence of substantial criteria in the conduct and assessment of research, and a “revision of the current hierarchical and bureaucratic structure and a move toward a form of university administration in which temporary and tenured staff, students, as well as support staff can participate in decisions over matters in which they are most knowledgeable”[25]. These concerns about the academic system are also expressed in Halffman and Radder’s (2015: 165) “academic manifesto”, which argues that universities have become “occupied by management, a regime obsessed with ‘accountability’ through measurement, increased competition, efficiency, ‘excellence’, and misconceived economic salvation”. In response to this diagnosis of academic management, they propose an alternative model of the “public university”, that includes increased democracy, limited control systems, a ban on mergers and university marketing, promoting inter-university collaborations, engaging in public debate, abolishing productivity as a research assessment criterion, and several other strategies (ibid.).

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5. Aspects of responsibility in national science policy

5.1 The conceptualizations of responsibility in national science policy

Our study of the national context of RRI in the Netherlands (interviews, workshop, and document analysis), points to three main themes in how responsibility is conceptualized in national science and innovation policies.

5.1.1 Science and innovation for the public good

Current Dutch science and innovation policies are highly ambitious. The 2025 Vision for Science, in which the Ministry of Education, Culture and Science outlines the national science policy, aims to further strengthen the “worldwide significance” of Dutch science in terms of its quality and productivity (MECS 2014a, 11). The national enterprise policy has the ambition for the Netherlands to be “among the world’s top-five most enterprising and competitive economies” (MEA 2016b, 6). The innovation policy that is part of the national enterprise policy, is called the Top Sectors. The Top Sectors aim to stimulate innovation and the Dutch economy, by promoting public-private collaborations in R&D, including by means of fiscal incentives. Public-private in this context usually means collaboration between large R&D-performing companies, and public research organizations such as universities or organizations for applied research. The Top Sectors approach focuses on promoting research and innovation in key sectors of the Dutch economy, such as agriculture, chemistry, logistics, high tech systems and materials, life sciences and health. A central idea in both the national science and innovation policies is that research and innovation are important keys to sustaining high levels of welfare and well-being, and that they should be governed towards this aim.

In recent years, the discourse about the societal and economic importance of science and innovation in the Netherlands has shifted. In interaction with international developments such as the Sustainable Development Goals of the United Nations and the Societal Challenges of the European Horizon 2020 program, solving societal challenges has become a main objective in Dutch science and innovation policies, including the Top Sectors policy (Kennis- en Innovatieagenda 2018-2021).

The idea that science and innovation should serve the public good is also reflected in a pervasive emphasis on producing societal impact and economic value. A key concept that is used in this respect is “valorization”. For instance, the 2025 Vision for Science mentions valorization as an important objective of scientific research that encompasses “economic utilization of knowledge”, “using knowledge for solving societal problems”, and “contributing to societal debates” (MECS 2014a, 40). The emphasis on impact can also be observed in the funding and evaluation of Dutch research. For instance, the Netherlands Organization for Scientific Research demands “knowledge utilization sections” in applications for research funding, and the national Standard Evaluation Protocol for scientific research includes “relevance to society” as one of the key assessment criteria (KNAW, VSNU, and NWO 2016).

5.1.2 Trust in inclusive deliberation and collaboration

As argued above, the Netherlands has a consensus- and collaboration-oriented political culture, in which inclusive deliberation plays a key role. Moreover, the Netherlands has a “history of public engagement in decisions affecting science and technology”, for instance concerning energy and GM food (Hagendijk and Irwin 2006, 179). Current initiatives in science and innovation policy reflect this

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26 This section is an adaptation of: F. van der Molen, D. Ludwig, L. Consoli, and H. Zwart, “Global challenges, Dutch solutions? The shape of responsibility in Dutch science and technology policies”, submitted for publication in the Journal of Responsible Innovation.
deliberative tradition, and also indicate that the emphasis on inclusion and collaboration has further increased in recent years.

This is exemplified by the National Research Agenda that was published by a broad coalition of organizations representing industry, academia, applied research, and science funding. This agenda aims to identify priority themes for Dutch scientific research through public engagement and collaboration. Its realization involved a public consultation that yielded 12,000 research questions, which were clustered into 140 main questions, and which were subsequently elaborated into 25 research themes by teams of researchers and representatives of NGOs and industry (Kenniscoalitie 2016b). The third Rutte cabinet, which was sworn into office in October 2017, has adopted the National Science Agenda and the Top Sectors as the main frameworks for increasing and prioritizing research funding in the coming years (VVD et al. 2017).

This emphasis on collaboration and partnerships in research and innovation is also clearly present in the Top Sectors and the research and innovation system more generally. For instance, one of the interviewees argued: “The interactive element in the Dutch knowledge and innovation domain, among the different parties, knowledge institutes and industries, is of a uniquely high level. [...] That also makes the Dutch knowledge and innovation system very effective”. In a similar vein, Van Dijck and Van Saarloos (2017) argue in their essay The Dutch Polder Model in Science and Research that tight-knit networks, cooperation, consultation and trust are vital features of the Dutch science system that have allowed it to “punch above its weight”.

5.1.3 Responsibility as an integrated feature of research and innovation

There are funding schemes and research programs in the Netherlands that explicitly focus on RRI (see for instance section 8.2.1). Nevertheless, our materials indicate that responsibility is also a multiform, dispersed and integrated feature of Dutch research and innovation that is often operationalised through other terms and concepts. Many of our interviewees had never heard of RRI, and both the interviews and the document analysis indicate that the Dutch translations of “responsible” and “responsibility” are usually not the preferred terms to designate societal and ethical aspects of research and innovation. However, it is clear that many aspects and dimensions of RRI, including public engagement, inclusive deliberation, diversity, ethical reflection, and openness and transparency, are well-integrated in Dutch policies and discourses on research and innovation (further elaborated in sections 5.2-5.8). For instance, one of the respondents called responsibility “a matter of course in how we work with each other”; another argued that RRI “is kind of in the DNA of everything that we do, but we don’t emphasize it that clearly”.

Responsibility, in the Dutch incarnation described above, is often perceived as complementary to, or synergetic with, other objectives and interests concerning research and innovation. For instance, some of the respondents argued that societal challenges can also be seen as a “revenue model” or as “markets of tomorrow”. Another respondent argued that societal challenges and scientific freedom need not be mutually exclusive: “innovation and progress on big societal themes requires programs with extensive collaborations”; at the same time, such programs may provide ample space for scientists to “follow their noses” and “explore new ideas”. The integration of NWO’s responsible innovation (MVI) program and the themes of the National Science Agenda into the Top Sectors policy also exemplifies how RRI, societal challenges, public engagement, and industrial policy are seen as complementary in the Dutch context (for more information on MVI, see section 8.2.1).
5.2 The notion of ‘RRI’ in national science policy discussions
In Dutch academia, and notably in disciplines and groups that focus on the social, ethical or political aspects of research and innovation, RRI appears to have become a prominent concept. This is exemplified by recent Science and Technology Studies-related (STS) conferences in the Netherlands, such as the S.NET conference, in which RRI was a major theme. Furthermore, Dutch researchers are productive contributors to the international academic literature on RRI, for instance by means of the Responsible Innovation series of edited volumes (see for instance Asveld et al. (eds.) 2017).

Some of the key national science policy reports refer to RRI. The report that most extensively discusses RRI, is the 2025 Vision for Science (MECS 2014a). This report emphasizes that RRI is an important principle for enabling inclusive and societally desirable research and innovation, through interactive processes that involve early-stage stakeholder engagement, reflection, and anticipation of possible impacts. The authors of this report state that they “firmly believe that effective interaction will not only increase the relevance of scientific research, but also its quality” (MECS 2014: 44).

Furthermore, the report mentions citizen involvement in large research projects, and NWO’s Responsible Innovation (MVI) program, as “excellent examples of participation” (ibid.). These developments towards participatory research and innovation are described as “just the beginning of a very important transition”, in which all scientists are encouraged to participate (ibid). Also in the National Research Agenda, MVI is mentioned as an important way of taking social, legal, and ethical aspects into consideration (Kenniscoalitetie 2016b).

Besides these examples, we found few explicit references to RRI in the reports. However, we did find all kinds of aspects and dimensions of RRI, which are described below. At the national research funding organization NWO, RRI is a prominent concept that has been conceptualized and implemented in various ways. These are further discussed in chapter 8.

5.3 Ethics in the national science system
The ethical assessment and regulation of research involving humans, and of animal experiments, are governed by law (see section 4.2). Furthermore, with respect to ethics, interviewees argued that the Netherlands has a tradition of open and inclusive debate about the ethical aspects of new technologies, such as medical technologies. Dutch society and politics are known for their relatively progressive viewpoints regarding sensitive medical-ethical issues.

In the last few years, research integrity has been a major issue, both in Dutch academia and in science policy. A series of scientific fraud cases at Dutch universities have caused much uproar in the media and society. Probably the most notorious case is the one of Diederik Stapel, a prominent professor of social psychology, who fabricated and manipulated research data for many of his publications. This case of misconduct came to light in 2011; subsequently, some other cases of fraud and misconduct by Dutch scientists were exposed.

In reaction to these fraud cases, promoting research integrity has become a priority in national science policy and governance. For instance, the Netherlands Code of Conduct for Scientific Practice, which has been formulated under the auspices of the Association of Universities in the Netherlands (VSNU), was reformulated in 2012, with, inter alia, rules concerning improper forms of self-citation, and additional measures to bring research integrity to the notice of both students and academic staff. This code is based on important ethical principles for scientific research: honesty and scrupulousness, reliability, verifiability, impartiality, independence, and responsibility. Researchers,
lecturers, and students are expected to “respect this Code and call each other to account on any questionable behavior”27.

Other policy measures also reflect the increased attention for promoting research integrity. For instance, the Standard Evaluation Protocol, which provides general guidelines for assessing research and policy research, was updated in 2015. The revised version of the protocol includes the assessment of scientific integrity policy in the evaluation of research groups or institutes28. In the 2025 Vision for Science, additional actions for stimulating integrity were mentioned, including: stimulating replication studies, preventing research waste, measures to avoid selective publication, and the further strengthening of the National Board for Research Integrity (LOWI). The latter is an independent body that gives advice to its affiliated institutions, regarding alleged violations of research integrity29. AWTI et al. (2016), in their review report on Dutch science, established that the attention for research integrity, and the participation of research institutions in the LOWI, were on the rise.

5.4 Societal engagement strategies in research
In the interviews and analyzed documents, societal engagement was a very prominent theme; the materials indicate that societal engagement is key objective in Dutch science and innovation policies. This theme has already been discussed quite extensively above, in section 5.1. This section summarizes the main issues and developments with respect to societal engagement, that were discussed in the interviews and that we found in the collected materials.

In Dutch policy, societal engagement is often conceptualized in terms of promoting the societal impact, relevance, or value of research (see also section 5.1). For instance, the 2025 Vision for Science has “science with maximum impact” as one of its three main objectives (MECS 2014a). Furthermore, many interviewees mentioned societal impact and relevance as key themes in Dutch policy. The interviews made clear that the current discussion regarding impact focuses on how societal impact and valorization can be further promoted, and how they can be monitored and measured. For instance, the VSNU is currently working on the further development and implementation of “valorization indicators”, that are intended to help universities monitor and make manifest the valorization in their education and of their research. This indicator framework has been developed as a “menu”, rather than as a fixed framework30. The valorization menu enables universities to choose the valorization indicators that match their research profile. It contains an extensive set of indicators, in the categories “people” (including courses, trainings, focus on entrepreneurship), “results” (including products, patents, spin-offs, start-ups), and “collaboration” (including contract research, consultancy, R&D, external funding, collaborations with public and private sector parties). The initiative of the VSNU to develop and implement valorization indicators builds on earlier initiatives, including by the Rathenau Institute, to develop such indicators31.

A second main theme in Dutch research and innovation policy is collaboration. For instance, public-private collaboration in R&D is a key instrument in the Top Sector Policy. A core idea in the TS approach, is that sustaining the international competitiveness of the Dutch economy, and addressing and solving societal challenges, requires collaborations between the “golden triangle” or “triple helix” of entrepreneurs, researchers, and governments (MEA 2015). Such collaborations are

28 https://www.vsnu.nl/sep
30 https://www.vsnu.nl/valorisatie-indicatoren.html
31 https://www.rathenau.nl/en/knowledge-policy/valuable
supposed to develop high-quality goods and services, attract talent, and secure a strong international position for key sectors of the Dutch economy. In recent years, some shifts have taken place in the TS policy; these include an increased focus on sustainable development, and on enabling cross-sectoral collaborations, in order to address grand societal challenges (Knowledge and Innovation Agenda 2017). This “re-labelling” in terms of societal challenges, is expected to better align the Top Sectors with the National Research Agenda, and the Grand Challenges in the context of the European H2020 program.

In recent developments in Dutch science and technology policy, a somewhat shifting approach with respect to societal engagement can be discerned. While relatively linear notions of science-society relation (such as impact) appear to remain in full force, also more dynamic, interactive, and participatory notions of societal engagement have risen to prominence. This is exemplified by the enthusiastic endorsement of a strongly participative notion of RRI in the 2025 Vision for Science (see section 5.2). Furthermore, the National Research Agenda (NWA) is a clear example of this development (see also 5.1). The NWA has invited Dutch citizens to participate in national research agenda-setting and programming. Also, it includes interactive and participative notions of research, such as using “living labs” that enable practice-based experimentation in which various disciplines and stakeholders are involved, and employing “citizen science”, in which citizens are involved in the formulation of research questions, collecting research data, and interpreting results (Kenniscoalitie 2016b).

5.5 Gender equality and diversity strategies in the science system

When asked about their understanding of the term “responsibility” in relation to research and innovation, none of the respondents in the interviews on the national context mentioned gender equality and diversity. However, the document study, and recent discussions in Dutch politics and academia, indicate that gender and diversity are perceived as important issues. This particularly counts for gender equality in Dutch science.

Concerning gender, the main issue on which science policy discussions have focused in the last few years is the uneven distribution of male and female scientific staff, particularly in the higher scientific positions. This is exemplified by the 2025 Vision for Science, which argues that “Dutch science is failing to make full use of female talent, particularly in more senior positions” (MECS 2014a: 72). This report acknowledges that, in this respect, the Netherlands are “lagging behind most other European member states […] the Netherlands is very near the bottom of the ranking in terms of the percentage of women professors” (ibid.)32. It argues that the current inequality can partly be “explained in terms of ‘implicit associations’ concerning the qualities of both men and women” in the context of science and research funding, and mentions a review of gender equality in NWO’s assessment and funding procedures as a relevant initiative in this context (ibid. 73; see also section 8.2.4). Furthermore, in this report, the Dutch government expressly commits itself to aligning its gender policy with European initiatives, such as the gender policy of the European Horizon 2020 program. Accordingly, it announces an “active policy intended to ensure that the male-female balance is at or above the European average by 2025” (ibid. 73). In recent years, the percentage of women professors in the Netherlands has increased, to 19.3% in 2017 (LNVH 2017).

These intensified efforts to improve gender equality in Dutch science were clearly noticeable in recent years. 2017 was the national Westerdijk year in the Netherlands, named after the plant pathologist Johanna Westerdijk, who was the first female professor in the Netherlands. She delivered

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32 When the 2025 Vision for Science was published, the percentage of female professors in the Netherlands was 13%, while the EU average was 20% (MECS 2014A)
her inaugural lecture at Utrecht University 100 years earlier. In the context of the Westerdijk year, the Dutch government allocated 5 million Euros for the appointment of 100 extra female professors at Dutch universities. This measure was in addition to already-existing initiatives to appoint more female professors. At the occasion of the Westerdijk year, the Royal Netherlands Academy of Arts and Sciences (KNAW) appointed 16 female members, in addition to the regular appointments of academy members.

One of the drivers for actions and debates on gender diversity in Dutch academia, is the involvement of active networks of female scientists. One of these networks is the Dutch Network of Women Professors (LNVH). The goal of this network is to “promote equal representation of women within the academic community” through various actions and strategies, including: strengthening links between women academics, promoting the rise of capable women to higher positions, cooperation with organizations with comparable goals, and striving for the proportionate representation of women in science governance and administration. One of the influential initiatives of the LNVH is the publication of the annual Women Professors Monitor. This monitor report and website provide statistics and interpretations of the current male-female distributions among scientists and administrators in scientific organizations in the Netherlands. Another example of such a network is Athena’s Angels, a network of four professors who aim to defend the interests of women in academia, for instance by inventorying good and bad practices concerning gender equality on their website.

5.6 Open access and open science strategies in the national science system
In recent years, open science has become a major priority, in Dutch politics and policy, and among key science organizations such as the KNAW and NWO.

In 2013, a national open science policy was instigated by the State Secretary of Education, Culture, and Science. One of the objectives of this policy is to “drastically change the scientific publication system” and switch to open science publishing (MECS 2017: 4). The policy includes the implementation of full and unconditional open access publishing in NWO’s funding conditions, as of 2018. Furthermore, it includes deals between the VSNU and major scientific publishing companies on open access funding. Due to these deals, the majority of papers by authors at Dutch universities, published by the participating publishers, will be available open access from 2018 onward. The advantage for Dutch researchers is that, under these deals, they can often publish open access free of charge.

During the Dutch presidency of the EU in the first half of 2016, open science was made top priority. During this term, arrangements with the EC and EU member states were made to implement open access publishing as default in the EU as of 2020 (ibid: 6). Also, during this European presidency, arrangements were made to stimulate the sharing and re-use of research data according to the FAIR principles in H2020.

34 https://www.knaw.nl/nl/leden/oproep-voor-nominaties-johanna-westerdijk-jaar
35 https://www.lnvh.nl/site/About-the-LNVH/Goals
36 https://www.athenasangels.nl/en/
Currently, efforts are made to implement these European agreements in the Netherlands, by means of the National Plan Open Science. The main goals of this plan are\(^{37}\):

- 100% open access publication in 2020.
- Optimal reuse of research data, according to the FAIR principles.
- Improving evaluation- and valuation systems, which involves the inclusion of open science-related criteria in the assessments of scientists.

The National Plan is further elaborated and implemented by the National Platform Open Science, which is a collaborative network of science institutions, chaired by Ministry of Education, Culture and Science (ECS). This platform is currently developing monitoring of open science, and serves as a knowledge sharing platform that aims to “respond to new developments in the field of open science”\(^{38}\).

The Association of Universities in the Netherlands (VSNU) has agreed with the ministry of ECS to monitor open access publications in the Netherlands. In 2017, the portion of open access publication was measured for the first time by the VSNU. This first monitoring effort showed that 42% of the peer-reviewed articles from Dutch universities, published in 2016, were published open access\(^{39}\). This percentage encompasses the following categories:

- 13% “gold” open access, i.e. open access papers in journals that are listed in the Directory of Open Access Journals (DOAJ).
- 20% “hybrid” open access, i.e. open access papers in subscription journals, or in open access journals that are not listen in the DOAJ.
- 9% “green” open access, i.e. papers that are only available in open access because they are available through “trusted repositories”.

### 5.7 Science education as integrated in research\(^{40}\)

With respect to education, the discussions and developments in national science policy mainly focus on higher education and how it relates to science (see for instance MECS 2014a). Science education, notably aimed at school children, is a topic that is on the policy agenda, albeit not as prominently as the other RRI policy keys.

One of the few reports in our collection that extensively covers science education is Between Research and Society, published by the Young Academy of the Royal Netherlands Academy of Arts and Sciences (KNAW) in 2012. The authors of this report argue that there is a need to increase the awareness and improve the image of science among citizens, and that this requires the improvement of science education in primary and secondary education. Accordingly, they recommend that research- and design-oriented learning should be better integrated in the curricula of teacher training colleges of primary education. Furthermore, recommendations in this report include that science education should be better embedded in scientific practice and skills training of scientists, and more prominently addressed in assessments and evaluations of scientists and institutes. The authors also recommend that Science Education Hubs should be more structurally embedded in universities (see also 7.2.6).

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\(^{37}\) [https://www.openscience.nl/en/national-platform-open-science/the-key-areas/index](https://www.openscience.nl/en/national-platform-open-science/the-key-areas/index)

\(^{38}\) [https://www.openscience.nl/en/national-platform-open-science](https://www.openscience.nl/en/national-platform-open-science)

\(^{39}\) [https://www.vsnu.nl/2014/percentages-open-access-publicaties-2016.html](https://www.vsnu.nl/2014/percentages-open-access-publicaties-2016.html)

For the KNAW, science education is one of its strategic themes. In its strategic agenda 2016-2020, it formulated some strategic priorities that partly correspond with those in the abovementioned report of the Young Academy (KNAW 2016). These include: strongly embedding the Science Education Hubs at universities, reaching out to teachers in primary and secondary education, and stimulating a scientific attitude among students in primary and secondary schools. Furthermore, like the Young Academy, the KNAW aspires to stimulate research- and design-oriented learning.

Also in national science policy, science education is a theme of interest. The Ministry of Education, Culture, and Science (MECS) aims to increase societal involvement in science, and the impact of science communication, through improving science education (MECS 2016). One of the associated actions is the development and implementation of an educational program about the National Research Agenda, in which students can formulate scientific research questions and reflect on what science has to offer. In the National Research Agenda itself, the importance of science education is also stressed, for instance in stimulating boys and girls from all backgrounds to choose a natural scientific education (Kenniscoalitie 2016b).

5.8 Incorporation of AIRR dimensions into science policy discussions

Regarding the AIRR dimensions (anticipation, inclusion, reflexivity, responsiveness), we can distinguish between the roles they play in national science policy together (combined in a framework), and the roles that separate dimensions play in policy.

The AIRR framework was not literally mentioned in the interviews or documents, but some conceptualizations of responsibility that we encountered are related, or bear resemblance, to this framework. An example of this is the way in which RRI is conceptualized in the 2025 Vision for Science (MECS 2014a, see section 5.2). This notion of RRI explicitly includes anticipation, inclusion, and reflexivity. Some of the reports, including the National Research Agenda, mentioned the Responsible Innovation (MVI) approach of NWO as a successful way of incorporating societal and ethical concerns in innovation processes (Kenniscoalitie 2016b). This approach is conceptually quite closely related to the AIRR framework, as it focuses on anticipation, reflection, and inclusion, in the co-design and development of socially and ethically robust innovations (see section 8.2.1).

Anticipation

The most explicit and organized form of anticipation that we encountered in the document study, appears to be the National Research Agenda, which is organized around “routes” towards new areas of societally-embedded research, and “game changers” that have the potential to “profoundly change research” (Kenniscoalitie 2016b: 6). Furthermore, it contains some cross-cutting future-oriented themes, such as the future of big data and digitization, new technologies and systems for enabling sustainable economic growth, and developing new forms of governance for sustainable development.

Responsiveness

Of the separate AIRR dimensions, responsiveness is most explicitly mentioned as an objective of national science policy. In a 2013 report called Towards a Learning Economy, the Scientific Council for Government Policy argued that a well-functioning and learning economy requires responsiveness, i.e. the capacity to quickly and adequately react to new circumstances (WRR 2013). The WRR distinguished three elements of responsiveness: resilience, adaptation, and a proactive attitude. This report inspired the Ministry of Education, Culture, and Science, to incorporate this idea of responsiveness as a key notion in the national science policy. For instance, the 2025 Vision for Science states that Dutch science should be more responsive in terms of reacting to new
(international) developments, absorbing new knowledge, and focusing on practical social and economic applications (MECS 2014a). Accordingly, it argues that the responsiveness of the system of science institutes in the Netherlands should become more responsive to societal concerns, for instance by means of the National Research Agenda.

Other dimensions

A noteworthy example of reflexivity in the context of research and innovation in the Netherlands, is the recent emergence of discussions and initiatives that have been strongly critical and reflexive with respect to the Dutch science system. These are further described in section 4.3 (political and cultural values).

Inclusiveness is an important principle in Dutch science and technology policies, and in Dutch culture and politics more generally. It is discussed in sections 4.3 (political and cultural values), 5.1 (the conceptualization of responsibility), 5.2 (the notion of RRI), 5.4 (societal engagement), and 5.5 (gender equality and diversity).

Also, openness and transparency are important values in the context of research and innovation in the Netherlands. These aspects are discussed in sections 4.3 (political and cultural values) and 5.6 (open access and open science).

5.9 The integrated or fragmented nature of different responsibility related aspects

The different responsibility-related aspects are generally well-incorporated in science and innovation policies (see also section 5.1). Some of the key research and innovation policy reports, such as strategy reports of key science organizations, and governmental reports and documents on national science policy, include different RRI aspects in a way that is comparable to the EC RRI approach, i.e. as separate policy keys that together constitute a policy. These aspects often include open access, societal engagement, and gender and diversity (see for instance KNAW 2016, NWO 2015d, MECS 2014a). Other reports mainly focus on just one of the RRI aspects, such as gender equality, open science, and science communication and education.

RRI as an integrated framework of anticipation, inclusion, responsiveness and reflexivity, is less present in the studied reports. An exception to this is the 2025 Vision for Science (MECS 2014a), which refers to RRI as an approach to participation in research and innovation, that involves anticipation, inclusion, and reflexivity (see section 5.8).

The reports on innovation policy, and particularly the Top Sectors, focus on a cluster of RRI-related themes, rather than on all RRI aspects. These themes usually include: addressing grand societal challenges, societal engagement in the form of public-private collaborations, anticipation of future challenges and breakthrough technologies, and sustainable development.
6. Organizational reviews and outlooks: Wageningen University and Research

6.1 Mapping of the organisation

Wageningen University and Research (WUR) is a research conducting organisation that focuses on life sciences and has a particular strength in agricultural and environmental sciences. In the academic year 2017/2018, WUR had 5,659 bachelor’s students, 5,821 master’s students and 1,975 PhD candidates while employing 4,840 FTE in 2016. Compared with generalist universities in the Netherlands (e.g. RU in the next section - 20,000 students and 4,100 FTE), WUR has therefore a relatively small number of students and many positions are tied to private and public research funding. FTE’s at WUR are split almost evenly between Wageningen University (WU) and between Wageningen Research (WR), which harbors a number of research institutes doing contract research for the government, private parties and others. Though WU and WR are legally separate, cooperation and coordination of research and education between them is strongly encouraged. An organizational chart is provided in Figure 6.1.

![Organizational chart of WUR](image)

Figure 6.1: Organizational chart of WUR

While WUR has a long tradition of applied and impact-driven research, its mission has been broadened in recent decades from the Dutch agricultural sector to global life sciences and biotechnology. Within this specialization, WUR has become established as a world-leading institution with a strong emphasis on its global impact.
One of our core findings has been that WUR is already embracing “responsibility” as an organizing concept while interpreting its responsibilities through contributions to solving global challenges from climate change and global health to food security and animal welfare. The dominance of this interpretation affected our analysis and we added “global challenges” as third category (section 6.2.8) in addition to the RRI Keys and the AIRR dimensions.

Our sampling strategy (for interviews and documents) aimed for evidence across the five science groups (Agrotechnology & Food Sciences, Animal Sciences, Environmental Sciences, Plant Sciences, Social Sciences) and the corporate structure (see figure 1). We conducted 25 interviews of which 16 were located in the science groups, 7 in corporate departments (e.g. Value Creation, Human Resources, Corporate Communications), and 2 in the WUR Library. The Social Science Group was more strongly represented (7 interviews) due to its involvement with core RRI components such as the Gender Action Plan, value creation, and ethics committees. The majority of core documents (e.g. the annual reports and the strategic plans) have been produced by corporate departments.

6.2 Aspects of responsibility in organisational policy and practice

6.2.1 The conceptualizations of responsibility in the organisation

Due to its historical roots in the Rijkslandbouwhogeschool, WUR has a strong tradition of taking an applied and impact-focused perspective. The institutional culture of WUR clearly contrasts with universities that have a tradition of conceptualizing “applied” and “basic” research as competing institutional priorities. Questions of responsibility do therefore not concern whether WUR should aim for societal impact, but rather what impacts are prioritized and how this prioritisation is done.

As an analysis of key documents at WUR shows, WUR understanding of impacts has considerably broadened in recent years. Starting from a focus on economic impacts, both documents and interviews have indicated a clear trend towards a broad understanding of “impact” that prominently includes factors from well-being of individuals to sustainable interactions with environments. This is perhaps best illustrated with the creation of the department of Corporate Value Creation in 2017 and its investigation into defining and measuring societal value creation. This ambition to have impact in a wider sense is also reflected in the WUR mission statement: ‘To explore the potential of nature to improve the quality of life’.

As an analysis of the Annual Reports since 2007 illustrates, this ambition to have a broader societal impact has increasingly been reflected by explicit statements about the responsibility of WUR as a research organisation. Figure 1 represents substantial mentions of “responsibility” in the annual reports of WUR (i.e. excluding phrases such as x is responsible for the budget of y) and shows a clear growth of programmatic interest in the responsibility of WUR as an organization.
This development in the institutional culture of WUR is not only reflected in the quantitative growth of references to “responsibility” but also in the overall status of responsibility-considerations in the annual reports. Between 2007-2011, the annual reports refer to “responsibility” using case-specific examples such as environmental permits that “include responsibility aspects in the areas of energy, water and waste.”\textsuperscript{41} In contrast, recent annual reports go beyond individual cases but present WUR itself as a responsible institution: “With this annual report Wageningen UR wishes to show that sustainability and social responsibility are valued at all levels of the organisation.”\textsuperscript{42} (Annual Report 2015).

WUR’s core documents (e.g. annual reports, strategic plans, corporate brochures) clearly show that it aims to take responsibility for addressing global challenges. However, WUR typically does not go into procedural aspects, such as who gets to define those challenges, or whether its current ways of doing scientific research are the best ways to address them. In the next sections, we analyse how WUR’s institutionalisation of responsibility is expressed through the RRI Keys and AIRR dimensions. However, the prominence of “Global Challenges” framings at WUR also motivated us to add this further dimension in our review (section 6.2.8).

**RRI Keys (6.2.2 – 6.2.6)**

The following sections summarize main findings regarding (a) barriers, (b) drivers, (c) best practices, (d) indicators, and (e) recommendations on each of the RRI Keys. While we did not add subheadings for each of these aspects, information on (a)-(e) can be found in the text and is summarized in the matrixes for each of the keys.

\textsuperscript{41} http://edepot.wur.nl/218885
\textsuperscript{42} https://www.wur.nl/upload_mm/5/7/5/d1114593-7d6a-4488-bcef-7dce51f09374_Jaarverslag%20Wageningen%20UR%202015_UK_08-07-2016_bookmarks_Totaal.pdf
6.2.2 Ethics in the organisation

Starting with the classical focus on morally acceptable *methods and behaviour*, WUR can lean on more overarching guidelines, such as the VSNU’s Codes of Conduct for Scientific Practice. Its integrity code complements this, not only with regard to scientific integrity, but also with regard to proper employee behaviour in general, and with regard to a complaints procedure. Similarly, the Committee for Animal Experimentation and the Medical Research and Ethics Committee are not only good practices: they are also required by Dutch law. There is also a Social Sciences Ethics Committee to evaluate research projects in the social sciences. As opposed to the other ethics committees, ethical approval for such research projects is not compulsory by either Dutch law or WUR regulations. Many social sciences projects thus receive no internal ethical screening, which is problematic. However, an interviewee indicated that such screening could become compulsory in the near future, not in the least because funders increasingly require project proposals to have received internal ethical screening.

Apart from the committees, the Wageningen Graduate Schools (WGS) organise *courses for PhD researchers on ethics and scientific integrity*. Most of these are one-day courses, though some are longer. They are optional for all WUR PhDs, but some are compulsory for PhDs in the Animal Sciences and Agrotechnology and Food Sciences Groups. In addition, WGS strongly recommends all PhDs to follow at least the scientific integrity course. Moreover, all PhDs are expected to know and endorse the VSNU Code of Conduct for Scientific Practice when they graduate.

An interviewee remarked that the increasing gender and cultural diversity of (PhD) researchers necessitates having more discussions on ethics: while severe transgressions like plagiarism are broadly understood to be unethical, there are many ‘grey areas’ of ethical behaviour about which people from different backgrounds have different intuitions on what is acceptable. At the same time, however, several interviewees indicated that PhD researchers often were discouraged by their supervisors from following courses on ethics or other non-specialist topics, as this would distract them from their core research and publication tasks.

As an organisation with its own social and environmental impacts, WUR has also drawn up its own *Corporate Social Responsibility* agenda (‘maatschappelijk verantwoord ondernemen’), maintained and coordinated by the MVO group since 2015. This agenda grew from an earlier focus on sustainability in corporate management and also includes employee wellbeing and development, responsibility for partnerships, transparency, sustainable procurement, etc. WUR students have created their own organisation that is (still) specifically oriented at sustainability at WUR, Green Office Wageningen.

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43 *Ethisch oké?* Interview with Michiel Korthals, then the chair of the Social Sciences Ethics Committee. Resource 17 Jan 2013. [http://edepot.wur.nl/245738](http://edepot.wur.nl/245738) (Dutch).
44 See for an overview [https://wgs.crs.wur.nl/](https://wgs.crs.wur.nl/), section 7.
45 See e.g. the WUR Annual Report 2016, pp. 17-19.
<table>
<thead>
<tr>
<th>Aspects of organisations</th>
<th>Structural issues</th>
<th>Cultural issues</th>
<th>Interchange related</th>
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<tbody>
<tr>
<td>Research ethics committees for animal experimentation; human medical research; social sciences present. Scientific integrity committee present. PhD courses on ethics and scientific integrity. Corporate Social Responsibility agenda.</td>
<td>Research ethics committees for animal experimentation; human medical research required by law. VSNU (Association of Universities in the Netherlands) Code of Conduct for Scientific Practice endorsed by WUR.</td>
<td>Broad consensus on relevance of scientific integrity. Strong sense of responsibility for helping society with ‘global societal challenges’. Increasing cultural diversity of PhD researchers necessitates (more) discussions on how WUR understands scientific integrity.</td>
<td>Research ethics committees for animal experimentation; human medical research required by law.</td>
</tr>
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</table>

| Potential drivers for RRI | Clear and accessible guidelines on scientific integrity. PhD courses provide opportunities for reflection on ethics and philosophy of science. | Strong internal motivation among employees to engage with societal challenges, stemming from WUR’s history and domains. Strong sense that scientific integrity and high-quality research are important. | EU and Dutch funding schemes for RRI-related research. EU and Dutch funders’ pressure for project proposals to undergo ethical screening or incorporate ethics committees. |

<p>| Potential barriers to RRI | Research ethics committees required by law, but do not necessarily promote wider ethical reflection. PhD courses on ethics and scientific integrity only optional for many WUR PhDs; PhDs have to sign the VSNU Code of Conduct for Scientific Practice when graduating, but are not encouraged by the institution to read or discuss it. | Feeling among some that WUR is already ‘world-leading’ in its field; therefore, little need for change experienced. Global societal challenge focus tends to be on research output, not research processes. PhD researchers sometimes discouraged from following RRI courses / organising RRI activities by supervisors, as it would distract them from their research/publication and teaching tasks. | EU and Dutch push for RRI sometimes experienced as nice claims, but not followed through with structural commitments (e.g. significant changes in funding or incentives for researchers). Decreasing government funding and strong government push for collaboration with industry (Dutch ‘top sector policy’) can create tensions in such collaborations. (See also the next section on societal engagement.) |</p>
<table>
<thead>
<tr>
<th>Most important potential organisational actions</th>
<th>Make a course on RRI (including ethics) compulsory for all first-year WUR PhD researchers.</th>
<th>Hold regular discussion sessions on ethical practice. Educate PhD supervisors about the importance of RRI (including ethics) education for PhDs.</th>
<th>Develop a policy on responsible partnerships between university and societal parties (preferably at VSNU level).</th>
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<tbody>
<tr>
<td>Indicators for success</td>
<td>Number of complaints received by the Committee Scientific Integrity.</td>
<td>Adoption of ethical considerations in research projects and grant applications across WUR life science domains</td>
<td></td>
</tr>
<tr>
<td>Potential indicators</td>
<td>% of WUR PhD researchers following a course on RRI (including ethics).</td>
<td>Having a policy on responsible partnerships in place at WUR or VSNU level.</td>
<td></td>
</tr>
</tbody>
</table>

6.2.3 Societal engagement strategies in organisation

WUR has a long tradition in focusing on applied, impact-driven research, particularly WR, and thus has a strong position in public engagement. One interviewee estimated that Wageningen cooperated with over 2000 different actors from the public, private and citizen sectors. This section looks particularly at the following themes:

- Collaboration of researchers with **private sector actors** (the business sector).
- Collaboration of researchers with **public sector or citizen actors** (e.g. government, citizen groups, NGOs).
- Collaboration of **students** with public, private and citizen actors.

Regarding **collaboration with private sector actors**, a significant part of WUR’s funding comes from contract research, co-financing, etc. There is a trend of direct funding from the government for WU not keeping up with the growth of the student population, and a decrease in contract research from the government for WR. Therefore, it is unsurprising that WUR aims to strengthen its collaboration with business.

Many examples can be found in WUR of successful researcher-business collaborations. WUR keeps extensive track of these: the number of indicators for such collaborations is far greater than those used for other public engagement activities (see the matrix). Overall, our interviewees were consistently optimistic about their relations with industry. They stated that their long-term value for companies was exactly in their objectivity, and that companies knew that; or that the fact that they had unique and high-quality research to offer put them in a strong bargaining position. They did mention that dealing with business stakeholders requires particular skills that you currently have to learn ‘on the job’: negotiating contracts, properly setting up experiments, etc. One interviewee mentioned that professional training in these skills would be useful here. (Relevant training in societal engagement at WUR mostly concerns media training, though there is also a course on creating societal impact for PhD researchers.)
However, collaborations with business may also create tensions, particularly regarding conflicts of interest and the autonomy of the researcher. One example of such tensions at WUR is that one interviewee mentioned that WUR has guidelines on collaborations with companies (e.g. no collaborations with companies from countries under a UN embargo; no collaborations with companies involved in illegal activities), but he didn’t know whether they were formalised, and we have not managed to find any online. Potentially ethically questionable collaborations (e.g. with tobacco companies) were discussed in the group or directly with the Executive Board. This interviewee also saw not turning down companies as their responsibility: given the unique position of WUR in the Netherlands, he saw it as their responsibility to be there for everyone who needed them. Therefore, collaboration guidelines should place some restrictions, but not be too restrictive either.

Regarding collaboration of researchers with public sector and citizen actors, the Science Shop has already been named as a place where (Dutch) citizen actors can request Wageningen expertise. It has a budget to fund small projects for those actors who cannot afford to fund their own. Requirements are that Wageningen can provide the needed expertise, and that the question is of broader societal relevance. The Interdisciplinary Research and Education Fund (INREF) program also has its own seed money for projects for the benefit of public, citizen and private actors in the global South. Here, though, the projects tend to be initiated by WUR researchers, with the aim of partnership building with partners in developing countries or emerging economies being one of the funding criteria.46

Interestingly, more interviewees indicated that their groups engaged in research of societal value that was not financially self-supporting or of interest to private actors (e.g. research for the benefit of actors in the global South or for nature and public green), but that it tends to be very challenging to find funds for this kind of research. This will likely remain challenging, given the trend (at least in the Netherlands) to increasingly link public funding to collaboration with the private sector. This observation was often accompanied by the critical remark that the Executive Board was too much concerned with profit-oriented research (e.g. promoting the Dutch Top Sector approach, prioritising nine economic sectors in which The Netherlands is a global leader) and too little with societally valuable but non-profit oriented research.

Students can also do societally engaged research as part of their studies, such as through the Education Project Services WUR and the multi-disciplinary Academic Consultancy Training course, where they have to work in interdisciplinary teams to address a research question in their field of expertise from a societal stakeholder, basically as a team of consultants. Apart from these educational arrangements, there are also student-led organisations that seek to work for or with society. One example is the Peasant Foundation (Boerengroep), that seeks to close the gap between scientific theory and (poor) farmers’ problems and practices.

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<th>Aspects of organisations</th>
<th>Structural issues</th>
<th>Cultural issues</th>
<th>Interchange related</th>
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<td></td>
<td>Various initiatives for societal engagement, such as the Science Shop, Wageningen Dialogues but some interviews also described activities as “scattered” and</td>
<td>Generally, WUR employees are quite active and enthusiastic about societal engagement, particularly business collaborations. However, such activities are sometimes narrowly valued</td>
<td>A significant part of WUR’s funding comes from contract research, co-financing, etc. As noted earlier, there is a trend of direct funding from the government for</td>
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<tr>
<th><strong>Potential drivers for RRI</strong></th>
<th>The WUR Science Shop has a budget to fund small projects. The Interdisciplinary Research and Education Fund (INREF) program has its own seed money. Wageningen Dialogues is a very recent initiative to facilitate dialogues between WUR science groups as well as between WUR researchers and societal actors (see section 6.2.7 for details). Interdisciplinary teams of students address research questions from societal actors in the Academic Consultancy Training.</th>
</tr>
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<tr>
<td>Overall, our interviewees were consistently optimistic about their relations with industry. They stated that their long-term value for companies was exactly in their objectivity, and that companies knew that; or that the fact that they had unique and high-quality research to offer put them in a strong bargaining position. Many interviewees strongly motivated to engage in research of societal value that is not financially self-supporting or of interest to private actors.</td>
<td></td>
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<tr>
<td>Funding schemes in the EU (such as the Science with and for Society component of Horizon 2020) and the Netherlands (such as the National Research Agenda) that stress the importance of collaboration with societal stakeholders.</td>
<td></td>
</tr>
<tr>
<td><strong>Potential barriers to RRI</strong></td>
<td>No policy for responsible partnerships between university and societal parties available to guide collaborations.</td>
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<td></td>
<td>Interviewees did mention that dealing with business stakeholders requires particular skills that you currently have to learn 'on the job': negotiating contracts, properly setting up experiments, etc.</td>
</tr>
<tr>
<td><strong>Most important potential organisational actions</strong></td>
<td>Develop a long-term vision or plan for the place of Wageningen Dialogues in the organisation. Develop a clear vision and commitment to the science shop. Provide researchers with a contact point for pursuing activities such as focus groups, deliberative mapping.</td>
</tr>
<tr>
<td>Several actions can be included</td>
<td>Develop a policy on responsible partnerships between university and societal parties (preferably at VSNU level).</td>
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or citizen panels within the organisation.

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<tr>
<th>Indicators for success</th>
<th>Private-sector cooperation:</th>
<th>Overlaps with ‘structural indicators’ for this Key.</th>
<th>Overlaps with ‘structural indicators’ for this Key.</th>
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<td>Number of public-private partnerships, EU-co-financing projects, patent applications filed, new spin-offs, student start-ups, licenses on patents and breeds, secondments of WUR employees with the business community, formation of cross-departmental market teams.</td>
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<tr>
<td>Collaboration with societal actors:</td>
<td>Number of joint publications with non-corporate partners, customer satisfaction and considered usefulness of Wageningen Research, publications for the general public, TV and radio appearances by WUR staff members, external matching of WUR strategic themes.</td>
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<tr>
<td>Potential indicators</td>
<td>Proposed organisational actions are taken or not; progress indicators not applicable here. WUR has a large number of indicators measuring societal engagement already, particularly for collaborations with the private sector.</td>
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6.2.4 Gender equality and diversity strategies in the organisation

As the 2013 Action plan for gender balance[^47] points out, the “issue [of gender diversity] has become more urgent since it has become clear that WU scores worse on this issue than does nearly every other European university.” Wageningen’s negative track-record in gender diversity is the result of interacting factors of institutional culture at WUR and disciplinary cultures in the life sciences. Recent

[^47]: https://www.wur.nl/web/file?uuid=1ef05948-5a32-42ea-a054-edf438d270c7&owner=2c3db26c-0f76-44f2-b7a1-0c69e32f96d8
numbers of the “Monitor Women Professors 2016” of the Dutch Network of Women Professors show that, while there has been some progress, this has been slow indeed. “At Wageningen University (...), 11.9% of the professors are now women, as compared with 7.6% in 2014.”

While the representation of women at WUR remains unacceptably low in both national and international comparison, the situation is improving. One factor that might have influenced this is the 2013 Action plan for gender balance that identified five already implemented measures: (1) equal opportunities for the tenure track, (2) gender balance in appointment advisory committees (BAC) and selection committees, (3) management reports and discussions that pay attention to the position of women, (4) an explicit focus on the position of women in the annual reports, (5) emphasis of the importance of female candidates for vacancies. Moving forward, the action plan focuses on four components: (a) increasing gender awareness, e.g. through trainings, (b) a systematic approach to mentoring, (c) a realistic approach to appointments, including supportive measures, (d) the creation, support and increase of the visibility of female role models at WUR, e.g. through publication of the book *Inspiring Women at WUR*.

The document analysis and interviews indicated an institutional culture in which gender diversity is recognized as a pressing responsibility issue at WUR. Not only is gender diversity addressed in main documents such as the strategic plan and annual reports but there was also a consensus in interviews about the urgency of addressing the lack of gender diversity at WUR. At the same time, the interviews also indicated a number of institutional barriers. First, there remain tensions between widely shared goals such as an increased representation of women as full professors (25% in 2020 in the Gender Action Plan 2.0) and reluctance to commit to enforceable mechanisms such as quotas for reaching these goals. Second, research on gender and other diversity issues is in a precarious position as the gender chair group does not exist anymore and the gender studies minor (WUGAS) is now defunct.

Though the Gender Action Plan 2.0 focuses on female professors and tenure-trackers, WUR does maintain indicators for female PhDs and women with a permanent contract. This is useful as it helps to show that there is a ‘leaking pipe’ syndrome, where the percentage of women decreases the higher one goes up in the organisation. WUR’s diversity indicators also take non-gender diversity issues into account, such as international researchers and people with poor job prospects.

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<th>Aspects of organisations</th>
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<th>Cultural issues</th>
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<td></td>
<td>WUR scores very low on gender diversity, with only 11.9% of professors being women in 2016. The ambition is to have 25% of WUR professors being women in 2020. Gender Action Plan 2.0 in place for 2017-2019, following the earlier plan from 2014-2016. Plan includes attention and mentoring for women tenure-trackers; gender education for professorial appointment advisory committees; attention to gender in...</td>
<td>Gender diversity, particularly among senior positions and higher management, recognised as pressing concern. Due to its orientation towards “global challenges”, diversity issues are embraced as integral to WUR identity</td>
<td>The 2013 Gender Action Plan mentioned that ‘WU scores worse on this issue than does nearly every other European university’. Clearly, this strengthened a felt need to change.</td>
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<tr>
<th><strong>Potential drivers for RRI</strong></th>
<th>The Gender Action Plan 2.0 provides a number of concrete measures to strengthen gender diversity at WUR. WUR’s annual reports have some non-gender diversity indicators.</th>
<th>Gender diversity, particularly among senior positions and higher management, recognised as pressing concern.</th>
<th>WUR participation in VSNU activities such as the Gender Task Force</th>
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<tr>
<td><strong>Potential barriers to RRI</strong></td>
<td>Research on gender and other diversity issues is in a precarious position at WUR as the gender chair group does not exist anymore and the gender studies minor (WUGAS) is now defunct. No non-gender diversity policy has been implemented at the time of writing.</td>
<td>Reluctance to go beyond ‘soft’ mechanisms (e.g. mentoring, education) for promoting gender diversity.</td>
<td>Focus on gender diversity as an RRI Key is good, but other important diversity considerations should also be taken into account by the EU under this heading.</td>
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<tr>
<td><strong>Most important potential organisational actions</strong></td>
<td>Strengthen and prioritise the internal Gender Action Plan 2.0. Support gender-related research at WUR by reviving the gender chair group and the gender studies minor. Address further diversity dimensions, including ethnicity, in a broader Diversity Action Plan.</td>
<td>Better positioning of gender related research, addressing the lack of a gender studies chair group</td>
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<tr>
<td><strong>Indicators for success</strong></td>
<td>% of female PhDs; % of PhDs with a non-Dutch nationality; % of female professors; appointment of people with poor job prospects in fte; % of employees with a non-Dutch nationality; % of women with a permanent contract; overview of % women per pay grade; % of female managers; number and position of female tenure-trackers. Number of mentor-mentee duos started.</td>
<td>Number of staff members attending awareness sessions; reflection on how awareness sessions were experienced. Possibility to obtain gender education for professorial appointment advisory committees (BACs), to ensure a</td>
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The WUR Gender Action Plan has relevant mechanisms and indicators. Gender diversity at WUR is improving, but has a long way to go yet.

| Potential indicators | The WUR Gender Action Plan has relevant mechanisms and indicators. Gender diversity at WUR is improving, but has a long way to go yet. |

### 6.2.5 Open access and open science strategies in the organisation

Open Access is a topic deemed important at various layers of governance, including the EU and the Netherlands (e.g. the National Plan Open Science⁴⁹) – indeed, for projects funded by the EU’s Horizon 2020 program as well as by the Dutch NWO programs, OA publishing is mandatory.⁵⁰ WUR is currently developing its own Open Access policy, keeping in mind the EU’s aim of having 100% of EU publicly funded academic publications OA by 2020.⁵¹ Moreover, WUR library offers support in OA publishing, has funding arrangements with various publishers⁵² and offers a repository for self-archiving / green OA.⁵³ There is also the ‘Open up to Open Access’ campaign, which figures posters with prominent WUR scientists endorsing OA all over the campus. According to the WUR Open Science blog, the percentage of OA publications in 2016 was 41.6%.⁵⁴ This is about on par with the average of all Dutch scientific publications in that year.⁵⁵ However, the current trend is that this percentage grows with about 7% per year, which means that the trend has to be accelerated if the Dutch government’s aim is to be achieved.⁵⁶

For Open Science, WUR has a weblog (https://weblog.wur.eu/openscience/). WUR has also recently signed the European Open Science Cloud Declaration⁵⁷ that facilitates Open Data, among others. Also, though the 2018 WUR Research Data Policy does not mention Open Data explicitly, it reinforces the need to apply FAIR principles (findability, accessibility, interoperability and reusability) to research data.

While WUR is thus active in promoting Open Access, interviewees note that this development is not uncontroversial. One interviewee mentioned that it is unclear how they should deal with publications

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⁴⁹ [https://www.openscience.nl/](https://www.openscience.nl/)
⁵¹ [http://www.openaccess.nl/nl/actueel/eu-vanaf-2020-is-open-access-de-standaard-voor-alle-wetenschappelijke-artikelen](http://www.openaccess.nl/nl/actueel/eu-vanaf-2020-is-open-access-de-standaard-voor-alle-wetenschappelijke-artikelen)
⁵⁴ [https://weblog.wur.eu/openscience/share-open-access-articles-wageningen-university-research](https://weblog.wur.eu/openscience/share-open-access-articles-wageningen-university-research)
from projects funded by both public and private partners. While the government wants all projects funded (partly) by public money to be Open Access, the private sector sometimes wants to restrict publications on findings that give them a competitive advantage. The researcher is then caught in the middle. Commonly, such disagreements are settled by agreeing on embargo periods. These dilemmas might well occur more often in the future, given that the Dutch government currently wants researchers to acquire more (co)-funding from private parties, a strategy that WUR endorses.

Another worry that several interviewees had, is that of the added societal value of Open Access. Scientific articles are primarily written for scientific peers. As such, non-scientists may not understand them properly, even if they can access them. It was stressed that ‘making science accessible to society’ requires a much more active role of the researcher, inviting stakeholders to meetings or publishing brochures, infographics or other material explicitly aimed at non-scientists. One interviewee stressed that doing this well would require a structural, university-wide change in incentives, where valorization – i.e. the process of making scientific knowledge suitable and available for economic and societal use - becomes more important relative to publications in scientific journals.

The WUR library contact persons for Open Access in an interview considered the greatest barrier for OA at WUR that there is currently too little (formal) incentive to change habitual publication practices, e.g. consider OA as a factor in selecting an appropriate journal for submission of research results. While researchers are generally enthusiastic about the idea of OA when discussing it, few show up at the education meetings / trainings that the OA contact persons organise on location for the different science groups. When the library contacts researchers about archiving their publications in their repository (green OA), they get few replies, or authors don’t know which version they are allowed to upload. This is a challenge from an RRI perspective, but also from a policy perspective (the Dutch government’s aim to have 100% Open Access by 2020) and even from a researcher perspective, as OA publications on average are cited more and thus increase researchers’ citation scores.58

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<tr>
<td>WUR is currently</td>
<td>Researchers are</td>
<td>Open Access is a topic deemed</td>
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<td>developing its own Open</td>
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<td>Access policy, keeping in</td>
<td>enthusiastic</td>
<td>governance, including the EU</td>
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<td>mind the Dutch</td>
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<td>government’s aim of</td>
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<td>National Plan Open Science)</td>
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<td>having 100% of Dutch</td>
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<td>publicly funded academic</td>
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<td>publications OA by 2020.</td>
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58 See the relevant WUR Open Science blog entry at https://weblog.wur.eu/openscience/citation-advantage-open-access/.
| Potential drivers for RRI | The WUR library offers support in OA publishing, has funding arrangements with various publishers (many through the VSNU) and offers a repository for self-archiving / green OA. There is the ‘Open up to Open Access’ campaign, which figures posters with prominent WUR scientists endorsing OA. | Researchers are generally enthusiastic about the idea of publishing Open Access. | Open Access is a topic deemed important at various layers of governance, including the EU and the Netherlands (e.g. the National Plan Open Science) – indeed, for projects funded by the EU’s Horizon 2020 program as well as by the Dutch NWO programs, OA publishing is mandatory. |
| Potential barriers to RRI | No internal penalties for not publishing Open Access (though funders may formally impose penalties). | There is currently too little (formal) incentive to change habitual publication practices, e.g. consider OA as a factor in selecting an appropriate journal for submission of research results. In some cases, it remains unclear how WUR should deal with publications from projects funded by both public and private partners. | RRI key focuses on Open Access, but should ideally be broadened to include Open Data and Open Science. |
| Most important potential organisational actions | Promote explicit consideration of Open Access publications in annual researcher evaluations. Have Open Access education activities during staff meetings | Promote a culture that values OA in which researchers feel encouraged to submit to OA journals, upload their articles to repositories, etc. |  |
| Indicators for success | Number of journals in which WUR (first) authors can publish OA without paying an Article Processing Fee (APC); % of peer reviewed WUR articles published per year; share of WUR OA articles per journal. | Participation of researchers in OA events by the library Number of researchers who respond to OA inquiries and actively upload their papers to repositories |  |
6.2.6 Science education as integrated in research

What distinguishes science education from public engagement is that the former is explicitly aimed at one of three specific groups: students, teachers, or lifelong learners. Educational activities aimed at others (e.g. businesses, broader society) are treated under the societal engagement header. For students, this section will focus on extracurricular (outside regular Bachelor and Master courses) educational activities.

Students: WUR has a Honours Program for talented and motivated Bachelor students that offers education on leadership, group work and extra courses or assignments to increase disciplinary excellence. The multidisciplinary and often international Academic Consultancy Training, also mentioned in the previous section, is compulsory for some Master tracks and allows students to work on real-life cases. Sometimes these cases are brought in by the science shop.

All Dutch universities have a Studium Generale department introduced shortly after the Second World War to provide students and academic staff with a broader education about society beyond the confines of their own discipline. The WUR department focuses on extracurricular education through lectures, workshops and various arts. Some examples of recent activities are: discussions on collaboration of science with industry; reflections on student life during WWII; a lecture series on modern slavery. During an interview, a Studium Generale employee stressed that they pay particular attention to intercultural diversity and bringing people from different backgrounds together. Studium Generale furthermore has a Certificate program where students can get a certificate for attending and reflecting on those activities.

Teachers: WUR offers Educational Staff Development courses for teachers, if desired leading up to a University Teaching Qualification (UTQ or ‘BKO’ in Dutch). The Qualification was developed in 2008 by the VSNU to create a quality standard for teachers in higher education in the Netherlands. Achieving it, usually within three years, is compulsory for new WUR teachers whose contract includes more than 10% teaching. For the UTQ, teachers have to follow a number of courses on e.g. planning and developing teaching, carrying out teaching and testing and assessment; apply insights gained to their own teaching and reflect on how they teach in a written portfolio. WUR also offers education for research professionals, e.g. career development for PhD’s; courses on patents; laboratory skills, etc. Teachers can also attend Studium Generale activities.

Lifelong learning. WUR has some initiatives to bring life sciences to the attention of children in primary and secondary education. There is the Science Hub (‘wetenschapsknooppunt’) for primary education, that invites children and teachers to the university and also develops activities and lesson plans. The Food Valley VO-HO Network is a network of secondary education schools and

62 https://esd.crs.wur.nl/
universities of applied sciences (‘hogescholen’) in the vicinity of Wageningen that offers to bring knowledge to and inspire children and students.\textsuperscript{64}

For mid-career professionals and executives, WUR offers courses, summer schools, seminars, etc. through \textit{Wageningen Academy}.\textsuperscript{65} Both professional skills and specialised, state-of-the-art knowledge are taught. WUR’s \textit{Centre for Development Innovation also} offers lifelong learning opportunities, though these are especially aimed at mid-career professionals from developing countries, and focus on creating capacities for change.\textsuperscript{66} As a member of edX, WUR offers a number of Massive Open Online Courses (MOOCs), many of which can be followed for free by anyone.\textsuperscript{67}

Of all these, education activities that incorporate RRI-relevant aspects such as ethics or reflexivity are particularly the Academic Consultancy Training (multidisciplinary work on real-life cases) and Studium Generale (reflecting on social/ethical topics related to the life sciences; intercultural diversity).

\textsuperscript{64} \url{https://www.wur.nl/nl/Onderwijs-Opleidingen/Docenten-vwo/Food-Valley-Scholennetwerk.htm}. (Dutch).
\textsuperscript{65} \url{https://www.wur.nl/en/Education-Programs/wageningen-academy-1.htm}. Before 2013, Wageningen Academy was known as Wageningen Business School.
\textsuperscript{66} \url{https://www.wur.nl/en/Expertise-Services/Research-Institutes/centre-for-development-innovation/short-courses.htm}.
\textsuperscript{67} \url{https://www.wur.nl/en/Education-Programs/online-education/MOOC.htm}. 

44
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<tr>
<td>WUR offers various science education options to various stakeholders, from school children to adult professionals. Many of the courses are specialist: education activities that incorporate RRI-relevant aspects such as ethics or reflexivity are particularly the Academic Consultancy Training (multidisciplinary work on real-life cases) and Studium Generale (reflecting on social/ethical topics related to the life sciences; intercultural diversity).</td>
<td>Science education is a well-established part of WUR identity and culture.</td>
<td>All Dutch universities have a Studium Generale department, introduced by the government shortly after the Second World War to provide students and academic staff with a broader education about society beyond the confines of their own discipline</td>
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| Potential drivers for RRI | (1) The Academic Consultancy Training is compulsory for some Master tracks and allows students to work on real-life cases. (2) Studium Generale focuses on extracurricular education through lectures, workshops and various arts. (3) WUR offers Educational Staff Development courses for teachers. (4) WUR has some initiatives to bring life sciences to the attention of children in primary and secondary education. (5) For mid-career professionals and executives, WUR offers courses, summer schools, seminars, etc. (6) WUR’s Centre for Development Innovation also offers lifelong learning. (7) As a member of edX, WUR offers a number of Massive Open Online Courses | Much enthusiasm among researchers to share their knowledge. | The University Teaching Qualification was developed in 2008 by the VSNU to create a quality standard for teachers in higher education in the Netherlands. |

| Potential barriers to RRI | Quick growth of student numbers at WUR can lead to inadequate educational offers Academic Consultancy Training does not require schooling in RRI processes or ethics beforehand. | WUR is a research oriented university and focus on research competitiveness can limit interest in education |
### Indicators for success

| Indicators for success | Number of students and teachers reached through Science Hub and Food Valley VO-HO Network activities; number of courses offered by Wageningen Academy; number of students following courses with Wageningen Academy; number of courses offered by the Centre for Development Innovation; number of students following courses with the Centre for Development Innovation; number of WU MOOCs; number of students who register for / complete a WU MOOC. |

### Potential indicators

Science education at WUR seems to be in a good place. Education is offered for age groups both before and after the typical student population, from primary (Science Hub) and secondary education (Food Valley Network; Wageningen Borlaug Youth Institute) to mid-career professionals and executives (Wageningen Academy). WUR offers education for professionals from developing countries as well (Centre for Development Innovation).

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6.2.7 Incorporation of AIRR dimensions into policies

“Grand challenges” play an important role in WUR’s vision statement of what it aims to address, as well as in stimulating current debates among researchers at WUR (see section 6.2.8). However, as two Wageningen researchers investigating RRI at WUR already have noted: ‘Wageningen UR needs to go beyond interdisciplinarity and public-private partnerships as the way to approach grand challenges, some of which are wicked problems.’ Rather, a substantive notion of responsibility in this context needs to engage with procedural questions of how grand challenges are identified and prioritized; who gets to be included in the process; and at which stage.

In this sub-section we first look at barriers and drivers at WUR for organising AIRR activities, before turning to an analysis of the status of the AIRR dimensions themselves at WUR.

1. In terms of institutional structure, it was noticeable that various anticipation, inclusion and reflexivity initiatives by individual researchers and research teams were pointed out while it remained less clear how such initiatives are institutionally embedded and fostered. In one of the interviews, public engagement activities were described as largely “scattered” and “fragmented” in the overall structure of WUR. Another interviewee remarked that initiatives such as the Wageningen Dialogues were a laudable way to increase public engagement. However, their impact would remain limited as long as researchers would receive no structural incentive to engage in communication activities (as they do for e.g. publishing in journals with a high impact factor).

Fragmentation appears to be an apt description given that core documents such as the annual reports do not indicate larger integrative efforts along any of the AIRR dimensions,

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but do illustrate a variety of initiatives. For the RRI keys there tends to be less fragmentation, with one responsible institution (e.g. the library for Open Access) or several (e.g. Studium Generale, the Wageningen Academy and several others for science education).

2. In terms of institutional culture, one recurrent topic of conversation was the character of public involvement. The social sciences in WUR have a long tradition of research on public engagement and various cross-disciplinary activities exist to integrate this social science expertise with the life sciences at WUR. However, one of the worries that is especially prevalent at the social sciences department is that a more substantial interpretation of public engagement along the AIRR dimensions does not always match the understanding and interests of life science research groups. This worry was described as a tendency to “attach” public engagement components to rather autonomous research projects and to focus on questions of technology acceptance and dissemination. This has its roots in the classical view on science, that good science is done autonomously and by disciplinary specialists, to be disseminated to the public once it is done. Existing reward mechanisms at universities and research funders tend to reinforce this view.

Institutional structures and institutional cultures can constitute barriers for procedural responsibility along the AIRR dimensions. Of course, these challenges are not unique to WUR but commonly found across universities and research institutions. On the other hand, the review process identified several institutional drivers of AIRR activities at WUR as well.

(1) The science shop is an established institution at WUR for public engagement and, though it has sometimes been in a precarious position, has been a crucial instrument of dialogue between science and society at WUR for more than 25 years. The science shop provides civil society organizations with little funds of their own with opportunities to receive research support; WUR with opportunities to contribute to the societal significance of its research; and WUR students with opportunities to hone their skills on real-life cases.

(2) When it comes to other forms of public engagement, the strongest asset of WUR is the close integration of social science and life science research across Chair Groups and Research Institutes. While the use of this multidisciplinary expertise for RRI is not institutionalised, except for the investment themes, many research groups have initiated promising projects. For example, the synthetic biology group is actively concerned with the integration of RRI perspectives in their research and the EVOCA project employs an RRI perspective by using digital technologies and citizen science to address development challenges in Africa.

(3) One recent initiative from the executive board that seems to fit the AIRR dimensions very well is the Wageningen Dialogues. The Dialogues have the goal to “shape our contacts with stakeholders and society […] in the form of dialogue.” Currently, Wageningen Dialogues is just beyond an exploration phase, where working formats have been found and several dialogues have been organised that both researchers and stakeholders have been enthusiastic about. However, the Dialogues lack visibility and their long-term effects are as of yet uncertain. Noteworthy, though, is that WUR plans to build a Dialogue Centre on campus, specifically designed to facilitate dialogues.

Below we move on from general procedural considerations to a specific examination of anticipation, inclusion, reflexivity and responsiveness at WUR.

69 http://www.wur.nl/nl/Over-Wageningen/Wageningen-Dialogues/Waarom-willen-we-dialogen.htm
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<tr>
<td>WUR focus on emerging technologies and global impacts requires engagement with AIRR dimensions. However, their institutionalization remains heterogenous with strengths in <strong>inclusion</strong> but lack of institutionalized <strong>anticipation</strong> and often insufficient depth in <strong>reflexivity</strong> and <strong>responsiveness</strong>.</td>
<td>WUR identity of “global challenges” and “improving the quality of life” deeply affects attitudes towards AIRR dimensions but also creates tension with focus on private funding and competitiveness in research outputs.</td>
<td>Strong collaborations with international partners, with Dutch private funders and especially with the agri-food sector</td>
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| Potential drivers for RRI | Strong representation of life science fields (biotech, environmental sciences) that raise **anticipatory** questions and require **reflexive** and **responsive** engagement. WUR domains very much a subject of public concern. Therefore, stakeholders push for **inclusion**, **reflexivity** and **responsiveness**. Institutionalization of global orientation fosters **inclusion**. Various institutions such as **Studium Generale**, **Wageningen Dialogue**, and **Wageningen International** can increase **inclusive** and **responsive** capacities. | The “grand challenge” perspective of WUR and the increasing emphasis on social impact encourages projects that need to **anticipate** wider effects from climate change to sustainability and to **include** various stakeholders. Prominence of wicked problems increases need for activities along **all four AIRR dimensions**. | Strong focus on international orientation fosters collaboration with diverse actors, in diverse geographic contexts, with diverse agendas |

| Potential barriers to RRI | Fragmentation of institutional structures that are concerned with activities surrounding AIRR dimensions. No entity that is taking explicit responsibility for **anticipatory** challenges at WUR. Strong reliance on grants and private partnerships. | “Grand challenges” are conceptualized as tame rather than wicked problems which limits **reflexivity** about different framings and recognition of the importance of **including** actors who prefer different framings. Strong culture of competitiveness and funding | WUR strongly relies on private partnerships that prioritise the problem framings and interests of industry actors rather than encouraging AIRR activities |
| Most important potential organisational actions | Institutionalize value creation criteria that are not dominated by economic reasoning but put sufficient emphasis on social dimensions. Create project teams to address wicked problems with not only disciplinary skills, but also skills in organising RRI activities and establish evaluation criteria of researchers that reflect activities along all AIRR dimensions. Strengthen existing institutions that contribute to AIRR such as inclusion through Wageningen International and responsiveness through the science shop. | Foster interaction between social sciences and natural sciences to facilitate anticipatory and inclusive practices. Deepen the dialogue about grand challenges to increase reflexivity about multiple framings and responsiveness towards them. Develop a policy on responsible partnerships between university and societal parties (preferably at VSNU level). Actively foster interaction with multiple societal partners – including those who represent relevant stakeholders but are less considered in economic value creation. |
| Indicators for success | Evaluation criteria that are employed by department of value creation. Evaluation criteria in the tenure track. Work responsibilities of WUR researchers. Number of explicit anticipatory activities across WUR. | Self-presentation and framing of grand challenges in annual reports, strategic plans, corporate brochures, etc. Diversity of private and public partners that reflect different interests in society rather than primarily the availability of funds. |
| Potential indicator for improved performance of the dimension in the research activities/programs | The main challenge for incorporating AIRR in WUR is acknowledgment of multiple framings of “global challenges” and multiple ways of responding to them. Progress will be indicated by approaches to “global challenges” in core documents of WUR and the institutionalization of capacities to reflexively engage with (and respond to) multiple framings that are embraced by heterogenous stakeholders. |

### II.2.1 Anticipation at WUR

Based on our interviews and document studies, we found little evidence of systematic anticipatory activities at WUR. There is anticipation on several levels, namely, anticipation of societal challenges (such as climate change and food insecurity) and anticipation of strategic challenges (such as declining funding from the government). Strategic challenges tend to be discussed at WUR at the relevant corporate department (particularly, that of Corporate Strategy & Accounts). However,
overall there is still a trust that existing ways of doing research will be sufficient to address the societal challenges. Moreover, as several interviewees noted, big promises and optimistic visions in grant proposals tend to be (financially) rewarded, while researchers have little if any accountability afterwards for any lack of results, or problematic results due to a lack of critical reflection. (Note that this is a problem of Dutch/EU research funding in general, rather than for WUR specifically).

Explicit, substantial anticipatory activities in research processes are only included on an ad hoc basis. In general, WR seems to be more concerned with those than WU. This is possibly because its contract research and focus on applied rather than fundamental science naturally brings questions of successful implementation and societal effects to the forefront. An example of a good practice is the Centre for Development Innovation (CDI)’s work on multi-stakeholder partnerships and the Theory of Change.

II.2.2 Inclusion at WUR

In other sections of this review, we specifically look at inclusion along gender and diversity lines; making research available to everyone through Open Access schemes; engagement of societal stakeholders in the research process and extracurricular education opportunities, that is: education beyond the curriculum for WUR students, and education of non-WUR students. In general, though there is no central institution in WUR to coordinate inclusion of stakeholders in the research process, several institutions cover aspects of this dimension. Furthermore, there are many relevant initiatives on the level of individual researchers and projects. Most salient WUR-wide examples are the Corporate Communications & Marketing department that facilitates science communication activities; the Wageningen Dialogues, to facilitate dialogues between science and society; the Corporate Value Creation department that is developing a WUR vision on societal value creation; and the science shop that offers societal stakeholders who lack funds for contract research access to WUR students and staff, on a limited scale.

II.2.3 Reflexivity at WUR

Though reflexivity as such is not institutionalised at WUR, there are various trends and initiatives that can help promote it. One such trend is the ongoing work to integrate WU and WR research and to promote multidisciplinary cooperation, for example, through the current investment themes. As researchers from different backgrounds tend to have different visions on and solutions for problems, such cooperations facilitate reflection on one’s own ideas and assumptions. Wageningen Dialogues also has the potential to stimulate reflection, though it is currently too early to say whether this indeed occurs systematically. Studium Generale facilitates reflection as well, though its main public is students rather than WUR employees. One specific form of reflection is reflecting on ethics and scientific integrity in research. A final form of (meta-)reflexivity is doing research on how to properly do RRI, societal engagement, deal with wicked problems, etc. An example of a good practice here is, again, the Wageningen Dialogues, that has been set up with advice and help of the Strategic Communication group. More often, however, such research remains limited to specific projects or chair groups and has little or no impact on WUR as a whole.

II.2.4 Responsiveness at WUR

Anticipation, inclusion and reflexivity exercises on their own cannot do good unless researchers can be responsive to their results. This, again, depends for a large part on the formal reward structure of

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70 The proposal for a future investment theme is ‘navigating trade-offs in an uncertain world’, which would also be strongly compatible with WU – WR, multidisciplinary research.
WUR: is being responsive actually incentivised in some way? Again, there is a salient difference here between WR and WU. As WR mostly does contract research for societal stakeholders, its researchers need to be responsive to their concerns or risk customer dissatisfaction and diminishing project funding. (Note, though, that a researcher can be responsive to customer concerns but not to those of other societal stakeholders, which would not be the kind of responsiveness RRI aims for).

A barrier to responsiveness is that, if an innovation fails in society, encounters resistance or has unexpected negative consequences, WUR is usually so far ‘upstream’ that it is not held accountable, and thus, has no reason to be responsive. Interviewees gave examples such as pesticide use in intensive agriculture, electric pulse fishing and genetic modification. They argued that WUR might not be accountable for resulting problems of or societal resistance to these innovations, even though it has participated in realising them. However, they also thought that, if the relevant WUR research processes had exhibited more anticipation and societal engagement, some of these problems might have been prevented or dealt with at an early stage.

For these reasons, several interviewees argued that a deeper change in WUR’s formal evaluation structure, that mostly reward publications, was needed. If this were not done, they argued, value creation exercises such as the Wageningen Dialogues would at best have a superficial and short-lasting impact, and responsiveness to societal concerns would remain limited. The creation of the department of Corporate Value Creation, and the search for indicators for social value creation, could be the start of such a deeper change, if managed wisely.

6.2.8 Other concepts used to characterise responsibility in the organisation

While RRI Practice emphasizes the RRI Keys and AIRR dimensions, WUR primarily sees its responsibility in terms of addressing global societal challenges. Given the dominance of this framing in key documents and interviews, we decided to incorporate “global challenges” as a third theme in addition to the RRI Keys and the AIRR dimensions. Indeed, the role of WUR in addressing “grand” or “global” problems is commonly emphasized in the presentation of the institution and its strategic direction:

1. The Corporate brochure WUR 2017 introduces the ambitions of WUR through a “global challenges” perspective.71

2. Vision Statement: While the short WUR vision statement does not mention “innovation” or “responsibility”, it is largely an articulation of the global challenges idea, phrased here as “urgent challenges”72

3. The Strategic Report 2015-2018 also frames the future positioning of WUR in terms of a grand challenge perspective: “Since our inception, we have been driven by our desire to make a significant impact. This is our inspiration: Science for Impact. We contribute to solutions for major social issues such as the world food problem, climate change, the development of a circular economy, conservation of nature and biodiversity, and poverty reduction.”73

71 http://edepot.wur.nl/328195


73 https://www.wur.nl/upload_mm/5/e/b/929b8071-3b1a-416c-bb43-0630b726e75c_8412101823_CC_strategisch%20plan_UK_LR.pdf
WUR does not only embrace a “grand challenges” perspective in its self-presentation but also in its practical investment priorities. For example, the strategic plan 2015-2018 identifies five investment themes that are of crucial importance for addressing wider societal problems on a global scale: (1) Global One Health, (2) Resource Use Efficiency, (3) Resilience, (4) Metropolitan Solutions, and (5) Synthetic Biology. These themes are explicitly acknowledged to require both fundamental and applied research, to require an interdisciplinary approach and to be addressed by public-private partnerships. Regarding the latter, WUR researchers stress that cooperation with business not only yields research funding, but also allows them to help businesses to reflect on their own processes and practices and become more responsible and sustainable.

6.3. Reflection on Review findings, Outlooks developed and ways forward

6.3.1 The integrated or fragmented nature of different responsibility related dimensions

Overall, WUR shows a number of clear strengths in relation to embedding science in society. WUR takes responsibility for societal issues in the domains of healthy food and the living environment, as for example witnessed by its mission, vision and latest strategic plan. It considers multidisciplinary research as very important; its very organisational structure is one of linking more fundamental (WU) research with more applied (WR) research; and it has a historical tradition of aiming at ‘science for impact’. It supports initiatives that fit under the banner of RRI, including those that are aimed at the organisation (e.g. the Gender Action Plan) and those that are aimed at society at large (e.g. the science shop, Wageningen Dialogues).

One of our main findings has been the increasing importance of “responsibility” as an organizing concept at WUR and its framing along contributions to solving global challenges. This perspective has an integrative function as different RRI dimensions from ethics and societal engagement to gender and inclusion can be approached by emphasizing their relevance for addressing these challenges. These integrative aspects are also already partly reflected in the institutional structure of WUR with aspects such as societal value creation and Wageningen International being centrally institutionalized in the corporate structure of the organization.

At the same time, we also found that the focus on global challenges can lead to neglect of crucial components of AIRR such as reflexive and responsive engagement with how challenges are framed and potential solutions are negotiated. Furthermore, fragmentation turned out to be a common effect of the institutionalization of issues around RRI Keys such as Open Access initiatives of the WUR library, the Gender Action Plan, or ethics committees. These more specific institutions rarely situated themselves in a broader RRI concept and rarely reach out towards other keys.

6.3.2 Common barriers or drivers

Our review indicates that WUR has adopted “responsibility” as an organizing concept that reflects a strong culture and leadership around some aspects of RRI. Especially where responsibility is entangled with global challenges, WUR is also willing to invest substantial resources that have contributed to making WUR an increasingly inclusive and publicly engaged organization. At the same time, there are very clear limitations along dimensions of culture, leadership, and resources. In terms of resources, there is a strong emphasis on private funding and grant acquisition that makes resources for global challenges and other RRI dimensions often contingent on sufficient economic value creation.

In terms of culture and leadership, a core barrier is the discrepancy between the desire for social value creation and responsible research that many interviewees had, and the formal reward....
mechanisms (annual evaluations, tenure-track requirements) that govern their behaviour at WUR, that focus on scientific publications and obtained research grants. One of our key recommendations in the Outlook is that these be better aligned through the inclusion of societal value criteria and indicators in those formal reward mechanisms. Moreover, expertise in societal value creation among personnel should become more important in hiring decisions and research team formation.

Some aspects of socially responsible research have a central institutional coordination and information point at WUR. This includes Corporate Communications & Marketing for science communication, and Corporate Value Creation for (societal) value creation. However, there is no central institutional home at WUR for socially responsible research. Given the expertise of the CVC department with (societal) value creation and the expertise of its science shop with public engagement activities, we propose to make a WUR contact point in the CVC for RRI / public engagement activities.

Concerning ethics, while the WUR has several ethics committees and subscribes to the VSNU Code of Conduct for Scientific Practice, courses in ethics and scientific integrity are available but optional for most students and staff. We recommend to make following such a course mandatory for at least PhD researchers to maintain ethical standards in a dynamic and diversifying environment.

6.3.3 Final reflections and plan for follow-up

There is a fundamental tension between WUR’s institutional culture and its institutional structure when it comes to societal value. On the one hand, both WUR and its scientists are driven, often quite explicitly and vocally, by the desire to create societal value. On the other hand, formal reward mechanisms at WUR, while not disconnected from societal value, are not sufficiently aligned with it. As one interviewee put it, WU basically rewards its researchers for high-impact publications, and WR rewards them for project acquisition.

‘Value creation’ is now an official pillar of WUR next to ‘research’ and ‘education’, and recently the main WUR website has been adjusted to reflect this. However, there are still gains to be made in institutionalising value creation more thoroughly, for societal value more than for economic value, and in defining links and trade-offs between different values.74 Our Outlook and plans for follow-up emphasize four larger themes.

- Develop mission-relevant, context-specific indicators for societal value creation. A CVC interviewee suggested a ‘fan’ of indicators from which Science Groups can pick and choose those most relevant or applicable to their own research. The Science Groups should be consulted throughout this process to get input and feedback on the set of indicators. Also, to keep a broad scope a balance should be maintained between ‘outcome’ indicators (valuable results), ‘process’ indicators (RRI/engagement activities during research) and ‘perception’ indicators (how these activities and results are perceived by the public).75 The task of developing societal value indicators is currently and should remain the responsibility of the CVC. The interviewee also told us the KNAW (Royal Dutch Academy of Sciences) is developing indicators for the societal impact of science as well.

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74 Several interviewees mentioned the donut economy as a promising example of how social, environmental and economic values can be linked together to form a sustainable system. See e.g. Kate Raworth’s (2017) Doughnut Economics. Random House Business.

- Appoint personnel with a focus on societal value creation. These staff members would help researchers develop their value creation and societal engagement activities, or organise such activities themselves. We recommend appointing scientific personnel with relevant expertise (e.g. comparable to teaching assistants); or tenure-trackers or senior ‘figureheads’ within a science group.

- Extend researcher evaluation with value creation criteria. This is another place where value creation and societal engagement activities should explicitly be made part of researcher activities, and become a topic of discussion between researchers and group chairs. (Note that especially for WR employees this requires allocating a set number of hours to such activities). This requires commitment of group chairs to have meaningful discussions with group members on the topic. We recommend to strive for excellent teams in deciding whose evaluation to extend, e.g. make it the responsibility of the chair group holder to create a balance between excellent researchers, teachers and value creators. Furthermore, use should be made of existing initiatives to connect WU and WR researchers, where WU groups should not only seek cooperation with WR groups on relevant topics and vice versa, but also for gaining access to relevant skills.

- Make societal engagement an integral part of WUR’s investment theme(s). In its previous Strategic Plan, WUR identified five investment themes: strategic topics at the intersection of scientific disciplines in the WUR domain as well as at the intersection of WU and WR activities. Exactly because these themes are interdisciplinary and relate fundamental to applied research, setting them up according to an RRI-like structure would help the involved researchers deal with the different kinds of knowledge, visions and problem framings that such themes inevitably evoke.

As of July 2018, we have distributed the review and outlook to interviewees and stakeholders for final feedback. In October 2018, we plan to distribute more widely a professionally designed version of the report that incorporates final feedback. The final and professionally designed report will also be used to make contact with the executive board and other decision makers at WUR. We will use these meetings not only to present our findings but also to discuss concrete commitments regarding our recommendations in the outlook.
7. Organizational reviews and outlooks: Radboud University Nijmegen

7.1 Mapping of the organization

The Radboud University Nijmegen is a broad, internationally oriented research university that performs research and provides education across nearly all scientific disciplines, including the humanities and natural, social, behavioral, and medical sciences. RU is connected to the Radboud University Medical Centre (RUMC), which provides patient care and medical research and education. RU employs around 4,100 FTE, and provides education for around 20,000 students; RUMC has around 10,000 employees and 3,500 students.

Nijmegen already had a university from 1656 until 1679, that was closed due to a lack of funds. In 1932, the Catholic University Nijmegen was established. The university aimed to promote the emancipation of Roman Catholics in the Netherlands, who were “strongly underrepresented in public administration, the legal profession, medicine and other sectors”76. This ideal of emancipation is still part of the organizational identity.

RU aspires to be an excellent, internationally leading university that performs top-of-the-line scientific research. Furthermore, its mission stresses the importance of academic freedom, and emphasizes ethical reflection and contributing to solving societal problems as key objectives.

Figure 7.1: Organizational chart RU and RUMC.

RU and RUMC both fall under the Catholic University Foundation (see figure 7.1). The Board of this Foundation “supervises and advises the Executive Board of the Radboud University and the Board of Directors of the Radboud University Medical Center”77. The Executive Board of RU “has a statutory responsibility for the University and establishes the general policy for the seven faculties”; each faculty has its own faculty board that “leads and governs the faculty”78. Furthermore, RU has several

76 https://www.ru.nl/english/about-us/our-university/history/radboudhistory/
77 https://www.ru.nl/english/about-us/organisation/stichting-katholieke-universiteit/
consultative bodies that “regulate student and staff participation and input”\textsuperscript{79}. These bodies include the University Council, Faculty Councils, Works Council & Representative Councils, University and Faculty Student Councils, and Program Committees for the educational programs.

For this review, we included both RU and RUMC. We focused on university-wide policies, issues, and developments, and zoomed in on three departments; besides RUMC, these include the Nijmegen School of Management (NSM) and the Faculty of Science (FS). The review is informed by document analysis and a total of 20 interviews. 7 of these interviews were with employees who are involved in university-wide matters or departments (e.g., the scientific integrity committee, gender policy, research data management support). The remainder of the interviews were with representatives of the three faculties. For the latter interviews, we involved respondents with a variety of disciplinary backgrounds and professional positions. Most of these interviewees are in senior positions, and are often involved in policy matters, management, and strategic issues.

7.2 Aspects of responsibility in organizational policy and practice
7.2.1 The conceptualizations of responsibility in the organization

The interviewees were asked to describe what they think responsibility in research and innovation means, and what their associations with the term are. Across the interviews, some main themes were mentioned relatively often. These are:

- Societal engagement, for instance researching and solving societal problems, or creating knowledge or applications that are useful to society.
- Ethics, particularly performing ethically sound science and promoting scientific integrity.
- Accountability, notably being accountable for using public money for performing scientific research in a transparent, efficient, and useful way. This association can be explained by the fact the Dutch translation of the term responsible (verantwoord) signifies both responsibility and accountability.

Many respondents stated that the term responsible was a new term for them in the context of reasoning about research and innovation. Moreover, the terms RRI and responsibility (in the RRI-related meaning of the word) are absent in the documents that have been analysed. This indicates that the terms RRI and responsibility (in direct connection to research and innovation) are not embedded in the organizational discourse of RU.

Our materials indicate that conceptualizations of responsibility strongly vary across the different faculties, and sometimes also across disciplines. RU appears to lack a central framework of RRI, but we found various responsibility-related frameworks, concerns, and operationalizations in different parts of the organization.

In the FS, respondents argued that an important societal contribution lies in educating high-skilled professionals who work in companies and societal organizations after graduation. A key concern in this faculty relates to the perceived tension between the long time horizon of fundamental research, and the pressures (for instance in science funding) to produce results that are societally and economically useful in the short term. This has recently led to discussions about how the research focus of the faculty can combine curiosity-driven and application-oriented research (see for instance the strategic plan 2016-2020 “Science that Matters”).

\textsuperscript{79} https://www.ru.nl/english/about-us/organisation/works-council/
In the NSM, societal engagement and relevance are seen as key elements of the scientific identity and practice. This faculty has “responsible organization” as a key framework for its research, which is inspired by Corporate Social Responsibility (CSR).

Also in RUMC, societal engagement and relevance are seen as essential elements of the organizational and scientific identity. In this part of the organization, responsibility is strongly related to ethical reflection, assessment and regulation in the context of medical research. RUMC has various responsibility-related agendas and frameworks. For instance, it has an ambitious and holistic sustainability agenda (also inspired by CSR) that involves a wide spectrum of issues and objectives, ranging from energy and materials to reducing research waste and promoting efficiency in medical research. Furthermore, the Radboud Biobank employs an ELSI framework to address ethical, legal, and societal issues.

7.2.2 Ethics in the organization

A. Description of the practice and its development and an assessment of how well it currently works

With respect to ethics at the Radboud University, three main themes emerged from the interviews and document study: scientific integrity, ethical regulation and assessment, and ethical reflection.

Scientific integrity is currently a major topic in Dutch academia, and this is no less at RU. Some notorious scientific fraud cases in the Netherlands, including the Stapel fraud case that was revealed in 2012, incited universities and other science organizations to strongly prioritize scientific integrity. At RU, a university working group on integrity was formed, which in 2012 provided advice on better embedding scientific integrity in the daily practice of research and education at RU. Subsequently, the executive board of the university implemented several measures. For instance, an advisory council scientific integrity was installed, which served as a think tank for RU on integrity-related matters. An important objective of this council was to promote the structural embedment of various aspects of integrity in the organization, which include integrity in education, installing confidential integrity advisers, promoting sound data management, and organizing relevant events and knowledge sharing initiatives.

RU has two confidential advisors on scientific integrity, and a scientific integrity committee that examines complaints about integrity and gives advice to the executive board. The procedures of these advisors and the committee are defined in the university's academic integrity regulations. Cases that have been handled by the committee, are published on the website of The Association of Universities in the Netherlands. Besides the integrity regulations, other codes of conduct at RU include regulations on undesirable behavior, a whistle-blower’s regulation, and secondary activities regulations. Furthermore, the RU endorses national codes such as the Netherlands code of conduct for scientific practice, the code of good governance for universities, and the code of conduct for animal testing transparency. The integrity advisory council’s recommendations on embedding integrity in education have resulted in the implementation of integrity education, for instance in PhD programs and academic leadership courses. Also, in 2017, the first annual “scientific integrity afternoon” was organized, which included debate between prominent RU scientists on integrity dilemmas concerning authorship.

Several interviewees argued that promoting scientific integrity is, for an important part, a matter of organizational culture that involves awareness-building through education and dialogue. They argued

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80 https://vsnu.nl/overzicht-wetenschappelijke-integriteit.html
that promoting integrity is a matter of having frequent discussions, for instance about integrity dilemmas. One of the interviewees for instance stated:

“We try to make sure that it [research integrity] is a topic of conversation that is not just confined to a couple of training days. We for instance suggest to the participants that, after the training, they get together in informal sessions, in which they discuss the topics every now and then.”

A second main topic regarding ethics is ethical regulation and assessment. The ethical assessment of medical research and research with animals is regulated by law in the Netherlands. Medical research that falls under the Medical Research Involving Human Subjects Act (WMO) needs to be assessed by an accredited Medical Research Ethics Committee. Research with animals needs to be approved by the Central Animal Experiments Committee, which is the national assessment committee for animal experiments. The assessment of this central committee is informed by the advice of an accredited local Animal Ethics Committee. RU and RUMC host such accredited committees for both medical research and animal experiments. For the assessment of research that does not fall under one of these regulations, but that does raise ethical questions, RU has ethical committees at the faculty level.

Ethical reflection in an university comes in all shapes and sizes, and is often an implicit and embedded part of academic practice. An explicit and organized form of ethical reflection at RU can be found in the Radboud Reflects department. This department organizes various kinds of activities that are aimed at ethical reflection and societal engagement. These include programs and lectures for a general public, often on current societal or scientific developments. Furthermore, the department organizes programs and activities for ethical and societal debate and reflection in the internal organization, for instance for PhD students or particular faculties.

Ethics and philosophy courses are a compulsory part of all Bachelor and Master curricula at RU. The value that is attached to such courses can in part be understood in the context of the Catholic origin and identity of the university.

B. Main barriers (structural, cultural or related to interchange dynamics)

With respect to ethical regulation, assessment, and reflection, no barriers were mentioned in the interviews. Regarding scientific integrity, the interviews indicate that promoting and embedding this in the organization is not so much a matter of breaking down major barriers, but rather of further embedding integrity in education and in the organizational culture.

However, with respect to organizational culture, some barriers to promoting integrity were mentioned. It was argued that the diversity in cultural backgrounds of employees, combined with the constant renewal of scientific personnel with temporary positions, makes it difficult to create a stable organizational culture and discourse of scientific norms and values. Also, it was mentioned that the anti-hierarchical and autonomy-oriented academic culture forms a barrier to implementing obligatory integrity education for all scientific personnel, in particular the senior staff. Consequently, other ways have to be invented to engage senior staff in the organizational integrity discourse.

Furthermore, an interviewee argued that sloppy science is more worrisome than flagrant violations of scientific integrity, because it may remain unnoticed:

“Fraud will be exposed sooner or later. The sloppy science, the grey area, that’s what I’m concerned about.”

Sloppy science may be caused by the high work pressure and the current academic system in which the assessment of scientific achievement and productivity, particularly in terms of publication
output, plays an important role. It can therefore be seen as a systemic problem, and not only a problem of individual researchers.

C. Main drivers (structural, cultural or related to interchange dynamics)

Scientific integrity is already high on the agenda at RU. The interviews suggest that further promoting and embedding integrity is a matter of further facilitating an organizational culture in which scientific integrity is a natural and embedded element. This may be enabled by further implementing integrity courses or debate activities in the organization.

Furthermore, open science is identified as an important driver for scientific integrity. Stimulating good data management and open science according to the FAIR principles, seems to be a matter of continuing the already strong efforts that are made in the organization, including the implementation of research data management policies (see also the section below on open science).

Particularly at the RUMC, efforts are made to reduce research waste and increase the efficiency of medical research, for instance in order to avoid unnecessary repetition of research with patients or animals. This includes the endorsement of the REWARD statement, which is a campaign of the Lancet to reduce research waste in medical science. One driver for improving efficiency and avoiding unnecessary animal testing, would be to include systematic reviews as a standard and obligatory part of all research with animals.

Sloppy science was mentioned as a concern. Integrity courses and the already existing organizational provisions for safeguarding integrity play a role in reducing sloppy science. Sloppy science may be addressed, in addition to focusing on scientific misconduct, by more strongly focusing educational activities and reflection and debate in the organization on what constitutes good scientific practice.

Finally, re-thinking academic excellence and re-orienting the assessment of academic quality towards a less production-oriented focus may help foster responsible and sound scientific practice.

D. Best practices (or bad practices)

- Compulsory ethics courses in all curricula.
- Seeing ethics and integrity as embedded elements of the organizational culture, that can be facilitated by stimulating organizational discourse on these matters.

E. Current indicators

Complaints about scientific integrity that have been handled by the scientific integrity committee, and on which the Executive Board has made a decision, are published anonymously on the website of the Association of Universities in the Netherlands (VSNU). This website shows that each year, usually a handful of complaints about integrity is handled by the committee and the Executive board of the RU. This is exemplified by the formally dealt-with integrity complaints at RU of recent years:

- 2017: 3 complaints, of which 1 well-founded and 2 unfounded
- 2016: 1 well-founded and 1 unfounded complaint
- 2015: 1 unfounded complaint

F. Recommendations

- Implement systematic review as a standard element of all medical research and animal experiments.

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- Continue current efforts to implement research data management.
- Further facilitate the organizational integrity discourse, for instance by organizing discussion meetings or seminars, and by addressing integrity in all curricula.
- Value quality over productivity in the assessment of scientists.

G. Resulting matrix

<table>
<thead>
<tr>
<th>Structural issues</th>
<th>Cultural issues</th>
<th>Interchange related</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aspects of organizations</td>
<td>Mandates, legislative frameworks, formal hierarchies</td>
<td>Culture, informal routines, informal reward systems, focus on management</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Potential drivers for RRI</th>
<th>Reduce unnecessary animal testing. Data management according to the FAIR principles.</th>
<th>Foster an organizational culture in which integrity is a natural and embedded element. Avoid sloppy science, foster good research practices.</th>
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<tr>
<th>Potential barriers to RRI</th>
<th>A highly diverse organization with a constantly changing pool of employees, characterized by an anti-hierarchical and autonomy-oriented culture. Sloppy science.</th>
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</table>

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<tr>
<th>Most important potential organizational actions</th>
<th>Systematic review as a standard element of all medical research and animal experiments. Continue current efforts to implement research data management.</th>
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<tr>
<th>Several actions can be included</th>
<th>Facilitate the organizational integrity discourse, for instance by organizing discussion meetings or seminars. Value quality over productivity in the assessment of scientists.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Indicators for success</th>
<th>Implementation of systematic review in all medical research. Full implementation of research data management according to FAIR principles.</th>
</tr>
</thead>
</table>

7.2.3 Societal engagement strategies in organization

A. Description of the practice and its development and an assessment of how well it currently works

Societal engagement is at the core of the mission and identity of the organization, both at central and faculty levels. For instance, RU’s mission statement stresses the importance of academic
freedom, and emphasizes ethical reflection and contributing to solving societal problems as key objectives. NSM’s motto is “creating knowledge for society”, which entails critical reflection, providing new perspectives and knowledge, and applying this knowledge in solving societal challenges. RUMC aims “to have a significant impact on healthcare”, in order to contribute to innovative, sustainable and affordable healthcare in the Netherlands. FS’s mission statement also includes the objective to contribute to society, for instance though application-oriented research that focuses on the Grand Challenges.

At RU, societal engagement is promoted, practiced and implemented in numerous ways. Across the organization, some common themes and understandings of this RRI aspect can be found. Firstly, societal relevance and responsibility are often seen as inherent aspects of scientific discipline, or of science in general. One of the interviewees at RUMC for instance stated:

“We want to cure patients, whether tomorrow or in 20 years from now. And we focus more and more on prevention, in order to prevent people from becoming patients. That is a very strong social responsibility that we all feel.”

Secondly, several interviewees argued that the importance that is attached to societal impact and relevance of science has increased over the years, along with the requirement to give account for how public money is spent on science. Thirdly, the “valorization” of knowledge is an important objective across the examined faculties. This terms signifies forms of knowledge transfer and value creation that often comes about in collaborations between the university and companies or societal organizations.

RU has several dedicated programs and departments for engaging with society. Radboud Reflects is a department that organizes lectures and programs for a broad public, which aim to facilitate debate and reflection on current scientific and societal developments. Radboud Talks is a scientific pitch competition for early career researchers, in which they get three minutes to explain their research to an audience and jury. Radboud Innovation is a department that focuses on project development and collaborations with societal partners, facilitating entrepreneurship, and grant support; also, it includes Radboud Research Facilities, which helps to provide research equipment, facilities, and scientific expertise, to companies and research organizations in the region.

Besides the commonalities described above, the faculties also each have their own priorities and practices concerning societal engagement. At RUMC, the participation and representation of patients in medical research is an important theme; the societal relevance of research, in terms of the impact on health and healthcare, is an important assessment criterion. At NSM, researchers often work by order of or in collaboration with societal organizations, and involve stakeholders in formulating research questions and priorities. At FS, current discussions focus on how curiosity-driven and application-oriented research can be combined in the faculty’s research portfolio. Some of the research in this faculty is inspired by societal themes, or is executed in collaboration with companies or societal organizations. Finally, this faculty understands an important part of its societal relevance to lie in educating highly-skilled professionals, who contribute to society after graduation.

On a more personal level, interviewees put societal engagement into practice by speaking at public events, engaging in societal debates, and writing articles or books for a broad public.

B. Main barriers (structural, cultural or related to interchange dynamics)

Interviewees at both RUMC and FS mentioned a tension between fundamental, curiosity-driven research and society- or application-oriented research. Researchers who are involved in the former type of research, sometimes feel that the emphasis on societal engagement in science funding and
governance has gone a bit too far. On the other hand, a strong focus on curiosity-driven research can be seen as cultural a barrier to societal engagement.

Other interviewees indicated that the current academic culture has become dominated by career development and performance measurement in terms of rankings, indicators, publications and acquisition of funding. They argued that in this academic culture, societal engagement is under pressure and not valued enough in the assessment of researchers. One of the interviewees for instance argued:

“We try to have academic freedom, conduct good research, and contribute to society. [...] However, the latter is not appreciated at all. Because it is clearly all about performance indexes.”

Research funding increasingly requires that companies or societal organizations are involved in research projects; this may include some form of involvement in the execution of the research, but often also providing a part of the project’s funding. Diverging interests between scientists and companies can be a barrier to such collaborations.

Finally, it was argued that scientific research is often highly specialized, and that a drive for originality and progress in science may incite researchers to focus on small niches. Such specialization and niche-oriented research may form barriers to societal engagement, as the latter requires a broad outlook on science and its societal context.

C. Main drivers (structural, cultural or related to interchange dynamics)

Societal engagement is already strongly embedded in RU. However, there may be ways to further promote this aspect in the organization. For instance, societal engagement could be more strongly considered in human resource management. Interviewees indicated that societal engagement could be a more prominent criterion in selecting scientific staff. Also, societal engagement activities could be more strongly appreciated in the assessment of individual researchers or of research groups. Some interviewees suggested that increased diversity in assessment criteria and researcher profiles could be a useful step.

Furthermore, societal engagement in the organization may benefit from the training relevant skills of researchers, such as skills in acquisition, collaboration with stakeholders, translating knowledge demands from practice into scientific research questions and projects, and translating scientific knowledge to relevant societal contexts.

Recent developments in the FS indicate that organized reflection and deliberation on the societal context and contribution of research, may be valuable in reorienting the research mission or strategy towards increased societal engagement. It seems advisable to continue these current efforts.

In some national and international science funding programs and schemes, societal engagement and solving societal challenges are a prominent themes. These include the Top Sectors, the National Research Agenda, and the European research and innovation framework programs (H2020, Horizon Europe). Some of the interviewed researchers perceive these programs as external developments from which they are quite detached. More concerted efforts in the faculties to forge new collaborations and apply for funding under such programs, may serve as a driver for society-oriented research and societal engagement at the RU.

Regarding societal engagement, the current strategic plan of the university (2015-2020) focuses on dissemination and valorization of knowledge, collaborating with companies and other organizations, science education, and adding value to the Nijmegen region. The next strategic plan, which is currently in preparation, could more explicitly incorporate societal engagement from an RRI
perspective. This may involve a more thorough elaboration and increased strategic attention to prioritizing and solving societal challenges, co-creation of knowledge together with citizens and stakeholders, involving societal actors in research agenda-setting, and facilitating participative, interactive research programs together with citizens and other societal actors. Also, initiatives can be taken to open up the university campus to society, for instance by creating spaces for engagement and interaction.

D. Best practices (or bad practices)

- The implementation of dedicated programs and initiatives for various forms of societal engagement, including public reflection and dialogue, and collaborating with companies and organizations in the Nijmegen region.
- Fostering differentiated approaches to societal engagement, that match the key issues and challenges on which particular disciplines focus.

E. Current indicators

RU’s annual reports and annual research reports contain information on various societal engagement-related indicators. The most recent versions of these reports (annual report 2017, research report 2016) mention the following indicators:

- Increase of open access publications (also see section 7.2.5)
- Lectures at public events
- The number of companies that uses Radboud Research Facilities (over 50 in 2017, see also above), turnover of RRF (€700,000 in 2016).
- Number of Extraordinary Professors that are also engaged outside RU (66 out of 482 Full Professors)
- Number of patent applications (11 in 2017)
- Collaborations with partners at the European, national and regional level as well as with non-European partners such as NGOs and companies.
- Contract research for societal actors (813 FTE / 34% of employees involved, €91.7 million turnover in 2016)
- Number of spin-offs
- Number of courses on sustainability (over 75) and number of sustainability scientists (22 according to the current inventory)82.
- Memberships of national advisory councils
- Articles were published in professional journals (1133), annotations to laws (284), and guidelines and protocols for improving medical treatments (several hundred in 2016).

F. Recommendations

- Include societal engagement skills in training curricula for researchers.
- More explicitly incorporate societal challenges and interactive, participatory forms of agenda-setting and engagement in the new RU strategic plan.
- Facilitate reflection and deliberation on improving the societal relevance of research.
- More concerted efforts to support and build collaborative networks with partners inside and outside the university.

82 https://www.ru.nl/duurzaamheid/onderzoek/duurzame-onderzoekers/
### G. Resulting matrix

<table>
<thead>
<tr>
<th>Aspects of organizations</th>
<th>Structural issues</th>
<th>Cultural issues</th>
<th>Interchange related</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>mandates, legislative frameworks, formal hierarchies</td>
<td>culture, informal routines, informal reward systems, focus on management</td>
<td>policy learning, pressures from key stakeholders (owners, the public, etc.)</td>
</tr>
<tr>
<td>Potential drivers for RRI</td>
<td>stronger appreciation of societal engagement in formal requirements and assessment criteria.</td>
<td>improved societal engagement skills of researchers.</td>
<td>increased collaborations with diverse partners and stakeholders.</td>
</tr>
<tr>
<td>Potential barriers to RRI</td>
<td>tensions between curiosity-driven and application-oriented science. academic culture that prioritizes publications, acquisition success and other quantitative indicators of output. focus on niches, specialization.</td>
<td></td>
<td>diverging interests between companies and scientists</td>
</tr>
<tr>
<td>Most important potential organizational actions</td>
<td>include societal engagement skills in training curricula for researchers. more explicitly incorporate societal challenges and interactive, participatory forms of agenda-setting and engagement in the new RU strategic plan.</td>
<td>facilitate reflection and deliberation on improving the societal relevance of research.</td>
<td>more concerted efforts to support and build collaborative networks with partners inside and outside the university.</td>
</tr>
<tr>
<td>Indicators for success</td>
<td>implementation of societal engagement skills in all PhD training programs. interactive and participatory notions of societal engagement in the new strategic plan.</td>
<td></td>
<td>increase of collaborative research consortia that receive funding from (inter)national programs.</td>
</tr>
</tbody>
</table>

### 7.2.4 Gender equality and diversity strategies in the organization

**A. Description of the practice and its development and an assessment of how well it currently works**

With respect to gender and diversity, the main focus in RU lies on gender equality. RU has long been one of the pioneers in the domain of gender equality in Dutch academia. This can in part be traced back to its original mission and identity as an "emancipation university". In 1923, the RU was founded with the objective to stimulate the emancipation of Catholics in the higher levels of Dutch society and administration. In recent decades, this notion of emancipation has been extended, *inter*
alia, to include the emancipation of women. Furthermore, RU has been a prominent university in the field of gender studies in the Netherlands. The NSM provides education on gender studies, and its research institute has a “hotspot” (a thematic research priority with an associated network of researchers) on gender and power in politics and management. Moreover, RU has an interfaculty research department of gender and diversity studies.

Whether gender inequality is considered a problem or important issue, varies between faculties and persons. It is particularly seen as problematic in faculties with relatively little female scientific staff. In faculties where male-female ratios among the staff are more or less even, it is perceived less as a problem. The current executive board considers improving gender equality across all staff as a priority.

The main topic in discussions and actions regarding gender, is how the percentage of women in higher scientific positions can be increased. This discussion focuses on both appointing more female professors, and stimulating the promotion of women to higher functions (e.g. from assistant to associate professor).

Various programs and policies are in place to increase the percentage of women in higher scientific positions, and gender equality at RU more generally. University-wide actions are taken under the Christine Mohrmann-program, the gender diversity program named after RU’s first female professor who was appointed in 1952. This program includes a mentoring program, fellowships for hiring and promoting talented female scientists, improving recruitment and selection procedures, awareness training for managers and selection committees, and facilitating a good work-life balance.

Furthermore, separate faculties have gender and diversity policies. For instance, FS has a gender policy 2016-2020, that contains various measures, including: building commitment to gender equality, allocating funds for appointing talented female scientists, providing financial support for tenure trackers on pregnancy leave, installing a gender and diversity committee, setting targets for the percentages of female researchers, promoting diversity training, and ensuring that selection criteria are stated in a gender neutral way (FS 2015).

B. Main barriers (structural, cultural or related to interchange dynamics)

In discussing gender equality, interviewees mainly mentioned cultural barriers. One of these barriers is gender bias, i.e. implicit and unintentional differences between how men and women are treated and assessed, and between expectation patterns towards men and women. Some interviewees argued that men and women often have different ways of manifesting themselves in social and professional context, for instance that women present themselves more modestly than men, and that this should be accounted for in improving gender equality. Furthermore, it was argued that some disciplinary cultures in academia are male-oriented or male-dominated.

Some interviewees, reasoning from a meritocratic perspective, argued against personnel policies aimed at promoting female scientists, since they felt that scientific quality and fitness for the job should be the only considerations in selection and promotion. From this point of view, some think that discussions on gender equality are irrelevant. Whether one agrees with this argument or not, in itself it forms a cultural barrier for stimulating gender equality.

C. Main drivers (structural, cultural or related to interchange dynamics)

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83 https://www.ru.nl/english/about-us/our-university/history/radboudhistory/
Further improving gender equality in the organization appears to be a matter of taking measures to further stimulate steady cultural change. One of the interviewees at FS for instance stated about gender equality:

“In my view, it is a long-term issue. The biases are deeply engrained in us all, men and women. It will take a long time to get rid of them.”

Several factors may contribute to such change. It seems advisable to continue the current programs and initiatives that are in place at RU. This includes initiatives to appoint more female professors, the promotion of female scientists to higher positions (e.g. from assistant professor to associate professor), and attention for gender neutrality and equality in recruitment and selection procedures. Moreover, it is advisable to facilitate the organizational discourse on gender equality by means of recurring discussions, debates, lectures and events. The combination of these actions should result in further gender equality in quantitative terms, and in an organization in which gender equality is further internalized.

Some interviewees argued that the executive board of RU has too modest ambitions when it comes to gender, and that for instance target figures for the percentage of female professors should be raised.

D. Best practices (or bad practices)

- An integrated, university-wide gender equality program that includes a variety of actions and strategies.

E. Current indicators

RU’s ambition is that by the end of 2020, in every level of the organization, at least 25% of the employees is female, and at least 25% male. For female professors, the original target of 25% has been raised to 30%. On 1-1-2018, the percentage of female full professors at RU, including RUMC, was 26,8%.

In 2017, RU took second place in the female professor ranking of Dutch universities (LNVH 2017). At RUMC, this percentage was 19,9 in 2017, which made it one of the lower-scoring university medical centres (ibid.).

FS’s target percentage of female professors in 2020 is 15%. This target has recently been achieved after a significant increase of the percentage of female professors, from 8,8% in 2014 to 15,8% in 2017 (FS 2018). The percentage of female scientific staff at FS was 29% in 2017.

F. Recommendations

- Continue current gender and diversity policies.
- Further raise target figures for female scientific staff.
- Further implement measures to address cultural barriers to gender equality and diversity, such as: bias trainings, organized reflection on the perceived male-dominated character of some disciplinary cultures, and examining and possibly re-defining excellence criteria, in order to render them gender neutral.

84 https://www.ru.nl/fnwi/nieuws-agenda/nieuws/nieuwsoverzicht/vm/radboud-benoemt-vrouwelijke-hoogleraren-westerdijk/
G. Resulting matrix

<table>
<thead>
<tr>
<th>Aspects of organizations</th>
<th>Structural issues</th>
<th>Cultural issues</th>
<th>Interchange related</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mandates, legislative frameworks, formal hierarchies</td>
<td>Culture, informal routines, informal reward systems, focus on management</td>
<td>Policy learning, pressures from key stakeholders (owners, the public, etc.)</td>
</tr>
<tr>
<td>Potential drivers for RRI</td>
<td>More women in high scientific positions.</td>
<td>Attention for gender neutrality in the recruitment and assessment of scientific staff. Gender equality embedded in organizational discourse.</td>
<td></td>
</tr>
<tr>
<td>Potential barriers to RRI</td>
<td></td>
<td>Gender bias. Masculine academic culture. Meritocratic ideal in science.</td>
<td></td>
</tr>
<tr>
<td>Most important potential organizational actions</td>
<td>Continue current gender and diversity policies. Further raise target figures for female scientific staff.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Several actions can be included</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indicators for success</td>
<td>Increased percentage of female scientific staff, at all levels of seniority.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

7.2.5 Open access and open science strategies in the organization

A. Description of the practice and its development and an assessment of how well it currently works

Open access publishing has been a top priority of the university’s executive board in recent years, and has been implemented and stimulated by various means. For instance, the Radboud Repository was launched, which is a repository in which RU researchers can upload scholarly publications and research data. It aims to make the results of RU research accessible worldwide, free of charge, as much as possible. Furthermore, the RU actively participates in national and international open access initiatives, which include collaborations with other universities, participation in European open access programs, and making open access publishing deals with scientific publishers. Organizational measures include the appointment of open access officers who offer support to researchers, and organising workshops and providing relevant information to scientific staff.

Some developments in the larger university and science funding landscape are of influence on the promotion of open access publishing at RU. For instance, the national science funding organization NWO has made open access publishing compulsory in its funding conditions. Consequently, all RU publications that come from NWO-funded research now need to be published open access. Also, the open access deals that the Association of Universities in the Netherlands (VSNU) have made with many prominent scientific publishers, enable researchers at RU (like at all other Dutch universities) to publish open access, free of charge, in many international peer-reviewed journals.
Despite these efforts, the degree to which open access publishing is actually practiced strongly varies between institutes. In some, it has become standard practice; in some, it appears to be still relatively uncommon.

Furthermore, RU is currently implementing a research data management (RDM) policy across the university. Like open access publishing, good data management in order to promote open data and scientific integrity is a major priority for the RU Executive Board. The aim of this RDM policy is that data connected to publications of RU researchers will be stored and made available according to the FAIR principles in 2020. The latter means that research data should be findable, accessible, interoperable, and reusable, under specified conditions, as much as possible. The central RDM policy of the university, which is promoted by a central RDM steering committee, contains provisions concerning data storage for reuse, writing data management plans, and responsibilities of managers and researchers. The central RDM policy is implemented in a decentral way across the organization, by appointing data stewards at separate faculties and research institutes, who formulate institute-specific policies, and who monitor and support data management in their institutes. Furthermore, various support mechanisms, infrastructures and facilities for data management have been implemented, including various institute-specific digital facilities and infrastructures for data storage, management, and sharing. All data management-related activities are supported by a RDM helpdesk.

The implementation of the GDPR (see section 4.2) has incited the RU to revise its privacy statements. Also, it has put the safe handling and storage of privacy-sensitive data even higher on the agenda. Currently, a GDPR working group at RU is inventorying the questions and possible impacts of this regulation, for instance with respect to research data management.

B. Main barriers (structural, cultural or related to interchange dynamics)

Despite the strong efforts that are currently made across the RU, open access publishing is still not commonly practiced. This appears to be caused by a combination of barriers. One of the main barriers lies in the scientific publication and assessment culture, in which there is a strong focus on publishing in journals with high impact factors and rankings. Some of the leading peer-reviewed journals have notswitched to open access, and some open access journals have a relatively low impact factor. Consequently, open access publishing is unattractive to those for whom journal rankings are important. Furthermore, cultural barriers include fixed routines that prevent scientists to switch to new publishing forms, and prejudices about the administrative fuss that comes with open access publishing. An interviewee for instance said about these barriers:

“Most Dutch scientists are still stuck in the traditional patterns. [...] In the end, a scientist’s main priority is to publish in a high-ranking journal, because it is better for his or her career. The career incentives prevent scientists from really embracing open access.”

Also, the high costs of publishing open access in journals that are not included in the open access deals between the VSNU and some major publishers, are perceived as a barrier.

With respect to open data, cultural barriers include the routines of (senior) researchers that are sometimes hard to change, and perceived barriers related to the competition- and privacy-related sensitivity of research data. Furthermore, some scientists are reluctant to share research data, or don’t see the use of sharing data. Also, it was mentioned in the interviews that RDM policies are sometimes interpreted as a breach of professional autonomy.

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C. Main drivers (structural, cultural or related to interchange dynamics)

Strong drivers to promote open access publishing are already in place. However, the interviews indicate that some measures could be taken to further promote open access. Firstly, open access publishing could be made compulsory. This may not be an option for all institutes of the RU, but in some cases it may be feasible. Secondly, an budget for covering author processing charges would take away some of the financial barriers. Thirdly, increased communication across the organization about how open access works and what its merits are, would be a driver. Finally, open access would be promoted by diminishing the importance of the impact factors and rankings of scientific journals.

Promoting open data appears to be a matter of continuing the already strong efforts that are currently made.

D. Best practices (or bad practices)

- A central research data management policy with strong commitment from the university's administration, that is implemented in a decentralized, context-sensitive way.

E. Current indicators

The RU endorses the national goal of 100% “gold” open access (i.e. publications are immediately available, free of charge, in open access journals) in 2020 (Annual report 2017).

At the time of finalizing this report, an inventory of open access publications from RU-based research was in preparation, but not yet publicly available.

The Radboud Repository contains academic output from RU-based research, both with restricted and open access. In August 2018, this repository contained almost 158,000 academic publications, including dissertations, articles, PhD theses, monographs, book chapters and other types. Of these publications, nearly 45,000 publications were available open access at that time.

F. Recommendations

- Continue current efforts to implement RDM policy.
- Continue communication across the organization about how open science is practiced and what its advantages are.
- Explore in which institutes and under which conditions open access publishing can be made compulsory.
- Allocate a budget for author processing charges
- Use alternative assessment criteria that do not use journal impact factors.

G. Resulting matrix

<table>
<thead>
<tr>
<th>Aspects of organizations</th>
<th>Structural issues</th>
<th>Cultural issues</th>
<th>Interchange related</th>
</tr>
</thead>
<tbody>
<tr>
<td>Implementation of GDPR. Open access publishing as standard practice.</td>
<td>Awareness in the organization about the workings and merits of open access publishing.</td>
<td>Policy learning, pressures from key stakeholders (owners, the public, etc.)</td>
<td></td>
</tr>
<tr>
<td>Mandates, legislative frameworks, formal hierarchies</td>
<td>Culture, informal routines, informal reward systems, focus on management</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potential drivers for RRI</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Increased funding for covering APCs.**

**Reduced importance of journal impact factors.**

### Potential barriers to RRI

- High costs of publishing open access in journals that are not included in open access deals.
- Strong drive to publish in high-impact journals that do not support open access.
- Old data management and publishing routines of scientists, stemming from before the open science movement.
- Various forms of prejudice and reluctance towards data sharing.

### Most important potential organizational actions

- **Open data:** continue current efforts to implement RDM policy.
- Explore in which institutes and under which conditions open access publishing can be made compulsory.
- Allocate a budget for author processing charges.
- Use alternative assessment criteria that do not use journal impact factors.
- Continue communication across the organization about how open science is practiced and what its advantages are.

### Indicators for success

- Full implementation of RDM policy.
- All data management meets FAIR principles in 2020.
- Increased open access publishing.

### 7.2.6 Science education as integrated in research

A. Description of the practice and its development and an assessment of how well it currently works

With respect to science education, the current RU strategic plan (2015-2020) mentions the further development of continuous education and a program for in-service training in secondary education as objectives. The latter has been implemented in in various ways, including by means of the Radboud Teachers Academy, which is a university institute that educates academic prospective and in-service teachers for the senior grades of Dutch secondary education. Besides its education program, it also includes a research program that aims to produce knowledge about cultivating creativity in secondary education. In the context of this program, several PhD projects on the connection between pre-university education and the university are conducted.
Furthermore, a key initiative regarding science education is the Science Education Hub Radboud University (WKRU). The WKRU aims to reinforce the relationship between RU, pre-service teacher education, and (primary) education. Its mission is to encourage an inquisitive and explorative attitude in students and (prospective) teachers. Towards this aim, it trains teachers, invites scientists to classrooms, conducts research on learning and education, and develops teaching materials. An example of the latter is the book series “scientific breakthroughs in the classroom”, which translates many research activities at RU (including natural science, social science and humanities) into classroom activities. The WKRU was initially started on the basis of temporary project funding; it is now structurally embedded in RU. This structural status reflects the commitment of the executive board to this initiative.

Furthermore, RU has a Pre-University College (PUC) of Science and a PUC of Society. The former focuses on natural science, the latter on social science and humanities. The PUCs aims to deepen, broaden and enrich the knowledge of students in secondary education, in an academic environment. Towards this aim, they organizes various activities and programs, including masterclasses, support in doing school projects, competitions, and talent programs.

Various faculties of RU provide continuous education programs (called post-academic education at RU), that provide in-service training in a wide range of disciplines and professions. The latter include law, notary’s practice, management, social science, languages, medicine, dentistry, safety management, and international development.

The degree to which scientific staff at RU are actively involved in science education activities, appears to vary between different faculties and institutes. The interviews indicate that at RUMC and NSM, engaging with society is predominantly conceptualized in other ways than in the form of science education. At RUMC, these ways for instance include public communication and patient involvement; at NSM, they include collaboration with administrative and societal organizations. The interviews indicate that various institutes at FS are actively engaged in science education.

B. Main barriers (structural, cultural or related to interchange dynamics)

One of the main barriers to science education that was mentioned by interviewees, is the lack of available time to engage in science education activities. Science education is often seen as one of the “fringe activities” besides the main activities of research and academic education. Science education is sometimes seen as coming at the expense of research and education time. Moreover, it was argued that engagement in science education activities is not appreciated as much as doing research or providing academic education.

Another barrier is the difficulty of translating highly specialized and complex research to a broader audience.

Finally, it was argued that science education activities and programs are somewhat scattered across the RU. Consequently, a common and coordinated vision or approach across the RU is lacking. Currently, initiatives are taken to improve this situation.

C. Main drivers (structural, cultural or related to interchange dynamics)

In the interviews, it was suggested that more explicit attention for and consideration of science education in research proposals and funding requests would be a driver for this RRI aspect. The

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86 https://www.ru.nl/wetenschapsknooppunt/english/wkru/
87 https://www.ru.nl/puc/
societal relevance and impact of research are already important criteria in the assessment of research proposals; science education is one of the ways in which such societal relevance can be achieved.

Furthermore, allocating the time of scientific staff would be a driver, since currently scientists often feel they don’t have time for science education, or that science education comes at the expense of academic research and teaching. Besides more formally allocated time, also increased appreciation of science education activities would be a stimulus.

D. Best practices (or bad practices)

- Translating current, state-of-the-art research into educational materials and activities.

E. Current indicators

In 2016, around 1200 courses for public professionals were organized, with a turnover of €32.8 million (Research report 2016).

In 2017, the PUC of science reached 854 teachers and 6550 students in secondary education with its science education activities. The latter included science matches, master classes, excellence and talent programs, science project supervision, and teacher days. In the same year, the PUC of science organized the 14th International Junior Science Olympiad, in which 284 students from 48 different countries participated.

The WKRU monitors the numbers of students, teachers, schools, and scientists that it reaches with its activities. The table below presents these numbers for activities of which the target audience is known; it does not include materials and newsletters. The levels in the table signify the following:

- Level 1: getting acquainted with science and research, gaining information about activities.
- Level 2: partly going through the inquiry-based learning cycle, deepening substantive insight, formulating questions in preparation of a scientists’ visit to a school.
- Level 3: completely going through the inquiry-based learning cycle, substantive learning, stimulating scientific process skills and science literacy.

<table>
<thead>
<tr>
<th>Target group</th>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
<th>Total reach</th>
<th>Indirect reach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Children</td>
<td>441</td>
<td>675</td>
<td>1230</td>
<td>2346</td>
<td>16850</td>
</tr>
<tr>
<td>Teachers primary education</td>
<td>347</td>
<td>237</td>
<td>201</td>
<td>785</td>
<td></td>
</tr>
<tr>
<td>School teams primary education</td>
<td>1</td>
<td>6</td>
<td>8</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Schools primary education</td>
<td>145</td>
<td>109</td>
<td>57</td>
<td>311</td>
<td></td>
</tr>
<tr>
<td>Teachers secondary education</td>
<td>1</td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Schools secondary education</td>
<td>1</td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Parents</td>
<td>10</td>
<td></td>
<td></td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Students in teacher training college</td>
<td>9</td>
<td>21</td>
<td>2</td>
<td>32</td>
<td>825</td>
</tr>
<tr>
<td>Teachers in teacher training college</td>
<td>25</td>
<td>8</td>
<td></td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>Scientists</td>
<td>36</td>
<td>38</td>
<td>59</td>
<td>133</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>61</td>
<td>32</td>
<td>1</td>
<td>94</td>
<td></td>
</tr>
</tbody>
</table>

Furthermore, the WKRU monitors the numbers of materials that it disseminates (see table below for 2017):
### Materials WKRU 2017

<table>
<thead>
<tr>
<th>Newsletters</th>
<th>Level 1</th>
<th>Internal: 178 persons, external: 1105 persons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Books from book series</td>
<td>Level 3</td>
<td>563</td>
</tr>
<tr>
<td>Posters</td>
<td>Level 3</td>
<td>101</td>
</tr>
<tr>
<td>Post cards</td>
<td>Level 3</td>
<td>175</td>
</tr>
<tr>
<td>Booklet</td>
<td>Level 2</td>
<td>230</td>
</tr>
<tr>
<td>Views of online video module</td>
<td>Level 2</td>
<td>1043</td>
</tr>
<tr>
<td>Visits main website</td>
<td>Level 1</td>
<td>4977</td>
</tr>
<tr>
<td>Visits materials website</td>
<td>Level 1</td>
<td>2366</td>
</tr>
<tr>
<td>Social media followers / connections</td>
<td>Level 1</td>
<td>396 Twitter, 639 LinkedIn</td>
</tr>
</tbody>
</table>

### F. Recommendations

- Allocate time of staff for science education.
- Develop advice or guidelines for including science education in research proposals and funding requests.
- Develop reward systems for engaging in science education activities.

### G. Resulting matrix

<table>
<thead>
<tr>
<th>Structural issues</th>
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<tr>
<td>Aspects of organizations</td>
<td>Mandates, legislative frameworks, formal hierarchies</td>
<td>Culture, informal routines, informal reward systems, focus on management</td>
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<tr>
<td>Structural issues</td>
<td>Mandates, legislative frameworks, formal hierarchies</td>
<td>Cultural, informal routines, informal reward systems, focus on management</td>
</tr>
<tr>
<td>Potential drivers for RRI</td>
<td>Increased time of staff to engage in SE.</td>
<td>Inclusion of SE in research proposals and funding requests, as a way of achieving societal relevance.</td>
</tr>
<tr>
<td>Potential barriers to RRI</td>
<td>Lack of allocated time of scientific staff to engage in SE.</td>
<td>Lack of appreciation for engaging in SE activities.</td>
</tr>
<tr>
<td>Most important potential organizational actions</td>
<td>Allocate time of staff for SE.</td>
<td>Develop advice or guidelines for including SE in research proposals and funding requests.</td>
</tr>
<tr>
<td>Most important potential organizational actions</td>
<td>Allocate time of staff for SE.</td>
<td>Develop advice or guidelines for including SE in research proposals and funding requests.</td>
</tr>
<tr>
<td>Several actions can be included</td>
<td>Allocate time of staff for SE.</td>
<td>Develop advice or guidelines for including SE in research proposals and funding requests.</td>
</tr>
<tr>
<td>Indicators for success</td>
<td>Formal allocation of time of scientific staff for science education activities.</td>
<td>Increased attention for science education in research proposals.</td>
</tr>
</tbody>
</table>
7.2.7 Incorporation of AIRR dimensions into policies

**Anticipation and reflexivity**

A. Description of the practice and its development and an assessment of how well it currently works

With respect to reflexivity, ethical reflection was one of the main themes in the interviews and document study (see section 7.2.2).

Furthermore, the interviews mainly focused on organized versus ad hoc, spontaneous forms of reflection in the organization. The interviews indicate that in some parts of the organization (including parts of the RUMC), recurrent reflection meetings or sessions take place, for instance to reflect on current or future developments in the field, and to discuss strategy development. In other parts of the organization, such organized forms of reflection do not take place.

Concerning anticipation, the long-term dimension of fundamental and curiosity-driven research was mainly discussed. Interviewees in both FS and RUMC argued that the societal contribution of fundamental and curiosity-driven research should be recognized.

B. Main barriers (structural, cultural or related to interchange dynamics)

The main barrier to anticipation (i.e. taking the long-term dimensions of science into account) that was mentioned, lies in the in the current policy and research funding context, in which the short-term relevance and impact of research are prioritized. This context includes industry, private research funders (for instance in the domains of medicine and health care), and current national research funding schemes. An interviewee argued that this context produces perverse incentives for scientists to “promise things they can’t deliver” in research proposals and funding applications.

C. Main drivers (structural, cultural or related to interchange dynamics)

The interviews provided some suggestions for increased anticipation and reflection in RU. For instance, an interviewee argued that scientists should be stimulated to reflect more on the societal implications of their research. Another interviewee argued that reflection on important societal challenges, and how to address them, should be facilitated more in the organization.

G. Resulting matrix

<table>
<thead>
<tr>
<th></th>
<th>Structural issues</th>
<th>Cultural issues</th>
<th>Interchange related</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aspects of organizations</td>
<td>Mandates, legislative frameworks, formal hierarchies</td>
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<td>Policy learning, pressures from key stakeholders (owners, the public, etc.)</td>
</tr>
<tr>
<td>Potential drivers for RRI</td>
<td></td>
<td>Increased reflection on societal implications of research.</td>
<td></td>
</tr>
<tr>
<td>Potential barriers to RRI</td>
<td></td>
<td>Increased reflection on societal challenges and how to address them.</td>
<td>Current policy and research funding context prioritizes</td>
</tr>
</tbody>
</table>
**Openness and transparency**

References to openness and transparency in the interviews all related to the themes of integrity and / or open science. These themes are discussed in sections 7.2.2 and 7.2.5.

**Diversity and inclusion**

References to diversity and inclusion in the interviews all related to the themes of societal engagement and / or gender equality and diversity. These themes are discussed in sections 7.2.3 and 7.2.4.

**Responsiveness and adaptation**

In the initial analysis of the materials collected for the RU review, responsiveness and adaptation did not emerge as key individual themes. Therefore, we have not pursued these themes separately in the further analysis. This does not imply that RU is an unresponsive organization, but rather that responsiveness is embedded in the other RRI aspects (e.g., responding to societal concerns in the context of societal engagement, responding to scientific fraud cases in the context of ethics and integrity).

### 7.3. Reflection on Review findings, Outlooks developed and ways forward

#### 7.3.1 The integrated or fragmented nature of different responsibility related dimensions

In the interviews and documents, the following RRI aspects were referred to together relatively often:

- Ethics and open science: scientific fraud cases have been an important driver for open science; at the same time, open science (particularly open data) is seen as a key driver for enabling scientific integrity.
- Societal engagement and science education are seen as closely related activities, in the sense that science education is seen as a way of engaging (with) society and fulfilling the university’s societal responsibility. Respondents often associated science education with science communication; the latter can be seen as a form of societal engagement.
- Reflexivity and societal engagement: these aspects were mentioned together mainly in the context of Radboud Reflects, which is an initiative that connects reflection on science and society with public lectures and debates.
- Societal engagement and anticipation: it was argued that societal engagement may form a barrier to anticipation. If societal engagement is narrowly defined as an activity that should produce societally relevant results in the short run, this may come at the cost of an openness towards long-term considerations and developments in science.
Some of the RRI aspects were discussed as relatively isolated themes. This is particularly the case for gender and diversity; for instance, the interviews contained few explicit linkages between gender and diversity and other aspects. Furthermore, open access was clearly linked to integrity, but less to other aspects. Finally, science education was linked to societal engagement, but not to other aspects.

The co-occurrence of these RRI aspects, combined with the conceptualization of responsibility in the organization, suggest that societal engagement is understood as an important and relatively cross-cutting aspect of responsibility at RU; furthermore, open science and ethics/integrity form a strong and prominent cluster in the understanding of responsibility. The other aspects appear to be treated a bit more as separate domains of interest. They are addressed alongside each other, for instance in strategy documents, but are not conceptualized as dimensions of an integrated framework of RRI.

Despite the various barriers to the RRI policy keys that this review has identified, all keys are high on RU’s agenda, and already well-embedded in the organization.

### 7.3.2 Common barriers or drivers

The analysis of barriers and drivers in the above suggests that the main barriers to the further implementation of RRI in RU are of a cultural nature. Barriers in the organizational culture that were mentioned in the interviews include: resistance to changing established research routines, reluctance to share research data, and a perceived lack of appreciation for activities such as societal engagement and science education. Furthermore, important barriers to RRI in academic culture more generally include gender bias, and the prioritization of quantitative output indicators and performance rankings in academic publishing and assessment culture.

The drivers for promoting RRI that were identified in this review, can be divided into two main categories. The first set of drivers include those that are of a relatively practical and predominantly structural nature. These include allocating time or funds for society-oriented activities, and further implementing open science (research data management and open access in particular). Furthermore, they include adjusting assessment criteria, personnel management, and requirements to research proposals, in order to more strongly emphasize aspects of RRI such as societal engagement and science education.

A second set of drivers concerns values in academic culture more broadly. These drivers include fostering cultures of integrity, openness, and inclusiveness. They also include a further reorientation of how science and scientists are assessed and valued, in terms of both quality and societal implications and contributions. Such cultural change in part requires reflection, debate, and action on a larger systemic level than the level of individual universities.

### 7.3.3 Conclusion and final reflections

Radboud University is a large and multifaceted organization that encompasses many different disciplines, with sometimes quite diverging disciplinary cultures. Across the university, responsible research is often associated with societal engagement and impact, ethics and integrity, and being accountable to society. However, our findings also show that there are differences between the ways in which faculties and disciplines understand and conceptualize responsibility.

The five RRI policy keys (ethics, societal engagement, gender equality, open science, and science education) are either already well-embedded in the organization, or are on the organization’s agenda and currently being promoted or implemented. At the same time, this review suggests that RRI can be further strengthened in the organization by:
• Re-thinking and re-orienting how scientists are assessed and what is valued in science, for instance by introducing alternative or additional assessment criteria and reward systems for researchers or research groups, that more strongly emphasize the societal contributions of science. Such criteria could include more diverse competences, open science-related achievements, and activities in the domains of science education and societal engagement.
• Further stimulating an organizational discourse of integrity and inclusion, by facilitating the continuous debate on these issues.
• Emphasizing the importance of interactive forms of agenda-setting and research in which societal actors actively participate. This could for instance be addressed in the new strategic document of the university.
• Making more concerted efforts to support and build collaborative networks with partners inside and outside the university, for instance in the context of national research initiatives such as the National Research Agenda, the Top Sectors, and other research and funding programs.

Currently, these points have the status of recommendations, not of points of agreement that have been agreed upon with the RU administration. These recommendations will be further elaborated in the final outlooks, and discussed with relevant contact persons in the organization.
8. Organizational reviews and outlooks: The Netherlands Organization for Scientific Research

8.1 Mapping of the organization

The Netherlands Organization for Scientific Research (NWO) is a key science organization in the Netherlands, with both research performing and funding tasks. The research performing division of NWO is the Netherlands Foundation of Scientific Research Institutes (NWO-I), which encompasses 9 research institutes, mostly performing research in the field of natural sciences. The other part of NWO is the granting division, which has as one of its core tasks to fund scientific research in the Netherlands (see figure 8.1 for NWO’s organizational chart). NWO’s mission is to “advance scientific research with scientific and societal impact. NWO approaches that from its vision of being a connector and is guided by its core values: groundbreaking, committed, reliable, and connecting.” (NWO 2018: 17) The NWO review and outlook for RRI-Practice focus on NWO’s granting division.

![Executive Board NWO](image)

**Figure 8.1: organizational chart NWO**
NWO is an independent directive body with a legally established mission and tasks, which falls under the responsibility of the Dutch Ministry of Education, Culture, and Science. It has around 2500 employees, of which around 1400 work as researchers at the NWO Institutes. With an annual budget of over 650 million Euros, it finances about 5800 research projects in universities and other research organizations each year. NWO has different funding schemes for open research and talent programs, research facilities, and themed programs that focus on solving societal challenges. These schemes use a competition model for selecting the best proposals. Grant applications are assessed in a peer review process by independent experts. These reviews are submitted to independent assessment committees, which give advice to a decision-making board about which proposals to fund.

Besides funding, NWO is also involved in research programming, promoting research collaborations between academic and societal actors, and implementing national science policies; furthermore, it engages in collaborative networks and initiatives concerning research and innovation policies.

NWO has gone through a major reorganization, or “transition”, in the last few years. An evaluation of NWO in 2013 concluded that NWO’s governance structure was too complex, which hampered flexibility and apt decision-making. Moreover, the division of responsibilities within the organization was deemed unclear. In the national science policy report “2025 Vision for science: Choices for the future” and NWO’s strategy 2015-2018, the main objectives for the transition were described. These included: increased flexibility and effectiveness, a stronger focus on collaboration, and improved responsiveness with regard to developments in science and society. Furthermore, one of the transition’s main aims is “to work more across disciplinary boundaries from a single coherent programming”.

The transition has resulted in a new organizational and governance structure that became effective on February 1\textsuperscript{st}, 2017. The new granting division encompasses three disciplinary domains: Social Sciences and Humanities, Science, and Applied and Engineering Science. At the time of the interviews for this organizational review, preparations were made to integrate a fourth domain, constituted by The Netherlands Organization for Health Research and Development (ZonMw), into NWO. Therefore, ZonMw was also included in the organizational review. However, in 2018 it was decided that NWO and ZonMw will remain two independent directive bodies, that will work closely together. This chapter’s main focus is on NWO, but it also includes insights from the interviews and document study on ZonMw.

The chairs of NWO’s domains work closely together as members of NWO’s executive board, which also includes a President and a Chief Financial Officer, and which is supported by the Executive Board Office. This new structure, with a limited set of domains that have a license to operate independently, but with a high degree of cross-domain coordination and interaction, aims to enable responsiveness, flexibility and effective decision-making capacity. Moreover, funding instruments and procedures are currently simplified and harmonized across the domains, and given a modular structure. This is aimed at removing disciplinary boundaries, improving transparency, and enabling the system to “respond flexibly to new developments”.

A new advisory structure is also implemented to contribute to increased responsiveness to new developments in science and society. A new central advisory council, involving experts from academia, industry, and societal organizations, provides advice on strategic issues. Furthermore,

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\textsuperscript{88} https://www.nwo.nl/en/about-nwo/nwo+in+transition
domain-specific advisory committees provide advice, for instance on relevant scientific developments.

Besides renewing its organization, NWO has also renewed its strategy in 2018. The new strategy (2019-2022) called “Connecting Science and Society” includes five strategic ambitions that are aimed at strengthening the scientific and societal impact of Dutch research (NWO 2018):

1. Nexus role: increasing connection and coordination in Dutch science, in order to further develop a national research strategy that balances thematic and curiosity-driven research. This ambition includes stimulating strong connections with European science policy.
2. People: supporting career development of talented researchers, for instance by means of a renewed talent scheme, and open competition for curiosity-driven research.
3. Research: supporting collaborations, for instance in teamwork, interdisciplinary collaboration, and between science and societal actors.
4. Infrastructure: funding and making available high-quality, large-scale research facilities.
5. Knowledge sharing: increasing collaborations with knowledge users in co-design and co-creation processes, stimulating pro-active reflection on societal impacts in order to enable responsible and desirable innovations, and strengthening collaborations between research institutes and industry. This strategic ambition includes elements of NWO’s Responsible Innovation (MVI) approach (further explained in the next section).

8.2 Aspects of responsibility in organizational policy and practice

8.2.1 The conceptualizations of responsibility in the organization

The interviewees (see section 3.3.2 for further information) were asked to describe their understanding of the meaning of the term responsibility in the context of their work. In their responses, some common themes were identified. The theme that was mentioned most often, is that research can be considered responsible, if it has societal impact or relevance. Accordingly, it is seen as a core task of NWO to stimulate such impact and relevance. This involves, according to interviewees, using societal impact or “knowledge utilization” as assessment criteria in selection procedures, stimulating the translation of scientific knowledge to broader audiences, and enabling the participation of, and collaboration with, societal actors in research and agenda-setting. This theme is further elaborated under the RRI aspect “societal engagement”.

A second theme that was also mentioned relatively often, is the responsibility of NWO’s funding procedures in terms of soundness, transparency and accountability. This involves being accountable about how public money is spent and decisions are made, being open and transparent about how review and funding processes and committees operate, and making selection procedures as fair, ethically sound, and unbiased as possible. This theme is further described under “openness and transparency”.

A third theme that interviewees often associated with responsibility is open science, particularly with respect to research data. This includes stimulating data sharing, the reproducibility and control of data, and the replication of research. This third theme relates to scientific integrity, that was also mentioned often in the interviews. These themes are further elaborated below, under “open science” and “ethics”.

The most explicit and elaborate conceptualizations of RRI in NWO and ZonMw can be found in two programs: Responsible Innovation (Maatschappelijk verantwoord innoveren, MVI) and Fostering Responsible Research Practices (FRRP).
MVI

When the MVI program was started in 2008, it was a new step in an already established tradition at NWO of funding research at the crossroads of ethics, policy, society and innovation. Programs in this tradition include Ethics, Research and Administration (2002-2009) and the Societal Component of Genomics Research (2001-2008). These programs were aimed at stimulating reflection about possible consequences in early stages of research, and informing citizens and decision-makers in order to facilitate well-informed deliberation and decision-making on research and innovation (NWO 2006). The MVI program was started as a collaboration between five NWO departments and six ministries. In 2012, a pilot was started in which MVI was connected to four Top Sectors; in 2016-2017, the program was fully linked to all Top Sectors (NWO 2016b) (see also chapter 4). This means that MVI is now one of the contributions of NWO to the programming and funding of research in the Top Sectors; MVI research is programmed in terms of the main societal challenges on which the Top Sectors focus. Since its start, it has funded over 60 research projects. From the moment that MVI became a ‘Top Sector program’, it has only funded research that is co-financed by industrial or societal partners.

The main concept of MVI has remained unchanged in the 10 years of the program’s existence. MVI aims to stimulate early reflection on various societal aspects (such as ethical, legal, social, economic, and psychological aspects), and to include multiple disciplines and societal partners in the co-design of innovations and innovation processes, in order to enable innovations with broad societal support (see also text box 8.1).

NWO describes the spearheads of the MVI approach as follows\(^90\):

- A proactive creation or design perspective. Ethical and social aspects are included in the design process of an innovation from the onset. Identifying aspects that play a role in the process and assessing an innovation’s impact on the stakeholders at the earliest possible stage allows these aspects to be taken into account during the design process, which results in socially responsible innovations.
- Interdisciplinarity. Researchers in the humanities, exact sciences and social sciences work together on the projects and take a collaborative, interdisciplinary approach to an issue based on their respective fields. This guarantees an integrated approach.
- Social relevance and valorization. During the selection process, all research projects are assessed as to social relevance and applicability of the results. In addition, each project also has a valorization panel comprising representatives of governments, businesses, civil society organizations and citizens who use the innovations, have to take them into account when formulating policy or who may – unintentionally – be affected by them. This ensures that stakeholders are closely involved in the research and that research results are suitable for practical implementation. The projects are implemented as public-private partnerships, so each project has one or more private partners. These are mostly businesses, but public authorities and civil society organizations can also be partners in a project. These partners may make financial contributions but also participate actively in the research or provide access to equipment or relevant data.

Text box 8.1: Spearheads of the MVI approach.

Due to its focus on anticipation, reflection, interdisciplinarity, collaboration, and a focus on co-design, the MVI approach bears resemblance to the AIRR framework (Stilgoe et al. 2013, see also chapter 3). It is also seen as related to RRI and the societal challenges in the context of the European Commission’s Horizon 2020 program (NWO 2016b). However, it does not explicitly focus on some of the RRI keys of the EC approach, such as gender and open science. Furthermore, the MVI approach

\(^90\) https://www.nwo-mvi.nl/approach
can be characterized as positive and enabling, rather than constraining and risk-oriented, with respect to innovation. MVI program texts for instance stress the advantages for industrial partners to participate in the program (NWO 2016b).

The interviews and document studies indicate that the program can be considered a success. For instance, it is recognized as a successful initiative in Dutch policy circles, and has become a benchmark for RRI implementation in the European context (NWO 2013, MECS 2014a). Furthermore, current efforts to further mainstream (elements of) the MVI approach show that within NWO, there is commitment to further expand and develop the program. One of these efforts is to develop MVI as a platform for sharing knowledge and experiences concerning responsible innovation, and expanding the network of interested stakeholders (NWO 2016b). Moreover, some elements that have been central to MVI, such as co-design, co-creation, and pro-active reflection on societal aspects, are now also included in NWO’s new strategy (NWO 2018). Also, the MVI approach is being connected to several other funding programs within the Top Sectors. For instance, recently a funding program on “sustainable living labs” in the context of mobility and transport was started; in this program, following the MVI approach is one of the requirements for receiving research funding.

**FRRP**

The second strongly RRI-related initiative is Fostering Responsible Research Practices (FRRP), which has been developed and implemented by ZonMw. The process from which FRRP emerged started in 2012, under the banner of “system failure”. The latter refers to “the undesirable effects of (well-intended) rules of the game and incentives in the current science system, which affect the behaviour of researchers” (Reijmerink 2014: 8). A combination of issues and developments incited ZonMw to prioritise the topic of system failure. These included observed barriers to publishing negative results of health research, a series of serious scientific fraud cases in the Netherlands, and the recognition of the Matthew effect in Dutch health research. The latter refers to the mechanism by which researchers or groups with a strong reputation win relatively large portions of available funding; thus, in a strongly competitive funding system, scientific reputation easily becomes self-reinforcing, at the cost of newcomers, or researchers with a less successful past record.

One of the main activities in the context of the system failure initiative, was the development of an assessment framework for “responsible programming”. This framework was developed on the basis of literature research, and validated in internal discussions at ZonMw. It was used to evaluate and reflect on ZonMw’s own programming practices; in this evaluation, a key question was whether ZonMw’s programming practices could be considered responsible, particularly from the perspective of societal impact. In total, 16 programs were evaluated. The assessment framework includes four criteria of responsible programming (Reijmerink and Oortwijn, 2017):

1. Societal relevance: the contribution of knowledge to find suitable solutions to societal challenges.
2. Scientific quality: the usefulness of the results of research for the scientific community.
3. Integrity: see to it that research is executed in a sound and correct way, in accordance with the Dutch Code of Scientific Conduct.
4. Efficiency: the research (program) needs to be set up as adequately as possible, considering the required knowledge. This includes learning from existing knowledge and shared experiences, to avoid stagnation of knowledge and research waste.

One of the insights that emerged from the activities described above, was that empirical knowledge about responsible and irresponsible research practices was missing. This has led to the establishment of a research funding program called Fostering Responsible Research Practices (FRRP). FRRP is co-
financed by ZonMw, NWO, The Netherlands Federation of University Medical Centres (NFU), and the Dutch Diabetes Research Foundation. It funds “research on research”, in order to inventory and create knowledge about responsible research practices, to gain insight into scientific integrity in the Netherlands, and to share best practices. The program has a budget of 2.825.000 Euros, and runs from 2016 to 2020\textsuperscript{91}. Currently, discussions are going on about how the FRRP assessment framework and funding program can contribute to strengthening the impact of research, which is one of the strategic priorities in ZonMw’s 2016-2020 policy plan (ZonMw 2016).

### 8.2.2 Ethics in the organization
#### A. Description of the practice and its development and an assessment of how well it currently works

With respect to ethics, several issues and themes play a role at NWO. In the context of ethics, integrity was one of the most prominent themes that came forward in the interviews. In the understanding of the interviewees, integrity encompasses scientific integrity, sound procedures, and good governance. The interviews and document study indicate that integrity is high on NWO’s agenda, and receives attention in several ways.

A number of serious scientific fraud cases in the Netherlands, which in some cases involved NWO-funded research, have incited NWO to re-think and strengthen its scientific integrity policy. A key aim of this policy is to focus attention on, and create awareness of, scientific integrity among scientists in all phases of the application, funding, and research execution process. For instance, application forms have been revised in recent years, in order to focus attention on the Netherlands Code of Conduct for Scientific Practice. Also in progress reports, the beneficiaries of funding are asked to declare that they observe this code. Another recent measure is the installation of a scientific integrity desk, which enables researchers to report integrity issues that are in some way related to the assessment or funding of research by NWO. Furthermore, in 2013, NWO’s fraud protocol was extended, so as to include the issue of scientific integrity. This protocol describes various measures that NWO can take in the case of the unlawful use of funding or violations of scientific integrity; these include the withdrawal of grants or suspending or excluding applicants from future grant applications.

Besides scientific integrity, procedural and administrative integrity is a key theme. Interviewees argued that sound and honest assessments, funding procedures, and administrative consultation, including avoiding conflicts of interests, are seen as critical, and are internalized in the organization. Several codes are used at NWO and ZonMw to guarantee that assessment and decision-making procedures are as honest and objective as possible. These include the Code of Conduct on Conflicts of Interest and the Code of Good Governance. Furthermore, currently the Netherlands Code of Conduct for Scientific Practice is being updated; NWO officers who are involved in this process, have argued that the new code should pay more explicit attention to integrity in drafting and assessing funding proposals.

In assessment and funding procedures, ethical aspects of proposed research are taken into account in several ways. For instance, applicants may be asked to reflect on ethical aspects in research proposals or application forms, and reviewers may be explicitly asked to assess ethical aspects of proposed research. Furthermore, formal approval by an ethical committee may be a requirement for funding. In the case of research with animals, ethical approval of an Animal Experiments Committee is required. Medical research that involves human subjects needs to be assessed by an accredited...
Medical Research Ethics Committee. The ethical assessment of both the former and the latter types of research is governed by law. Furthermore, NWO may ask applicants to request ethical assessment by a local (for instance university’s) ethical assessment committee. This may for instance be the case in social scientific research in which ethical issues play a role.

Ethics and scientific integrity also play an prominent role in the content of some of NWO’s research programs. For instance, MVI explicitly addresses ethical aspects of, and ethical reflection on innovation, and FRRP explicitly focuses on researching and promoting scientific integrity (see above). Furthermore, ZonMw has implemented several funding programs in the last decade on Ethics and Healthcare. The current ethics and healthcare program (3M€ budget, 2018-2023) funds research proposals on ethical aspects of healthcare, and focuses on answering policy-related questions with respect to ethics and healthcare that are asked by the Dutch Ministry of Health, Welfare and Sport (VWS). Finally, NWO has recently started a Replication Studies program, which funds research aims at reproducing or replicating influential research. Interviewees at NWO see this program as one of the various ways in which NWO promotes research integrity, and responsible research more generally.

B. Main barriers (structural, cultural or related to interchange dynamics)

There were some barriers in the implementation of the new NWO-wide scientific integrity policy and the scientific integrity desk. Previously, each NWO-institute had its own integrity regulation; therefore, the individual institutes were not convinced that a central integrity desk was needed. After some discussions in the organization, agreement about a more centralized approach was reached. This was mainly a structural barrier (decentralized organizational structure, fragmented policy) that appears to have been solved.

Another barrier concerns the scientific integrity desk. In the interviews, it was argued that information about integrity issues at universities does not always reach NWO; at the same time, universities were critical about the NWO integrity desk because they feared that they may miss out on information about integrity issues, when the latter are reported to NWO instead of them. This is an interchange barrier with respect to information flows between NWO, the Association of Universities in the Netherlands, and individual universities.

Finally, the replication studies program was confronted with barriers of a more cultural nature. Interviewees argued that there was resistance in the academic community against this program, because funding the same research twice was seen as a waste of money. Moreover, some critics of the program argued that replication research was not innovative because it merely repeats earlier research.

C. Main drivers (structural, cultural or related to interchange dynamics)

Several interviewees argued that open science, particularly in the form of good data management and data sharing, is a key driver for scientific integrity, because it enables the control and verifiability of research and research data.

Furthermore, NWO has identified the improvement of information exchange with universities as a driver for the implementation of the integrity policy. In the coming years, NWO plans to more strictly enforce the integrity policy by making agreements about information sharing, and by including the obligation to report integrity issues to NWO in the terms of funding.

D. Best practices (or bad practices)
• A strong focus in the organizational culture on the soundness and honesty of assessment and funding procedures, and on organizational integrity.
• Ethical assessment and reflection are structurally embedded in assessment and funding procedures.
• Research funding programs (MVI, FRRP, Ethics and Healthcare) that explicitly incorporate ethical considerations, and “research on research”, in order to promote ethical reflection in and on research and innovation.
• Funding replication studies, in order to promote and safeguard research integrity.

E. Current indicators

• The interviews indicate that NWO’s integrity desk receives little complaints about research integrity. Exact numbers are currently unavailable.
• Since its start, MVI has funded over 60 research projects on responsible innovation, that take ethical considerations into account.
• FRRP has a total budget of almost 4M€. ZonMw’s website lists 13 projects that are currently in progress.
• NWO’s annual report 2016 mentions research integrity as a topic of importance, but does not mention indicators.

F. Recommendations

• Further stimulate open science, and open data more specifically (see RRI aspect “open science” for further elaboration).
• Include the obligation to report integrity issues in terms of funding.
• Keep promoting replication studies as a valuable contribution to reliable science, in national and international academic circles.
• Make agreements with universities about sharing information on integrity issues.

G. Resulting matrix

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<td>Potential drivers for RRI</td>
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<td></td>
<td>Improving the information position of NWO with respect to integrity issues at universities.</td>
</tr>
<tr>
<td>Potential barriers to RRI</td>
<td></td>
<td>The idea that scientific research should always be new and innovative is a barrier to replication studies</td>
<td>Reluctancy at universities to inform NWO about scientific integrity issues</td>
</tr>
<tr>
<td>Most important potential organizational actions</td>
<td>Further stimulate open science, and open data more specifically (see RRI)</td>
<td>Keep promoting replication studies as a valuable contribution to reliable science, in national and</td>
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aspect “open science” for further elaboration). Include in the obligation to report integrity issues in funding terms. international academic circles.

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<td>Improved flow of information on integrity cases from universities to NWO</td>
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8.2.3 Societal engagement strategies in the organization

A. Description of the practice and its development and an assessment of how well it currently works

The interviews and document study indicate that promoting the societal impact and relevance of research is a major priority for NWO, which is stimulated, embedded in the organization, and brought into practice in various ways. For instance, societal relevance and potential impact are used as assessment criteria for research proposals. Since 2013, applicants have to describe the potential societal and economic benefits of the proposed research in a “knowledge utilization section”. The relative weight of this section in the overall assessment of proposals depends on the aims of the funding scheme or program. In thematic, society-oriented schemes, it plays a more prominent role in the assessment, as compared to curiosity-driven research funding schemes. Furthermore, ZonMw has an implementation policy, which focuses on promoting the impact of the results of medical research in policy and practice. This policy involves knowledge sharing on successful implementation strategies, funding implementation-oriented projects, and promoting network-building for enabling implementation.

The active involvement of, and collaboration with, societal actors (citizens, societal organizations, companies) is also a key priority that has received much attention in recent years. NWO is involved in the programming, implementation, and execution of the National Research Agenda (NWA) and the Top Sector policy. The former involves the active engagement of citizens in national research agenda setting; the latter involves stimulating collaborations between research institutes and industries in public-private partnerships. The MVI program is one of the contributions of NWO to the Top Sectors. Both the NWA and the TS aim at enabling interaction and participation in research programs that focus on solving main societal challenges.

Besides these large programs, separate domains in NWO and ZonMw have their traditions and practices when it comes to societal engagement. At ZonMw, citizens or “experts by experience” are involved in early stages of health research agenda-setting. This takes place for instance in mixed panels or dialogue sessions in which researchers, professionals, and representatives of patients are involved. In the domain of Applied and Technical Science, every funded project includes a “user committee”. Such committees consist of the researchers and a group of representatives of interested parties; the latter are usually companies, but may also include societal organizations. User committees give advice to project leaders about the project design and execution, in order to maximize the potential for impact and knowledge utilization. This model of user committees has inspired similar approaches in other programs; MVI for instance uses “valorization panels” (see section 8.2.1).

In NWO’s strategy 2019-2022 (NWO 2018), societal engagement is identified as an important strategic theme in various ways. For instance, NWO plans to make available a funding scheme for
projects that involve citizens by means of citizen science. This aims at both enriching knowledge creation, and enabling public support for research. Furthermore, NWO aims to involve citizens and other societal actors in programming (co-design) and executing research (co-creation). This includes stimulating knowledge exchange, using co-financing and public-private partnerships in research projects, and exploring possible “impact pathways” and theories of change in early phases of research projects.

Finally, societal engagement is embedded in the organizational structure of NWO. For instance, the central advisory council involves experts from academia, industry, and societal organizations. Furthermore, the domain boards include societal representatives, who engage in the boards’ deliberations from a societal perspective.

B. Main barriers (structural, cultural or related to interchange dynamics)

The interviews and document studies revealed no major frictions or barriers to societal engagement. One theme that was discussed, was the relation between “free”, blue-sky research, and “thematic”, society-oriented research. It is sometimes felt that there is a trade-off between the two, but this is not a general consensus.

Furthermore, it was argued that there can be asymmetries of expertise in dialogues or participatory processes in which researchers, professionals and laypeople are involved. Dealing with such asymmetries requires thoughtful selection of participants and moderation of discussions. This was discussed more as a point of attention than as a major barrier for societal engagement.

The interviews and document study indicate that impact and relevance are important concepts that frame discussions and initiatives regarding societal engagement at NWO. However, these concepts presuppose a somewhat linear relation between knowledge and action. This may form a barrier to more participatory and interactive forms of engagement.

C. Main drivers (structural, cultural or related to interchange dynamics)

At ZonMw, increased attention for the societal impact of research is seen as an important driver for societal engagement. Currently, efforts are made to connect the responsible research practices framework (see above) to the strategic theme of improving impact. This includes the development of a new impact framework that focuses on knowledge use, implementation, productive interactions, and responsible research practices (Reijmerink 2018). Furthermore, monitoring the actual impact of health research in healthcare practice is a priority for the coming years. One of the interviewees for instance argued the impact of research:

“Our ambition for the near future is to increase insight into this. [...] I think it requires building coalitions with stakeholders in the field [...] and asking them what has changed in practice since a research project was conducted”.

In the Science domain, new cross-sectoral research in the context of the Top Sectors is seen as one of the drivers for societal engagement in the coming years. This includes drafting a new call for a cross-over research program, for public-private and interdisciplinary research collaborations, which will focus on solving important societal challenges.

Finally, a driver for public engagement at NWO could be the application of concepts or process designs for engagement that imply more dynamic, interactive relations between knowledge and action, and between science and society. A good step in this direction is the focus on co-creation and co-design in the new strategy. However, a further elaboration of these notions is required, in order to implement them across the organization. Successful approaches and experiences from MVI,
Applied and Engineering Science, and ZonMw, can serve as inspiration for such further elaboration and implementation of co-design of research and co-creation of knowledge.

D. Best practices (or bad practices)

- Connecting RRI to an impact creation framework or agenda.
- Involving of experts by experience and user committees in agenda-setting and early stages of research and innovation.
- Involving societal actors in the organization, for instance in the central advisory council.

E. Current indicators (from annual report 2016).

- Number of funding applications (384) and awards (151) in societal challenges-oriented research (total applications in all domains: 5,518, total awards: 1,470).
- From 2012-2015, NWO contributed 463M€ to public-private research collaborations.
- Funding of Top Sector research through NWO: 275M€ per year, of which 100M€ for public-private research collaborations (2016-2017).

F. Recommendations

- Further develop cross-sectoral, interdisciplinary research (funding) programs that focus on societal challenges, with active involvement of societal stakeholders.
- Further elaborate and implement dynamic and interactive models of engagement, building on experiences and successful approaches.
- Build coalitions with organizations in the field to enable the monitoring of societal impact.

G. Resulting matrix

<table>
<thead>
<tr>
<th>Aspects of organizations</th>
<th>Structural issues</th>
<th>Cultural issues</th>
<th>Interchange related</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mandates, legislative frameworks, formal hierarchies</td>
<td>Culture, informal routines, informal reward systems, focus on management</td>
<td>Policy learning, pressures from key stakeholders (owners, the public, etc.)</td>
<td></td>
</tr>
<tr>
<td>Potential drivers for RRI</td>
<td>Further increased funding of collaborative, societal challenge-oriented research.</td>
<td>Using more dynamic and interactive models of societal engagement.</td>
<td>Improved monitoring of the actual societal impact of research and funding programs.</td>
</tr>
<tr>
<td>Potential barriers to RRI</td>
<td></td>
<td>Linear notions of the relation between knowledge and action (impact, relevance).</td>
<td></td>
</tr>
<tr>
<td>Most important potential organizational actions</td>
<td>Further develop cross-sectoral, interdisciplinary research (funding) programs that focus on societal challenges, with active involvement of societal stakeholders</td>
<td>Elaborate and implement dynamic and interactive models of engagement, building on experiences and successful approaches.</td>
<td>Build coalitions with organizations in the field to enable the monitoring of societal impact</td>
</tr>
<tr>
<td>Several actions can be included</td>
<td>Indicators for success</td>
<td>Further mainstreaming of co-creation and co-design</td>
<td>Establishment of an impact monitoring network.</td>
</tr>
</tbody>
</table>
8.2.4 Gender equality and diversity strategies in the organization

A. Description of the practice and its development and an assessment of how well it currently works

Gender equality is a theme that is high on NWO’s agenda, and is seen as almost self-evidently a high priority. A major gender-related issue in the Netherlands, that also concerns NWO, is the low percentage of women in high scientific positions. For instance, women had less than 20% of all professor positions in the Netherlands in 2017. Various initiatives have been taken to stimulate the careers of female scientists, and to facilitate their promotion to higher positions. NWO had the task to execute the Westerdijk Talent Scheme, which is an instrument to appoint 100 women as professors at Dutch Universities (see section 5.5).

Already longer running is the NWO’s Aspasia program, which provides grants to female scientists for their promotion to associate or full professorships. In order to counter meritocratic arguments against promoting women to higher positions, only candidates who received very positive assessments in NWO’s Talent Scheme are eligible for funding. The Talent Scheme is an open funding competition that provides personal research grants to talented scientists in various stages of their careers. A condition in the Aspasia program is that a part of the grant is to be used by the institute of the beneficiary to implement diversity policy that aims at facilitating female scientists in their career development or research work.

Besides in scientific careers, gender equality is also a priority in NWO’s organization, procedures, and committees. This includes striving for equal gender ratios in administrative and management positions and in assessment committees. Furthermore, there is much attention for gender ratios in the awarding of research funding; in the case of personal grants, these ratios are monitored and made publicly available. In 2013, NWO commissioned a study about gender ratios and biases in the awarding of its funding (Van der Lee and Ellemers 2015). This study demonstrated that in the first tier of NWO’s Talent Scheme (which is called the Veni scheme), awarding rates for female applicants were lower than those for male applicants. Furthermore, the study revealed that women received less positive evaluations than men, and that assessment procedures employed gendered language; words to express quality, relatively often referred to male gender stereotypes. In reaction to this study, NWO announced several measures in 2015, including stimulating gender awareness, employing gender neutral assessment criteria and, and avoiding gendered language.

Current discussions in NWO also focus on a broader notion of diversity, which extends beyond gender diversity. Some interviewees indicated that cultural and ethnic diversity, and diversity in terms of career paths of scientists, are also important topics. This broader understanding of diversity has to date been less prominently implemented and addressed, compared to gender diversity.

B. Main barriers (structural, cultural or related to interchange dynamics)

Interviewees indicated that NWO takes many types of actions to promote gender equality; at the same time, the influence of NWO in the Dutch science system is perceived as somewhat limited. The main perceived barriers to gender equality in Dutch science are of a cultural nature. These cultural barriers include gender bias in the assessment of women, and ingrained prejudices about the career ambitions of women.
Furthermore, the standard model of the scientific career is perceived as too rigid and monomorphous, focusing on a standard path towards professorship, and valuing a limited set of competences.

C. Main drivers (structural, cultural or related to interchange dynamics)

In the coming years, increasing the percentages of women in high scientific positions is likely to remain a key issue in the Netherlands and an important driver for gender equality. Interviewees indicated that gender bias training of assessment committee members is seen as an important way of diminishing gender bias in assessment procedures. Furthermore, it was suggested that application forms for research funding should be adapted, for applicants to have more room to display their competences. Such competences could for instance include collaborative, communicative or societal engagement-related skills, in addition to other scientific excellence-related competences. Also, selection criteria can be adapted, in order to include a higher diversity of competences in assessments. For instance, one of the interviewees stated about promoting gender equality:

Another driver for diversity in science is emphasizing science as team work, rather than as an individual endeavor. In the interviews, it was argued that the current assessments of researchers focus too strongly on individual achievements and qualities, while scientific research is often a team effort. Emphasizing this team work aspect, and the associated competences such as networking and collaborative abilities, would facilitate an increased appreciation of researchers that make valuable contributions in collaborative settings, but that stand out less when it comes to individual excellence. In this way, the diversity of “individualists” and “collaborators” in science would be done more justice in the assessment of scientists.

Also, it was suggested to include the diversity of teams as an criterion in the assessment of research proposals. One of the interviewees for instance stated about one of NWO’s most prestigious funding programs:

“In the first two rounds, there was just one female applicant. [...] All other consortia were led by men. [...] We found this very undesirable, and the minister had also expressed her concerns about this issue. [...] So in the new call, as a policy measure, we included the composition of research teams as an assessment criterion. [...] Subsequently, of the 37 submitted applications, 11 were led by women, 4 of which were granted. [...] The women are there, but apparently you have to do something to increase their visibility.”

Furthermore, actions can be taken to further stimulate cultural or ethnic diversity in science. Recently, a funding pilot called “refugees in science” was started, which funds “one-year appointments for academics who have fled their home country and wish to continue their scientific career in the Netherlands”\(^\text{92}\). The intention of this pilot is to help these academics build a network in the Netherlands, and possibly continue their career or research line. NWO argues that “these academics will enrich Dutch science and society with the expertise they bring with them”\(^\text{93}\).

Enabling diversity of scientific career paths requires rethinking the notion of a successful scientific career, and what the role of NWO in the latter can be. One concrete action in this direction, suggested by an interviewee, is to alter or abolish the application terms for the Talent Scheme. Currently, it is only possible to apply for a grant in this scheme within set terms after obtaining a PhD.

D. Best practices (or bad practices)

• Commissioning independent research or audits on gender (in)equality in research funding procedures.
• The Aspasia program, in which the promotion of female scientists to higher professional position is combined with clear meritocratic criteria in order to avoid stigmatization, and in which such promotion is combined with the obligation to develop and implement gender and diversity policy.
• The refugees in science pilot project, which enables scientists who live in the Netherlands as refugees to build networks, continue their research, and contribute to Dutch science and society with their expertise.

E. Current indicators

Since 2010, NWO has been working towards a 40% share of women in all boards and committees. Between 2010 and 2014, the proportion of women in boards and committees grew from 20% to 40%.

NWO also has target figures for the proportion of women in high positions in the organization:

<table>
<thead>
<tr>
<th></th>
<th>Target figure for proportion of women</th>
<th>Actual figure ultimo 2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top level positions</td>
<td>28%</td>
<td>19%</td>
</tr>
<tr>
<td>Sub-top positions</td>
<td>36%</td>
<td>26%</td>
</tr>
<tr>
<td>Middle management</td>
<td>40%</td>
<td>40%</td>
</tr>
</tbody>
</table>

In 2016, 32% of NWO’s employees (granting division and research institutes) were female.

Furthermore, NWO monitors the gender ratios in grant applications and awards, and publishes these figures. In 2014, about one third of around 5,000 proposals was submitted by women. In that year, 20% of the proposals from female applicants were awarded, against 26% of the proposals from male applicants.

In 2016, almost two third of all funding applications were submitted by men; over a third came from women (annual report 2016).

For the various types of personal research grants, including under NWO’s Talent Scheme, there were 1,495 applications from men, and 1,124 from women in 2016. 276 applications from male scientists, and 229 from female scientists, were granted. This means that for these grants, the total awarding rate for male applicants was 18.5%, and for female applicants 20.4%.

The study of Van der Lee and Ellemers (2015) indicated that from 2010 to 2012, the awarding rates for female applicants in the first tier of the NWO Talent Scheme (the Veni program), were lower than those for male applicants. The awarding rate for female applicants was 14.9%; for male applicants, it was 17.7%.

F. Recommendations

• Further develop broader and more inclusive notions of diversity and scientific success.
• Adapt application forms and selection criteria in order to include a broader set of competences.
• Include the diversity of research teams as an assessment criterion.


95 https://www.nwo.nl/en/policies/gender+diversity

96 https://www.nwo.nl/en/policies/gender+diversity
Abolish the application time limit (years after PhD graduation) in the Talent Scheme.

G. Resulting matrix

<table>
<thead>
<tr>
<th>Aspects of organizations</th>
<th>Structural issues</th>
<th>Cultural issues</th>
<th>Interchange related</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Mandates, legislative frameworks, formal hierarchies</td>
<td>Culture, informal routines, informal reward systems, focus on management</td>
<td>Policy learning, pressures from key stakeholders (owners, the public, etc.)</td>
</tr>
<tr>
<td>Potential drivers for RRI</td>
<td>Increasing the percentages of women in higher scientific positions.</td>
<td>Avert gender bias in assessment committees. Emphasize the team work aspect of science. Re-think the notion of a successful scientific career.</td>
<td></td>
</tr>
<tr>
<td>Potential barriers to RRI</td>
<td></td>
<td>An overly rigid and monomorphic “standard model” of the scientific career.</td>
<td>Limited influence of NWO on (inter)national academic culture.</td>
</tr>
<tr>
<td>Most important potential</td>
<td>Adapt application forms and selection criteria in order to include a broader set of competences. Include the diversity of research teams as an assessment criterion. Abolish the application time limit in the Talent Scheme.</td>
<td>Further develop broader and more inclusive notions of diversity and scientific success.</td>
<td></td>
</tr>
<tr>
<td>organizational actions</td>
<td>Several actions can be included</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indicators for success</td>
<td>More inclusive criteria and procedures.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

8.2.5 Open access and open science strategies in the organization

A. Description of the practice and its development and an assessment of how well it currently works

Open science, which includes open access publication and open data, is a key priority for NWO and ZonMw. Also in the broader academic, political, and policy landscape of the Netherlands, open science is high on the agenda. For instance, during the Dutch presidency of the EU in 2016, open science was made one of the priorities. Both the current and previous boards of NWO have been strong proponents of open science, and have argued for both its national implementation and (inter)national harmonization. Accordingly, NWO has played a directive role in the implementation of open science in the Netherlands, in its own policies, as well as in the context of the National Plan Open Science (see chapter 5).

In the Dutch context, discussions on open science are clearly linked to the topic of research integrity. Scientific fraud cases have been one of the drivers of open data initiatives; open data is seen as an important driver for promoting and safeguarding scientific integrity.
NWO and ZonMw have data management policies, which require data management sections in funding applications, and full data management plans (DMPs) for approved research projects. DMPs have to be in accordance with the FAIR principles, in order to facilitate replication, control, and re-use of research data. In its “access to data” policy, ZonMw also has provisions on compiling data files according to the FAIR principles; also, ZonMw is currently further specifying this policy with respect to research data infrastructures.

In 2010 NWO introduced an Incentive Fund for open access publishing and for open access-related activities at scientific conferences. Due to increased opportunities for open access publishing, this fund was terminated in early 2018.

As of December 2015, open access publishing is obligatory under NWO’s granting conditions. Publications that result from NWO-funded research have to be immediately available, either as “green” or “gold” open access. The former means publishing in a traditional subscription journal, while also sharing a version of the publication through a database or repository; the latter means publishing in an open access journal.

B. Main barriers (structural, cultural or related to interchange dynamics)

In the interviews, it was argued that the importance that is attached to impact factors and journal rankings is a barrier to open access publishing, because some of the scientific journals that top the rankings do not support open access. Also, some big publishers do not support open access.

Furthermore, it is difficult to monitor whether open access policy is actually observed, because articles are sometimes published years after a project has ended. In comparison, research data management can more easily be monitored, at the closing of a project.

With respect to data management, there are still questions and uncertainties in the universities about what proper data management entails, and what the standards and procedures for data management should be.

For both data management and open access, there are financial challenges. The required facilities and infrastructures for data management according to the FAIR principles will require substantial funds; with respect to the switch to open access, the financial sustainability of the publishing system is at stake.

C. Main drivers (structural, cultural or related to interchange dynamics)

Further enabling open access publishing requires a culture change in academia regarding how scientific output and quality are assessed and valued. In some fields, open access publishing may be stimulated by reducing the importance of impact factors, and increasing the importance of open-access related activities or parameters.

In order to see whether open science policies are observed in practice, monitoring of both data management and open access publishing is necessary. At NWO, such monitoring is currently under development.

Furthermore, clear standards and best practices regarding data management would help reduce the current uncertainties in academia about what good data management entails and what the requirements are.

Finally, the open data policy can be taken further, by not only requiring research data management that facilitates data re-use, but by also stimulating the actual re-use of data. Some of NWO’s funding,
for instance for replication research, already goes in this direction. However, further steps can be taken, for instance by making available funding for research that uses already existing data sets.

D. Best practices (or bad practices)

- Making open access publishing mandatory in research funding conditions
- Requiring data management sections in all applications, and data management plans in all granted projects.

E. Current indicators

The need to monitor researchers’ compliance with the RDM policy and the open access policy has been acknowledged by NWO. A monitoring system is currently under development.

In 2016, an estimated number of 5,457 publications from NWO-funded research (probably an underestimation) were published open access, which was 34.3% of the total (annual report 2016).

F. Recommendations

- Implement a monitoring and control system for open access and open data.
- Further develop standards and share best practices of data management.
- Reduce the importance of journal impact factor in assessments, include aspects of open science as assessment criteria, for instance in funding procedures.
- Set up funding of research that re-uses existing research datasets.

G. Resulting matrix

<table>
<thead>
<tr>
<th>Structural issues</th>
<th>Cultural issues</th>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Aspects of organizations</strong></td>
<td>Mandates, legislative frameworks, formal hierarchies</td>
<td>Policy learning, pressures from key stakeholders (owners, the public, etc.)</td>
</tr>
<tr>
<td><strong>Potential drivers for RRI</strong></td>
<td>Monitoring of open data and open access.</td>
<td>Culture change with respect to assessing scientific output and quality, less importance of impact factors and journal rankings.</td>
</tr>
<tr>
<td><strong>Potential barriers to RRI</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Most important potential organizational actions</strong></td>
<td>Implement a monitoring and control system for open access and open data.</td>
<td></td>
</tr>
</tbody>
</table>

94
Several actions can be included

<table>
<thead>
<tr>
<th>Indicators for success</th>
<th>Implementation of open science monitoring system.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Inclusion of open science criteria in funding procedures.</td>
</tr>
<tr>
<td></td>
<td>Establishment of a funding scheme for the re-use of existing data.</td>
</tr>
</tbody>
</table>

8.2.6 Science education as integrated in research

The interviews and document study indicate that science education (in the sense used in RRI-Practice, not to be confused with science communication or public engagement) is not a core theme in NWO’s policies and strategy. Science education is sometimes a theme or an objective in separate research projects that are funded by NWO, but such individual projects are outside the scope of this review.

8.2.7 Incorporation of AIRR dimensions into policies

**Anticipation and reflexivity**

A. Description of the practice and its development and an assessment of how well it currently works

NWO and ZonMw have various programs in which anticipation and reflexivity are key principles; clear examples of these include the MVI and FRRP programs (see above). The MVI program funds projects in which in any case industrial stakeholders, but often also societal stakeholders, are involved in early stages of the design of innovations or innovation processes, in order to take societal aspects (such as ethical, legal, social, economic, and psychological aspects) into account from the start, and try and meet future societal concerns and expectations; reflection on the societal aspects of such innovations is an important aspect of this program. The FRRP program, and the responsible programming initiative to which is it connected, aim at enabling reflexivity in at least two ways: reflection on how to foster responsible research practices in the academic world, and reflection on responsible programming and funding practices in the internal organization.

Anticipation also plays an explicit role in other programming and funding processes. At ZonMw, the involvement of societal actors the first stages of priority- and agenda-setting for research funding is an established practice in many programs. At NWO, other programs besides MVI also involve an
anticipatory approach to ethical, legal, and societal issues surrounding science and innovation. An example of the latter is the Data2person program, which focuses on the roles of big data and data science in personal health empowerment97.

Some of the interviewees mentioned strategy development, and the new strategy of NWO in particular, as an important anticipatory process in the organization. The new strategy (NWO 2018) came about in an interactive process with representatives of diverse scientific disciplines and organizations, who were invited to reflect on the futures of their domains of expertise. This input was used to prioritize themes of the strategy.

Furthermore, long term considerations play a role in NWO’s separate domains. For instance, in the Science domain, recent discussions have focused on sustaining long-term research programs, infrastructures, and alliances, in areas such as astronomy and particle physics. This involves research that in some cases has a time horizon of several decades. Interviewees emphasized the importance of keeping an eye on this far horizon, particularly at this juncture in which short-term societal relevance and impact are prominent in the science and innovation discourse.

Organizational reflexivity at NWO and ZonMw has various focus points. Firstly, the interviews indicate that reflection on developments in the broader institutional and academic landscape, in which NWO is situated, is seen as crucial. For instance, interviews indicated that reflection on sound science and aspects of the science system such as the publishing culture, is constantly encouraged in the organization. Secondly, organized self-reflection takes place in various ways. These include reflection on NWO’s selection and funding procedures, for instance by commissioning external research (see also section 8.2.4), and in learning-oriented knowledge sharing sessions for NWO policy officers, that in recent years focused on topics such as policy, procedures, gender, and ethics. Thirdly, reflexivity pertains to NWO’s outlook on its roles and responsibilities regarding the broader institutional and academic landscape, and how such roles and responsibilities can be given shape. This was for instance an important topic in the development of the new strategy.

B. Main barriers (structural, cultural or related to interchange dynamics)

In the interviews at ZonMw, it was mentioned that the FRRP initiative initially met with scepticism and resistance from various directions. These included prominent academics who were not keen on initiatives to critically scrutinise the science system.

In the focus group at NWO, it became clear that sharing knowledge, experiences, and best practices is a challenge, due to the size and complexity of the organization. For instance, one of the participants argued that “we all have a piece of the puzzle”. This underlines the importance of sharing knowledge in the organization, in order to facilitate reflexivity and learning.

C. Main drivers (structural, cultural or related to interchange dynamics)

Anticipation and reflexivity in NWO and ZonMw would benefit from the application of strong points of the MVI and FRRP approaches in other funding schemes and programs. This would entail the broader implementation of the early-stage involvement of societal actors, the further development and mainstreaming of frameworks of responsible research and innovation, further reflection on responsible programming practices, and further stimulating “research on research”, i.e. research on responsibility and irresponsibility in the current science and innovation system.

D. Best practices (or bad practices)

Both MVI and FRRP can be considered as best practices of the implementation of integrated notions of RRI in research funding. Key aspects of MVI that appear to have contributed to its success, are its recognizable profile and approach that have remained stable for over a decade, its focus on network-building in order to foster and engage a community of responsible innovation scholars and practitioners, and its solid embedment in the broader institutional landscape, e.g. in the Top Sectors. An important aspect of the FRRP program is that it enables reflexivity, simultaneously in academia and in the internal organization. This combined internal and external reflexivity appears to be a strong driver of organizational learning.

If we translate these practices to a more general notion of what a best practice of RRI research funding could entail, the following elements come to mind:

- Formulate a program with a clear focus, for instance reflected in a clear framework of RRI, or in a clear problem statement with respect to research and innovation that the program should address.
- Invest in engaging with, and involving, the relevant societal, industrial, and academic “stakeholders”, in order to ground the program in the institutional and policy landscape, and in a community of practice.
- Position the program as a means of reflection and learning in the internal organization, by including a diverse group of employees and departments in its development, by facilitating discussion and reflection on the program and its products, and by exploring ways of rolling out or mainstreaming the approach.

E. Current indicators

F. Recommendations

- Further implementation of key features of the MVI and FRRP approaches across the organization.
- Facilitate knowledge exchange and network-building in the organization, also between domains, in order to enable reflexivity and learning.

G. Resulting matrix

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<td>Culture, informal routines, informal reward systems, focus on management</td>
</tr>
<tr>
<td>Potential drivers for RRI</td>
<td>Further mainstreaming of RRI in funding schemes and organizational practices</td>
<td>Combine internal and external reflexivity in order to enable organizational learning.</td>
</tr>
<tr>
<td>Potential barriers to RRI</td>
<td>Complexity and fragmentation in the organization.</td>
<td></td>
</tr>
</tbody>
</table>
Most important potential organizational actions
Several actions can be included

| Indicators for success | Further implementation of key features of the MVI and FRRP approaches across the organization. | Knowledge exchange and network-building in the organization, in order to enable reflexivity and learning. |

Openness and transparency

A. Description of the practice and its development and an assessment of how well it currently works

The interviews indicate that openness and transparency are core values at NWO. Interviewees for instance stressed the importance of accounting for how public money is spent in research funding. Furthermore, the importance of sound, clear, unbiased and transparent assessment and funding procedures was emphasized. Several interviewees mentioned these values of openness and transparency, when they were asked to describe their understanding of responsibility.

Furthermore, interviewees emphasized that sound procedures require the preclusion of conflicts of interests in assessment procedures, in order to safeguard a level playing field for all applicants. Provisions for this include the code of conduct on conflicts of interest. With respect to conflicts of interests, one of the respondents stated that NWO and ZonMw are “under a magnifying glass”, i.e. under intense public scrutiny. For instance, a controversy arose in 2017, when a Dutch investigative radio program claimed that there was a pretence of a conflict of interests in particular assessment procedures at ZonMw. The latter argued that the program portrayed the affairs one-sidedly, and at the same time reinforced monitoring and control with respect to conflicts of interests.

B. Main barriers (structural, cultural or related to interchange dynamics)

No barriers to openness and transparency were mentioned in the interviews.

C. Main drivers (structural, cultural or related to interchange dynamics)

In the interviews, it was suggested that openness and transparency at NWO could increase, by making interim and final reports and research proposals publicly available.

D. Best practices (or bad practices)

- Treating openness and transparency as core values in the organization.
- Explicitly addressing transparency and possible conflicts of interests in procedures and administrative consultations.
- Being accountable, and open to continuous learning, when it comes to preventing conflicts of interests.

E. Current indicators

• The implementation of a code of conduct on conflicts of interest.
• Openness about funding procedures and their outcomes, for instance in terms of assessment regulations, success rates, gender ratio, the number of objections lodged, and the decisions taken on objections (annual report 2016).

F. Recommendations
• Make research proposals and reports publicly available as much as possible.

G. Resulting matrix

<table>
<thead>
<tr>
<th>Structural issues</th>
<th>Cultural issues</th>
<th>Interchange related</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aspects of organizations</td>
<td>Mandates, legislative frameworks, formal hierarchies</td>
<td>Culture, informal routines, informal reward systems, focus on management</td>
</tr>
<tr>
<td>Potential drivers for RRI</td>
<td>Public availability of research proposals and reports.</td>
<td></td>
</tr>
<tr>
<td>Potential barriers to RRI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Most important potential organizational actions</td>
<td>Make research proposals and reports publicly available as much as possible.</td>
<td></td>
</tr>
<tr>
<td>Several actions can be included</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indicators for success</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Responsiveness and adaptation

A. Description of the practice and its development and an assessment of how well it currently works

The interviews indicate that responsiveness is an important value for NWO, which entails observing trends in science and the science system, and responding to these trends by means of research programming and improving governance and procedures. Such trends include new concerns and developments in science and society, developments in scientific career paths, governance and personnel management at universities, academic publication cultures, and the research ecosystem in general.

In recent years, NWO has responded to trends in society and the science system by means of various funding pilots and programs. For instance, discussions about the reliability of science, incited NWO to start the Replication Studies scheme (see section 8.2.2). Another example is the Refugees in Science pilot, which provides funding for hiring academics who live in the Netherlands as refugees (see section 8.2.4).

There are also various recent examples of responsiveness in funding procedures and governance. These include recent measures to reduce “application pressure” and increase funding success rates.
of applications, and recent initiatives to reduce the Matthew effect in Dutch science (see also section 8.2.1) (NWO 2018).

B. Main barriers (structural, cultural or related to interchange dynamics)

No barriers to responsiveness and adaptation were mentioned in the interviews and analyzed reports.

C. Main drivers (structural, cultural or related to interchange dynamics)

The interviews indicate that keeping in close touch with stakeholders and experts in the field, and organizational reflexivity, i.e. keeping a constant focus on organizational renewal and learning, are drivers of responsiveness.

D. Best practices (or bad practices)

- Foster organizational flexibility, openness, and learning, for instance by using pilots to experiment with, reflect on, and learn from new initiatives in research funding and governance.
- Foster good relations and facilitate interactions with stakeholders and experts in the field.

E. Current indicators

- The emergence of several new pilots and funding programs that respond to concerns and new developments in science and society (refugees in science, big data research, replication studies)
- The timely formulation and implementation of measures to respond to observed pressures or frictions in the science system, for instance concerning “application pressure”.

F. Recommendations

- Further implement experimental and learning-oriented approaches to research funding in the organization.
- Further invest in network-building with relevant academic, industrial, and policy stakeholders.

G. Resulting matrix

<table>
<thead>
<tr>
<th>Structural issues</th>
<th>Cultural issues</th>
<th>Interchange related</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mandates, legislative frameworks, formal hierarchies</td>
<td>Culture, informal routines, informal reward systems, focus on management</td>
<td>Policy learning, pressures from key stakeholders (owners, the public, etc.)</td>
</tr>
<tr>
<td>Aspects of organizations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potential drivers for RRI</td>
<td>Organizational reflexivity: a constant focus on organizational renewal and learning.</td>
<td>Keeping in close touch with stakeholders and experts in the field.</td>
</tr>
<tr>
<td>Potential barriers to RRI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Most important potential organizational actions</td>
<td>Use pilots to experiment with and learn from new initiatives</td>
<td>Foster organizational flexibility, openness, and learning.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Foster good relations and facilitate interactions with stakeholders.</td>
</tr>
</tbody>
</table>
Several actions can be included in initiatives in research funding and governance. Stakeholders and experts in the field.

Indicators for success

8.3. Reflection on Review findings, Outlooks developed and ways forward

8.3.1 The integrated or fragmented nature of different responsibility related dimensions

In the interviews and documents, the following RRI aspects were referred to together relatively often:

- Anticipation and societal engagement: these aspects are combined in several processes and approaches (including MVI and research programming at ZonMw), in which societal actors are involved in agenda-setting and early stages of research and innovation. Furthermore, it was argued that societal engagement with a short-term focus on societal relevance should not be a barrier for taking the long term into account.
- Ethics/integrity and open science: cases of scientific fraud in the Netherlands have been an important driver of open science policies and initiatives; open science is seen as a key driver of scientific integrity.
- Ethics and societal engagement: these RRI aspects are for instance combined in both the MVI and FRRP programs.
- Gender/diversity and reflexivity were mentioned together several times in the interviews. This co-occurrence relates to the self-reflective research on gender equality in funding procedures, to reflection activities that focused on gender, and on the reflection on NWO’s role with respect to diversity in scientific careers.

Integrated notions of RRI can be found in the MVI and FRRP programs. An interesting aspect of these programs is that they involve quite different conceptualizations of RRI: MVI focuses on the anticipatory co-design of societally desirable and acceptable innovations, while FRRP focuses on researching responsible practices and countering failings in the science system. The differences between these programs suggest that there is not one golden route to RRI implementation, and that it is useful to tailor RRI programs and frameworks to the issues and contexts in which they are expected to do their work.

In the focus group, we discussed the further mainstreaming of MVI in the organization, and asked whether this would require a re-framing or broadening of the MVI approach, for instance by including additional RRI aspects. In answer to this, it was argued that this would not be a good idea, because it would make the approach more diffuse and less recognizable. Therefore, it would diminish one of the current strengths of the program, namely its clear profile and approach. Consequently, it can be argued that RRI approaches or frameworks do not gain power by infusing them with a large array of RRI keys or dimensions, but rather by building them around a powerful core idea of responsibility.

8.3.2 Common barriers or drivers

The analysis of the various RRI aspects above indicates that there are some common barriers and drivers for aspects of RRI at NWO.

The findings suggest that a key cultural barrier for further promoting RRI lies in conceptions in the broader academic landscape, regarding what (good) science is and how it should be valued. These conceptions include the idea that science should always be new and innovative, linear notions of the
relation between knowledge and impact, limited and rigid notions of what a successful scientific career entails, and the importance of journal impact factors and rankings in the assessment of scientists.

A second barrier that more specifically concerns NWO, relates to the exchange of information between NWO and research organizations such as universities. The interviews for instance indicated that NWO’s information position with respect to scientific integrity issues and compliance with open science policies in universities, are points for improvement.

The analysis suggests that there are three main drivers for further implementing RRI in NWO, and through NWO’s instruments and actions:

- Further mainstreaming successful RRI-related approaches (MVI, FRRP), and further promoting the sharing and re-use of research data, in funding schemes and research programs.
- Further stimulating activities to reflect on and re-think science, for instance regarding science as team work, the notion of a successful scientific career, and how scientific output and quality are valued and assessed.
- Strengthening NWO’s information position with respect to RRI aspects such as integrity and open science, in order to strengthen responsiveness to new developments concerning these aspects. This includes monitoring, network- and community-building, and keeping in close touch with stakeholders and experts in the field.

8.3.3 Conclusion and final reflections

The aim of RRI-Practice is to support the implementation of RRI in research producing and conducting organizations. In the case of NWO, RRI is already well-addressed and internalized in the organization. This counts both for RRI-related programs such as MVI and FRRP, and for separate RRI aspects such as societal engagement, gender equality, ethics, open science, reflexivity, and responsiveness. In this sense, NWO itself may be considered a best practice from the perspective of RRI.

NWO is currently in the final stages of both a transition towards a new organizational and governance structure, and of implementing a new strategy. This situation provides opportunities for further implementing RRI in the organization and its instruments. Our findings indicate this may be enabled by:

- further mainstreaming already established RRI approaches
- further strengthening collaborative and informational ties with the broader academic and societal network
- further re-thinking science, for instance in terms of career development, excellence, and societal contributions and implications.

Currently, these points have the status of recommendations, not of points of agreement that have been agreed upon with the NWO administration. These recommendations will be further elaborated in the final outlooks, and discussed with relevant contact persons in the organization.
9. Summary of findings on each responsibility dimension

9.1 The concept of responsibility
In the national context and the organizations that we studied, we found one particularly pervasive understanding, or conceptualization, of responsibility. This understanding is that science and innovation should be relevant to, or have impact on, society and the economy. Accordingly, research funding and performing organizations are generally understood to have the responsibility to stimulate or produce results, knowledge, and applications, that are of value to society and the economy. In recent years, this notion of societal and economic impact has shifted and broadened, for instance by emphasizing the need to address or solve societal or global challenges in domains such as food, health, energy, and environment.

Furthermore, responsibility in the Netherlands is often associated with research ethics and integrity, and with accountability. The latter association is partly explained by the fact that the Dutch word for responsible (verantwoord) also signifies giving account or being accountable. In this context, accountability often pertains to transparency, openness, and fairness with respect to procedures of assessment and decision-making, and with respect to how public money is spent on research and innovation.

Our findings also show that, besides such widely shared meanings, understandings of responsibility may also be quite diverse, because they are often rooted in disciplinary, cultural, and organizational contexts and practices. Our study of Radboud University for instance shows that responsible research has different connotations in a university medical center and in a management sciences faculty.

9.2 The notion of ‘RRI’
In Dutch academia, particularly in research fields and departments that focus on the interactions between research, innovation, society, and economy, RRI has become a prominent theoretical concept.

In some national science and innovation policies, RRI is mentioned and identified as an important and inspiring concept. However, although many aspects of RRI are embedded and internalized, RRI has not become an explicitly elaborated, organizing notion or framework in national research and innovation policy.

In the organizations that we studied, the status of RRI as a central concept or framework varies. In NWO, funding schemes and programs exist that employ RRI as an organizing conceptual framework, or that use frameworks that are closely related to RRI. The new strategy of NWO incorporates key elements of these programs and frameworks. In the research conducting organizations we studied, responsibility is part of the organizational discourse, and various aspects of RRI are addressed or internalized, but an explicitly elaborated and broadly embedded concept or framework of RRI is missing in organizational strategies and policies.

9.3 Ethics
In recent years, in reaction to several notorious cases of scientific misconduct, stimulating research integrity has become a topic of major importance in the Netherlands. Accordingly, national policies and regulations have been revised, NWO has revised its integrity policies, and research organizations have implemented various provisions in order to stimulate scientific integrity and prevent misconduct.

The organizational studies indicate that further facilitating research integrity is a matter of combining organizational provisions and facilities, with fostering an culture and discourse in which integrity is
engrained in the cultural fabric of the organization. The latter is complicated in modern universities that are characterized by diversity and a constant flow of employees into and out of the organization. Furthermore, sloppy science and other “grey areas” of research integrity and scientific conduct, are matters of concern. Both in the national context and the organizations, open science is perceived as a key driver for research integrity.

For medical research with humans and animal experiments, dedicated regulations are in place in the Netherlands, that prescribe assessment procedures and the conditions under which permits may be provided. Our studies showed no frictions or barriers in this regard. However, in the study of RU it was argued that improvements can be made in reducing unnecessary animal experiments, for instance by making systematic reviews obligatory in animal research.

Ethical regulation of other types of research, such non-medical research with human participants, appears in varying degrees. Particularly at WUR, implementing ethical assessment of such research is a point for improvement.

9.4 Societal engagement
Of all the RRI aspects we investigated, societal engagement appears to be the most prominent, both in national policy and organizational strategies and priorities. In the national policy, several initiatives have been taken to stimulate public-private partnerships and public engagement in agenda-setting and research and innovation programs.

In the organizations we reviewed, societal engagement is already well-embedded, and still rising on the organizational agendas. At the same time, our reviews suggest that there is room for improvement. Societal engagement is often conceptualized in terms of societal and economic impact. Further embedding RRI in these organization requires the further implementation of forms of societal engagement that involve more participatory, dynamic notions of the relations between science and society, and between knowledge and action. Furthermore, it requires increased active participation of citizens and societal organizations in agenda-setting and research. Barriers to this development are the strong focus on collaborations with industry, and the academic publication and assessment culture, in which societal engagement often has relatively low priority; a driver is the increased focus on co-creation and participation in national policies and organizations.

9.5 Gender equality and diversity strategies
Regarding gender, the main discussion in the Dutch science system is about the low percentages of women in higher scientific positions. Gender inequality is often recognized as a pressing responsibility issue, both in national policy circles and in the organizations we reviewed. Many initiatives have been taken in recent years to promote women to higher scientific positions and to appoint more women professors. These initiatives include national policies and funding schemes, and organizational actions and policies. The strong efforts of recent years appear to pay off, judging by the steady increase of women amongst professors and other senior staff. Still, our interviews indicate that there are tough barriers for gender equality, that are mainly of a cultural kind. These notably include gender bias, and a male-dominated culture in some parts of the organizations we studied.

9.6 Open access and open science strategies
Stimulating open science has become a top priority in recent years in the Netherlands, in politics, science policy, and research organizations. European and national policies are strong drivers for the further implementation of open science, i.e. open access publishing and open data. The organizations we reviewed, are all currently implementing policies to stimulate open access, and to implement policies for research data management according to the FAIR principles.
Both for open access and open data, some important barriers still exist. These include: a lack of incentives, intellectual property rights in collaborations with industry, engrained data management and publishing habits of scientists, and a strong focus on impact factors and rankings of journals in the current academic publishing system. Potential drivers for the further implementation of open science are: revising evaluation- and valuation criteria and systems, improving the monitoring of open science, and stimulating the re-use of research data, for instance by means of funding.

9.7 The inclusion of science education into research

Compared with other RRI aspects, science education occupies a somewhat less prominent place on the science policy agenda. However, it is recognized as an important topic, for instance in national policies and by key science organizations in the Netherlands. For instance, the National Research Agenda, which is one of the major current science programming initiatives, includes a science education component.

Our study of RU showed that, while science education is seen as important, scientists feel that they have little time and receive little recognition for science education activities. Consequently, drivers for further promoting science education include: allocating time of staff, further developing reward or incentive systems, and developing advice or guidelines for including science education in research proposals and funding requests.

9.8 Incorporation of AIRR dimensions

In this report, we have investigated the status and role of the AIRR dimensions (anticipation, inclusion, reflexivity, responsiveness) from various perspectives.

In the study of the national context and the review of NWO, we encountered some conceptualizations and approaches that are related to the AIRR framework, such as the responsible innovation (MVI) program of NWO. Furthermore, we encountered individual dimensions of this framework, both in national policies and the organizations. In science policy, the capacity of the science system to respond to new developments in science and society, is an important objective. Some recent initiatives, such as the National Research Agenda and Science in Transition, have anticipatory and reflexive elements.

The organizational studies indicate that institutionalized reflexivity and responsiveness are important requirements for organizations that aim to align research and innovation with societal challenges and the concerns of stakeholders. Our studies of NWO and WUR showed interesting differences concerning the degrees of internalization of these dimensions. In NWO, we encountered forms of reflexivity and responsiveness that are firmly embedded in the organization. We argued that this reflexivity and responsiveness could be promoted by further mainstreaming existing RRI approaches, and by further investing in network-building with key stakeholders. In the WUR study we found little evidence of institutionalized reflexivity, and a limited form of responsiveness through contract research. In this case, a strong focus on scientific output appears to form a barrier to these dimensions; a deeper change in WUR’s formal evaluation structure is needed in order to break through this barrier.
10. Conclusions

10.1 Policy recommendations to national policy makers

In Dutch science and innovation policies, various aspects of Responsible Research and Innovation are already well-incorporated. This particularly counts for societal engagement, gender equality, research integrity, and open science. It is advisable to continue the already strong policy efforts that are made with respect to these issues.

Yet, our findings also indicate that there is room for further improvement. The promotion of the abovementioned aspects is impeded by cultural barriers in the Dutch academic system, including gender bias in academic culture, ingrained data management and publishing habits, and research, assessment, and publication cultures that prioritize productivity and high impact and citation rankings over quality and societal contributions. Accordingly, further promoting responsibility in Dutch research and innovation requires concerted actions aimed at instigating cultural change in Dutch academia.

One line of action that would contribute to such a culture change, would be to further intensify the current reflection and debate on how science is and should be valued, how the openness and inclusiveness of science can be promoted, and how public values and the societal contributions of science can be taken into account in the valuation of science. Reflexive debates and initiatives concerning these issues have been going on in the last few years in the Netherlands. These debates and initiatives could be further brought into the mainstream of Dutch research and innovation policies and discourses, for instance in the context of the National Research Agenda and the elaboration and implementation of NWO’s strategy.

Furthermore, our findings suggest that further promoting RRI requires a change in the formal ways in which researchers and research institutions are assessed and evaluated. Assessment and evaluation criteria should more explicitly incorporate performance and competences regarding various RRI aspects, such as societal engagement, science education, diversity, and open science. Such criteria could be more strongly addressed in current indicators (e.g. the valorization indicators), implemented in national policies and research funding, and incorporated in evaluation protocols (e.g. the Standard Evaluation Protocol).

10.2 Recommendations to research conducting and funding organizations

The organizational studies in this report (chapters 6-8) have provided several insights on strategies to promote RRI in research conducting and funding organizations.

In research funding organizations, RRI can be promoted by developing and implementing programs that explicitly focus on RRI, and that incorporate elaborated frameworks of RRI (such as a responsible innovation framework), or that focus on particular RRI-related problems in research or innovation systems (such as systemic failures and tensions in academia). The case study on NWO shows that RRI may be further promoted by mainstreaming such approaches in the organization.

The case studies in the Netherlands suggest that supporting and building collaborative networks with stakeholders is an important driver for RRI, for several reasons. Such networks for instance enable societal engagement, responsiveness to new developments in science and society, and building communities of practice that are involved in doing RRI.

Our findings also indicate that interactive and participatory forms of agenda-setting and research are key drivers of RRI. These may include citizen engagement in formulating research agendas, and engagement of societal actors in conducting research. The Dutch case shows that such participatory
forms of agenda-setting and research can be promoted by means of national research programs and initiatives, and through research funding schemes that explicitly require such participation.

Furthermore, the studies in this report suggest that promoting responsibility in research and innovation is for an important part a matter of organizational cultures and discourses. Accordingly, embedding RRI in research funding and performing organizations is a matter of stimulating organizational cultures and discourses in which responsibility is internalized. This may be achieved by a combination of strategies, that include:

- Organizing reflection and debate on issues such as integrity, inclusion and societal engagement, and incorporating such reflection and debate in various “interaction moments” such as department meetings, consultations with colleagues, and progress and evaluation meetings.
- Taking into account RRI-related performance and competences in recruiting and promoting academic staff. Relevant aspects of RRI may for instance include societal engagement, science education, open science, and collaborative and communicative skills.
- Further developing and implementing indicators and assessment and evaluation criteria for researchers and research groups, that include these RRI aspects.

10.3 Best practices scalable to European or national level

- Develop RRI policies or initiatives that can count on commitment on the executive level of the organization and the broader policy context, and implement them in a decentral, context-specific way, in order to tailor them to local and disciplinary issues and practices.
- Connect RRI policies or initiatives to impact frameworks and monitoring efforts that enable conceptualizing and measuring desirable impacts.
- Approach societal engagement as a multidimensional phenomenon that includes agenda-setting, involvement in research and innovation processes, and participation of stakeholders in the governance of the organization.
- Commission independent audits or reviews of the organization’s performance on one or more RRI aspects.
- Implement programs that simultaneously promote reflexivity in the science system and in the organization, in order to promote organizational responsiveness and learning.
- In developing an RRI program of framework, use a limited set of RRI aspects, that together constitute a clear and coherent narrative of responsibility. This helps to keep sufficient focus and avoid that the approach becomes too diffuse.
Annex 1: List of abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>AIRR</td>
<td>Anticipation, Inclusion, Reflexivity &amp; Responsiveness</td>
</tr>
<tr>
<td>AWTI</td>
<td>Advisory Council for Science, Technology and Innovation</td>
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<tr>
<td>BAC</td>
<td>Appointment Advisory Committee</td>
</tr>
<tr>
<td>FRRP</td>
<td>Fostering Responsible Research Practices</td>
</tr>
<tr>
<td>CCMO</td>
<td>Central Committee on Research Involving Human Subjects</td>
</tr>
<tr>
<td>CDI</td>
<td>Centre for Development Innovation</td>
</tr>
<tr>
<td>CSR</td>
<td>Corporate Social Responsibility</td>
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<td>CVC</td>
<td>Corporate Value Creation</td>
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<td>DMP</td>
<td>Data Management Plan</td>
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<td>EC</td>
<td>European Commission</td>
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<td>ELSI</td>
<td>Ethical, Legal and Societal Issues</td>
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<td>ERC</td>
<td>European Research Council</td>
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<td>EU</td>
<td>European Union</td>
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<td>FAIR</td>
<td>Findable, Accessible, Interoperable, Reusable</td>
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<td>FS</td>
<td>Faculty of Science</td>
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<tr>
<td>GDPR</td>
<td>General Data Protection Regulation</td>
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<td>H2020</td>
<td>Horizon 2020</td>
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<tr>
<td>INREF</td>
<td>Interdisciplinary Research and Education Fund</td>
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<tr>
<td>IPRs</td>
<td>Intellectual Property Rights</td>
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<tr>
<td>KNAW</td>
<td>Royal Netherlands Academy of Arts and Sciences</td>
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<tr>
<td>LNVH</td>
<td>Dutch Network of Women Professors</td>
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<td>LOWI</td>
<td>National Board for Research Integrity</td>
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<td>MEA</td>
<td>Ministry of Economic Affairs</td>
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<td>MECS</td>
<td>Ministry of Education, Culture and Science</td>
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<td>MOOC</td>
<td>Massive Open Online Course</td>
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<td>MVI</td>
<td>NWO’s responsible innovation program</td>
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<td>MVO</td>
<td>Corporate Social Responsibility</td>
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<td>NSM</td>
<td>Nijmegen School of Management</td>
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<td>NWA</td>
<td>National Research Agenda</td>
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<td>Abbreviation</td>
<td>Description</td>
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<tr>
<td>NWO</td>
<td>The Netherlands Organization for Scientific Research</td>
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<tr>
<td>OA</td>
<td>Open Access</td>
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<tr>
<td>OECD</td>
<td>Organization for Economic Co-operation and Development</td>
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<tr>
<td>PUC</td>
<td>Pre-University College</td>
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<tr>
<td>R&amp;D</td>
<td>Research and Development</td>
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<tr>
<td>RDM</td>
<td>Research Data Management</td>
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<tr>
<td>REWARD</td>
<td>Reduce Research Waste and Reward Diligence</td>
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<tr>
<td>RRF</td>
<td>Radboud Research Facilities</td>
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<td>RRI</td>
<td>Responsible Research and Innovation</td>
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<td>RU</td>
<td>Radboud University Nijmegen</td>
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<td>RUMC</td>
<td>Radboud University Medical Centre</td>
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<tr>
<td>STS</td>
<td>Science and Technology Studies</td>
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<tr>
<td>TNO</td>
<td>The Netherlands Organization for Applied Scientific Research</td>
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<td>TO2</td>
<td>Large Technological Institutions</td>
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<td>TS</td>
<td>Top Sectors</td>
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<tr>
<td>VSNU</td>
<td>Association of Universities in the Netherlands</td>
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<tr>
<td>WEF</td>
<td>World Economic Forum</td>
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<tr>
<td>WGS</td>
<td>Wageningen Graduate Schools</td>
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<tr>
<td>WKRU</td>
<td>Science Education Hub Radboud University</td>
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<tr>
<td>WMO</td>
<td>Medical Research Involving Human Subjects Act</td>
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<tr>
<td>WRR</td>
<td>Scientific Council for Government Policy</td>
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<tr>
<td>WU</td>
<td>Wageningen University</td>
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<td>WUR</td>
<td>Wageningen University and Research</td>
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<td>WR</td>
<td>Wageningen Research</td>
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<tr>
<td>ZonMw</td>
<td>The Netherlands Organization for Health Research and Development</td>
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</tbody>
</table>
Annex 2: Reviewed documents

National context


De Jonge Academie (2012) Tussen onderzoek en samenleving: Aanbevelingen voor optimale wetenschapscommunicatie, Amsterdam: KNAW.


Kenniscoalitie (2016a) Investeringsagenda voor onderzoek en innovatie.

Kenniscoalitie (2016b) Portfolio voor onderzoek en innovatie.


MEA (2014a) Global Challenges Dutch Solutions. The Hague: MEA and MECS.


MEA (2015a) Topsectoren: Hoe & waarom, Den Haag: MEA.


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