

D2.1: Diagnosis: RRI in Excellent Science

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1. Executive Summary

As part of its research and innovation (R&I) strategy, the European Commission (EC) is in the process of funding its eighth framework programme, Horizon 2020 (H2020), for €77 billion from 2013-2020. Plans for the ninth framework programme are rapidly taking shape. Within H2020, approximately one-third of programming is carried out under the Excellent Science priority. Excellent Science activities are divided among four autonomous programmes: The European Research Council (ERC); Future and Emerging Technologies (FET); Marie Skłodowska-Curie Actions (MSCA); and European Research Infrastructures (including e-Infrastructures) (INFRA). These Excellent Science programmes, like all H2020 programmes, are required to attend to a range of cross-cutting issues in R&I. One of these cross-cutting issue areas is to advance responsible research and innovation (RRI) (EC 2013a, SEC 14.1.1). **This deliverable reports on the current state of awareness and integration of RRI into Excellent Science activities, as comprised by ERC, FET, MSCA, and INFRA programming.**

The synthesis presented in this document is summarized from individual “Diagnosis Reports,” presented in full in four annexes. We find that Excellent Science programming adopts select elements, rather than the overarching concepts, of RRI and the Open Agenda. Further, some elements are integrated successfully, while progress on others lags. Excellent Science programs seem to adopt different approaches to RRI and Open Agenda institutionalization without evidence of coordinated strategic planning or learning from experiences.

European Commission vision and Horizon 2020 investments in RRI and Open Agenda elements have helped point the way toward smart, sustainable, and inclusive R&I in Europe. Through various tactics, ERC, FET, MSCA, and INFRA each advance ethical considerations (e.g., related to researcher integrity and data management), open access and Open Science, and gender balance concerns. Open Innovation efforts also often find emphasis in programme documents, in particular in FET, MSCA, and INFRA programmes. Integration of these RRI and Open Agenda elements was deemed effective when traceable from work programme documents all the way to proposal templates and Excellence and Impact evaluation criteria (the exception being ERC, which evaluates the majority of proposals using only a narrow definition of excellence, created in an ad-hoc, insular manner).

Despite successes, Excellent Science activities exhibit high variability of RRI and Open Agenda adoption, pointing to several areas where efforts might improve. Consideration for gender dimensions, ethics beyond privacy or researcher integrity, and governance issues are not well supported across Excellent Science programming. Efforts at public engagement and science literacy and science education most often practice one-way communication and dissemination, as opposed to two-way, dialogic modes desired by the Commission (EC 2014d). It is possible that institutionalization of these narrow forms of ethics and public engagement prematurely close-down or pre-empt entirely broader conversations about RRI and the Open Agenda. Finally, and related to variability in performance, definitions of “excellence” in evaluation criteria are not consistent across the Excellent Science priority, with ERC definitions, for example, excluding gender considerations.

Investments in RRI and the Open Agenda could be continued in the remainder of H2020 and beyond with greater: attention to strategy and clear commitment; investment in capacity building; and inclusion of more diverse perspectives and expertise. Recommendations offered relate directly to ways that the H2020 Interim Evaluation indicated current and future EC R&I programming could be improve more broadly (EC 2017a).

2. Introduction

2.1 Responsible Research and Innovation, Horizon 2020, and the NewHoRRizon Project

2.1.1 Responsible Research and Innovation in European Research and Innovation

Research and innovation (R&I) contribute directly and indirectly to many beneficial advances in how we live and how we support our societies. Indeed, R&I feature centrally in the European strategy for smart, sustainable, and inclusive growth (EC 2010). At the same time, scientific and technological developments resulting from R&I contribute to undesirable or unsustainable impacts in our lives, societies, and the environment. Evidence of unequal benefits and burdens of R&I are visible in many spheres of our daily lives, from transportation systems, to agriculture, from the built environment, to health care, water and energy systems.

The European Commission (EC) supports R&I to expand the scientific and technological base of the European economy and industry, fostering broader benefits for society and tackling pressing societal challenges, while also upholding European values of inclusiveness and democratic politics (EC 2013a). One of the tactics taken by the EC to create and disseminate socially and economically beneficial knowledge and drive prosperity has been to include cross-cutting requirements into its multi-year, large-scale research framework programmes—most recently the €77 billion Horizon 2020 (H2020; the eight framework programme, running from 2013-2020) (EC 2013a).

One of these cross-cutting requirements includes the concept of Responsible Research and Innovation (RRI) (EC 2013a). RRI activities aspire to more open, accountable, and democratic R&I cultures and processes, strengthening the ways groups of people think about and respond to new opportunities in R&I. In practice, this means drawing on more diverse ways of understanding and addressing problems, sharing knowledge, and empowering people to learn and work together. A central aspiration of RRI is to contribute to excellent science and innovation for socially desirable, economically vibrant, and sustainable societies (EC 2014d). For the Commission, this means, in particular, focusing on:

- **Gender equality**, including gender balance of R&I teams, and accounting for gender dimensions of R&I projects;
- **Public engagement**, envisioned as a two-way communication and learning process to include in R&I industry and SME, policymakers, non-governmental organisations (NGOs), civil society organisations (CSOs), and citizens who would not normally interact with each other on matters of science and technology;
- **Science education and science literacy**, to nurture modes of scientific inquiry, curiosity, and creativity;
- **Open access and Open Science**, to make data and results of research more accessible, earlier to improve R&I;
- **Ethics**, going beyond legal compliance and researcher integrity to include also reflection on questions of how R&I do and do not relate or respond to societal interests;
- **Governance**, to ensure effective, inclusive, and sustainable ways of co-designing agendas and activities to achieve the above and broader objectives of European R&I.

More recently, the Commission has made additional commitments to Open Science, Open Innovation, and Open to the World (EC 2016a) as part of its continued prioritization of fostering alignment among science and society in R&I. The EC Open Agenda includes three dimensions:

- **Open Innovation** — “co-creation” that unfolds across innovation ecosystems and requires knowledge exchange and innovation capacity of all actors involved, be they financial institutions, public authorities or citizens, businesses, or academia (EC 2016a, p.12).
- **Open Science** — a concept of transformed scientific practice, wherein the foci of researcher activity shifts from “publishing as fast as possible” to “sharing knowledge as early as possible,” in manners that are accessible to as many parts of the innovation ecosystem as possible (EC 2016a, p. 34).
- **Open to the World** — “Fostering international cooperation in research and innovation” to enable access to “the latest knowledge and the best talent worldwide, tackle global societal challenges more effectively, create business opportunities in new and emerging markets, and use science diplomacy as an influential instrument of external policy” (EC 2016a, p. 59).

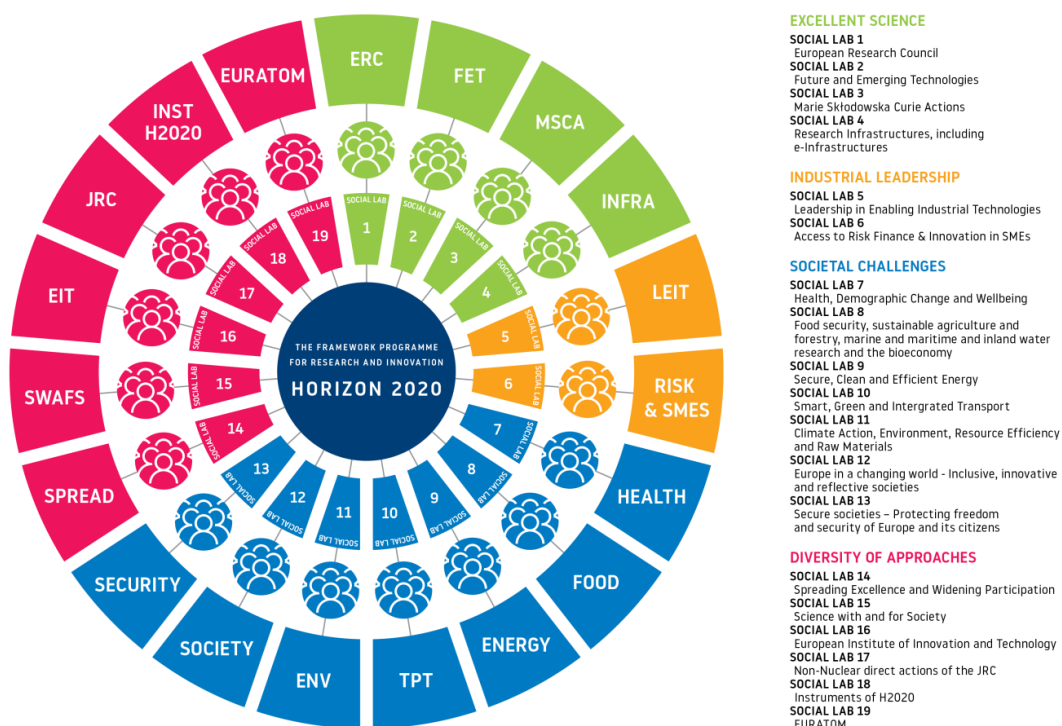
2.1.2 The NewHoRRIZon Project

The NewHoRRIZon project (European Commission Grant Agreement No 741402) seeks to promote integration of RRI and Open Agenda approaches into national and international R&I management. To do so, the project engages a wide-ranging group of R&I stakeholders from across Horizon 2020 programming in order to co-create tailor-made “pilot actions” supporting RRI and Open Agenda aspirations. Through such engagement, pilot actions can be based on key needs of European and national research and innovation funding programmes. NewHoRRIZon’s specific objectives include:

- bring together different stakeholders to co-create social experiments that foster the uptake of RRI;
- develop narratives and storylines on how to implement RRI;
- provide recommendations on how to better integrate RRI into the next European Framework Programme and beyond;
- raise awareness, mainstream best practices and share NewHoRRIZon results;
- develop and disseminate a concept of Societal Readiness Levels (SRL) of technology; and
- create a sustainable RRI Network and RRI Ambassador Programme.

To achieve these objectives, NewHoRRIZon has organized 19 Social Labs, where interventions will be co-created for pilot implementation, evaluation and cross-sector learning, one for each Horizon 2020 programme line (see Figure 1). Social Labs build on a tradition of participatory action research to bring together people with common interests in solving complex problems related to technology and society. Inviting people with a range of expertise from all across society, the labs will be creative, engaging spaces for collaborative experimentation. Every Social Lab hosts three workshops and a series of smaller additional activities and meeting formats. Participants have the opportunity to co-create, prototype and test pilot actions and activities to support RRI. In addition, selected participants of each Social Lab are invited to cross-sectional exchange events after the second and third Social Lab workshops.

Figure 1: NewHoRRizon Social Labs and corresponding H2020 programme lines



2.1.3 NewHoRRizon Deliverable 2.1

Deliverable 2.1 presents, summarizes, and analyses the results of the first phase of project research, related specifically to the Excellent Science priority of H2020 (project work package 2). The diagnosis phase of the project included two intertwined tasks. First, to analyse the specifics of the current use and practices of RRI within the respective programme line, and second, to identify and recruit stakeholders to the various programmes of H2020 into social labs. While future deliverables will report on interactions with participants of and pilots co-developed in social labs, Deliverable 2.1 presents an overview of the current state, enablers, barriers, and examples of RRI and Open Agenda activities.

NewHoRRizon Social Labs devoted to the Excellent Science priority submitted the following diagnosis reports, each available in full as Annexes to this deliverable:

- [NewHoRRizon Diagnosis Report, Social Lab 1, European Research Council](#) (Griessler and Brandstätter)
- [NewHoRRizon Diagnosis Report, Social Lab 2, Future and Emerging Technologies](#) (Bernstein)
- [NewHoRRizon Diagnosis Report, Social Lab 3, Marie Skłodowska-Curie Actions](#) (Cohen and Loeber)
- [NewHoRRizon Diagnosis Report, Social Lab 4, European Research Infrastructure \(including e-Infrastructures\)](#) (Marschalek, Seebacher, and Unterfrauner)

Material presented in Deliverable 2.1 is synthesized from the above reports. Each report draws information, evidence, examples, and experiences from a range of document sources and

interviews, the methodologies of which are presented in each Annex. In general, desktop research began with investigation of the founding regulation of Horizon 2020 (EC 2013a), and narrowed to scoping documents of H2020, the European Commission Interim Evaluation of Horizon 2020, general Annexes to each H2020 Work Programme, and the specific Work Programme texts for ERC, FET, MSCA, and INFRA. Supplementary inputs were gathered from the European Commission’s online research manual (various proposal templates, ethics guidelines, gender FAQs, proposal templates and evaluation guidance, etc.), Commission documents, and broader academic literature. Project-level information for case studies was gathered from periodic project reports submitted by projects (posted on the EC CORDIS website), as well as by reviewing project website and publicly accessible deliverable documentation.

In addition to desktop research, a combined 61, 45- to 60-minute interviews were conducted with various stakeholders of and participants in Excellent Science programming. Interviews were semi-structured, taking an interview protocol developed by the NewHoRRizon Consortium as a point of departure (please see, for example [FET Annex, Appendix 7.8.1](#)). Interviews were recorded—for future reference in order to validate findings and quotations indicated as important—but not transcribed. Notes were taken in the course of the interview to guide subsequent review and analysis. All interviews were conducted with informed consent of participants in accordance with the General Data Protection Regulation, EU Regulation 2016/679 (GDPR) and, in the case of the Norway-based research team for Social Lab 2 (FET), using a consent form reviewed and approved by the Norwegian Centre for Research Data.

2.2 Putting Excellent Science into Perspective

The Commission states diverse rationales for Union-level intervention in research and innovation. Reasons for funding include: supporting trans-national mobility, career training and development; initiating high-risk long-term research and development; raising the profile of excellent research; addressing identified societal challenges; and fostering economic and commercial gains (EC 2011c, p. 3). Indeed, R&I makes up a central aspect of the Europe 2020 Innovation Union Strategy.¹ The three priorities of H2020—Excellent Science, Industrial Leadership, and Societal Challenges—comprise a broad response of the Union to stabilize the financial and economic systems of Europe following economic recession in 2008 and open Europe to future economic opportunities (EC 2011a).

Within Horizon 2020, the Excellent Science priority focuses, “On the next generation of science, technology, researchers and innovations and providing support for emerging talent from across the Union and associated countries, as well as worldwide” (EC 2013a, L347/123). In contrast to the Industrial Leadership and Societal Challenge priorities of H2020, Excellent Science priorities are demarcated by placing much greater emphasis on investigator-driven funding. As the regulation establishing H2020 states, “In view of their science-driven nature and largely 'bottom-up', investigator-driven funding arrangements, the European scientific community will play a strong role in determining the avenues of research followed under Horizon 2020” (EC 2013a, L147/123).

With some exceptions, elaborated in section 2.2 below, the main target group of the Excellent Science priority of H2020 is the scientific community (EC 2013a p. 187). Excellent Science projects emphasize “fundamental research” (EC 2013a, p. 194), including work below Technology Readiness

¹ European Commission, Research and Innovation, Strategy, Innovation Union, About, Action Points, available at: <https://ec.europa.eu/research/innovation-union/index.cfm?pg=action-points>

Level 4² (EC 2013a, p.194). Overall, the Excellent Science priority, consisting of approximately one-third of the total budget of H2020, produces more than half of the peer-reviewed publications of H2020³ (EC 2017a, p. 114).

2.3 Overview of Excellent Science Programmes

Excellent Science activities are divided among four autonomous programmes: The European Research Council (ERC); Future and Emerging Technologies (FET); Marie Skłodowska-Curie Actions (MSCA); and European Research Infrastructures (INFRA). Despite overarching commonalities in targeting the scientific community through investigator-driven research funding, each of these programmes implement a different strategy related to the Excellent Science objective of supporting next generation science and technology researchers and innovators. Table 1 presents an overview of total approved budgets, current expenditures, signed grants, contribution per project and general participation statistics of Excellent Science activities to date.

Table 1: Proposal and funding information for Excellent Science Priority and Programmes⁴

	European Research Council (ERC) Programme	Future and Emerging Technologies (FET) Programme	Marie Skłodowska-Curie Actions (MSCA) Programme	European Research Infrastructures (INFRA) Programme	Excellent Science Total
Total approved budget (in million EURs), based on EC 2013a, L347/173	13,094	2,696	6,162	2,488	24,441
Total approved budget as percentage of Excellent Science Total	53.57%	11.03%	25.21%	10.18%	100%
EU contribution as of 23 July 2018 (in million EURs)	6,430	1,090	3,370	1,190	12,080
Signed grants as of 23 July 2018	4,100	240	6,249	200	10,789
Average EU contribution per project as of 23 July 2018 (in million EURs)	1.57	4.56	0.538	5.94	1.12
Average participation⁵ per project as of 23 July 2018	1.18	9.28	2.87	19.39	2.67

² For example, focusing on basic principles, technology concepts, and experimental proof of concepts. Several exceptions in this regard are elaborated below and in Annex reports.

³ Based on Interim Evaluation data, cut-off date 1 January 2017.

⁴ Data from European Commission Europa Webgate Portal, filter for Pillar Description "Excellent Science," available at: <https://webgate.ec.europa.eu/dashboard/sense/app/93297a69-09fd-4ef5-889f-b83c4e21d33e/sheet/erUXRa/state/analysis>

⁵ Definition of participant and participations, from European Commission (2017) HORIZON 2020 in full swing Three years on: KEY FACTS AND FIGURES 2014-2016, European Union, Brussels. Page 63: "Participant: Any legal entity carrying out an action or part of an action under Regulation (EU) No1290/2013 [Horizon 2020] having rights and obligations with regard to the European Union or another funding body under the terms of the Horizon 2020 Rules for Participation (Regulation 1290/2013). A single Participant can be involved in multiple Projects through multiple **participations.**"

The following sections describe the Excellent Science programme and activity areas. Each section provides a brief overview of programme objectives, scope, structure, and defining features.

2.3.1 The European Research Council (ERC)

The European Research Council funds “excellent scientists and their most creative ideas” (ERC 2018a). ERC’s organizational structures emphasize excellence and independence to ensure achievement of programmatic objectives (ERC 2018, p. 2; Luukkonen 2014, p. 35). Four principles govern ERC operations (ERC 2018a): first, the sole selection criterion evaluated in funding projects is “scientific excellence”; second, proposal selection is determined by international, high-quality peer-review; third scientists represent and determine the direction and organization of funding—ERC is run “for scientists, by scientists” with President, Vice President and Scientific Council positions held by scientists; fourth, an independent ERC Executive Agency (ERCEA) manages applications and grants.

In total, at EUR 13 billion, ERC represents 17% of the Horizon 2020 budget (ERC 2018b). ERC provides awards for five main activities:

- Starting Grant (up to EUR 1.5 million) to “support researchers at the early stage of their careers, with the aim of providing working conditions enabling them to become independent leading researchers” (ERC 2018h);
- Consolidator Grants (up to EUR 2 million) for researchers “who are at the early stage of their careers but often already working with their own group” (ibid.);
- Advanced Grants (up to EUR 2.5 million) to “support outstanding and established research leaders by providing them with the resources necessary to continue the work of their teams in expanding frontiers of scientific knowledge” (ibid.);
- Proof of Concept Grants for establishing the innovative “potential of ideas stemming from (...) existing ERC grants, helping (ERC grantees) bridge the gap between research and social or commercial innovation” (ibid.);
- Synergy Grants (up to EUR 10 million) to support “small teams of scientists who wish to jointly address ambitious research problems at the frontiers of knowledge, bringing together complementary skills, disciplines and resources” (ERC n.d.)

The majority of some 8,160 Starting, Consolidator and Advanced Grants went to the Physical Science and Engineering domain (3,687 grants); followed by the life sciences (2,825 grants) and the Social Sciences and Humanities (1,648 grants). Across ERC funding, a small number of Member and Non-Member States receive the vast majority of awards, creating a controversial imbalance. Despite frequent criticism for such an imbalance, ERC is regularly and staunchly defended by advocates in favour of the argument for the excellence criteria trumping all other possible considerations (e.g., equitable distribution of excellent projects across Europe). As Helga Nowotny, former ERC president, states, “Excellent science is not about equal distribution, but despite the politically sensitive skewness, excellence must prevail” (2017, p. 997).

2.3.2 Future and Emerging Technologies (FET)

Future and Emerging Technologies (FET) programming of Excellent Science aspires, “To foster radically new technologies with the potential to open new fields for scientific knowledge and technologies and contribute to the European next generation industries, by exploring novel and

high-risk ideas building on scientific foundations” (EC 2013a, L347/127). FET programming is divided into three main lines: Open, Proactive, and Flagship.

- FET Open projects foster early-stage investigation into new ideas positioned to challenge scientific and technological paradigms.
- FET Proactive projects support more mature but still emerging research communities, with the goal of helping consolidate “a European pool of knowledge” on science and technology topics (EC 2011b, p. 36).
- FET Flagships are large-scale initiatives to address major science and technology grand challenges to provide “a strong and broad basis for future technological innovation and economic application...plus novel benefits for society” (EC 2011b, p. 35).

These three FET activities are supplemented by calls devoted to the topic of High-Performance Computing (HPC). FET programming is thus in part an outlier of Excellent Science Programming. Although Open programming—comprising 40% of FET by law (EC 2013a)—is an investigator-driven initiative, Proactive projects are explicitly top-down. Proactive topics are grouped by scientific and technological themes to foster R&I communities and ecosystems and accelerate the advance of knowledge from foundation to application. In addition, topic-directed HPC investments and Flagship investments are each more strongly top-down than other Excellent Science priority programme elements (the other exception being INFRA activities).

In the Interim Evaluation of H2020, FET was lauded for being adaptive to emergent research needs (along with other Excellent Science programmes). As an example, the report praised a responsive research project on economic and societal needs from privacy, security, and financial concerns of emerging biotechnologies (EC 2017a). The Interim Evaluation also noted that FET has been true to its open, non-prescriptive calls by fostering a range of “approaches and solutions” to future and emerging technology research (EC 2017c). FET was also noted for making a large percentage contribution to the Europe 2020 Digital Agenda for Europe and the “Digital Single Market Strategy” (EC 2015). FET spending on digital research and innovation tracked in H2020 shows that as of 1/1/2017, 68% of FET funding was flagged as progressing the Digital Agenda (EC 2017a).

FET has three main goals: knowledge generation, capacity building, and commercialization. Overall, FET specific aspirations align with H2020 objectives by attempting to mobilize networks of scientists and engineers; boost innovation and industrial potential of innovation ecosystems; and contribute to science and technology in service of addressing economic development. Beyond researchers, stakeholders targeted by FET most commonly include technology providers, young scientists and engineers, high-tech SMEs, and, less commonly, potential users of new ideas or developments (EC 2017c, p. 88). Stakeholders from CSOs, SSH, general publics, and non-commercial partners are less commonly engaged. According to the Interim Evaluation assessment of the logic model underlying FET programming, an emphasis on fostering future economic application—beyond scientific capacity building—also makes FET stand out among Excellent Science initiatives of the Commission (EC 2017c, p. 77, Figures 36 and 37).

2.3.3 Marie Skłodowska-Curie Actions (MSCA)

The Marie Skłodowska-Curie Actions (MSCA) of H2020 seek to strengthen career opportunities of promising academics by enabling worldwide and cross-sector mobility. In addition, MSCA supports researcher and staff training in innovation and other skills. The Innovation, International

Cooperation and Sport Unit within the European Commission Directorate-General for Education, Youth, Sport and Culture (Dir C), is responsible for design and content aspects of the MSCA, although the programme is executed by the Research Executive Agency and implemented with the help of external disciplinary-specific evaluators and experts.

A larger rationale for MSCA investment in research training and researcher networks is an argument that, “Highly-trained researchers are necessary to advance science and business competitiveness, which, in turn, are important factors in attracting and sustaining investment in Europe” (EC 2017v, p. 133). Related, MSCA is the main EU programme supporting doctoral training, financing some 25,000 PhDs. Further, the programme is “endowing researchers with new skills and a wider range of competences, while offering them attractive working conditions... In addition to fostering mobility between countries, the MSCA also seek to break the real and perceived barriers between academic and other sectors, especially business. Several MSCA initiatives promote the involvement of industry etc. in doctoral and post-doctoral research” (EC 2018i).

There are five main MSCA award activities:

- **Innovative Training Networks** bring together employees of universities, research institutions, research infrastructures, businesses (among them SMEs), and other relevant parties from different countries to foster cross-sector training of doctoral students.
- **Individual Fellowships** offer support for experienced researchers to move between countries, with the option to work outside academia. Individual fellowships are advertised as being “a great option if you are an experienced researcher looking to give your career a boost by working abroad” (EC 2018h). Unlike innovative training networks, applicants must hold a doctoral degree and have at least four-years full-time research experience to be eligible for individual fellowships.
- **Research and Innovation Staff Exchange** funds short-term movements of personnel among academic, industrial, and commercial organisations around the world. The staff exchange helps people develop their knowledge, skills, and careers, while also building links among organisations working in different sectors of the economy (EC 2018n). Eligibility of Staff members in managerial, technical, or administrative roles is unique to the Exchange topic.
- **Co-funding of regional, national, and international programmes** support co-financing of doctoral research training or fellowships for experienced researchers. These extra funds are made available for training researchers from abroad and across various sectors.
- **European Researcher’s Night** funds support regional, national, or international partners and other legal entities from an EU Member State or associated country to organize events that “promote science” (EC 2018g). The main goal of Night funding is to show the positive impact of European funded research on the daily lives of citizens: “Any event that boosts public awareness of the positive role of research in society, especially among young people, can be supported. European Union funded researchers should interact as much as possible with visitors and show how their research has an impact on people’s daily lives” (EC 2018g).

In addition to the EC-run programming of MSCA, there is an active Marie Curie Alumni Association (MCAA) run by volunteers of former and current beneficiaries of the programme. The MCAA seeks to “Enhance the flow of knowledge across different countries, sectors of the economy, and scientific disciplines; Encourage networking, cooperation, and mutual understanding among MCAA members,

and external stakeholders; Serve as a forum of debate for researchers and citizens” (MCAA, 2018). The MCAA is funded by the Directorate General for Education and Culture of the EC.

2.3.4 European Research Infrastructures (INFRA)

European Research Infrastructures (including e-Infrastructures) is a funding programme within the EC that aims to foster the development, use, and distribution of research infrastructures. The INFRA work programme defines research infrastructures as:

“facilities, resources and services that are used by the research communities to conduct research and foster innovation in their fields. Where relevant, they may be used beyond research, e.g. for education or public services. They include: major scientific equipment (or sets of instruments); knowledge-based resources such as collections, archives or scientific data; e-infrastructures, such as data and computing systems and communication networks; and any other infrastructure of a unique nature essential to achieve excellence in research and innovation. Such infrastructures may be 'single-sited', 'virtual' or 'distributed'” (EC 2017I, p. 4).

The programme emphasizes “fostering the long-term sustainability of research infrastructures (including through the optimisation of assessment and evaluation procedures)...expanding the role and impact of research infrastructures in the innovation chain and ... maximising the exploitation of data produced and/or collected by research infrastructures” (EC 2017I).

INFRA funding helps, “To structure the scientific community and play a key role in the construction of an efficient research and innovation environment” in order to foster the development, use, and distribution of research infrastructures. Additionally, INFRA justifies investments as contributing “to national, regional and European economic development” and as “key in helping Europe to lead a global movement towards open, interconnected, data-driven and computer-intensive science and engineering.” Indeed, e-Infrastructure investments made by the program are meant to make European researchers, “Digital, increasing creativity and efficiency of research and bridging the divide between developed and less developed regions” (EC 2017I).

The INFRA programme is administrated jointly by two Directorate-Generals (DGs) of the European Commission, namely the DG for Communications Networks, Content and Technology (DG-CONNECT) and the DG for Research and Innovation (DG-RTD). Research infrastructure projects most commonly take place in the physical sciences and engineering (17%), environmental sciences (13%), or biological and medical sciences (12%). Research infrastructures in social sciences and humanities (7%), energy (3%), and material sciences and analytical facilities (3%) or cross-domain sciences also receive INFRA support (RICH Observatory, 2017b).

3. Current state of RRI in Excellent Science Programmes

3.1 RRI in Horizon 2020 Policy Documents

As noted in the introduction, in addition to the three distinct H2020 priorities of Excellent Science, Industrial Leadership, and Societal Challenges, the Commission requires all H2020 programmes to take account, “Of advice and inputs provided by independent advisory groups of high level experts set up by the Commission from a broad constituency of stakeholders, including research, industry and civil society, to provide the necessary inter-disciplinary and cross-sectoral perspectives, taking account of relevant existing initiatives at Union, national and regional level” (EC 2013a, II.1.12.1).

H2020 therefore includes a variety of cross-cutting issues and other mechanisms to foster such, “Informed engagement of citizens and civil society in research and innovation” (EC 2013a, Annex I). In particular, all programmes have a requirement to advance “responsible-research and innovation [RRI] including gender” as a cross-cutting issue (EC 2013a, sec. 14.1.I).

As articulated in the founding regulation of H2020, RRI consists of attending to six cross-cutting issues: gender, ethics, science literacy, stakeholder and public engagement, open access, and governance (EC 2013a; see also EC 2014). Beyond these RRI Keys, the Commission has since prioritized fostering an alignment among science and society through ideas of Open Innovation, Open Science, Open to the world (the Open Agenda) (EC 2016a). The following sections report on the current state of RRI and Open Agenda activities of Excellent Science programming according to document research.

3.2 RRI in Excellent Science Programmes: Document Research

Excellent Science programmes are modelled as investigator-driven basic research investments with priorities on supporting the current and future human, physical, and digital infrastructure of research and innovation in Europe. Whether supporting distinguished researchers through ERC awards or investing in large-scale cloud infrastructures through INFRA, Excellent Science programming should stand to benefit from application of RRI and Open Agenda approaches.

As vital sources of funding for scholars at every stage career, working at the frontiers of high-risk research, ERC, MSCA, and FET offer a proving ground for addressing concerns with **gender** inequality in STEM fields. Similarly, research infrastructures—with their long-lived footprints in R&I sectors—need to be considerate and inclusive of gender balance and dimensions, offering INFRA a chance to have a high impact in this domain of RRI, as well. **Open access** and **Open Science** approaches would also seem to fit naturally with Excellent Science programming. Rapid and early access to knowledge and research infrastructures—not only to researchers and innovators but also to wider networks of stakeholders and publics—could accelerate diffusion and testing of innovative, potentially paradigm-changing research.

Public engagement and foci on **science literacy and science education** could make for natural priorities to programmes like ERC and MSCA, keen to cultivate a curious, capable, and responsible community of future researchers in Europe. For FET and INFRA, RRI dimensions of public engagement and science literacy and science education offer transparent and dynamic ways to share lessons and benefits of cutting-edge R&I. These RRI elements also offer Excellent Science programmes ways to learn from diverse communities and publics about potential needs, impacts, and values that shape technological systems. **Ethical** reflection could help ensure that ERC, FET, MSCA, and INFRA take these diverse values into account and explore the frontiers of research and innovation in sustainable, societally responsive ways.

Adequate **governance** structures would stand to benefit each Excellent Science activity line, with residents of Europe rightly expecting R&I investments to provide lasting benefits through efficient, effective, and accountable systems of social organization. Finally, in pursuing **Open to the World** and **Open Innovation**, Excellent Science programs each stand to benefit from international, cross-sector collaborations to harvest and bring-to-bear bright minds and talents on key scientific, technological, and societal challenges of the age.

Based on document analyses, the sections below explore how ERC, FET, MSCA, and INFRA programmes are progressing on these aspirations of RRI and the Open Agenda, as set forth by the Commission of the European Union.

3.2.1 Overview: RRI at different levels of ERC, FET, MSCA, and INFRA programming

This section summarises the key content of the Desktop Findings sections of Annexes for [ERC \(Section 6.5\)](#), [FET \(Section 7.4\)](#), [MSCA \(Section 8.4\)](#), and [INFRA \(Section 9.3\)](#), in which NewHoRRizon partners presented evidence of RRI and Open Agenda implementation. Based on the data available from each Annex diagnosis input, five of seven levels are summarized below: policy document; work programme; call; proposal template; and evaluation. Insufficient data were collected to comment on the scoping levels. Project level examples are presented in [section 3.4 Selected Projects](#).

For policy, work programme, and call levels, results are subdivided into sections for each RRI Key and Open Agenda element, with Open Access and Open Science elements presented together. These data are presented as high-level “points of evidence” in tables 2-9. Readers are referred to the relevant sections of each programme-specific annexes (noted above) for complete tables and textual excerpts. Results on RRI and Open Agenda in proposal template and evaluation levels are presented in aggregate. A narrative summary of desktop findings is presented in [section 3.2.2](#).

3.2.1.a Policy document, work programme, and call levels by RRI key and Open Agenda element

Gender

Table 2: Gender dimension of RRI across Excellent Science Programming at policy document, work programme, and call levels

	Policy document level	Work Programme level	Call level
ERC	+ ERC Scientific Council statement supporting gender equality + Presence of a Thematic Working Group on Gender Balance + Flexible rules regarding parental leave (Peer review evaluation processes blind to gender)	+ Gender balance included as an objective in WP 2018-2020	<i>No data presented</i>
FET	<i>Nothing different than what is expected of other H2020 programme lines</i>	+ Explicit attention given to gender issues in each WP	+ Attention to all RRI keys included in Flagship topics + Mentioned, additionally, in other topic texts (e.g., FETPROACT-01-2016) + In WP 2018-2020, Proactive calls include specific language on gender
MSCA	+ Emphasis on gender equality	+ Active consideration of gender equality and dimensions of research and training from first WP, and kept throughout	+ Additional emphasis in NIGHT calls
INFRA	<i>Nothing different than what is expected of other H2020 programme lines</i>	+ General mention of gender aspect in WP 2016-2017 and WP 2018-2020 text	<i>No additional emphasis at call level</i>

Public Engagement

Table 3: Public Engagement dimension of RRI across Excellent Science Programming at policy document, work programme, and call levels

	Policy document level	Work Programme level	Call level
ERC	+ ERC co-hosted public engagement held 31 May 2018.	<i>No data presented</i>	<i>No data presented</i>
FET	<i>Nothing different than what is expected of other H2020 programme lines</i>	+ Explicit attention given to public engagement in each WP	+ Attention to all RRI keys included Flagship topics + Mentioned in OPEN CSAs and in Proactive calls
MSCA	<i>Nothing different than what is expected of other H2020 programme lines</i>	+ Requirement for public outreach activity plans from first WP and kept throughout	+ Various additional emphases in certain calls, especially NIGHT
INFRA	<i>Nothing different than what is expected of other H2020 programme lines</i>	+ General mention of public engagement aspect in WP 2016-2017 and WP 2018-2020 text	<i>No additional emphasis at call level</i>

Science education and science literacy

Table 4: Science Education and Science Literacy dimension of RRI across Excellent Science Programming at policy document, work programme, and call levels

	Policy document level	Work Programme level	Call level
ERC	(No requirements for communication or dissemination activities, but expectation to invest in public communication) + Annual Report 2017 supportive of multiple formats of engagement	<i>No data presented</i>	+ Two CSAs showcasing ERC-funded research
FET	+ Explicit focus on next generation of science, technology, researchers, and innovations	<i>No additional emphasis at WP level</i>	+ RRI keys included in Flagship call + Specific foci on SE&SL in Quantum Technologies Flagship CSA
MSCA	+ Emphasis of programme on training + Emphasis on science education and science literacy	+ Increased attention to multiple platforms of education and outreach in WP 2016-2017	+ Various additional emphasis in certain calls, especially NIGHT
INFRA	+ Education and training purposes of research infrastructure explicitly mentioned	+ General mention of science education and science literacy in WP 2016-2017 and WP 2018-2020 text	<i>No additional emphasis at call level</i>

Ethics

Table 5: Ethics dimension of RRI across Excellent Science Programming at policy document, work programme, and call levels

	Policy document level	Work Programme level	Call level
ERC	+ Mandatory ethics pre-screening process + Provides ethics self-assessment tool (narrow conception of ethics focused mostly on scientific misconduct, privacy, and human or animal subject research)	+ Ethics and researcher integrity included as objectives in WP 2018-2020	<i>No data presented</i>
FET	<i>Nothing different than what is expected of other H2020 programme lines</i>	+ Ethics dimension of research mentioned in some WPs	+ Attention included in Flagship topics + In WP 2018-2020, Proactive calls include specific language on ethical implications - Language most commonly included only at end of call texts
MSCA	<i>No additional emphasis at policy level</i>	+ Additional emphasis on ethical dimensions and research integrity added in WP 2016-2017	<i>No additional emphasis at call level</i>
INFRA	(Implicit introduction of privacy, intellectual property, and security aspects of infrastructure)	+ General mention of ethical dimensions in WP 2016-2017 and WP 2018-2020 text	<i>No additional emphasis at call level</i>

Governance

Table 6: Governance dimension of RRI across Excellent Science Programming at policy document, work programme, and call levels

	Policy document level	Work Programme level	Call level
ERC	<i>No data presented</i>	<i>No data presented</i>	<i>No data presented</i>
FET	+ Explicit focus on “entire spectrum of science-driven innovation,” from small-scale exploration to large flagships	<i>No additional emphasis at work programme level</i>	+ Specific attention to scientific leadership and governance in Flagships in WP 2016-2017 and 2018-2020
MSCA	+ Emphasis on governance	<i>No additional emphasis at work programme level</i>	<i>No additional emphasis at call level</i>
INFRA	+ provides a charter of principles and guidelines related to regulations for research infrastructure	+ Emphasis on infrastructures’ long-term viability via governance and legal structures	+ Emphasis in some calls on developing policies for research infrastructure use (e.g., FAIR-principle)

Open Access / Open Science

Table 7: Open Access dimension of RRI and Open Science dimension of Open Agenda across Excellent Science Programming at policy document, work programme, and call levels

	Policy document level	Work Programme level	Call level
ERC	+ Mandatory open access publication + Adopted open access guidelines + Provides Open Research Data and Data Management Plan templates to assist applicants	+ Open access included as an objective in WP 2018-2020	<i>No data presented</i>
FET	<i>Nothing different than what is expected of other H2020 programme lines</i>	+ Strong emphasis placed in each WP + Projects default into Pilot on Open Research Data	<i>No additional emphasis at call level</i>
MSCA	+ Emphasis on open access	(Optional participation in Open Research Data Pilot; completion not considered in evaluation) + Data Management Plan if participating in Open Research Data Pilot from first WP.	+ Specific emphasis added in multiple calls, e.g., with reference to support for training models on culture of Open Science
INFRA	+ Emphasis on supporting effective and efficient research infrastructures promoting open science	+ Emphasis on open access to e-infrastructure environments and data sharing by default. + Emphasis on creation of European Open Science Cloud e-infrastructure	+ Various calls emphasize implementation of open science approaches and open access in WPs 2016-2017 and 2018-2020

Open Innovation

Table 8: Open Innovation dimension of Open Agenda across Excellent Science Programming at policy document, work programme, and call levels

	Policy document level	Work Programme level	Call level
ERC	<i>No data presented</i>	<i>No data presented</i>	<i>No data presented</i>
FET	+ Explicit reference to including range of actors and stakeholders	+ Strong emphasis on cooperation across science, industry, citizens, and policy makers in each WP	+ Emphasis on engagement and partnerships in Proactive and Flagship calls
MSCA	+ Emphasis on cross-sector circulation of knowledge and culture of entrepreneurship	+ Emphasis on cross-sector mobility throughout WPs, emphasis added on inclusion of civil society organizations in WP 2016-2017, and emphasis on entrepreneurship in WP 0218-2020	+ Continued and specific emphasis on cross-sector mobility and training in several calls.
INFRA	+ Emphasis on interaction and cooperation across spectrum of research infrastructure providers and users across sectors.	+ Emphasis on leveraging use of research infrastructures across sectors, and based on stakeholder and advisory body consultation	+ Various calls, especially in WPs 2018-2020 emphasize open innovation

Open to the World

Table 9: Open to the World dimension of Open Agenda across Excellent Science Programming at policy document, work programme, and call levels

	Policy document level	Work Programme level	Call level
ERC	<i>No data presented</i>	<i>No data presented</i>	<i>No data presented</i>
FET	<i>Nothing different than what is expected of other H2020 programme lines</i>	+ Participation of non-EU partners invited in each WP introductory text	<i>No additional emphasis at call level</i>
MSCA	+ Emphasis on international circulation of knowledge and mobility of researchers	+ Emphasis on international mobility throughout WPs	+ Continued and specific emphasis on international mobility and training several calls.
INFRA	+ Emphasis on contributing to regional, national, European, and global development through research infrastructure investment	+ Emphasis on bridging divides between developed and less developed regions	+ Minimal additional emphasis at call level, and only in WP 2018-202

3.2.1.b Proposal template level

Excellent Science programmes employ a suite of different funding actions tailored to programme-specific needs. ERC frontier awards differ from FET large and small-scale research and innovation actions (RIAs). FET also funds coordination and support actions (CSAs) to advance objectives like R&I horizon scanning, cross-project networking, and other activities of interest to the EC unit and FET community. By contrast, MSCA funds individual fellowships, training networks, and other activities focused on knowledge exchange, engagement and communication. Similar to FET, INFRA funds a mix of RIAs and CSAs to establish current and future traditional and e-infrastructure objectives. At small scales, programmes use specifically tailored mechanisms like expert contracts to support monitoring, advising, or programme preparation activities. At largest scales, programmes activities like FET Flagships and INFRA GÉANT develop Specific Grant Agreements to involve many partners on large-budget, high-visibility, high-impact, high-priority efforts. We report below on a brief overview of how RRI and Open Agenda dimensions are featured in the proposal templates provided by the Commission for Excellent Science programming.

In the H2020 Work Programme for 2014-2015, the RIA template includes a variety of RRI keys, without explicitly devoting attention to RRI as an overarching concept (EC 2017h). These RIA and CSA templates especially and specifically related to FET and INFRA projects. RIA Proposal templates included requirements to check a box related to **ethics**, for example. In addition, Section 5.1 was devoted to an ethics self-assessment related to compliance with national legal and ethical considerations of vulnerable populations, consent, and potential dual-use, environmental, or other undesirable impacts of research. In section 1.3, under “concept and approach” projects were asked to make note, “where relevant” how **gender** would be taken into account in the project content. Further, in Section 4.1, submitters were required to indicate the gender of researcher/project participants. Section 2.2.a contained a section related to dissemination and exploitation of results, potentially connected to **public engagement** and / or **science education and science literacy**. Section 3.1 asked proposers to indicate participation in the Pilot on Open Research Data (related to **open access** and **open science**). Administrative data sections on participants offered means to verify commitments to interdisciplinary and cross-sector partnerships related to **Open Innovation**, and **Open to the World** dimensions.

Beginning in WP 2016-2017, proposals were requested to justify decisions to opt out of the Pilot on Open Research Data. Whether this decision to opt-out is weighted in evaluation criteria is up to the discretion of individual programme lines (e.g., ERC and MSCA do not consider this point in evaluation). With relevance to RRI keys and the Open Agenda, the proposal template in the second work programme is otherwise the same (EC 2017h; EC 2017i).

Subsequently, a significant change was made in reference to **gender**, elaborating the difference between accounting for gender balance and accounting for gender dimensions of research. The new proposal template language related to gender reflects a recommendation from the Interim Evaluation of H2020: “The qualitative analysis of a subset of 111 projects from gender- flagged topics showed the 53% included the gender dimension either well or in part. The notion does not seem to be well understood and is often confused with gender balance in research teams – nor is it always well evaluated” (EC 2017a, p. 173-174). Recognition of such challenges with consideration of gender dimensions in R&I are also illustrated in modifications to the MSCA Individual Fellowship template.

Such changes first appear in WP 2016-2017, in the Excellence section (EC 2016c), and were expanded upon in WP 2018-2019: “Discuss the gender dimension in the research content (if relevant). In research activities where human beings are involved as subjects or end-users, gender differences may exist. In these cases the gender dimension in the research content has to be addressed as an integral part of the proposal to ensure the highest level of scientific quality” (EC 2018b, p.2).

Finally, in the third work programme, several sections make explicit mention of public and stakeholder engagement (EC 2017i). Section 1.3.a now states: “Describe and explain the overall concept underpinning the project. Describe the main ideas, models or assumptions involved. Identify any inter-disciplinary considerations and, where relevant, use of stakeholder knowledge. Where relevant, include measures taken for public/societal engagement on issues related to the project” (connecting to **open innovation**) (2017i, p. 2). Section 2.2.b now states: “Where relevant, include measures for **public/societal engagement** on issues related to the project” (2017i, p. 5).

CSA Proposal templates of 2014-2015 and 2016-2017 share similar overall structures to RIA templates. This similarity covers **gender** and **ethics** dimensions of research (EC 2017j; 2017k). However, the CSA proposal is unique in containing additional language and attention to **public engagement** and **governance** dimensions, respectively:

Your plan for the dissemination and exploitation of the project's results is key to maximising their impact. This plan should describe, in a concrete and comprehensive manner, the area in which you expect to make an impact and who are the potential users of your results. Your plan should also describe how you intend to use the appropriate channels of dissemination and interaction with potential users (EC 2017k, p. 3).

And

Your plan should give due consideration to the possible follow-up of your project, once it is finished. Its exploitation could require additional investments, wider testing or scaling up. Its exploitation could also require other pre-conditions like regulation to be adapted, or value chains to adopt the results, or the public at large being receptive to your results (EC 2017k, p. 3).

Changes to RIA and CSA templates between 2014-15 and the 2016-2017 versions reveal the kinds of minor modifications that can be carried out to proposal templates to emphasize cross-cutting issues. Examples include:

- in the **ethics** tables, addition of language related to Environment & Health and Safety;
- in section 2.2., greater prominence to inclusion of business plans where relevant;
- more abundant notes to submitters regarding the Open Research Data Pilot in Horizon 2020 (**open access** and **open science** connection);
- more specific articulation of where, who, and how impact will be disseminated and followed-up;
- in section 3.3, new prompts to articulate the specific contributions of project partners to the project (**open innovation** connection).

Beyond funding consortia projects, Excellent Science also funds individual researchers and training networks through programme activities of ERC and MSCA. ERC includes a multi-step **ethics** check and self-assessment as part of proposals, with specific attention to issues of research integrity. RRI and Open Agenda dimensions of templates for four of five MSCA actions are presented below.

- The Innovative Training Networks (ITN) and Individual Fellowship (IF) proposal templates include an **ethics** section—although fashioned as a check-box—as well as a section for reflection on **gender** dimensions of research. In addition, applicants are asked to include materials on communication and dissemination (connecting to **science education and science literacy** and using **open access** language), as well as **public engagement** measures. ITN applicants are also encouraged to consider incorporating interdisciplinary and cross-sectoral arrangements (connecting to **Open Science** and **Open Innovation**) (EC 2017s, p. 4; EC 2018b, pgs. 2, 3, 12, 13, 14)
- Similar to ITN and IFs, co-funding of regional, national and international programmes (COFUNDS) require applicants to consider **each aspect of RRI except for governance** (EC 2018b, pgs. 2, 3, 7). COFUND templates include extensive attention to **ethical** reflection, stating, for example, when taking, “a bottom-up approach and it is often not known in advance if the fellowships to be funded will raise ethics issues. Therefore, it is important to describe how the proposal meets the European as well as the national legal and ethics requirements of the country or countries where the tasks raising ethics issues are to be carried out” (EC 2018a p7). Further, the proposal template notes that a report on ethics issues must be produced by beneficiaries for each call organized by COFUND programming.
- Research and Innovation Staff Exchanges (RISE) template requirements on **ethics, gender, public engagement, science education and science literacy**, and **Open Science** and **Open Innovation** activities are similar to those found in ITN, IF, and COFUND templates (EC 2017a, p. 5 and p. 29). Additional attention in the RISE template is devoted to the Open Research Data Pilot (**open access** and **Open Science**) and international partnership development (**Open to the World**).

The above summary of RIA and CSA templates, as well as MSCA templates, reveals how Excellent Science programme proposal templates may be meaningfully updated to encourage research, prospective anticipation of risk, management dimensions, and engagement plans to consider RRI and Open Agenda dimensions. Importantly, several of these proposal template changes are reinforced by evaluation criteria—specifically, the criterion: “quality and efficiency of implementation.” While this criterion often carries only a minority weight in evaluation, it offers on potentially solid leverage point for influencing adoption of cross-cutting content into H2020 activities.⁶

3.2.1.c Evaluation level

The H2020 framework gives programmes specific remit to modify their own proposal evaluation criteria. General evaluation criteria for proposals are included in Annex H of each H2020 Work

⁶ Whether and how changes to proposal templates affect proposals and project implementation, in relation to evaluation criterion and scoring, would require analysis beyond the scope and permissions granted to NewHorizon.

Programme (WP). Evaluation criteria are one of the most robust tools available to R&I management for shaping research and innovation practice. As such, whether and how H2020 evaluation criteria enable or hinder RRI and the Open Agenda is of central concern to this NewHoRRizon analysis.

RRI in H2020 General Evaluation Criteria

No general RIA or CSA evaluation criteria explicitly reference RRI or the Open Agenda. The main way any action is incentivized to implement RRI or the Open Agenda is if said action lists cross-cutting elements as an expected impact of a WP *and* the Impact Criterion text references back to this WP text. For example:

- WP 2014-2015 Impact Criterion, for all types of actions, states: “The expected impacts listed in the work programme under the relevant topic” (EC 2013b, Section H).
- WPs 2016-2017 and 2018-2020 Impact Criterion, for all types of actions, states: “The extent to which the outputs of the project would contribute to each of the expected impacts mentioned in the work programme under the relevant topic” (EC 2017f and EC 2017g Section H).

Despite a general absence of RRI and Open Agenda language in evaluation criteria, specific, individual RRI keys and Open Agenda elements do gain prominence in H2020 criteria over time. Specifically, H2020 prioritizes gender dimension, public engagement, and open innovation elements in its evaluation criteria. For example:

- **Gender:** WP 2018-2020 Excellence Criterion for RIAs states, “Appropriate consideration of interdisciplinary approaches and, where relevant, use of stakeholder knowledge and gender dimension in research and innovation content.” (EC 2017g, Section H).
- **Public engagement,** by connection to communication, exploitation, and dissemination requirements: WPs of 2014-2015; 2016-2017, and 2018-2020 Impact Criteria for RIAs and CSAs state, “Quality of the proposed measures to: Exploit and disseminate the project results (including management of IPR), and to manage research data where relevant; Communicate the project activities to different target audiences” (EC 2013b, Section H; EC 2017f Section H; EC 2017g Section H).
- **Open Innovation,** WP 2014-2015 Excellence Criterion for RIAs states, “Soundness of the concept, including trans-disciplinary considerations, where relevant” (EC 2013b, Section H). Subsequently modified in WP 2016-2017 as, “Appropriate consideration of interdisciplinary approaches and, where relevant, use of stakeholder knowledge” (EC 2017f, Section H). Modified again in WP 2018-2020 as, “Appropriate consideration of interdisciplinary approaches and, where relevant, use of stakeholder knowledge and gender dimension in research and innovation content” (EC 2017g, Section H).

RRI in Excellent-Science-specific Programme Evaluation Criteria

An in-depth study cataloguing the expected impacts of every H2020 topic, cross-referenced to type of action (e.g., RIA or CSA, etc.), and accompanied by the text of evaluation criteria is beyond the scope and purpose of the NewHoRRizon project. However, a general sampling of modifications to evaluation criteria by Excellent Science programmes provides insight into the extent H2020

programmes choose to use evaluation criteria to support RRI and Open Agenda activities prioritized by the Commission and European Union.

For ERC actions, the sole evaluation criterion for Frontier research awards is scientific excellence. Vinkenburg et al. (2014) note, “the ERC’s peer review evaluation process has been carefully designed to identify scientific excellence irrespective of the gender, age, nationality or institution of the Principal Investigators and other potential biases, and to take career breaks as well as unconventional research career paths into account” (p. 1). The singular nature of this ERC excellence criterion raises concerns not only for negative impacts on gender equality, but also in bias towards a status-quo orientation which, upon further reflection seems anathema to ERC’s aspiration of supporting path-breaking work at high-risk research frontiers (Lukkonen 2012).

The FET programme has made changes to criterion that are supportive of RRI—particularly in Flagship programming, where the excellence criterion, unlike in ERC, reinforce RRI interests. Use of RRI in the FET Flagship topic text is an example of how language within evaluation criterion text referencing WP text works in practice. To take one example, in WP 2018-2020 the Excellence criterion for the FETFLAG-01-2018 topic states, “Degree of adherence to the FET Flagship concept as specified in the work programme” (EC 2017e, p. 40). The corresponding text in the WP then states: “An approach to address **responsible research and innovation**, in particular aspects such as education, gender aspects and societal, ethical and legal implications” (EC 2017e, p. 32, bold text added for emphasis). Thus, although not motioned in the box elaborating on the Excellence criterion for topic proposal, RRI is flagged for consideration by extension to the general WP text.

Beyond Flagships, WP 2016-2017 and WP 2018-2020 Impact Criteria for FET Proactive topics demonstrate means of supporting **Open Innovation** and **science education and science literacy** cross-cutting activities. For example, the WP 2018-2020 text referenced by the FET PROACTIVE-01-2018 Impact criterion calls for: “Emergence of an innovation ecosystem around a future technology in the theme addressed from outreach to and partnership with high potential actors in research and innovation, and from wider stakeholder/public engagement, with due consideration of aspects such as education, gender differences and long-term societal, ethical and legal implications” (EC 2017e, p. 19).

The MSCA offers an alternative to the ERC approach of funding individual awards based only on an ERC-directed definition of excellence. MSCA criteria are designed to incentivize various dimensions of RRI and the Open Agenda. The ITN excellence and impact criteria explicitly support **gender, open access, open innovation, and open science**. The IF impact criterion mention interdisciplinary and cross-sector work (connecting to **open innovation**), and the IF excellence criteria states: “Quality and credibility of the research/innovation project; level of novelty, appropriate consideration of inter/multidisciplinary and gender aspects” (EC 2017w, p. 68), touching on **public engagement** through credibility; **gender**; and **open innovation** through interdisciplinarity.

MSCA COFUND and RISE criteria for excellence emphasize RRI and Open Agenda elements, as well. For example, the criterion for COFUND, states, “Quality of the research options offered by the programme in terms of science, interdisciplinarity, intersectorality and level of transnational mobility” (EC 2017w, p. 68). The criterion for RISE states: “Quality and credibility of the research/innovation project; level of novelty and appropriate consideration of inter/multidisciplinary, intersectoral and gender aspects” (EC 2017w, p. 69). Impact criteria for RISE

and COFUND alike also focus on open access, science education and science literacy, and public engagement dimensions (EC 2017w)

Overall, the above modifications demonstrate ways that H2020 programmes have the capacity to shape evaluation criteria to incentivize adoption of RRI and Open Agenda activities. Further, FET and MSCA efforts to specifically tailor excellence and impact criteria to advance RRI and Open Agenda dimensions offer an example of ways programme lines can change R&I management to encourage cross-cutting activities in H2020, if they so choose.

3.2.2 Analysis: RRI and the Open Agenda Across Excellent Science Programming

This section presents narrative summaries of progress toward institutionalizing RRI and Open Agenda activities across Excellent Science programming. Sources include the points of evidence from sections 3.2.1.a, b, and c, as well as the specific input annexes for each programme line. The section begins with a high-level observation before presenting brief programme-by-programme overviews for ERC, FET, MSCA, and INFRA. A summary can be found in [section 3.2.5](#).

The most common and seemingly effective way for H2020 programmes to institutionalize RRI and Open Agenda activities is through consistent inclusion across multiple programmatic levels. In Excellent Science programmes, RRI and Open Agenda activities are rarely framed in their complete forms as overarching concepts. However, some specific elements of RRI and Open Agenda aspirations are well covered in consistent and seemingly effective ways—with RRI keys and Open elements mentioned in work programme and call texts, reinforced in proposal template language, and incentivized through specific Excellence and Impact criteria (except in the case of ERC).

ERC Overview

At first glance RRI does not seem to play a role at all at in ERC programming. ERC documents rarely if ever reference RRI. Further, effectively 0% of ERC projects have been flagged in the Common Research Data warehouse (CORDA) as RRI-relevant (EC 2017b, p. 248). While project contents, work programme, call, and evaluation texts do not strongly support RRI or Open Agenda Activities, ERC policies, in general, do support select RRI and Open Agenda dimensions.

For example, the ERC attempts to address **gender** concerns through a Thematic Working Group on Gender Balance. This group has produced a gender equality plan for the programme. In addition, ERC CSA studies have been contracted to better understand gender biases in ERC evaluation. Application rules for Frontier awards do include provisions considerate of parental leave. Evaluators are provided video training to learn more unconscious biases in recruitment processes. ERC support of **open access** offers another example of programme policy support for RRI and the Open Agenda. ERC runs another Thematic Working Group on Open Access, and open access for peer reviewed articles is mandatory in the programme. Regarding **ethics**, ERC requires ERC Frontier applicants to consider research ethics and research integrity dimensions in proposals. The programme further provides an ethics self-assessment tool to support the process, and reviews proposals in light of a three-step ethical issues assessment. Regarding **governance** and RRI, the ERC holds a Standing

Committee on Conflict of Interests, Scientific Misconduct and Ethical Issues (CoIME) as a way to monitor and address ethics issues in programming as needed.⁷

On the other end of the spectrum, ERC governance mechanisms to support **public engagement** and **science literacy and science education** are less prominent, but still present. ERC applicants are encouraged to include communication and dissemination dimensions of this work, but project proposals do not have to include such plans. Rather than standing policy-level initiatives, ERC funds various CSAs to accelerate science literacy and science education efforts, for example through citizen science initiatives. Additionally, ERC organized together with the office of Science and Technology Options Assessment (STOA) a Spring 2018 workshop on public engagement (ERC 2018f).

FET Overview

In contrast to ERC, FET employs traditional R&I management approaches to advancing RRI and Open Agenda elements (rather than standing, policy-level efforts). In practice, FET has altered work programme, call texts, and evaluation requirements to promote cross-cutting programmatic activities. FET adoption of RRI and the Open Agenda has increased markedly over time, presenting an example of how H2020 programming promotes policy learning and R&I management adaptation work-programme by work-programme.

The 2014-2015 WP of FET mentions **gender** and **public engagement** explicitly (e.g., EC 2014a, p.5), but not in the context of RRI. By contrast the 2016-2017 and 2018-2020 FET WPs introduce explicit use of the term **RRI in general text**. Further, the introductory texts of these WPs include more detailed overviews of, for example, public engagement and **ethics** keys (EC 2017d; 2017e). Related to **open access** and **Open Science**, in WP 2018-2020, FET further strengthened requirements to promote data sharing (EC, 2017e).

Over the course of the three WPs of H2020, FET has increasingly featured RRI not only in programme introductory text, but also in specific call texts. In WP 2016-2017 and 2018-2020, Open and Proactive topics each begin to explicitly mention responsibility in research and innovation. For example, FET's 2016-2017 WP encourages exploration of micro (data protection, privacy, consent, misuse) and macro (desirability, socioeconomic issues) ethical dimensions in Proactive RIA text.⁸ Further, RRI dimensions have been consistently advanced in FET Flagships in each of the three FET WPs, with calls for FET Flagship Core Projects consistently stating: "Proposals should detail activities in areas such as education, dissemination, ethics and societal aspects" (EC 2014a, p. 30 & 31; EC 2017d, p. 41 & 43; EC 2017e, 45 & 46). As noted above in [section 3.2.1.c](#), in many cases, these changes to FET call text are reinforced by changes to evaluation criteria.

FET support of **open innovation** is visible in the way interdisciplinary and cross-sector collaborations are encouraged, especially in Launchpad, Flagship, and CSA activities. In an uncommon move for STEM programming endemic to FET, the specific challenge text for the 2018-2020 WP explicitly calls for, "including the social sciences and humanities" in interdisciplinary collaborations (new language compared to 2016-2017) (EC 2017e, p. 7). This position reflects guidance by the advisory board (FET Advisory Group 2016), and aligns with aspirations of **Open Innovation**.

⁷ Note, the use of Thematic Working Groups to support gender and open access cross-cutting issues in ERC offers an additional example of applying the **governance** RRI key.

⁸ See Herkert 2005 for a discussion on differences between micro and macro ethical considerations.

MSCA Overview

Similar to FET, MSCA attention to RRI and Open Agenda activities increase markedly in the second and third work programmes. This ramp-up has roots in the way constitutive elements like **gender**, **science literacy and science education**, **open access**, and **open innovation** have been with MSCA since the first WP. As part of the increased emphasis on RRI in MSCA activities, more recent WP texts (2016-2017 and 2016-2020) note that RRI goes beyond the basic stipulations of the European Charter for Researchers,⁹ the Code of Conduct for the Recruitment of Researchers,¹⁰ and the European Code of Conduct for Research Integrity¹¹; and references the Rome Declaration on Responsible Research and Innovation in Europe,¹² and the EC material on RRI topics.¹³

Consideration of **gender** balance and dimensions of research are each addressed in the legal founding text of MSCA, as well as in the proposal template and excellence criterion for ITN, IF, and RISE. **Science literacy and science education** is similarly flagged in the founding legal text of MSCA (in relation to communication and dissemination), and reinforced in impact criteria of calls (being also of-a-piece with the programme's *raison d'être*: promoting doctoral and post-doctoral education and training). **Open access** and **Open Science** are consistently prioritized through participation in Open Research Data Pilot activities, with additional language in work programme documents, calls, and proposal templates. MSCA attention to the other Open Agenda elements—**Open Innovation** and **Open to the World**—is similarly strong. From policy and work programme documents to topics, proposal texts, and evaluation criteria, Open Agenda elements are indicated with language promoting cross-sector, inter- and trans- disciplinary collaboration, as well as international mobility.

MSCA programme support for **public engagement** and **ethics** are similarly robust, although narrow in scope, as reflected in WP texts, templates, and impact criteria. For example, public engagement considerations, while present since the first WP, most often refer to unidirectional engagement, holding that knowledge flows from researchers to publics in communication, but not back from publics to researchers (an exception being the most recent scoping paper). Another example, related to ethics, is in the way the formal ethics table for self-assessment emphasizes microethical issues of researcher integrity, rather than also opening up broader macroethical dimensions of research in society. Unlike the previously mentioned RRI keys, **governance** receives much less attention in MSCA programming. The main mention of this key being implicit, through requirements for quality and risk management related to the infrastructures of IF, COFUND, and RISE applicants.

⁹ European Commission, EURAXESS, Jobs & Funding, Charter & Code for Researchers, European Charter for Researchers, available at: <https://euraxess.ec.europa.eu/jobs/charter/european-charter>

¹⁰ European Commission, EURAXESS, Jobs & Funding, Charter & Code for Researchers, The Code of Conduct for Recruitment, available at: <https://euraxess.ec.europa.eu/jobs/charter/code>

¹¹ ALLEA – All European Academies (2017) The European Code of Conduct for Research Integrity: Revised Edition. Berlin, Germany. Accessed on 26 July 2018. Available at: https://ec.europa.eu/research/participants/data/ref/h2020/other/hi/h2020-ethics_code-of-conduct_en.pdf

¹² Italian Presidency of the Council of the European Union (2014). Rome Declaration on Responsible Research and Innovation in Europe. 21 November 2014. Accessed 26 July 2018. Available at: https://ec.europa.eu/research/swafs/pdf/rome_declaration_RRI_final_21_November.pdf

¹³ European Commission (2012) Responsible Research and Innovation: Europe's Ability to Respond to Societal Challenges. Accessed 26 July 2018. Available at: https://ec.europa.eu/research/science-society/document_library/pdf_06/responsible-research-and-innovation-leaflet_en.pdf

INFRA Overview

Unlike FET and MSCA, INFRA programming has less robust support for RRI across the chain of R&I management instruments. RRI is only fully mentioned at the WP level, with none of the calls referring explicitly to RRI as a concept, and little evidence of the concept gaining traction in any specifically tailored evaluation criteria. The most common manifestations of RRI in INFRA programming are to be found through disaggregation into constituent cross-cutting activities. The most prominent and consistently addressed RRI key in INFRA is **open access**. While **public engagement, governance, science literacy and science education**, and **ethics** mentioned sporadically throughout programme materials, detailed elaboration of these concepts is sparse. Further, there is little evidence that incorporation of these RRI dimensions will be incentivized beyond consideration already given in H2020 evaluation criteria for RIA and CSA proposals.

By contrast, INFRA strongly emphasizes Open Agenda elements as guiding principles on multiple programme levels. **Open Science** features most prominently, commonly referred to as an important enabler of efficient collaboration among researchers and industry. **Open Innovation** features in texts related to advancing user-driven approaches to R&I and increasing industry involvement. **Open to the World** is prominent at policy and work programme levels, with texts often referencing supporting EU strategies for international cooperation. Use of Open Innovation and Open to the World are most commonly positioned as enhancing the EU's global and strategic interests in research competition, rather than reshaping relationships among science and society more generally.

3.2.3 Excellent Science programming: beyond the RRI keys and Open Agenda

Researchers and research managers have given extensive consideration to notions of responsible research and innovation in other ways than the six keys and Open Agenda approaches advanced by the Commission. These other perspectives on RRI include (but are not limited to):

- A procedural approach to enhancing anticipation, inclusiveness, reflexivity, and responsiveness (AIRR) in research and innovation (Stilgoe et al., 2013). Ideas behind this AIRR approach are that R&I processes will be more responsible with and for society if efforts are increased to incorporate people's values, diverse sets of expertise, broader considerations of goals, and greater consideration of long-term intended and unintended consequences into R&I activities. Stilgoe et al. (2013) most commonly refer to this set of procedures as comprising "responsible innovation," as opposed to the EC terminology of the cross-cutting topic, "responsible *research and innovation*" (emphasis added).
- An interactive approach advocated by von Schomberg (2013), in which procedural elements of AIRR concepts are applied in pursuit of broadly recognized "normative anchors" to "provide a legitimate basis for defining the type of impacts, or the 'right' impacts that research and innovation should pursue" (p. 57). According to von Schomberg (2013), a more open and interactive approach to R&I enhances the ability of "societal actors and innovators [to] become mutually responsive to each other with a view to the (ethical) acceptability, sustainability and societal desirability of the innovation process and its marketable products" (p. 64). The Societal Challenges dimension of H2020 programming is recognizable as addressing the "normative anchors" perspective that von Schomberg (2013) has argued for, without the corresponding procedural dimensions of AIRR.

Procedural and interactive approaches to responsibility in research and innovation are not in opposition to the aspirations of RRI and Open Agenda aspirations of the Commission. Rather, these alternative perspectives complement and, as noted above, articulate different foci in pursuit of the same goal: aligning science in, with, and for broad societal interests.

Each of the above AIRR and “normative anchors” approaches are visible in Excellent Science programming. Most commonly, FET applies CSAs as part of R&I management to promote programme-level reflexivity and anticipation. FET also employs inclusion strategies to help build more responsive programme agendas. MSCA and INFRA programming operationalize “anchor approaches,” orienting calls toward societal challenges like sustainability. In addition, INFRA engages in reflexivity regarding its overarching approach to advancing European research infrastructure.

ERC Overview

No data provided.

FET Overview

Procedural elements of the AIRR framework are visible in the ways that FET employs CSAs as part of its R&I management repertoire. Specifically, anticipatory activities can be seen in the 2017 FET Open Futures CSA, with its interest in “identifying strategy options, challenges and opportunities to stimulate and organise interdisciplinary research and innovation towards new and visionary technologies of any kind” (EC 2017d, p. 10). Also in FET WP 2016-2017, the FETPROACT-01-2016 topic on future technologies for societal change, being human in a technological world, takes a reflexive stance, stating: “The work should provide fresh perspectives that challenge current thinking, include ethical and social aspects, reflecting on the purposes, impacts and motivations for the research and innovation activity, the associated uncertainties, areas of ignorance, assumptions, questions and dilemmas; and by this crystalize through active stakeholder engagement concrete options for shaping a worthwhile and responsible future” (EC 2017d, p. 19).

Regarding inclusivity and responsiveness, there is some evidence that FET Advisory Group (FETAG) works to integrate diverse expertise and disciplines into FET agenda setting. While not diverse from the perspective of including humanities and multiple social science perspectives, the FETAG traditionally has included one social scientist (c.f., FET Advisory Group 2016), as well as a range of life and physical scientists and engineers. In a similar spirit of RRI beyond the keys, there is evidence that FET seeks to integrate and respond to stakeholder and public considerations in the process of WP-development itself. The third FET WP built off of several inputs, including a public consultation process for the Proactive call, and a horizon scanning CSA that engaged various stakeholder groups. Further, industry groups are invited as primary external experts shaping FET Flagship initiatives: to take one example, FET established a committee of 12 industry experts to advise the strategic agenda of the nascent Quantum Technology flagship. Of note, there is little evidence of effort to include CSOs, public interest groups, or public bodies at a similar level when it comes to shaping nascent Flagships (still, optimistically, the inclusion of one societal interest group demonstrates how other groups could be included in the future).

MSCA Overview

In contrast to FET with its de-facto approach to AIRR, MSCA demonstrates integration of a “normative anchors” approach to RRI beyond the keys. The regulation establishing MSCA in H2020 discusses societal challenges, like sustainability (EC 2013a). Sustainability and other societal

challenges are also mentioned in work programme texts. The most recent MSCA scoping paper pointed out societal challenges related to migration. The most recent work programme also explicitly mentions the UN Sustainable Development Goals.

MSCA takes an inherently anticipatory stance to the human capital challenge of doctoral training, noting, for example, “Although Europe hosts a large and diversified pool of skilled human resources for research and innovation, this needs to be constantly replenished, improved and adapted to the rapidly evolving needs of the labour market. [...] This, combined with the need for many more high-quality research jobs as the research intensity of the European economy increases, will be one of the main challenges facing European research, innovation and education systems in the years ahead” (EC 2013a, p. 347/127). This attention has manifested most recently in the 2018-2020 WP’s inclusive approach to issues of migration as well as Widening Participation concerns of the Union.

INFRA Overview

The most common operationalization of RRI beyond keys and beyond Open Agenda activities in INFRA can be seen with reference to “normative anchors,” as well. European Research Infrastructure investments are often framed as a way to help address societal challenges—most commonly related to sustainability. In pursuit of this goal, societal inclusion in research infrastructure is often also part of INFRA framings, as are FAIR (Findable, Accessible, Interoperable and Re-Usable) approaches. INFRA programming also explicitly engages in reflection on the limitations of FAIR approaches as related to national security concerns, issues of intellectual property rights, and privacy.

3.2.4 Context: Conceptual Underpinnings of R&I across Excellent Science Programming

Three overarching conceptualizations of research and innovation seem to buttress Excellent Science programming. To various degrees, each of these conceptualizations characterize the structure, language, and operations of ERC, FET, MSCA, and INFRA programmes. The three observed conceptualizations—a linear perspective; a republic of science structure; and a deficit model of public understanding—are described below. After each conceptualization, points of alignment are illustrated between theoretical underpinnings of R&I and Excellent Science programme lines. A closing comment is offered on tensions between these conceptualizations and the aspirations of RRI and Open Agenda activities set forth by the Commission.

Linear Perspectives on Scientific and Technological Progression

Formalized in a philosophy of science treatment by Douglas (2009), but with much deeper roots, the idea of a “linear model” perspective is very strong in Excellent Science programming. The essential encapsulation of this perspective is expressed as the aphorism: science discovers, technologies applies, and society benefits as a result. Emphasis on “basic research,” a type of science divorced from context or application, is another hallmark of the linear character of Excellent Science programming¹⁴—the notion that fundamental understanding must precede applied knowledge, and should be funded as such.¹⁵ A central perspective and increasing challenge with the linear view is the trap of expanding promises that often accompany arguments for R&I investments—as more is

¹⁴ c.f., Stokes 1997 on ideas of a simplified typology of science; see McNie et al., (2016) for a more recent and more complete attempt at elaboration.

¹⁵ For just one contrasting view on the nature of technical knowledge and experiential knowledge, and the ways that engineering application does indeed lead to basic knowledge see Sarewitz (2016).

promised, more is expected, and more pressures are placed on R&I systems to deliver, stressing research integrity, researcher well-being, and the robustness of R&I systems.

The ERC and FET programmes of Excellent Science offer the clearest example of a linear perspective in action (although it is visible as well in MSCA and INFRA, as well). ERC is the result of a well-orchestrated political endeavour (König 2017) in which high-level scientists argued for the importance of basic research funding for making Europe, “The most competitive and the most dynamic knowledge-based economy in the world,” a major objective espoused by the then-current European Council’s Lisbon Strategy on growth.¹⁶ Advocates of the ERC have argued that more investment in curiosity driven basic research would lead in the end to more innovation and greater economic competitiveness. As König (2016) finds: “In the initial reasoning for setting up the ERC, frontier research was perceived as the (necessary) counterpart to a top-down approach in research funding, because frontier research is an investment in the European knowledge base and the innovation cycle” (p. 151). The former President of the Union best encapsulates the ideal—and pressure of promise—made by the ERC: “without continuous investment into basic research, there will be no radical innovation in the future, i.e. innovation that has the potential of changing the technological paradigm of how the economy functions” (2010: 658).

At its core, FET’s structure reflects a linear progression of technological advancement driven by fundamental scientific understanding. FET brands itself an investigator-driven, basic-research arm of European R&I investments, and must commit 40% of its EUR 2.69 budget to “bottom-up” high-risk, “early explorations of embryonic and fragile” science and technology ideas through FET Open (EC 2011b, p. 25; EC 2013a). One level more advanced in progression, FET funds Proactive, a “critical-mass” building program to aggregate talent and capacity in specified science and technology domains. Finally, FET Flagships fund massive, scientific “grand-challenge” level initiatives to be supported at large scale (more than 100 partners per flagship, with each flagship originally costed for EUR 500 billion from the Commission and EUR 500 billion matching from EU member states and associated countries) over the long-term (10+ years) (EC 2011c). Despite FET’s notable deference to investigator-driven initiatives, there is a strong and visible push for funded projects to funnel toward industrial partnerships in support of commercialization (less so, and with less clear language, to addressing societal challenges). Such emphasis on a bridging function for the promise of economic benefit is best encapsulated the 2018-2020 WP: “In spite of the high initial risk, the long-term impact can be enormous: these new technologies can become the core for new high-growth companies, for new industries, or for radically new ways of tackling societal challenges” (EC 2017e, p. 6).

A Republic of Science

The idea of a “Republic of Science,” coined and championed by Polanyi (1962), may best be summarized as an interest of the scientific community being a self-governing, dynamic group of mutually supported, yet independent peoples in search of truth. In this ideal, truth comprises, “for brevity, all manner of excellence that we recognise as the ideal of self-improvement” (Polanyi 1962, p. 20). This ideal of a Republic of Science fosters a push for scientific autonomy in research agenda-setting, execution, and evaluation, with a narrow and subjective ideal of excellence at the core scientific pursuits. As Jasanoff (2004) expressed, Polanyi’s “highly idealized republic of science

¹⁶ European Parliament, Lisbon European Council 23 and 24 March 2000, Presidency Conclusions, Section 1.5, Accessed 27 July 2018, available at: http://www.europarl.europa.eu/summits/lis1_en.htm

developed its own rules of the game essentially uncontaminated by power or politics; these rules, Polanyi suggested, are suited to democratic governance because they deny any authority except that which is constituted from below by the self-critical and equally positioned ‘peers’ of the scientific polity” (p 37).

Here again, ERC and FET best express the underlying conception of having a scientific polity shape Excellent Science programming. The fundamental rationale for the ERC was to have an autonomous unit supporting basic research, insulated from outside “political influence.” Use of quotation marks here denotes the irony of ERC’s use of political lobbying for a politically un-accountable polity within the Commission. For example, in an interview given by the former ERC President, she recommends to researchers the lobbying strategy: “Speak with one voice, speak at the right time, speak at the right places and above all, repeat, repeat, repeat the message and you will be heard. (...) You have to keep at it” (Nowotny 2010:658).

Once secured as an independent body, the ERC further drew on underlying conceptualizations of a Republic of Science by constructing legitimacy through the concept of excellence. As Luukkonen observed, “The promotion of excellence was an important justification for the adoption of the ERC. Excellence (or the lack thereof) in European scientific institutions became an important concept in the causal analysis of the problem (...) and simultaneously became a normative idea” (2014, p. 31, see also p. 34). Today, the ERC Scientific Council enjoys large autonomy and centralized control within a particular group of scientists, holding to specific notions of excellence and quality, exercising political power in the process (c.f., securing a proposed 16.6 billion in current draft of the Commissions draft ninth framework programme: an increase of more than 3 billion over FP8 (EC 2018n)).

Although at a far smaller scale than ERC, FET demarcates 40% of its budget, through Open calls, into a similarly autonomous zone for a polity of scientists and engineers. The second work package sees the introduction of FET Open “gatekeepers,” as a way to demarcate the boundaries of this zone of autonomy (EC 2017d, p. 6). The FET WP 2018-2020 Open gatekeepers unequivocally state, when it comes to Open proposals:

- “Research to advance on the roadmap of a well-established technological paradigm, even if high-risk, will not be funded” (EC 2017e, p. 7).
- “Blue-sky exploratory research without a clear technological objective will not be funded” (EC 2017e, p. 7).
- “Projects with only low-risk incremental research, even if interdisciplinary, will not be funded” (EC 2017e, p. 7).

The gatekeepers do not contain any mention of RRI or the Open Agenda (beyond a weak-case for interdisciplinarity as being partially related to Open Innovation).

Deficit model of public understanding of science

The deficit model of science communication holds non-scientists to be something like empty vessels into which technical information can and should be poured to remedy perceived gaps in understanding. A common correlate of this model of interaction (to which social scientists and humanists fall prey as much as anyone else (c.f., Horst 2011)) is the assumption that if only people knew and understood the science, they would agree with the conclusions offered by experts (Sturgis

and Allum 2004). Among other problematic assumptions endemic to this perspective are a) homogeneity of “the public” in terms of values, preferences, beliefs; b) neglect of overt and hidden agendas related to communication; c) presumption that there is nothing to be learned in the process of two-way communication (see Horst 2011 re: learning from objection); d) lack of understanding of the social context of information; and e) that the “science” of scientific subjects is at all settled and straightforward (National Academies of Sciences, Engineering, and Medicine 2016).

FET, MSCA, INFRA, and ERC, to the extent that ERC promotes public engagement, each advance a deficit model of communication. In the rare instances where FET programming mentions communication with and understanding of publics, it is spoken about as serving a function, “To disseminate the project results, and to attract large public support” (EC 2017d p. 40), rather than to spur genuine two-way engagement to learn public values and values related to new and emerging technologies (again, as the Commission originally elaborated in EC 2014). MSCA public engagement and science literacy and science education efforts can similarly be seen as having a unidirectional model of engagement, characterizing publics as homogenous. Although in the most recent work programme, MSCA seems more open to dialogue and other forms of engagement, the Impact evaluation criterion is still framed mostly in terms of engagement as one-way communication of results. For its part, INFRA programme perspectives on public engagement—when mentioned—are framed as necessary in order to increase citizens’ trust in science and disseminating results—two agendas held independent of heterogeneity of audience, social context of information, or other dimensions of the aforementioned deficit model.

Traditional Conceptualizations of R&I, RRI, and the Open Agenda: Closing Comment

The above perspectives on theoretical and underlying conceptualizations about R&I in Excellent Science programming do, of course, need to be taken with a measure of caution. The scientific and broader stakeholder communities engaged and served by ERC, FET, MSCA, and INFRA hold a wide range of perspectives more complicated and nuanced than the above caricatures afford.

In addition, the programmes, as observed, have made genuine progress toward advancing RRI and Open Agenda activities. In part, uneven progress may be related to the challenges posed by the underlying conceptualization of R&I embodied by RRI and Open Agenda—a conceptualization fundamentally different than what one finds in Excellent Science Programming. For example:

- Where the linear-model promises progress, RRI and Open Agenda approaches are more reflective on the nature of goals pursued, sensitive to the consequences and pressures created by *overpromise*, and awareness of the reality of accidents and unforeseeable winding paths of discovery in science.
- Where republic of science perspectives close-down debate and reserve agenda setting and seals of excellence for a select few, RRI and Open Agenda approaches seek to include more people with diverse values, experiences, and expertise as participants in research agenda setting and activities.
- Where the deficit-model of engagement can preclude learning from publics and stakeholders engaged, humility and openness to alternative perspectives enable mutual, iterative learning that can enhance the quality and relevance of research.

These contrasting perspectives of RRI and Open Agenda activities present novel, sometimes challenging ways that disrupt “business as usual” practices. As potential disruptors, they may be

perceived as threats to existing power structures; as unknown entities and thus sources of fear; or as passing fads. And of course, the approaches are fallible in their own right: take for example the not insignificant promise made by RRI and Open Agendas of improving alignment of R&I with societal interests and values.

In closing of this section, let it be said that fostering conceptual change of large bureaucratic entities, and the people that comprise them, is difficult. Further, understanding root-theoretical positions underlying R&I systems is complicated. Despite these aspects of reality, Excellent Science programmes—just as they are shaped and shape themselves to advance current conceptualizations—are in the process of and have the power to continue to re-shape themselves toward RRI and Open Agenda aspirations.

3.2.5 Summary: Institutionalization of RRI and Open Agenda in Excellent Science

This section summarizes progress toward each RRI key and Open Agenda element in Excellent Science programming, based on the materials presented above. The summary is presented in abridged form in table 10 beneath the section narrative.

Institutionalization of **ethics** appears to be strongest in Excellent Science programming. Each of the ERC, FET, MSCA, and INFRA programmes include language supporting ethical reflection across work programme, topic, proposal template, and—in cases—at evaluation criteria. Most common attention to ethics is paid at a micro level, related to research integrity, privacy, and data management; ethical reflection at a macro / societal level (for example related to dual-use, broad objectives of R&I, and social and cultural implications of R&I in society) is far less institutionalized.

Institutionalization of **open access** and **Open Science** could be considered next strongest in Excellent Science. ERC, FET, MSCA, and INFRA each place emphasis in work programme, topic, and proposal templates, but commonly stop short of linking evaluation criteria to these considerations. A main tension related to full institutionalization of open access and Open Science relates to rules and norms about intellectual property when private-sector actors are involved in projects.

After these three elements, institutionalization of RRI and Open Agenda elements is far more variable across Excellent Science programmes. Of relevance, a review of the European Commission CORDIS database for Excellent Science projects flagged as “RRI” revealed:

- ERC: 0 out of 2931 projects (0%)
- FET: 9 out of 150 projects (6%)
- MSCA: 314 out of 4526 projects (6.9%)
- INFRA: 18 out of 162 projects (11.11%)

Project flagging methodologies were found, through interviews, to be ad-hoc and conducted by project managers as part of ticking a box, which asks whether they think their project has any RRI elements (yes, no, or missing (if blank)). Flagging data were not available at the level of constituent RRI keys or open agenda elements.

Gender receives strong attention in ERC, FET, MSCA, and INFRA at policy and work programme levels, but only FET, MSCA, and INFRA programmes include provisions for evaluation criteria to consider gender dimensions. Further, **gender balance** is most consistently considered in Excellent Science programmes, with less attention paid to **gender dimensions** of R&I content. **Open**

Innovation receives strong attention in FET, MSCA, and INFRA programmes at all levels—including evaluation criteria. For ERC however, this element is less relevant, as most awards focus on individual investigators. Additionally, as an investigator-driven, bottom-up programme, ERC is unlikely to require any activity that would be perceived to constrain the independence of R&I actors (i.e., e.g., incorporating a user-perspective; consulting across sectors; engaging in interdisciplinary collaboration). Attention to **science literacy and science education** is more variable still, with MSCA demonstrating the most robust institutionalization of this RRI key at all levels. By contrast FET, ERC, and INFRA coverage is more variable and dependent on inclusion in specific topics.

Open to the World, governance, and public engagement are the most inconsistently addressed elements of RRI and Open Agenda aspirations in Excellent Science. MSCA and INFRA place strong emphasis on **open to the world**, each pointing, respectively to benefits from international mobility in education and training, and global engagement as advancing EU strategies and interests. **Public engagement**, when emphasized, is almost universally referenced as a unidirectional activity in ERC, FET, MSCA, and INFRA programmes. In this one-way form, public engagement enterprises are designed to push knowledge and information out into the world, rather than seek to systematically learn from and with broader publics and stakeholders holding diverse values. **Governance** is rarely attended in ERC, FET, or MSCA; if included, it is through implicit consideration of project infrastructures (as in the case of setting up MSCA COFUNDS or FET Flagships), or only at the policy level (as in the case of ERC Thematic Working Groups). By contrast INFRA places strong attention to the legal and social institutions that can support vibrant, long-term research infrastructures, but does not seem to relate this concept to RRI.

Finally, a note: full institutionalization likely starts only when a programme—either at the EC level or the level of the programme committee shaping the agenda—genuinely opens up to the potential contributions of RRI and Open Agenda elements. As the FET WP 2016-2017 expressed, the programme aspires to align with RRI cross-cutting issues, attending to gender, ethics and education dimensions, “Being convinced that this can offer new perspectives, pose new questions and open new areas of investigations” (EC 2017d, p. 4).

Table 10: Overview of level of institutionalization of RRI and Open Agenda elements* in Excellent Science Programming, based on desktop research.

	Level of Institutionalization Across Excellent Science Programmes
Ethics (micro)	Very strong: ethical reflection, mainly on research integrity, included from work programme through to evaluation in all four programmes.
Gender (balance)	Strong: gender balance concerns mentioned at most levels of all four programmes, but not considered in evaluation for ERC programme
Open Access and Open Science	Strong: emphasis placed on open access / Open Science processes and products at many levels of all four programmes, but not considered in evaluation criteria
Open Innovation	Strong: emphasis placed at all levels, including evaluation, for FET, MSCA, and INFRA programmes; not included at all in ERC
Public engagement (unidirectional)	Moderate: addressed most commonly as dissemination and communication in FET and MSCA, across all levels; supported in ERC but not at evaluation level; unclear support from INFRA research
Science Literacy and Science Education	Moderate: variable coverage in programmes, with MSCA demonstrating commitment at all levels; FET, and INFRA coverage is more variable and dependent on specific topics; ERC encouragement but not requirement or inclusion in criteria
Open to the world	Moderate: variable coverage in programmes, covered at all levels in MSCA and INFRA; but far less consideration in FET and very rarely in ERC
Governance	Weak: variable coverage, with emphasis in INFRA and some elements of specific FET and MSCA calls; most commonly implicit in reference to project organization, rather than study of / learning from ways governance arrangements shape Excellent Science project content
Gender (dimensions)	Weak: variable coverage, with emphasis to distinguish gender balance from gender dimension topics increasing in WP 2018-2020 activities, but rarely clearly elaborated or considered
Public engagement (bidirectional)	Very weak: variable coverage, with very little indication—excepting a few topics—that programmes grasp the potential for R&I learning or enhancement to happen through public engagement
Ethics (macro)	Very weak: variable coverage, with very little indication—excepting a few topics—that programmes grasp the potential for collective societal reflections on how R&I shape and are shaped by society in desirable and undesirable ways

*RRI keys ethics, gender, and public engagement are split in two dimensions because of how variable coverage is in Excellent Science programming. Microethics refers to issues of research integrity most commonly covered on ethics self-assessments, as well as data management and privacy ethics. Macroethics refers more broadly to topics like dual-use, roles of technology in society, how diverse values shape technology, etc. See Herkert (2005) for an elaboration of micro- and macro-ethics. Gender balance refers to team composition considerations. Gender dimensions (of research) refers to whether and how projects give consideration to the way gender concepts shape research content, and research content affects genders differently. See EC (2017a) for the difference between ways programmes realize the cross-cutting gender dimension of H2020. Unidirectional modes of public engagement refer to R&I actors seeking to fill a deficit in public knowledge. Bidirectional modes of public engagement refer to R&I actors seeking to exchange information and values through dialogue with a variety of people.

3.3 RRI in Excellent Science Programmes: Interview Results

3.3.1 Understandings of RRI from Interviews Across Excellent Science Programmes

This section presents key findings and patterns observed from 61 interviews conducted by NewHorizon participants with parties connected to Excellent Science programming. Interviews are distributed across the four programme lines in the following way:

- 18 related to ERC, including former Commission officers, researchers, representatives from CSOs, and research funding organizations;
- 19 related to FET, including current Commission officers; project coordinators; programme committee members; advisory group members; business stakeholders; and national contact points;
- 12 related to MSCA, including current Commission officers; MSCA alumni and representatives from the alumni association, national contact points, and evaluators;
- 13 related to INFRA, including NCPs, RIs, ERICs or ESFRI, or infrastructures-users at a project level.

ERC Overview

The concept of RRI was not uniformly well known by interviewees, with the exception of the small number of ERC applicants and people from research funding organization (RFOs) interviewed. Interviewees differed in their understanding of responsibility, familiarity with RRI keys, and awareness of institutionalization of RRI.

- Regarding **public engagement**, interviewee views ranged from unidirectional deficit-models to fully involving practitioners and stakeholders in research.
- In a similar vein, **science literacy and science education** were most commonly pointed to as useful for awareness raising. Interviewees did recognize the significant logistical and managerial resources and expertise needed to bring people together for SLSE activities.
- Awareness of **gender** equality issues focused on issues of gender balance, although some were aware, too, of the issues associated with gender dimensions of R&I.
- **Ethics** was most commonly understood in ERC as related to dimensions of research integrity, be it related to experimental design and data management; issues of authorship; or exercise of caution against hype (see microethics discussions above). Less common conceptions of ethics included notions of responsibility toward society and environment, and to promote justice.
- **Open access** and **Open Science**, were widely and commonly understood in ERC as relating to publication, supported by institutional policies at research organizations (e.g., to help with funding costs).
- No data were reported on awareness of **governance**, **open innovation** or **open to the world** approaches.

Consistent with the tensions observed in section 3.2.4 between underlying conceptions of Excellent Science programme and RRI and Open Agenda approaches, many interviewees expressed scepticism about the present and future of RRI and Open Agenda in ERC. While interviewees recognized some aspects of potential value of RRI and Open Agenda approaches, there was a sense that it would be

frowned upon to respond to ERC calls in ways that emphasized societal impact, based on ERC's tight regard for autonomy and insulation from the EC.

FET Overview

Awareness of responsible research and innovation (RRI) six keys was relatively high among interviewees associated with FET. An overall perception seems to be that larger projects, like Flagships, are more amenable to including RRI considerations. This perception seems to be related to the higher technology readiness levels of the systems involved in these projects, and as such the perceived proximity of the research and innovation system to end-user audiences. By contrast, investigator-driven, FET Open projects, were perceived to be less relevant for including RRI dimensions, raising the question—as one interviewee put it: “at which point in the development of a new or enabling technology should citizen and stakeholder interactions occur in a way that allows for meaningful exchange, discussion, and interaction?”

- For those projects adopting RRI, activities associated with **gender** equality are more focused on the balance of teams, work package, and task leaders, rather than gender dimensions of research. Interviewees were aware, too, that the gender equality dimension of RRI is a systemic issue that requires action before undergraduate and graduate education (i.e., at the point of project funding)—and that this facet may be beyond the scope of any individual research project in FET.
- **Ethics**, especially related to data management issues, were often viewed as necessary compliance activities. In addition, some FET projects addressed microethical issues related to researcher integrity, and macroethical issues related to topics like dual-use technology.
- Attention to **open access** and **Open Science** were held by all interviewees (including those from business, who noted challenges with open access and intellectual property rights), with parties noting various ways that projects support open publication and data management procedures.
- Interviewees conceived of **Public engagement** mostly as unidirectional undertakings to share information about projects. In some cases, interviewees noted the importance of activities that break with unidirectional practices to engage in a range of two-way activities, from in-person and web seminars, to country-by-country stakeholder consultations.
- An area of ongoing difficulty in FET (and H2020 at large) relates to **open innovation** and broader involvement of CSOs in projects and agenda setting. This challenge is often framed as a difficulty identifying relevant societal stakeholders when it comes to future technologies. Interviewees actively engaged in RRI components of FET projects noted that cultures of RRI take time, consistent interaction, and capacity development of teams.
- **Governance** and **science literacy and science education**, as well as **open to the world** dimensions were very rarely brought up in interviews.

MSCA Overview

Apart from a very strong awareness of RRI held by programme officers, awareness of RRI and Open Agenda elements varied highly amongst MSCA interviewees. While there were interviewees who demonstrated a growing awareness of topics nested under the RRI label, the overarching concept seemed less well understood. For example, some saw the concept of RRI as ill-defined, and thus difficult to use effectively; they therefore resort to focusing on constitutive keys. Others noted

advantages with the overarching RRI label to provide coherence to the principles and objectives of the aspiration: a useful operational heuristic.

- Perspectives on **public engagement** were predominantly in terms of unidirectional interactions designed to increase public understanding of science. Only rarely did interviewees note the possibility of conducting public engagement to improve public debate
- Concerning **gender**, there was an understanding that gender balance and gender dimensions are each important and under consideration in the Excellence evaluation criterion for the programme. This emphasis on gender in the evaluation process was noted as especially important for encouraging researchers to think-through how it might affect their research. Despite these successes, it was observed on several occasions that more needed to be done to overcome discrimination from supervisors and other aspects hampering gender equality.
- **Science literacy and science education** was among the most well understood RRI aspects for interviewees. In general, this RRI key is highly valued, although sometimes also approached as a form of unidirectional communication or dissemination of results.
- Interviewees were also well aware of **open access** and **Open Science** issues, given the standard obligation to provide for some form of open access to research process and products. Interviewees in MSCA also noted tensions between open access and data privacy concerns, as well as intellectual property rights.
- Interviewees were familiar with **ethics**, with some participants noting the utility of programme-provided trainings, information events, and self-assessment template and guidelines. Research integrity dimensions (microethics) featured most prominently in interviewees' awareness.
- Limited awareness of **governance** dimensions served as an outlier of other RRI dimensions in MSCA interviews.
- *No data were reported on awareness of **open innovation** or **open to the world** approaches.*

INFRA Overview

In general, INFRA interviewees had some awareness of RRI as overarching concept, with awareness, as well, of most of the constitutive elements of RRI keys and Open Agenda elements.

- Interviewees had strong views on **open access** and **Open Science**. According to interviewees, physical access to research infrastructures should be as open, wide, and useful as possible. For INFRA, an important distinction is that open access does not equate with free access, as infrastructure—even open—requires funding.
- **Ethics** awareness seemed second highest regarding interviewee awareness. It is, however, understood by different parties to mean different things. Some interviewees expressed the position that research infrastructures (especially non-human, large-scale installations) only entail ethical issues when in-use. Others, especially those involved in medical research, social science and health care fields, noted that issues such as privacy, site selection, resource use, and other topics have ethical dimensions important to consider from the start.
- While aware of **gender** issues, interviewees could not identify any efforts to mainstream gender equality in INFRA programming. Gender balance was the aspect most predominantly addressed, with female researchers interviewed still noting underrepresentation in the field, as well as structural discrimination and glass-ceiling barriers.

- Awareness of **public engagement** was split in a way similar to ethics, with some having no awareness of trends toward or necessity of public engagement, and others actively engaged in outreach at multiple levels.
- INFRA interviewees were aware of science literacy and science education, and observed two distinct orientations to this RRI key, approaching SLSE of students, post-docs, and other researchers differently from publics.
- There was very little mention or awareness of **governance** among interviewees, beyond needs tied to project transparency in reporting and respect for ethics and open access guidelines.
- *No data were reported on awareness of **open innovation** or **open to the world** approaches.*

3.3.2 Understandings of RRI Beyond the Keys and Open Agenda: Interview Results

Beyond RRI Keys and Open Agenda elements, several ERC interviewees touched on issues with the way the programme is responsible toward applicants and grantees. Interviewees noted that the programme seems to disregard differences in research cultures across Europe, for example with regard to financial resources available at supporting institutions to help prepare applicants. As one interviewee noted, there is cottage industry of ERC application preparation, which can be very resource intensive for submitters and host institutions. Other remarked on elements included entrenched biases that favour traditional disciplines, English language speakers, and men. Finally, several interviewees expressed concern with the lack of preparation that the programme offers awardees, particularly of Starting Grant winners, for the change of going from precariously funded, anonymous professor to “superstar” overnight.

Regarding FET, many interviewees noted ongoing difficulties in FET (and H2020 at large) in securing broader involvement of CSOs in projects and agenda setting. In FET, this challenge was often framed as a difficulty identifying relevant societal stakeholders of future technologies. Interviewees actively engaged in RRI components of FET projects noted that cultures of RRI take time, consistent interaction, and capacity development of teams—features not usually found in WPs funding 2-4 year projects, within FPs funded on a 7-year cycle (again, Flagships proving an occasional exception). For those familiar with RRI keys, Open Agenda, and AIRR or “normative anchor” approaches to RRI, there were strong feelings expressed that there is ample room for “keys” and “other” approaches to RRI. Such interviewees noted, for example, how foresight exercises might help identify ethical issues associated with R&I, and how commitments to inclusive engagement could support gender equality efforts. A minority of interviewees raised a larger question of whether RRI in any form should be expected of all projects of all programme lines all the time, or if, by contrast, more limited and targeted combinations would be more feasible and desirable.

Societal impact concerns, a hallmark of the “normative anchors” perspective on RRI, featured prominently in MSCA interviews. A predominant concern of these interviewees was how to improve knowledge transfer between scientific and more general societal spheres, whether through conversations with policy makers or more diverse modes of public engagement. Despite conversations around societal impact, MSCA interviewees expressed no sense of a common societal or ethical challenge that the programme addresses. Similar to ERC, MSCA programme interviewees also expressed concerns related to a lack of accounting for the different conditions under which researchers work across countries.

In INFRA interviewees, most people expressed the view that research infrastructures represent important tools that can help policy makers address societal challenges. Specific challenges noted by interviewees included societies, inequalities, delocalization of food production and consumption, data protection, and energy security. Some, however, when presented with this perspective, strongly objected, expressing the view that tuning research to address societal challenges involves a political process that would inherently and undesirably bias research. Interviewees touched on an ongoing redefinition of the way people perceive relationships between research and society. In this context, interviewees noted that research infrastructures not only represent crucial accessories to R&I, but also provide a foundation for generating cross-cutting insights.

3.3.3 Summary: Awareness of RRI among Excellent Science Stakeholders Interviewed

Across Excellent Science, the concept of RRI was less well known than the constitutive RRI keys or Open Agenda elements. Regarding RRI, interviewees across the four programmes had greatest awareness of **open access** and **Open Science** topics; **ethics**, most closely related to research integrity concerns; and **gender** balance, rather than gender dimensions of R&I. Least awareness was shown with regard to **governance**, with insufficient data to comment on the state of awareness of **open innovation** or **open to the world** dimensions. For the remaining RRI keys **public engagement** and **science literacy and science education**, awareness was variable across programmes: when present, awareness was most commonly expressed in terms of unidirectional engagement to advance understanding of science and technology projects, rather than in two-way dialogues on questions of values, responsibility, or roles of R&I in and for society.

See table 11, on the next page, for an overview of the above summary.

Table 11: Overview of level of Awareness of RRI and Open Agenda elements* in Excellent Science Programming, based on interviews.

	Awareness of RRI and Open Agenda across Excellent Science Interviewees
Ethics (micro)	Very strong: almost all interviewees across all Excellent Science programming demonstrated awareness of micro-ethical dimensions of R&I
Open Access and Open Science	Very strong: almost all interviewees across all Excellent Science programming recognized open access priorities and challenges
Public engagement & Science Literacy and Science Education (unidirectional)	Strong: most interviewees across Excellent Science programming were aware of and discussed public engagement and / or science literacy and science education priorities and activities in this way
Gender (balance)	Strong: most interviewees were aware of gender balance concerns, although in the case of INFRA, interviewees were more aware of the absence of robust action to tackle the issue
Gender (dimensions)	Weak: Only a few interviewees across Excellent Science programming were aware of or able to speak to priorities and activities about this issue.
Public engagement & Science Literacy and Science Education (bidirectional)	Weak: Only a few interviewees across Excellent Science programming were aware of and discussed public engagement and / or science literacy and science education priorities and activities in this way
Ethics (macro)	Very weak: very few interviewees across Excellent Science programming spoke activities or concerns related to this issue
Governance	Indeterminate: insufficient data collected / reported
Open Innovation	Indeterminate: insufficient data collected / reported
Open to the world	Indeterminate: insufficient data collected / reported

*RRI keys ethics, gender, and public engagement (lumped with science literacy and science education in this case) were split in two dimensions because of how variable coverage was in Excellent Science programming. Microethics refers to issues of research integrity most commonly covered on ethics self-assessments, as well as data management and privacy ethics. Macroethics refers more broadly to topics like dual use, role of technology in society, how diverse values shape technology, etc. See Herkert (2005) for an elaboration of micro- and macro-ethics. Gender balance refers to team composition considerations. Gender dimensions (of research) refers to whether and how projects give consideration to the way gender concepts shape research content, and research content affects genders differently. See EC (2017a) for the difference between ways programmes realize the cross-cutting gender dimension of H2020. Unidirectional modes of engagement refer to R&I actors seeking to fill a deficit in public knowledge. Bidirectional modes of engagement refer to R&I actors seeking to exchange information and values through dialogue with a variety of people.

3.4 Case Briefs: Flavours of RRI in Excellent Science Projects

Six cases of projects within Excellent Science programming are presented below. Projects selected seek to showcase advanced and basic implementations of RRI and Open Agendas, alike. Data sources for each case draw from the CORDIS database, the Europa Webgate, and immediately available project web-pages. Cases were selected based on exemplifying different dimensions of RRI at the project level, or for contributing to larger research and innovation infrastructure conducive to RRI more generally. Each case heading denotes Excellent Science programme of origin (FET, MSCA, or

INFRA), and is pulled directly from the respective diagnosis input in the Annexes to this deliverable. No cases were provided by the group researching ERC.

3.4.1 FET: Human Brain Project Flagship

The Human Brain Project (HBP) is a Flagship Research Innovation Action started in 2013, at the end of FP7, with plans to continue ten years and potentially beyond. The consortium is funded through periodic (biennial) Specific Grant Agreements (SGAs). Project participations draw mainly from HES (73% of participations), with the remaining quarter from REC (26%), and the final 2% from PUB (1%) and PRC (1%) respectively.¹⁷ In the course of H2020, EU Net Contribution to the HBP has been EUR 177 million, with EUR 89 million through SGA1 (from April 2016 through March 2018) and EUR 88 million through SGA2 (*information not yet available on CORDIS*).^{18, 19} The Impact evaluation criterion for SGA1 explicitly called for approaches, “to address societal benefit and potential ethical and legal implications, including engagement with authorities and end-users” (EC 2014a, p. 32). FET calls for each Flagship Core Project to: “detail activities in areas such as education, dissemination, ethics and societal aspects” (EC 2014a, 31; EC 2017d, p. 43; EC 2017e, 46).

The HBP has a robust infrastructure to support RRI dimensions of the project. The landing page includes a dedicated tab on “Social, Ethical, Reflective” sub-project activities; the “about” tab offers an immediate option for a “gender equality” page; there is a dedicated “education” tab. The landing page on “overview” includes the following text in the, “Short Overview of the Human Brain Project”: “In addition, the Project studies the ethical and societal implications of HBP’s work.”²⁰

Beyond the project webpage, social and ethical reflection is built into HBP governance. One of the 12 subprojects is “Ethics and Society” (E&S) advancing not just RRI within the project (relating to governance key of RRI), but also neuro-ethics and -philosophy as subjects in-and-of themselves. The project has a dedicated Ethics Advisory Board, and the leader of the Ethics and Society team has a seat on the Directorate of the project, helping manage the Core Project of the Flagship (relating to governance key of RRI),²¹ as well as the Science and Infrastructure Board dedicated to research planning and road-mapping.²² HBP address not only RRI as established by the EC keys, but also beyond the keys, as embodied by the Stilgoe et al. (2013) procedural dimensions of anticipation, inclusion, reflection, and responsiveness.

- **Anticipation:** The “Foresight Lab,” “focuses on identifying and evaluating the future impact of new knowledge and technologies generated by the HBP.”²³ Foresight lab activities have

¹⁷ Participation information from Europa Webgate, accessed on 9 July 2018, searching for “HBP,” available at <https://webgate.ec.europa.eu/dashboard/sense/app/93297a69-09fd-4ef5-889f-b83c4e21d33e/sheet/PbZJnb/state/analysis>

¹⁸ Project entry for HBP SGA1 in CORDIS available at: https://cordis.europa.eu/project/rcn/205371_en.html

¹⁹ Funding information from Europa Webgate, accessed on 9 July 2018, searching for “HBP,” available at: <https://webgate.ec.europa.eu/dashboard/sense/app/93297a69-09fd-4ef5-889f-b83c4e21d33e/sheet/erUXRa/state/analysis>

²⁰ HBP website page available at: <https://www.humanbrainproject.eu/en/about/overview/>

²¹ HBP, The Directorate, available at:

<https://www.humanbrainproject.eu/en/about/governance/boards/directorate/>

²² HBP, Science and Infrastructure Board, available at:

<https://www.humanbrainproject.eu/en/about/governance/boards/science-and-infrastructure-board/>

²³ HBP Foresight Lab, About Us, available at: <https://www.humanbrainproject.eu/en/social-ethical-reflective/foresight-labs/>

included a range of seminars, webinars, and trans-disciplinary workshops on issues ranging from neuroscience modelling to RRI, as well as reports on topics such as “future computing and robotics”, “future medicine,” and “future neuroscience.”²⁴

- **Reflection:** The “Neuroethics and Philosophy Work Package,” focuses on “conceptual, social, ethical, and regulatory issues, from potential privacy threats to understanding consciousness and the meaning of human and personal identity.”²⁵ The work package maintains an active “ethics blog,”²⁶ and publishes on issues of neuroethics and neurophilosophy, as well as dual-use.²⁷
- **Inclusion (and Public Engagement key):** The “Public Engagement and Dialogue” work package organises and facilitates public dialogues on issues of potential controversy and relevance to the HBP to “broaden the debate on the ethical, legal and societal issues arising from the project.”²⁸ In-person and online consultations with publics and stakeholders (including scientists, other experts and decision makers), led by the Danish Board of Technology Foundation (DBT), constitute the majority of this work. DBT meetings for HBP have occurred all over Europe, and covered topics from privacy and data, among a range of other issues. Extensive documentation for these events is available online.²⁹
- **Responsiveness (and Ethics RRI Key):** HBP has a dedicated Ethics Support Team to help collect, address, and circulate best practices related to ethical R&I. The Ethics Support team conducts research on ethics, governance, and RRI; provides public outreach resources; supports data management; and coordinates with the independent Ethics Advisory Board. The team is also responsible for data privacy and protection.³⁰ Two particular mechanisms for engaging ethical issues encountered in the course of HBP work include the PORE registration site, to “Register and identify these issues and keep track of how they are dealt with.”³¹ PORE issues (listed on the website) have ranged from ethics approval of research with human data to dual-use and consent. Second is the “Ethics Rapporteur Programme” which involves, “an academic, a scientist, a technologist or an administrator engaged in the work of the HBP who is designated with the responsibility to communicate with the Ethics and Society programme about the ethics, science and technology work of the SubProject. Ethics Rapporteurs include senior and junior members, each possessing a unique set of

²⁴ King’s College London, HBP Foresight Lab: Events and Outreach, available at:

<https://www.kcl.ac.uk/sspp/departments/sshm/research/Research-Groups/BIOS/BIOS-Projects/HBP/HBP-events-and-outcomes.aspx>; HBP Foresight Lab: Publications & Working documents, available at:

<https://www.kcl.ac.uk/sspp/departments/sshm/research/Research-Groups/BIOS/BIOS-Projects/HBP/HBP-Publications-&-Working-documents.aspx>

²⁵ HBP, Neuroethics and Philosophy, Why neuroethics and philosophy in the HBP, available at:

<https://www.humanbrainproject.eu/en/social-ethical-reflective/neuroethics-and-philosophy/>

²⁶ Available at: <https://ethicsblog.crb.uu.se/tag/neuroethics/>

²⁷ Publications available at: http://www.crb.uu.se/digitalAssets/445/c_445284-l_1-k_neuroethics-philosophyofhtebrain2017.pdf

²⁸ HBP, Public Engagement and Dialogue, about us, available at: <https://www.humanbrainproject.eu/en/social-ethical-reflective/citizen-engagement/>

²⁹ Danish Board of Technology Foundation, Citizen Meetings in the Human Brain Project, available at:

<http://www.tekno.dk/article/citizen-meetings-in-the-human-brain-project/?lang=en>

³⁰ HBP, Ethics Support, available at: <https://www.humanbrainproject.eu/en/social-ethical-reflective/ethics-support/>

³¹ HBP; Social, Ethical, Reflective; Register an Ethical Concern, available at:

<https://www.humanbrainproject.eu/en/social-ethical-reflective/register-ethical-concern/>

competencies in science and ethics.”³² Issue arising from ethics rapporteur conversations have led to direct changes in HBP project structure and practice, for example establishment of the Data Protection Officer position and activities (*FET diagnosis interview sources*).

HBP publications and deliverables are, for the most part, shared openly (see for example pages on publication and deliverables). HBP has devoted initiatives for RRI keys on Gender and on Education:

- **Gender:** HBP has a devoted set of Gender Equality Activities, including development of a Gender Action Plan, career building opportunities for female PhDs and Postdocs, and sharing best practices and stories about career models and considerations.³³ The Executive Director of the HBP is an active participant of the Gender Advisory Committee.
- **Education:** HBP has dedicated efforts related to interdisciplinary brain science curriculum development, short-courses, an annual student conference, as well as other young researcher events.³⁴ Educational materials are made available after events on an e-library.³⁵

3.4.2 FET: Levitate Project Case

Levitate full project title, “Levitation with localised tactile and audio feedback for mid-air interactions,” is a FET OPEN Research and Innovation Action funded from 2017 through December 2020 for approximately EUR 3 million.^{36, 37} The topic announcement was *FETOPEN-01-2016-2017 - FET-Open research and innovation actions*, and explicitly called for public engagement, Open Science, and gender dimensions in the call text, “Impact is also sought in terms of the take up of new research and innovation practices for making leading-edge science and technology research more open, collaborative, creative and closer to society. [[See also the discussion on public engagement in the introduction to this FET work programme]].”³⁸

Levitate positions itself as a project that will be, “The first to create, prototype and evaluate a radically new human-computer interaction paradigm that empowers the unadorned user to reach into levitating matter, see it, feel it, manipulate it and hear it.”³⁹ The project website gives no indication of any RRI keys of ethical reflection, open access planning, science education initiatives, gender, or governance elements. Videos of participation at science festivals, publications, and a Twitter account constitute visible efforts at public dissemination.⁴⁰

3.4.3 MSCA: NextGenVis Project Case

Training the Next Generation of European Visual Neuroscientists for the benefit of innovation in health care and high-tech industry also known by its acronym **NextGenVis** (NextGenVis, 2018) is an

³² HBP; Social, Ethical, Reflective; Ethics Support; Ethics Rapporteur Programme, available at:

<https://www.humanbrainproject.eu/en/social-ethical-reflective/ethics-support/ethics-rapporteurs/>

³³ HBP, About, Gender Equality, available at: <https://www.humanbrainproject.eu/en/about/gender-equality/>

³⁴ HBP, Education, available at: <https://education.humanbrainproject.eu/>

³⁵ HBP, Education, E-Library, available at: <https://education.humanbrainproject.eu/web/hbp-education-portal/documents>

³⁶ Project entry in CORDIS available at: https://cordis.europa.eu/project/rcn/207474_en.html

³⁷ Funding information from Europa Webgate, accessed on 9 July 2018, searching for project acronym “levitate,” available at: <https://webgate.ec.europa.eu/dashboard/sense/app/93297a69-09fd-4ef5-889f-b83c4e21d33e/sheet/erUXRa/state/analysis>

³⁸ Topic text available at: https://cordis.europa.eu/programme/rcn/700831_en.html

³⁹ Project entry in CORDIS available at: https://cordis.europa.eu/project/rcn/207474_en.html

⁴⁰ Levitate project page; Videos, available at: <https://www.levitateproject.org/videos/>

ITN coordinated in the Netherlands and funded through the 2014 ETN call. The project provides 15 Fellows with a place to do their doctoral studies in a network of organisations located in Germany, the UK, Denmark, Italy, The Netherlands and Israel with organisations from both the public and the private sector. The total costs are approximately EUR 3.8 million and it runs from 2015 until February 2019.

The ITN uses university courses and workshops to enhance science literacy and science education. Analysis of the mid-term report shows that ESRs and PIs have contributed to various local and international outreach and dissemination activities such as presentations to patient groups (with vision loss and from vision support organisations) and participation in the Long Night of the Sciences in Germany (NextGenVis, 2017). Based on the available documentation it was deduced that most activities consist of one-way engagements only.

Even though the project appointed an external Equal Opportunities Coordinator, there are more males than females taking part in the network (which means that Gender equality is absent). Next to this, all publications are online (which means it should score on Open Access). Moreover, a quick search in the midterm report showed that Ethics are not only taken care of by the appointment of a special Ethics Adviser, but also in interesting novel ways. E.g., it is taking place at the Lundbeck in Denmark where, “general policy is to have high focus on the 3Rs – For example every year a price is awarded to the group that has implemented new routines that reduce the number of animals used and/or implemented better methods to reduce the number of animals. In general, all animals at Lundbeck are housed according to Danish law with ad libitum access to water and food. Animals are provided wooden blocks and nest material” (NextGenVis, 2017).

Responsible Research and Innovation as a concept was not addressed in the available report.

3.4.4 MSCA: CLoSER Project Case

The Italian project Cementing Links between Science and society toward Engagement and Responsibility also known by its acronym **CLoSER** (CLoSER, 2018a) involves Public Engagement, Gender Equality, Ethics, and Governance dimensions of its work. It was a NIGHT project funded by a CSA in 2016 and funded 5 Italian organisations working together to organise a Researchers’ NIGHT:

which aims at establishing an alliance between researchers and the various societal actors by bringing them closer to one another, using the RRI approach to encourage them to take responsibility and work together to design a sustainable, ethically acceptable and socially desirable future. For this purpose, specific actions will be devised to actively engage citizens, schools and young people, policy makers and industries, who won’t be just the audience but the protagonists of each of the proposed action. A special programme will particularly target young people to foster their interest in scientific careers. In addition, CLoSER aims at strengthening the European citizenship feeling of the public involved as well as increasing their awareness of the importance of the European dimension in research through specific activities such as the ‘European Stage for Research and Innovation’, ‘A talk with young research!’ and ‘The Human Face of Research’. To realise such an ambitious programme, the engagement of a large, trans-disciplinary, gender-balanced community of researchers committed to public engagement will be vital: CLoSER will provide them with innovative, creative formats of communication that will strengthen their capability of communicating their research. (CORDIS, 2018)

RRI-themed questions were asked in the project, including, “Who should communicate the research’s results, to empower citizens and all the societal actors and let them take part in the R&I process?” (CLOSER 2017). Many of activities conducted aligned with a one-way approach to public understanding of science (CLOSER 2017).

3.4.5 INFRA: OpenAIRE 2020 Project Case

OpenAIRE 2020 started at the beginning of 2015 and finishes at the end of June 2016. In this period, a large scale initiative has been set up to promote open scholarship and substantially improve the discoverability and reusability of research publications and data. It offers much support and information and services and is thus a key infrastructure itself. The amount is for more than EUR 13 million supporting also a pilot on gold-level open access.

Open Access is the main key word throughout all descriptions and project activities. In its objectives it clearly states its main goal to “support the H2020 Vision of open access” (OpenAIRE website). Accordingly, the project provides a support kit for open research, legal frameworks and services on the portal. Apart from this *RRI* dimension only ethical issues are mentioned, concerning data protection and privacy law. No reference (process; mention; method) to downstream societal engagement could be identified.

In terms of better embedding the research process into society, one of the project objectives is described as to support evidence-based decision-making. Furthermore, the project takes the view of *Open Access* as a public good, to open up for society: “The rationale for open access relies in part on the characterization of scientific knowledge as a global public good, which should be disseminated freely for the wider benefit of society” (OpenAIRE D 5.3., p44).

3.4.6 INFRA: vre4eic Project Case

The vre4eic project (vre4eic 2018) is a “Europe-wide interoperable Virtual Research Environment to Empower multidisciplinary research communities and accelerate Innovation and Collaboration,”⁴¹ and should thus offer a solution for easier collaboration within research communities. Project related material lacks explicit references to any of the *RRI* keys or the concept of *RRI* at a more general level.

In terms of down-streaming societal engagement, societal involvement is not foreseen. However, for piloting and beta-testing the use of ambassadors and beta users has been set up. This should ensure a ‘pyramid’ approach, inviting project teams and collecting feedback from them by the means of setting up specific user groups. These user groups (end-users) are integrated in impact assessment and usability checking activities. References or methods to better embed the research process into society could not have been identified in the projects’ deliverables and other materials.

With regard to further *RRI* issues, *Open Access* was mentioned in terms of interoperability and open source. Open science for example is explicitly mentioned in the evaluation plan, stating that a “number of countries where the VRE4EIC building blocks are available to users and developers” and also a “number of languages that the e-VRE is available “ (D 2.2., p. 19). In terms of *Ethics*, the project is also “Trust, Security and Privacy aware.”

⁴¹ Information available at: <https://www.vre4eic.eu/>

4. Conclusions

4.1 Bright Spots

Excellent Science programming adopts RRI and Open Agenda approaches to varying degrees of success. Most comprehensive institutionalisation can be found for particular, individual RRI and Open Agenda *elements*. By contrast, there is far less evidence of institutionalization on a *conceptual* level (i.e., with reference to overarching concepts of RRI and the Open Agenda in an way that reflects systemic, strategic intent). This disparity illustrates the distance still to travel on the way to building an ‘epistemic community’ in European R&I capable of fulfilling the EC and Union vision of “a Research and Innovation policy driven by the needs of society and engaging all societal actors via inclusive participatory approaches” (EC 2014, p. 3).

Regarding successfully institutionalized RRI and Open Agenda *elements*, four in particular can be found across ERC, FET, MSCA, and INFRA. Most notably, (micro) **ethics** considerations (e.g., related to researcher integrity and data management), **open access and Open Science**, and **gender balance** concerns are integrated in work programme documents and traceable all the way to proposal template and evaluation materials (excepting ERC). **Open Innovation** efforts also often find emphasis in such programme documents, particularly in FET, MSCA, and INFRA.

In addition to programming documents, Excellent Science programmes have taken various approaches to practicing R&I management in line with RRI and Open Agenda approaches at the policy level. The ERC stands-up Thematic Working Groups for Gender Balance and Open Access; these work groups have developed specific plans to improve programme performance in these areas. Furthermore, ERC offers applicants guidelines for science literacy and science education; assessment tools and governance mechanisms for ethics topics; and has begun to engage more seriously on advancing of public engagement. In similar fashion, MSCA has an active Working Group on Policy and Gender that reflects and seeks to respond to implicit biases in evaluation; and the programme separately offers trainings on science literacy and science education as well as public engagement.

For its part, FET has made efforts to practice **Open Innovation** in agenda setting practice. The FET Advisory Group (FETAG) works to integrate diverse expertise and disciplines into FET agenda setting. While not diverse from the perspective of including humanities and multiple social science perspectives, the FETAG traditionally has included one social scientist (c.f., FET Advisory Group 2016), as well as a range of life and physical scientists and engineers. In a similar sprit, the third FET WP built off of several inputs, including a public consultation process for the Proactive call, and a horizon scanning CSA that engaged various stakeholder groups. Further, industry groups are invited as primary external experts in shaping FET Flagship initiatives. In INFRA, similar programme-level policy can be seen related to open access and the concept of *FAIR* (Findable, Accessible, Interoperable and Re-Usable) protocols.

4.2 Challenges

Despite the above successes at institutionalizing RRI and Open Agenda activities, high variability of adoption points to several areas where Excellent Science programming might improve. Consideration of **macro-ethical**, **gender dimension**, and **governance** issues were not well institutionalized across Excellent Science, rarely included in work programme text, and more rarely

still considered in evaluation criteria. Regarding **public engagement** and **science literacy and science education**, efforts at one-way communication and dissemination seem far more entrenched in Excellent Science programming (as opposed to more rare, two-way, dialogue-based and reflective engagements). Although institutionalization of unidirectional public engagement is a fair start to bridging divides among R&I and society, it comes with potentially undesirable consequences of fostering alienation, lack of accountability, and lack of critical reflection on the scientific process.

In the case of ERC programming, RRI and Open Agenda aspirations associated with gender, public engagement, ethics, and even open innovation are at times interpreted as conflicting with programme objectives to pursue a self-defined course of excellence. As the former president of the programme stated: “The ERC has been a unique and bold experiment to put the scientific community in charge. It must safeguard this position” (Nowotny 2017, p. 997). RRI and Open Agenda elements seem to be viewed, in this light, as a burden on researchers and perceived as a threat to ERC’s core identity.

For FET, adoption of RRI and Open Agenda activities is contingent on activity line. Most research and innovation actions of the programme (e.g., in FET Open, most Proactive and HPC topics) devote less attention to cross-cutting priorities (the exception being Flagship RIAs). Opportunities for programme-level reflection in the spirit of RRI seem lacking, too: there are few chances to reflect on how and why programme elements (like Open) are fenced-off as investigator-driven projects but the programme also pushes, overall, to advance commercialization.

In MSCA programming, analysis has revealed that Impact and Excellence criteria, as currently conceived, may hinder a fuller realization of RRI. Inclusion of RRI and Open Agenda considerations into MSCA evaluation criteria is among the most advanced across Excellent Science. Nevertheless, analysis seems to hint that by privileging narrow conceptions of public engagement and ethical reflection, broader conversations related to RRI and Open Agenda activities are being prematurely closed-down, or pre-empted entirely.

Related, observations across Excellent Science points to inconsistencies in the way the Excellence criterion gets defined from programme to programme. In ERC Frontier awards, gender considerations are excluded from evaluation based on an objection to interference with the “excellence only” approach of the programme. By contrast, MSCA often considers gender in Excellence; FET has begun noting the importance of Open Innovation in its Excellence criterion. More confoundingly still, key criteria for Excellence from the perspective of the H2020 regulation and Interim Evaluation of H2020 relate to number of patents and publication in peer-reviewed journals per millions of euro invested (EC 2013a; EC 2017a).

4.3 Recommendations

The above successes and challenges point to several concrete, evidence-based actions with the potential to help Excellent Science programming better realize European Union aspirations for open, inclusive, and responsible research and innovation.

4.3.1 Institutionalize with greater strategy, commitment, and clarity

Part of the challenge facing Excellent Science vis-a-vis RRI may relate to a lack of clear, legitimate strategy.⁴² Different Excellent Science programmes adopt different approaches to RRI and Open Agenda institutionalization without evidence of clear, strategic-level coordination or learning from experiences. Cultures of RRI take resources to foster: they require time, consistent interaction, clear incentives, capacity development, and monitoring. Excellent Science could consider a “portfolio approach” to RRI, where all programmes may still have to consider certain RRI and Open Agenda dimensions more fully, but the resource intensity of other RRI activities might be distributed (e.g., single CSAs tackling science literacy and science education or governance efforts). Excellent Science could consider investing in collaborative workshops across ERC, FET, MSCA, and INFRA to strategize such a portfolio approach in conversation with immediate and broader stakeholders.

Related, and as the above analyses illustrate, the most effective way for Excellent Science to advance RRI and Open Agenda aspirations is through consistent inclusion in Work Programme documents down to evaluation criterion. Any meaningful strategy would have to help shape WP and evaluation criterion to promote full-meanings of RRI and Open Agenda activities which, as the above analyses reveals, is a non-trivial act. Currently, micro-ethical concerns are more strongly emphasized than macro-ethical concerns; one-way public engagements more strongly emphasized than two-way engagements; gender balance issues more strongly emphasized than gender dimensions of R&I. Such variable and selective reinforcement diminishes the capability of Excellent Science programming to fully realize RRI and Open Agenda elements, and creates confusion. For example, A study by ERC CSA, GendERC (2016), noted that vague and non-standardized definitions of excellence leave space for individual, subjective, and de-contextualized interpretations of excellence to bias selection processes.

Finally, and not unique to Excellent Science, EC guidance on RRI are incomplete and difficult to access. To investigate RRI elements, one must search for keywords associated with gender, ethics, and dissemination—there as of yet being no central portal for guidance on RRI or Open Agenda elements from the EC. As discussed in the next section, this lack of clear guidance presents a missed, but relatively easy-to-remedy opportunity for the EC to leverage major and robust investments in research on RRI and the Open Agenda from the Science with and for Society programme (SwafS) of H2020.

4.3.2 Invest in capacity building of the R&I community on RRI

Excellent Science programmes are already investing in capacity-building of the research community on select aspects of RRI. As noted, ERC and MSCA independently offer guidelines for science literacy and science education; and assessment tools and governance mechanisms for ethics topics. Much more could be done across the program to raise awareness of and experiences with all RRI and Open Agenda elements. Now that the SwafS programme of H2020 has invested in an RRI Toolkit,⁴³ Responsibility Navigator,⁴⁴ and RRI Indicator System,^{45, 46} Excellent Science—as part of a strategy on

⁴² Legitimate in terms of representing the interest of parties with immediate and broad stakes in the R&I, as a publicly funded entity.

⁴³ RRI Tools project, available at: <https://www.rri-tools.eu/>

⁴⁴ Res-AGorA project, Responsibility Navigator, available at: <http://responsibility-navigator.eu/>

institutionalization of RRI—could prioritize funds to sustain and augment capacity by leveraging existing tools, and fund studies of such training implementation efforts. Incentives could be designed to encourage participation across Excellent Science programming, and even the other two priorities of H2020 (e.g., contingent appropriations; supplemental awards; modified evaluation or proposal review mechanisms, etc.).

Indeed, advancing this recommendation beyond Excellent Science could connect the programme to larger networks and deeper resources from across H2020 and other EC activities. Existing EC R&I management infrastructures such as European Innovation Partnerships, National Contact Point Networks, Coordination and Support Actions, individual tenders, and ERA-Net Co-funds provide robust examples to learn from, partner with, and / or tailor to the purpose of tackling systemic issues related to RRI. Such initiatives could be vital to promoting networking, across the scientific community and beyond, and help to collect and share best practice sources and resources. Advancing cross-H2020 coordination in this fashion would align with a long-term action item for H2020 effectiveness highlighted by the Interim evaluation: “Focus investments in areas of strategic interest for the EU which are relevant to society, and where multiple impacts are expected, for example through focus areas” (EC 2017a, p. 236). Such a recommendation transcends H2020 and would relate to future Horizon Europe activities, as well.

4.3.3 Involve more diverse perspectives and expertise

In the process of developing more advance strategy to continue transforming European R&I systems, Excellent Science programming could take steps to ensure that more diverse perspectives, values, and areas of expertise are included. As R&I promise more, more will be expected and more steps will be taken to demand that promises are delivered upon. If and as expectations of impact from Excellent Science programming increase, engaging more stakeholders from a range of societal sectors (beyond industry, to include NGOs, CSOs, labour and consumer groups, as well as public regulatory bodies) can help to increase the relevance, legitimacy, and quality of R&I (c.f., Cash et al., 2003). Creating spaces for broader constituencies to have a meaningful voice in shaping agendas, work programmes, projects, evaluations, and assessments could help build genuine appreciation of and support for EC investments in R&I—and do so in a fashion that present-day one-way approaches will likely never realize.

We noted in our first NewHoRRizon policy brief: “As Member States, Associated Countries and the European Commission continue to aspire to smart, sustainable and inclusive growth, remaining H2020 work programme efforts and future initiatives such as Framework Programme 9 (FP9) could benefit from strengthening incentives to implement RRI at programme and project levels.”⁴⁷ Opening up Science and Innovation processes in the ways listed above can avoid ‘closed-loop’ feedback of scientists, engineers, and ethicists rating their work as societally relevant without

⁴⁵ Indicators for promoting and monitoring Responsible Research and Innovation; Report from the Expert Group on Policy Indicators for Responsible Research and Innovation, 2015, available at: https://ec.europa.eu/research/swafs/pdf/pub_rri/rri_indicators_final_version.pdf

⁴⁶ MoRRI—Monitoring the Evolution and Benefits of Responsible Research and Innovation, available at: <http://www.technopolis-group.com/morri/>

⁴⁷ NewHoRRizon, Policy Brief #1, Responsible Research and Innovation in H2020: Current Status and Steps Forward. Posted 1 June 2018. Accessed 27 July 2018. Available at: <https://newhorizon.eu/policy-brief-1/>

external validation from a more diverse and representative range of societal actors. Pursuit of such openness aligns with several Interim Evaluation action items for better ensuring the relevance and effectiveness of European R&I framework programming in the long-term. Most notably, the Interim Evaluation stated need to: “Involve end-users and citizens in co-designing the R&I agenda and co-create solutions, which should also stimulate user-driven innovation” (EC 2017a, p. 235).

Science, research, and innovation are central to the European strategy for smart, sustainable, and inclusive growth. European Commission vision and Horizon 2020 investments in RRI and Open Agenda elements have helped point the way toward smart, sustainable, and inclusive R&I. If strategic, clear guidance; broad-based capacity building; and genuine resourcing and commitment of RRI and Open Agenda activities are sustained, Excellent Science programming (legacy institutional forms) will be well positioned to champion the co-design of R&I with and for European society and beyond.

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5. Literature, links, resources to Deliverable 2.1

The following references and literature supplements are referenced in the main body of this deliverable, in addition to the footnotes placed throughout the document.

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6. Annex: NewHoRRizon Diagnosis Report, Social Lab 1, European Research Council (ERC)

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6.1 Executive Summary

This Diagnosis for Social Lab # 1 “ERC and Basic Research” addresses several questions: (1) what is the self-definition of European Research Council (ERC)? (2) How does the ERC perform in terms of its self-definition? (3) What is the status and practice of RRI at the ERC?

In order to address these questions, the research team did desk research, studied relevant research literature, analysed websites, policy papers and working documents as well as evaluation studies. In addition, we did interviews with relevant stakeholders from research funding organisations (RFO) and research performing organisations (RPO) as well as civil society organisations (CSO).

Unfortunately, the main actor, the ERC did not agree to interview. The ERC’s perspective therefore had to be concluded solely from documents.

The ERC is a research funding organisation committed to several key principles: open for all researchers and all disciplines; strictly bottom up, curiosity driven research without thematic priorities; providing long-term, individual grants for ground breaking, high risk research. In its definition funding decisions are based on peer review evaluation and scientific excellence as sole criterion. The ERC stresses its autonomy from the EC.

In the literature and reports the ERC is in many ways considered a successful institutional innovation. This includes its attractiveness for research applicants, its recognition and prestige within the scientific community, its ability to identify cutting edge research and its scientific impact. However, the ERC is not unchallenged because of potential conservatism and gender biases in peer review, skewness of grantees towards prestigious institutions and a few countries, problems to address interdisciplinary research and little societal impact.

Although the ERC in its documents never uses the term RRI, it deals with all RRI keys to different degrees and uses lesser or stronger means of governance to address them. The comparison of ERC documents and interviews shows similarities and differences how various keys of RRI are addressed:

- Both, ERC documents and interviews show a high awareness for **Open access**. ERC documents and interviewees also show some awareness for **Science Education and Science Literacy** and no awareness of **Open Innovation**.
- There is higher awareness in interviews than in ERC documents for the topics of **Ethics, Gender Equality, Public Engagement** and **reflexivity/anticipation**
- There is higher awareness in ERC documents than in the interviews for **Governance**.

The central question, whether, how and to what extent the ERC is ready to take up RRI issues is a highly political one. There is a serious friction between, on the one hand, the ERC’s self-image and its tasks, its understanding of how to do proper science, of what constitutes a right relationship between science and wider society, about the autonomy from the European Commission it strives

for, and, on the other hand, its understanding of RRI and its perceived implications for science and the ERC.

A strong call for “excellence only” is frequently used in basic research funding – and this is not limited to the ERC - to reject the call for RRI; this is in particularly the case deeper forms of Public Engagement (PE), Gender Equality (GE) that is not limited to counting numbers of staff and ethics assessment that is not only understood as research ethics and research integrity but looks at the societal and environmental impact of research and its applications. Elements of RRI such as GE, PE, and Ethics (ET) are at times interpreted as in conflict with the concepts of “excellence only” and “autonomy of science”. Other elements of RRI such as Science Literacy and Science Education (SLSE), ET, Governance (GOV) are considered at times as burden for researcher.

The analysis showed numerous openings for RRI:

RRI can contribute to scientific excellence. As case study research showed, introducing RRI into research can have a positive impact on science, e.g., PE and asking gender sensitive research questions can lead to new research questions and insights, PE can provide access to previously unavailable data, diversity in research groups might increase performance (Wuketich et al. 2017). Also, a survey amongst European researchers showed a high share of researchers who either observed or expected scientific benefits of applying RRI keys in their work (Bührer et al. 2018).

The evaluation suggests that interdisciplinary research can be a way to increase societal impact. Interdisciplinary research can also be a means to assess societal impact of research. However, challenges to evaluate interdisciplinary research mentioned in interviews and the literature should be addressed.

At the ERC, several initiatives exist that address keys of RRI. There are Thematic Working Groups for Gender Balance and Open Access (including respective plans). Furthermore, there are guidelines for SLSE and, in addition, assessment tools and governance mechanisms for ET.

There already exist a number of projects which deal with the question of Public Engagement (citizen science, stakeholder engagement). There are signs for certain awareness for citizen science within the ERC on institutional level.

Already today, applicants and grantees are active in PE activities such as lectures, interviews, and popular articles. These are already supported by the ERC. These efforts could be strengthened, receive support by research institutions and recognition in evaluation. RRI should not create additional pressure and burden for researchers (who are already heavily burdened by administration and teaching) and funders.

6.2 Scope of this document

In this report we address several questions: (1) what is the European Research Council (ERC) in terms of its self-definition? (2) How does the ERC perform in terms of its self-definition? (3) What is the status and practice of RRI at the ERC?

The report is structured in the following way. The first section explains the methods used and material collected as well as the selection of interview partners. The next chapter explains the general objectives and performance of the ERC and reports from the literature about its

accomplishment and critical points. This is followed by a chapter elaborating the status of RRI as it can be concluded from documents. We start with the six key of RRI (Public Engagement, Gender Equality, Science Literacy and Science Education, Open Access, Ethics, Governance) and are looking then for notions of responsibility in research and innovation beyond the six keys. The chapter concludes with a description of challenging issues within the ERC as well as an overall assessment of RRI in the ERC. The next chapter is dealing with the understanding of RRI as it emerged in the interviews.

The chapter starts with the interviews perspective on how they think RRI is taken up in the ERC and continues with challenging issues of the ERC from their perspective. Again, we are looking of the perception of the six key by the interviewees. This is followed by issues of responsibilities raised by the interviewees that are not connected to the six keys. The chapter is concluded by a short assessment of RRI within the ERC based on the interview findings. The last chapter presents conclusions from document analysis and interviews.

6.3 Methods

We started our inquiry into the ERC with doing desktop research. We explored literature on the ERC and searched the Internet for policy papers and working documents as well as studies and evaluation reports in order to generate a basic understanding about the ERC, its mission, structure, processes, actors and their functions, its performance as well as the role RRI does and could play within the ERC.

At the same time, we did exploratory expert interviews in order to supplement our desktop research. Criteria for being considered an expert within this context was intimate knowledge about the formal and informal structures and processes of the ERC, its performance and/or societal impact. At the beginning of our research we defined the following list of expert as relevant:

- applicants and grantees of the ERC,
- representatives of the ERC and the ERC Executive Agency (ERCEA),
- researchers studying the ERC,
- representatives of organisations acting as National Contact Points (NCP).

In the beginning we identified and recruited interviewees via snow-ball system. Later in our research, Centre for Science and Technology Studies (CWTS) from Leyden University identified potential interview partners via keyword - search an analysis of the CORDIS data base.

In the first interview we tried to learn how ERC panels work, we tried to understand the meaning of excellence within the ERC and the role RRI currently plays. In the second conversation we interviewed a NCP to gather knowledge about the requirements applicants have to fulfil in order to receive an ERC grant and how the ERC addresses RRI issues. Finally, we interviewed a researcher who did an ERC commissioned study.

After gathering first knowledge we wanted to start interviewing ERC representatives. We contacted the President, the Vice President, the members of the Scientific Council, the Heads of relevant Thematic Working Groups and the Head of the ERCEA asking for interviews by separate letters. After a few days we sent a reminder, this time carbon copying all addressees. Thereupon the press office declined our request arguing that there were too many interview requests and that we therefore

should refer to the website for further information instead. Also, the former President refused our interview request. Therefore, it was not possible to learn about the perception and situation of RRI from interviews with ERC and ERCEA staff.

This situation forced us to rethink our approach towards setting up and populating the Social Lab and gathering insights about the ERC.

Facing the fact that it would be impossible for us to involve the ERC at this moment we decided to broaden the scope of the Social Lab from “RRI in ERC” to “RRI in the ERC and basic research”. This meant that we not only invited to our Social Lab actors with direct connection to the ERC and the ERCEA but, more broadly, actors who are concerned with funding of basic research.

In a next step, we selected interviewees for the diagnosis, which later on could become members of the Social Lab by using different strategies.

First, we asked a NCP we already interviewed to recommend colleagues from other countries. These NCPs should provide hands-on experience with the funding of the ERC; on the one hand because they are involved in negotiations with the ERC on a political level, on the other hand because they support researchers when applying for grants.

Second, we interviewed two representatives of an Academy of Science which addresses the issue of societal relevance of basic research in two funding schemes. Since the direct avenue to the ERC was blocked, we wanted to better understand how a research organization that is dedicated to funding and performing excellent basic research, perceives and addresses societal relevance of its research, RRI and the ERC.

Third, we asked a basic research funding organisation in Austria for participation, an organization whose mission, like the ERC, is to fund excellent basic research. This contact led to an interview with a representative from Science Europe, an association of European Research Funding Organisations (RFO) and Research Performing Organisations (RPO), based in Brussels. Again, this should remedy the lack of access to the ERC.

Fourth, with the help of a consortium partner we have identified several Civil Society Organisations (CSO) which are dealing with issues of research and innovation (R&I). Interviewing them should provide us information how they perceive R&I and RRI. The recruitment of CSOs was difficult because of their limited resources. Even when we explained that we would cover their travel costs for workshops, two CSO were unable to participate because they lacked staff and time.

In contrast, contacting applicants and grantees of the ERC turned out to be relatively easy, though work intensive. We started with interviewing several applicants and grantees we already knew in person from previous projects. An important source of information for identifying additional interviewees and Social Lab participants was the keyword research on CORDIS of ERC-projects our colleagues from CWTS did. A first search covered key words related to the six keys of RRI and resulted in eight top projects with regards to the key. We contacted all of them and interviewed many of their principal investigators.

We also asked our colleagues at the CWTS to identify ERC-projects which an emphasis on inter- and transdisciplinary. We asked the ERC press office for data about such projects. Our request was

declined, this time because of issues of data protection. The CWTS key word search on inter- and transdisciplinary projects resulted in a list 195 projects. We hand selected the abstracts and identified 39 projects which might be particularly RRI relevant. We contacted all project leaders or project members and received two replies.

Both of them joined our Social Lab and participated in the workshop. We speculate that the low turnout of our request was related to the fact that we sent out the mail in late April, only three weeks before the workshop

By the end of April, we had interviewed 15 people who either had direct experiences with the ERC (as grantee, applicant, evaluators, NCP, researcher studying the ERC) and/or with basic research in general (RFO). Grantees came from the natural and social sciences as well as humanities; they either hold a Starting, Consolidator or Proof of Concept Grant. We interviewed applicants who so far were not successful in getting a grant, NCP's, representatives from funding agencies, representatives from EuroScience, CSO and one ERC panellist.

6.4 General scope of the program

The ERC was established in 2007 in the 7th Framework Programme and was part of the "Ideas Programme" (Ferarri 2014). In subsequent Horizon 2020, the ERC became part of the first pillar "Excellent science".⁴⁸

6.4.1 What is your program about?

The ERC's objective is to "fund excellent scientists and their most creative ideas" (ERC 2018a). The ERC strongly emphasizes a funding philosophy that differs in vital aspects from other Horizon 2020 program lines. This philosophy can be summarized as:

- The ERC is "open to top researchers of any nationality, age and gender, from anywhere in the world to perform research in Europe" (ERC 2018a);
- it funds "bottom up, curiosity driven research";
- It has "no thematic priorities; any field of research (life science (LS), physical sciences & engineering (PE), social science and humanities (SH))" is eligible.
- it provides long-term, individual grants for ground breaking, high-risk (high gain research) research;

The ERC stresses several principles of its governance⁴⁹ (ibid.)

- sole selection criterion for funding is so called "scientific excellence";
- selection of proposal is based on international high-quality peer review;
- the ERC is a funding scheme "for scientists, by scientists"; its representatives are researcher, this includes the President, Vice Presidents and its Scientific Council;
- the ERCEA is responsible for the management applications and grants.

The ERC philosophy and governance structures emphasize "independence of the scientific community in the governance" (Luukkonen 2014: 35). The ERC considers this as one of "the secrets

⁴⁸ For the history of the ERC see later parts of this report.

⁴⁹ For a concise overview of the governance of the ERC see König 21016: 152 or its website <https://erc.europa.eu/>.

of the success” (ERC 2018: 2) or, to put it differently, vital “for the achievement of its fundamental objectives” (Luukkonen 2014: 35).

The ERC provides five different forms of Grants

- Starting Grant (up to € 1.5 million) “support researchers at the early stage of their careers, with the aim of providing working conditions enabling them to become independent leading researchers” (ERC 2018h).
- Consolidator Grant (up to € 2 million) for researchers “who are at the early stage of their careers but often already working with their own group” (ibid.)
- Advanced Grant (up to € 2.5 million) “support outstanding and established research leaders by providing them with the resources necessary to continue the work of their teams in expanding frontiers of scientific knowledge” (ibid.)
- Proof of Concept Grant for establishing “the innovating potential of ideas stemming from (...) existing ERC grants, helping (ERC grantees) bridge the gap between research and social or commercial innovation” (ibid.).
- Synergy Grant (up to 10 million) to support „small teams of scientists who wish to jointly address ambitious research problems at the frontiers of knowledge, bringing together complementary skills, disciplines and resources“ (ERC n.d.)

The ERC is entirely funded by Horizon 2020 of which it is a key component (ERC 2018a). It represents 17% of the overall budget of Horizon 2020 (ERC 2018b), i.e. € 13 billion (2014-2020). In 2018 has an annual budget of around € 1.9 billion.

6.4.2 Distribution by Funding Schemes

The main shares in term of numbers of grants are Starting Grants and Advanced Grants, followed by Consolidator grants. In ten years of its existence the ERC funded

- 3,853 Starting Grants,
- 2,678 Advanced Grants (2008-2017),
- 1,629 Consolidator Grants (2013-2017).

There are significantly less Proof of Concept Grants as well as Synergy grants in comparison. The ERC funded

- 778 Proof of Concept Grants (2011 to 2017),
- 24 Synergy Grants (2012 to 2013) (ERC 2018a: 14).

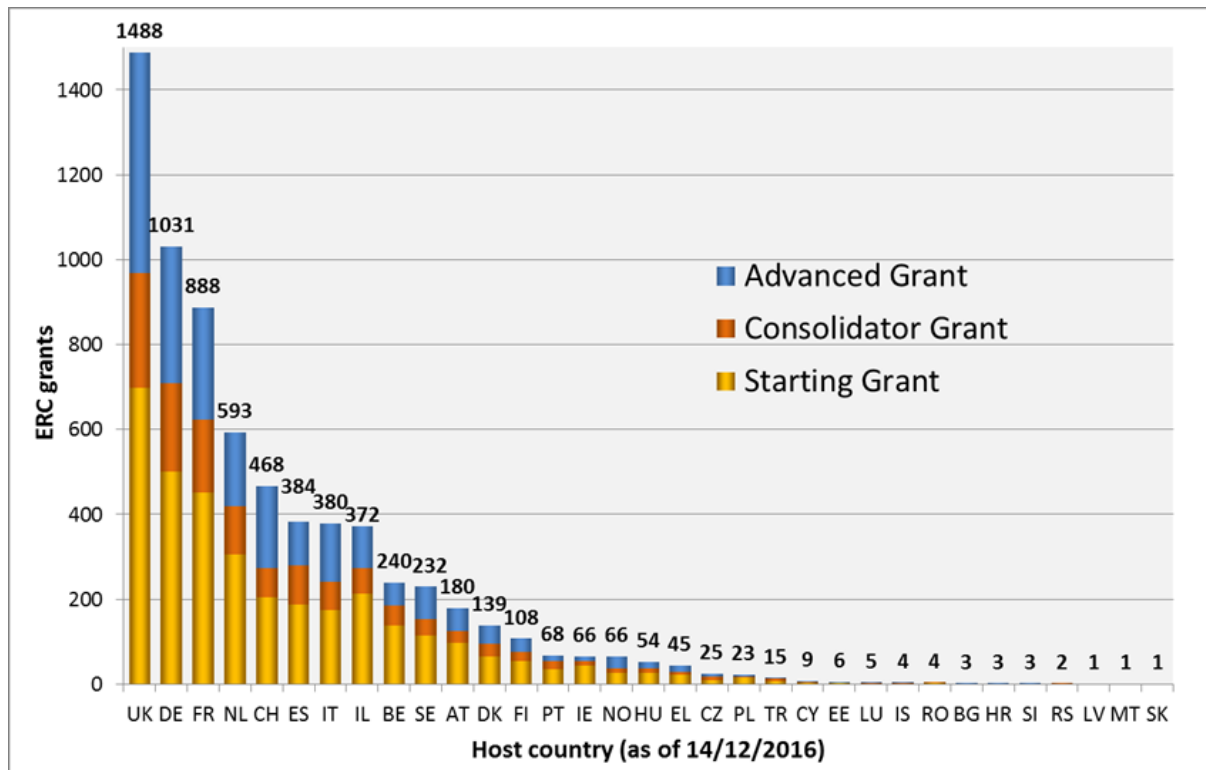
6.4.3 Distribution by Scientific Domains

The main share of 8,160 Starting, Consolidator and Advanced Grants went to the Physical Science and Engineering domain (3,687 grants); followed by the life sciences (2,825 grants) and the Social Sciences and Humanities (1,648 grants).

6.4.4 Distribution by Host Countries

In the allocation of grants to host countries there is an imbalance in favour of a small number of Member and Non-Member States.

Figure 2: Number of grants per host country, ERC. Total 8,160



(Source: ERC 2018a)

This imbalance is criticized frequently, but regularly defended by advocates of the ERC with the argument of “excellence only”. Helga Nowotny, e.g., states “excellent science is not about equal distribution, but despite the politically sensitive skewness, excellence must prevail” (2017: 997). Nowotny does not address the questions why such a bias exists and whether conscious or unconscious systematic mechanisms exist that disadvantage researchers from Central and Eastern European countries.⁵⁰ We will return to this issue later in this text.

6.4.5 A “success story”

The ERC considers itself and is considered by many of its observers as success story. Already as early as 2009 a review of “six experts in research policy and management” highlighted “the great successes of the ERC in attracting both large numbers of grant applications and outstanding scientists from around the world to review them” (European Commission 2009).

Luukkonen (2014: 36) reports based on qualitative interviews carried out in 2010 with European stakeholder groups⁵¹ that the ERC “enjoys wide appreciation and has achieved excellence in its operations and panels within a short time” (...) She continues: “ERC grants carry high prestige and are regarded as symbols of excellence and as a benchmark for quality among individuals, organisations and sub-organisational units”.

⁵⁰ We will return to this question later in this paper.

⁵¹ She interviewed 25 representatives of the ERC Scientific Council members and officials, ERCEA, other European funding organisation as well as interest organisations.

However, she also mentions that the ERC was little known outside Europe. Luukkonen also did a quantitative survey among ERC Starting Grant recipients and a control group. She found that the ERC in this group “is regarded as the most prestigious funding organisation with high-quality peer review and appropriate grant sizes to enable innovative research and the achievement of significant research findings” (2014: 36).⁵²

Similarly, to give another example for the high appreciation of the ERC among researchers, the Comité d’éthique du CNRS (COMETS) stated in its report about excellence that the ERC’ goal of “identifying supposedly ‘excellent’ researchers has largely been reached” (COMETS 2014).⁵³

The support action “Emerging research areas and their coverage by ERC-supported projects” (ERACEP) aimed at identifying “topical emerging research areas and (analysing) to what extent the activities, supported by the ERC cover and contribute to these research areas” (ERACEP 2013). In other words, ERACEP tried to verify whether ERC grants really do research in cutting edge areas. The project showed that the ERC indeed “is able to address emerging topics” (ibid.). However, the study also uncovered substantial differences across thematic fields in terms of the actual coverage of emerging research areas identified by ERACEP by ERC grants and success rates of proposals. In order to better understand these differences ERACEP suggested exploring ERC procedures in subsequent research using qualitative expert-based approaches.

An assessment of ERC grantees’ performance in social media carried commissioned by the European Commission (EC) addressed two questions: (1) does the funding provided by ERC help grantees to improve their altimetric⁵⁴ visibility? (2) Do ERC grantees perform better than researchers sponsored by other European and American funding agencies?” (EC 2015: 17). The study showed that “ERC-funded applicants, both junior and senior, systematically obtained higher altimetric scores than unsuccessful ones, and that these results are observed in each of the panels, application years and ESI discipline”. However, one might add, it is not clear from these results whether their higher scores were caused by their excellence as researchers or by the fact that they received an ERC grant that is considered highly prestigious.

Results were more mixed regarding the second question: “In all three domains, ERC-funded researchers obtained higher Mendeley scores than their international comparison groups—except for the group of junior researchers in the Social Sciences and Humanities, who scored below their NSF peers. For other indicators—and especially Twitter— NSF and NIH groups typically score higher than ERC researchers, which might be a consequence of US researchers’ favourable attitude towards social media and the fact that they are likely to use it to publicise their work (...). Another factor which might play a role is the fact that the NSF decided to recognise all scholars’ research products, rather than just publications, as indicators of research activity (...)” (EC 2015: 17).

Since 2015 the ERC carries out annual ex-post “qualitative assessments of the research outputs from completed ERC projects” (ERC 2016, 2017, 2018).

⁵² Since the surveyed group applied for ERC grants they were obviously aware of the ERC and therefore were not representative of European junior researchers.

⁵³ We will return to critical comments from COMETS later in this paper.

⁵⁴ Altimetric “can be considered indicators of the online visibility of scientific documents” (EC 2015: 1).

In 2017 expert evaluators nominated by the Scientific Council⁵⁵ assessed 223 completed and randomly selected projects. Evaluators were asked to rank the projects as

- (A) Scientific Breakthrough;
- (B) Major scientific advance;
- (C) Incremental scientific contribution;
- (D) No appreciable scientific Contribution (ibid: 4).

In addition, evaluators were asked nine questions concerning the various aspects of the projects' scientific and societal impact (ERC 2018: 6).

The evaluators assessed 19% of the projects as scientific breakthroughs. A share of 60% was considered as major scientific advances; 20% as incremental scientific contribution and only 1% achieved no appreciable scientific contribution. These results were consistent with previous years' findings. The evaluation report therefore summarizes: "taken together, 79% of projects were assessed as having produced a major scientific advance or a scientific breakthrough".

Evaluators also were asked: "To what extent has the project resulted in new important scientific advances of knowledge?" This question is paramount to determine excellence. According to the ERC report "80% of projects resulted in new important scientific advances of knowledge to an exceptional or significant extent" (ERC 2018: 6).

With regard to the question "Have the project findings opened a promising new research agenda for a particular field (i.e. a set of new research questions, new hypotheses to be tested) or a possible paradigm shift?" the report states that "around 65% of projects opened a promising new research agenda for a particular field or a possible paradigm shift".

Regarding the development of new research methods⁵⁶, the report states that "over 80% of the evaluated projects have developed at least "moderately" new research methods or instruments, while over 50% of the projects have achieved this objective to an exceptional or significant extent" (ibid. 7).

In summary, the ERC is considered by many observers and itself a successful institutional innovation in terms of attractiveness for research applicants, esteem and recognition within the scientific community, its ability to identify cutting edge research and its impact. However, there are also issues to ponder with regards to different biases to which we will return later chapters of this paper.

6.5 Current situation of RRI in the program

6.5.1 RRI in brief

The ERC is a basic research funding organization that attempts to fund frontline basic research. The paramount question in the context of RRI is whether, to what extent and under what circumstances a RFO that is committed to this goal is able to implement RRI.

⁵⁵ Evaluation involved 76 panel members and 65 remote evaluators.

⁵⁶ Has the project developed new research methods or instruments?

Is it possible to implement GE, not only in terms of securing equal numbers of male and female researchers/evaluators/administrators, but also in terms of funding projects that pose gender sensitive research questions? Is it possible to promote PE in basic research, and if yes, how can this be done? What are its potentials and limits? How ET is practiced in basic research and is it possible to leave the narrow limits of research ethics and research integrity and also to anticipate and reflect on potential societal and environmental impact of basic research? What is the notion of SLSE in a program funding basic research? What are the potentials, challenges and limits of OA and what are governance mechanisms for in a RFO that is dedicated to ground breaking research and scientific excellence?

6.5.2 Desktop findings

6.5.2.1 General use of RRI

Looking at documents and reports, RRI at first glance does not seem to play a role at all at the ERC: The ERC does not use the term RRI in documents. EC project officers and from executive agencies who manage different parts of H2020 have flagged those project, they consider RRI-relevant in the Common Research Data warehouse (CORDA) (European Commission 2017). Within the ERC almost no project (99, 9%) was flagged as RRI relevant (ibid: 248).

On second look, however, the ERC addresses some RRI keys with different intensity:

- The Thematic Working Groups on Gender Equality (GE) and Open Access (OA) addressed RRI keys.
- Applicants have to address issues of ethics (ET) in their grant proposals and the ERC supports them to identify issues it considers relevant in this context.
- Open Access (OA) is a policy within the ERC.
- A workshop the ERC organized together with Science and Technology Options Assessment (STOA) in spring 2018 addressed the issue of Public Engagement (PE) (ERC 2018f).
- The ERC encourages its applicants to disseminate their findings.
- Bibliometric research carried out by CWTS within this project identified several projects, which related to the five keys as well as interdisciplinary research. Furthermore, a number of projects practice citizen involvement (ERC 2018f).

In the following sections we will look at different keys of RRI as presented in documents.

6.5.2.2 Public Engagement

The event “Investing in young researchers, shaping Europe’s future” which was jointly organized by STOA and ERC on May, 31st 2018 indicates certain openness of the ERC for public engagement beyond informing about research findings (ERC 2018f). At this workshop a panel “Science policy, communication and global networking” was announced as follows:

“Science is no longer credible for many individuals at all levels of society; evidence is no longer enough to be credible beyond the scientific community. Social media and new communication platforms are driving those attitudes, despite the fact that a scientific and technological revolution is changing profoundly our lives.

At the same time, a new trend is emerging: ordinary citizens, regardless of literacy or education, are actively engaging in scientific work, in numbers and at a scale that is only possible thanks those same digital communication platforms. How should science engage with society? What should be the role of society in order to reap the benefits from scientific advances and to drive them to where they want? Must all new technologies be adopted? What is the potential and function of ‘citizen science’?”(ERC, 2018f).

Speakers at this event were ERC grantees from projects from various disciplines which include elements of PE in their research. Apart from this activity we did not find any documents hinting at deeper public engagement.

6.5.2.3 Gender Equality

Gender Equality and avoiding discrimination is an important objective of the ERC. The ERC Scientific Council postulates that “women and men are equally able to perform excellent frontier research. It continues its efforts to avoid gender bias and to encourage more female top scientists to apply for ERC grants” (ERC 2018a). Nevertheless, as an observer commented in 2014, there are gender differences in ERC applications and success rates (Boyle 2014: 351). The ERC recognizes indeed that “in all ERC calls until 2016, around 26% of applicants and 23% of grantees were women. The lower share of women in the ERC calls mirrors the overall situation in science in Europe” (ERC 2018a: 13). Vinkenburg et al. also perceive gender differences in application and grants. They observe “persistent inequalities (...) between men and women scientists in ERC funding success as well as other career outcomes” despite the fact that “the ERC’s peer review evaluation process has been carefully designed to identify scientific excellence irrespective of the gender, age, nationality or institution of the Principal Investigators and other potential biases, and to take career breaks as well as unconventional research career paths into account” (Vinkenburg et al. 2014).⁵⁷

What are the reasons for gender differences and are they caused by systematic biases? The project GendERC was funded by the ERC as Coordination and Support Action (CSA) aimed at explaining the “lower success rates of female applicants in ERC grants” (GendERC 2016)⁵⁸. The research team collected performance data of applicants of Starting and Advance Grants and did qualitative interviews with 32 panel members about selection criteria that were practiced in general and “specifically for female and male applicants” (ibid.). Finally, the study included a survey of applicants.

Data analyses revealed a gender bias and showed that “current evaluation practices are suboptimal, leading to some gender-biased (gendered) practices.” Gender biases exist in both directions; most often, however, they favour men.

Because of the “vague definition of excellence and quite open process how to apply different elements of excellence in practice” (ibid.) the study recommended to “define what excellence means

⁵⁷ The project “Capturing career paths of ERC grantees and applicants: Promoting sustainable excellence in research careers” (ERCAREER) wanted to study “unconventional careers” paths in science which might have an impact on gender differences in application and success rates between male and female researchers (Vinkenburg 2014).

⁵⁸ It was not possible to find the study in full length, but a project summary is available online.

in the context of ERC” and “to better standardise the process” in order to “reduce space for individual interpretations and improve selection processes” (ibid.).⁵⁹

The analysis of interviews carried out by the GendERC team revealed mostly unconscious “gendered practices – which affect female and male applicants differently” and were related to gendered stereotype, i.e. “personal assumptions and attributions on how men and women are or should be (ibid.). Examples for such stereotypes and different standards for men and women are:

- independence and mobility as a researcher, which are checked in some panels for female applicants whereas not for questioned for males;
- the GendERC researcher point out that the notion of excellence so widely used in the ERC is not gender neutral. “Male-dominated networks are relevant for recruitment processes”,
- female applicants because of care responsibilities and unpaid work have less time to generate the necessary number of publications/citations which are used to measure excellence;
- Women might be less inclined to overselling their research proposal during the presentation to the evaluation panel.

The authors of GendERC mentioned a number of suboptimal processes within the peer review process such as:

- panel members apply non-binding guidelines differently and
- employ guidelines selectively;
- reviewers make no differences in evaluation between Principal Investigator and the project, “although these are rather different dimensions of excellence;
- evaluators apply “informal elements of excellence” such as “mobility, the (prestige of host institution, collaboration networks;
- the aim to bring researcher back-to-Europe (from US) plays a role;
- personal characteristics like assertiveness are considered as well as;
- the well written nature of a proposal and the ability to sell it” is considered (ibid.: 7);
- finally, some evaluators apply “informal elements of excellence” such as their “gut feeling” or “intuition” because, as a evaluator mentioned in an interview “as experienced evaluation we know what to do” (ibid.)

The GendERC project mentioned that some of the ERC staff members were interested in their research, whereas panel members were only marginally interested. There was also a lack of governance of the gender aspect. A “certain level of gender awareness” from panel members existed, “but no clear instructions for implementing them” was given by the ERC. The GendERC study recommended to “raise awareness for gendered practices” by “unconscious gender bias checks or trainings, films” for “panel members, ERCEA staff and also the ERC” (ibid.).

⁵⁹ The observation that the notion of excellence is not standardized, but is defined by each and every panel anew is also shared by an interviewee from a research funding organization. “Excellence is what the panellists say. It is quite simple” (01). However, this interviewee who has a keen knowledge of evaluation processes perceives this rather as an advantage of the ERC evaluation process and considers the moment, when the panel arrives at a shared understanding about the excellence of a project as “magic”. The shared definition of excellence disappears after each and every panel session (01).

Already in 2008, the ERC installed a Thematic Working Group on Gender Balance and drafted a gender equality plan. The ERC Gender Equality Plan (2014-2020) aims at:

- “raising awareness about the ERC gender policy among applicants
- working towards improving the gender balance among ERC applicants and within the ERC funded teams
- identifying and removing any potential gender bias in the ERC evaluation procedure
- embedding gender awareness within all levels of the ERC processes
- striving for gender balance among the ERC peer reviewers and ERC decision-making bodies” (ERC 2018a: 13)

The establishment of this working group, the changing of application rules⁶⁰ as well as CSAs such as ERCAREER and GendERC indicate awareness and certain openness towards the RRI key gender equality.

6.5.2.4 Science Literacy and Science Education (SLSE)

Project proposals do not have to include planned communication and dissemination activities. Nevertheless, ERC grantees are expected to communicate their research and findings (ERC 2018g), to

- show the value of basic research for society and how public money is spent;
- promote the visibility of EU research funding and the ERC;
- improve the researchers own scientific assessments, as this would increasingly include publications “in communication tools, such as social media and web 2.0 platforms”;
- create new collaborations and opportunities; and, finally,
- “invest in public engagement”, since “more and more researchers are active communicators, promoting their results and feeding the public debate on science” (ERC 2018g).

The ERC website provides some suggestions when, what and how to inform the public and a special Project Promotion team provides support for grantees.

The ERC is open for activities promoting SLSE. The annual report 2017 mentions several activities such as:

- stories in various online formats;
- thematic brochures;
- engaging social media content;
- By means of a new dedicated webpage and information sessions, the ERC encouraged grantees to promote their work independently;
- “Two Coordination and Support Actions (CSA) continued to be part of this pillar, showcasing ERC-funded research to a wider audience through innovative communication. One CSA, ERCcomics, produced eight different web-comics and organized illustrated talks at science

⁶⁰ “To help female scientists who are mothers, the ERC has established a set rules regarding parental leave. It allows them to have their eligibility window extended by 18 months per child. For example, if a scientist has one child, and she obtained her PhD 8 years earlier, she can still apply for a Starting Grant (although the general rule is that only those who received their PhD between 2 to 7 years are eligible)” (ERC 2018a).

events. The other, ERC=Science2, engaged in activities such as events in science museums, talks, science-café, workshops, videos, articles, social media posts focusing on the themes of longevity and the senses.” (ERC 2018h: 68)”.

6.5.2.5 Open Access

The ERC is committed to the “idea that the results stemming from publicly funded research – including publications and primary data – should be made freely accessible on the Internet” (ERC 2018j). For grants received from 2014 onwards open access for peer reviewed publications is mandatory.

The ERC adopted Open Access Guidelines which “strongly encourage the use of discipline-specific repositories and in particular recommend the use of Europe PMC and arXiv, for the LS and PE domain respectively.” In the “the Council may recommend specific repositories for the SH domain”. It is recommended to use “OAPEN library as a repository (...) for long-text publications (such as monographs or book chapters) in any discipline (ibid.).

Moreover, “the ERC Scientific Council strongly encourages all ERC funded researchers to seek to establish and practice good research data management in accordance with the current best practices in their respective fields, and to share their data with other researchers in a responsible way” (ibid.).

The ERC produced “Open Research Data and Data Management Plans” to assist its applicants (ERC 2018k).

6.5.2.6 Ethics

The ERC frames ethics narrowly as research ethics (RE) and research integrity (RI). The former President and Vice-President defined ethics at ERC in a joint article in these terms (Nowotny/Exner 2013). Issues they mention are “fraud, conflicts of interest and scientific misconduct”. The authors provide examples of plagiarism in proposal writing and conflicts of interests for evaluators if applicants are from their own organisation or in close personal relationships. They promise that the ERC “will succeed in not accepting anything less than the highest standards”. Also, a ERCEA official proclaims that the “ERC has a firm commitment to maintain the highest standards in ethics and integrity as fundamental principles for research” (Ferrari 2014: 22).

As regards research ethics, since 2009 the ERC analyses all research proposal in a three-step procedure. First, all proposals are pre-screened within the ERCEA whether they raise ethical issues or not. If ethical issues are identified, proposals are forwarded in a second step to ethical screening by experts which take a decision either to “request documentary evidence that the research proposed is in compliance with the fundamental ethics principles as laid down in the EU treaty and related legislation” (Ferrari 2014: 22) or ask for further information about the project. They can also submit the proposal in a third step to an “expert panel for more in-depth Ethics Review” (ibid.).

Ferrari states that “around 50% of research proposals submitted to the ERC present some inherent ethics issues which can be resolved at Ethics Screening level (e.g. animal and or/ human experimentation, privacy and data protection issues, research in developing countries and/or with vulnerable population, etc.), with around 10-15% of them requiring a more in-depth ethics review.

Ethics scrutiny does not end with evaluation but continues, whenever needed, “during the lifetime of the grant” (ibid.).

The ERC assists applicants to identify sensitive issues of research ethics with an ethics self-assessment tool (ERC 2018e). Issues covered in this text include whether human embryos/foetuses, human subjects, human cells/tissues or animals are used for research, personal data is sufficiently protected, concerns which appear when research is carried out in “developing or emerging economy countries where participants may be more vulnerable due to economic or political reasons, and a significant disparity of power may exist between researchers and research participants” (ibid. : 7). In addition, questions of environmental protection and safety as well as malevolent use of research results are raised.

RI is considered a guiding principle in proposal writing, selection of projects, carrying out projects and publications. The ERC set up a “Standing Committee on Conflict of Interests, Scientific Misconduct and Ethical Issues” (CoIME) and in 2012 adopted a strategy on scientific misconduct (ERC 2012). The CoIME investigates allegations of scientific misconduct (e.g. plagiarism, conflicts of interest, fraud) after they have been brought forward by the ERC or the ERCEA. The annual report publishes the number of cases brought up and dealt with.

In summary, questions of ethics in research and innovation are limited to, and governed at the ERC in terms of RE and RI. They are not broadly framed as societal or environmental impact/risks of research or as contribution to the solution of societal challenges.

6.5.2.7 Governance

As already described in the previous chapter, despite the absence of RRI in ERC documents, a number of different governance mechanisms exist that address some of the RRI keys.

6.5.2.8 Societal Challenges

As mentioned several times, the ERC’s fundamental principle is “excellence only”. This also applies to the role of societal needs or grand challenges within the ERC, as the former President explained in 2010:

“Excellence is the only criterion that matters and we are not going in any other directions; we do not intend to have any dramatic changes, even when faced with the ‘grand challenges’, like energy, health, climate change, that the EC [European Commission] wants to tackle. We trust that the scientists know best where the frontiers of research are. We are also convinced that a number of very interesting scientific developments will emerge from basic research and hopefully new scientific and technological breakthroughs that will indirectly, but significantly, contribute to the grand challenges. But we are not setting any thematic priorities. Our approach remains based on excellence only and trusting the individual PI [Principal Investigator]” (Nowotny 2010: 655).

In this line of argument, scientific excellence, a strict bottom up approach and scientific autonomy will eventually lead to scientific breakthroughs and indirectly to innovation and thus contribute to the solution of societal challenges.

The ERC, however, also seems to be aware to address societal challenges and to document its contribution toward solving them. The Working Group on Science behind the Project develops a classification system of ERC funded projects that should “allow the assignment of projects based on

various 'tags', such as “societal challenges” and/or “cross-cutting issues” (ERC 2018i). This indicates certain awareness for the topic.

6.5.3 RRI beyond the keys

6.5.3.1 Theoretical framework of RRI applied in the program line

In order to grasp the notion of RRI within the ERC it is necessary to understand its self-conception, its history and its relationship to the EC as well as to other program lines of H2020.

The establishment of the ERC is an outcome of a successful “political campaign” (Luukkonen 2014: 35) that enrolled major stakeholder groups of research policy. These included “scientific and scholarly communities that initiated the process, European industries, member state-level politicians who were decision makers at the level of the Council, the European Parliament, and key persons from the European Commission. The creation of the ERC was a well-orchestrated political endeavour (König 2017) in which elite actors from science and research policy successfully campaigned for a new funding instrument that was based on a different rationale and legitimation. In essence the rationale of the ERC is autonomous self-governance of basic research, independent from political influence as much as possible.

Advocates of what later became the ERC took initiative because they were dissatisfied with the EU Framework Programmes and were inspired by the model of the US National Science Foundation.⁶¹ This initiative was also supported by the European Commission and various Member States (particularly the Nordic countries) (Ulnicane 2018, König 2017).

König (2017) distinguishes three phases in the political campaign for the ERC. In a first phase (2000-2003) an elite network of scientists self-organized to campaign in conferences and ad-hoc meetings for an alternative way of research funding by the EC. They linked their objective of creating a funding organisation that would only focus on basic research with the Lisbon Strategy “to make Europe the most competitive and the most dynamic knowledge-based economy in the world”. Advocates of the ERC argued that more investment in curiosity driven basic research, like in the US, would lead in the end to more innovation and greater economic competitiveness. “In the initial reasoning for setting up the ERC, frontier research was perceived as the (necessary) counterpart to a top-down approach in research funding, because frontier research is an investment in the European knowledge base and the innovation cycle” (König 2016: 151). The former President puts this argument that is central to link the ERC to the objectives of the European Union in the nutshell:

“The argument is straightforward: while not all innovation depends on research or science, without continuous investment into basic research, there will be no radical innovation in the future, i.e. innovation that has the potential of changing the technological paradigm of how the economy functions. This is what ICT, biotech and nanotech are all about now and we do not yet know what opportunities await us in the future. This message has to be conveyed loudly and clearly and we will need the voices from the scientific community to make it heard. The discussion has already started and we need to influence the debate.” (2010: 658).

⁶¹ At the beginning EMBO, an organisation of life scientists, was particularly important in lobbying (König 2017: 42, Luukkonen 2014: 34).

From 2003 to 2005 European Commission actors took over to advocate for such a funding body and from 2005 to 2007 the institutional structures were set up as they exist today.

Being able to construct, sustain and defend a funding organisation is not only a matter of having the right arguments, but also of possessing the knowledge, prestige and capability to wield political power and the power of definition. In an interview the former ERC President recommends to researchers a lobby strategy for the ERC:

“Speak with one voice, speak at the right time, speak at the right places and above all, repeat, repeat, repeat the message and you will be heard. (...) You have to keep at it” (2010:658).

During and by political campaigning political legitimacy was built. Luukkonen observes “the promotion of excellence was an important justification for the adoption of the ERC. Excellence (or the lack thereof) in European scientific institutions became an important concept in the causal analysis of the problem (...) and simultaneously became a normative idea” (2014: 31, see also 34). European research funding departed with the establishment of the ERC from several of its former principles, i.e. focuses on collaboration and applied research, mobility and coordination of national efforts (Table 12).

Table 12: Outcomes of principles of EU research support

- | |
|--|
| <ul style="list-style-type: none"> • Changes in ERA agenda (strengthening of excellence agenda) • Changes in the definition of European added value in research support (in addition to international collaboration and competition at European level) • Changes in other traditional principles in EU research support (support of individuals vs. organisations, no <i>juste retour</i>, no pre-allocation of funds to fields or specific areas, and targeted research vs. fundamental research) • Examples of delegation of strategy formulation and implementation of strategies to external stakeholders (but only that which is fully based on EU money) |
|--|

(Source: Luukkonen 2014: 35)

The ERC added the focus on Europe-wide competition and support for basic research as well as the promotion of excellence (Ulnicane 2018: 230). The ERC is committed towards investigator-driven ‘frontier research’ in all fields of science, including social sciences and the humanities” with the main aim to stimulate scientific excellence. With the adoption of the ERC the EU moved away from targeting organisations towards targeting individuals. The ERC Scientific Council enjoys large autonomy; it is composed of scientists. The ERC considers these elements essential for achieving its fundamental objectives. This is the “aura of the ERC”, which “was cast, institutionalized and routinized” (Ulnicane 2018:238).

The rhetoric of success dominates in the ERC’s self-presentations and in many descriptions by others (Ferrari 2014: 22, Nowotny 2017: 997, ERC 2018a). The ERC considers several factors as decisive for this success, i.e. strict Bottom-Up approach, high level evaluators, excellence as sole evaluation criterion, self-governance by scientist and scholars, scientific and financial independence of grantees; the size of the grants, simplicity of the scheme and the procedures. This rational is consistent with what Glerup and Horst (2014) call “demarcation rationality” to describe how a particular group of scientists perceives responsibility in research, i.e. keeping it within the control and autonomy of the scientific community by exercising internal norms:

“the Demarcation rationality articulates science as a profession that should have a high level of autonomy from other actors: outsiders to the scientific realm should not interfere with the discussions about scientists' responsibility and how to achieve it. But the profession itself ought to employ a number of techniques to install a specific kind of responsibility to be honest and objective in every single individual scientist. So the profession's freedom from interference from external actors is articulated as dependent on the internal establishment of a strong professional culture. This internal control system should constantly monitor the members of the scientific profession by scrutinizing methods and results and by socializing aspiring scientists into the system. Only by assuring that each individual scientist is rigorous, honest, transparent, and not influenced by society's interest in her work, is it possible to maintain proper responsibility within science“ (Glerup/Horst 2014: 37).

6.5.4 Challenging issues

Despite its successes, the peer review system practiced by the ERC creates also some effects worth to consider.

6.5.4.1 Bias towards conservatism

In 2010, Luukkonen carried out semi structured interviews with chairs and/or panel members of Starting and Advanced Grant panels (Luukkonen 2012: 6). From these interviews she noticed that “despite the ERC’s aims, the peer review process in some ways constrains the promotion of truly innovative research. These constraints arise from the very essence of peer review, namely, its basic function of judging the value of the proposed research again current knowledge boundaries. (...) The ability of the ERC panels to take great risks in funding is a further limiting factor. (...) the control and management of risks in decision-making (...) plays a major role in an agency that purposefully aims to fund ground-breaking research, which is by nature risky and controversial” (ibid.: 11 ff.). She lists a number of customary interpretative and deliberative rules applied by the evaluation panel that affect their decision making such as deferring to expertise and disciplinary sovereignty, use of seemingly ‘democratic’ procedures customary in other spheres of life to solve otherwise difficult situations” (ibid.). Luukkonen concludes: “From the point of view of controversial proposals, these rules of deliberation had the potential to provide opportunities for cronyism and/or conservative decisions by gifting the greatest decision power to the panellists with expertise closest to the application, or in case of voting, to the average opinion” (ibid.).

Luukkonen explains the reasons for conservatism in peer review: “The relevance of the research plans, the research design, and the framing of the research questions are often defined within existing dominant paradigms or epistemic cultures. However, ERC funded research is expected to go beyond these and break through current research frontiers between and across research fields. Still, the yardsticks that are available for the peer review panellists come from dominant belief systems and paradigms” (ibid. 11).

6.5.4.2 Gender bias

We already described in a previous chapter that the ERC’s practice of peer review is not free from gender biases.

6.5.4.3 Imbalance in host countries

An observer criticizes the imbalance of host countries in ERC grants (Boyle 2014: 351): “With more than half of the 2012 starting grant awards secured by the United Kingdom, Germany, France and

the Netherlands alone, there is concern about research concentration, especially because ERC grants are portable between institutions”. In the same way, the COMETS report on excellence in research policy, after recognising the ERC’s accomplishments observes that “some preferential selection has been noted: the candidates working in the best context have an advantage; interface topics are not as easily recognized; fashionable fields of research are favoured” (COMETS: 2014). To this observation the former president of the ERC answers:

“So, if there is chronic under-spending [in countries which receive less or no ERC grants, EG] where should the critical mass, a precondition for excellence, come from? It is also a signal to those countries that it is indispensable to invest into research and education and that they have to do more. (...) There are preconditions, financial and institutional ones that have to be met for excellence to grow locally because even if you have excellent people, if the environment is not right, they will move to more attractive places and it is a loss for the country. It sends out a clear and strong message to everyone who is concerned about research but also about innovation policy in their respective country. (...) So, we have to recognize that there is concentration within certain institutions and countries in Europe, but this a strength and not a weakness. We have also been encouraged by high-level politicians in some of the new Member States who say ‘continue to set the mark for excellence only, don't make any adjustments in terms of quality’. It may seem politically risky, but we will continue to do so.” (Nowotny 2010: 655ff.)

6.5.4.4 Interdisciplinary research and wider societal impact

Boyle also comments that “managing interdisciplinary applications will continue to be challenging, because ERC funding is allocated through three discipline-specific budget lines, and the review process requires experts in evaluating such multifaceted proposals” (2014: 351). An overview of interdisciplinary projects funded between 2007 and 2013 within and across panels shows:

- 42% have a connection to another panel within the same or a different domain.
- The life science domain has a cross-panel component of 54%.
- Physical science and engineering have a share of 31%.
- Social science and humanities have 45% of interdisciplinary projects.
- Most of the cross-panel connections are between panels within the same domain (ERC 2014: 26).

Ex-post evaluation showed that the reviewers thought that about 8% of the project reviewed was bringing research areas together to an exceptional extent that previously did not have much interaction; for another approx. in 30 % of the project this was significantly the case, and in the approx. another 30% this was moderately the case (ERC 2018c). These numbers, and the fact that most interdisciplinary project remain in the same domain indicate that there is room for more and stronger interdisciplinary research bringing together different domains.

The challenge of applying for an interdisciplinary project to the ERC is also addressed in interviews. An applicant mentioned that he works in a research area that is suitable for both Science and Technology Studies (STS) and bioethics. However, in the STS panel his work was considered not theoretical enough, in the bioethics panel, on the other hand, there was no social scientists present. In his experience it is inherently difficult to compose interdisciplinary panels. This problem is not confined to the ERC (5). This assessment was confirmed by another interviewee from a different RFO

than the ERC who reported the difficulties of having interdisciplinary panels. Although the objective of the scheme was to fund interdisciplinary research that creates societal impact, the reviewers remained focused on disciplines. In his experience little experience exists how to evaluate interdisciplinary projects (12). Another problem of interdisciplinary research, mentioned by the previous applicant, is where to publish and how this is going to be evaluated. Reviewers, in his experience, evaluate excellence, by publications in high ranking disciplinary journals of one’s own profession. His research is situated at the interface of bioethics, medicine and social science. In order to be close to the object of his research, which is medical, he also attends medical conferences and, in order to have an impact on the medical field publishes rather in medical than social sciences journals. This strategy, however, is little appreciated by reviewers (5).

Another challenging point is the wider societal impact of ERC funding, an argument that was central to legitimate the ERC in the beginning. The rationale was that investment in basic research in the long run would lead to innovation and would strengthen European competitiveness. Reviewers of the already mentioned ex-post evaluation exercise assessed that approx.4 % of the reviewed project had an exceptional impact on economy, on society on policy making (17 % significant, 25% moderate). They also thought that approx. 7% of the research projects could have an exceptional potential impact in the future (approx. 41% significantly, 25% moderately). Data helped reveal a positive correlation between the extent of interdisciplinary in of a project and the strength of its wider societal impact (ERC 2018c: 15). Increased interdisciplinarity therefore seems to be a way to strengthen the societal impact of ERC research.

6.5.5 Overall assessment of RRI in the program line (based on desktop research)

Table 13: Overall assessment of RRI in the program line (based on desktop research)

Category	Value	Description
A	High awareness: <ul style="list-style-type: none"> Open Access⁶² 	<ul style="list-style-type: none"> RRI as concept is (implicitly or explicitly) present in most documents on all levels; RRI keys and O’s are used and referred to in several documents; Governance structures reflect societal embeddedness; Upstream/Downstream engagement is present on multiple levels

⁶² A Thematic Working Group on Open Access, Open Access Guidelines and Open research and management plans exist. Open Access for peer reviewed articles is mandatory.

Category	Value	Description
B	Some awareness <ul style="list-style-type: none"> • Gender⁶³ • Ethics⁶⁴ • Governance⁶⁵ • Science Education and Science Literacy⁶⁶ 	<ul style="list-style-type: none"> • RRI as concept is (implicitly or explicitly) present in some documents; • Some RRI keys and O's are used and referred to in any document; • There is some process of better social embeddedness through governance or engagement
C	Limited awareness <ul style="list-style-type: none"> • Public Engagement⁶⁷ 	<ul style="list-style-type: none"> • Responsibility or ethical awareness is referred to in any document • Any RRI key is mentioned; • There is reference to the need for social embeddedness of the research at hand.
D	No awareness <ul style="list-style-type: none"> • Open Innovation • Reflexivity / anticipation as responsible innovation concepts beyond the RRI keys⁶⁸ 	<ul style="list-style-type: none"> • RRI as concept is not present in any document; • No RRI key is mentioned implicitly or explicitly; • There is no reference to societal embeddedness or civic engagement;

6.6 Interview findings

Following a shared template, we interviewed three ERC applicants, four grantees, five individuals from RFOs, four representatives of CSOs and one a researcher who studied the ERC. We asked them about their understanding of responsibility in research, the role the six keys therein, what factors

⁶³ The Scientific Council is committed to gender equality. A Thematic Working Group on Gender Balance is installed; a Gender Equality plan exists. Studies have been contracted to understand unconventional career paths and gender biases in evaluation. Application rules take into account parental leaves. Evaluators are encouraged to watch a video to become aware of unconscious biases in recruitment processes (<https://www.youtube.com/watch?v=g978T58gELo>, 12.07.2018). Individual grants include gender as a topic. However, it is unclear to what extent reviewers are actually aware of, and take into account gender biases and whether current evaluation practices continue to create a gender bias.

⁶⁴ Ethics is limited to a few topics of research ethics and research integrity. Ethics Self-Assessment tool exists to assist applicants to identify sensitive issues. A three steps process is in place to assess ethical issues during review process. Monitoring of project during grant management is carried out, if considered necessary. Standing Committee on Conflict of Interests, Scientific Misconduct and Ethical Issues (CoIME) is installed.

⁶⁵ Strong governance mechanisms exist for Open Access; there are also some governance mechanisms in place for Gender and Ethics; there are only weak governance mechanisms in place for Science Literacy and Science Education and Public Engagement.

⁶⁶ Project proposals do not have to include planned communication and dissemination activities. Researchers are expected and supported to disseminate their findings. Several SLSE formats have been developed. CSA are in operation that deals with SLSE.

⁶⁷ The ERC addressed Public Engagement at a ERC-STOA event in May 2018 in the session "Science policy, communication and global networking". On project level a number of grants deal with citizen science and citizen engagement

⁶⁸ Ethics assessment does not include societal impact of research.

support and hinder them to act responsibly in research and innovation as well as about their experience about the uptake of RRI within the ERC.

6.6.1 Shared understanding of RRI

6.6.1.1 Perspective on the uptake of RRI by the ERC

Consistent with the findings of the document analysis, many interviewees, particularly from RFOs, mentioned scepticism towards RRI within the ERC:

One interviewee stated that the ERC is very keen not to be framed, directed and controlled by political interests. The ERC emphasizes a clear and deliberate separation from EC's policies. The ERC argues, he observed, that the EC's research funding includes various program lines that represent the six keys and three O's as well as the as the notion of RRI. It is the ERC's viewpoint, in his perception, that it is very important to have a program line that focuses solely on "science first" and "excellence only". Innovation for the ERC means innovative methods, scientific theory, and new scientific conceptual frames (01).

A researcher who studied ERC evaluation practices assessed the ERC's willingness to consider public engagement in research sceptically because public engagement is perceived as in conflict with freedom of science. She also was sceptical about the ERC's readiness to consider societal impact of research, because it is the ERC's perspective that basic research doesn't need the claim of responsibility towards society. She experienced no interest of the ERC in RRI during her research.

This assessment was in general shared by an interviewee from a RFO, who thought that the ERC is eager to preserve its autonomy from the EC. It tries to avoid too much bureaucracy and, in her opinion, doesn't want to think too much about societal impact. She advises applicants whom she coaches in proposal writing not to waste too much space with RRI issues such as career-boosts for the team members, gender balance in the team, etc. when they write their first stage proposal, but to strongly focus instead on explaining why their project is ground breaking (03).

This perception is consistent with an applicant's narrative. He framed his proposal in terms of RRI and wanted to link his research to a broader scheme and view. However, none of the reviewers took these points into account; neither as strength nor as weakness. There was no reaction at all. He thinks that the notion of responsibility in terms of RRI doesn't play that strong a role in the ERC. He also mentioned that he cannot remember if the concept of RRI was explained to applicants. RRI was very detailed explained within Science with and for Society (SWAFS) calls but not in the other calls and the ERC. He understood that in this framework it was not a guiding concept. He did not have the feeling that it was important to integrate such notions in his proposals (06). Similarly, another applicant said that RRI issues did not play a role in her review. She contrasted this with the Dutch NWO which emphasizes knowledge dissemination plans in proposals (07).

A representative of a CSO remarked that RRI has been a lot discussed in the SWAFS program but outside SWAFS challenge it's not clear for her if researchers use this concept. She considered the number of CSOs participating in the different programs as catastrophic low. In her perspective, the EC it is unclear how society produces knowledge and how it should organize knowledge producers (11).

In contrast to these statement, one grantee thought that topics have to be social relevant in the Social Science and Humanities panel (10).

6.6.1.2 Challenging issues: Country bias/excellence/evaluation criteria

One senior RFO representative, although he appreciated the ERC's merits in general, was also very critical of the ERC, particularly concerning the country bias mentioned in the previous chapters. He explained that from citizen perspective the work of the ERC can be looked at quite critically: He assessed the societal impact of ERC research as low. The ERC, he thought, is funding elites and divergence, it funds and deepens differences and does not react adequately towards societal changes. The ERC certainly is successful; however, it mainly funds organizations and researchers who already "have"; it focusses on natural sciences. In this context the relevant question is not only about responsible science but responsible science policy. That means, the ERC funds centrifugal forces and is driven by divergence. It does not react properly to the societal conditions in Europe, i.e. the problem that scientists migrate from illiberal countries. Hungary, e.g., is losing researchers. Funding instruments like Marie Curie or ERC therefore do not reach these countries.

The ERC has had its ten years' anniversary and it is successful, but there are also problems. The ERC funds top-level research in countries like Norway, UK, Switzerland and Israel who are not, or will not be for much longer, member states. These countries profit strongly from the ERC. Central and eastern European countries profit less, but that is not a matter of quality of brains but of difficult framework conditions of their universities. They cannot provide comparable services like western European universities which support applicants. Applications of good qualities originating from these countries are rejected because they cannot recognize technical aspects such as "quality of training" in the same way like western European universities.

Funding also goes to Germany, Austria, Netherlands and Belgium. In what sense is it responsible that countries that do not benefit from funding are co-financing rich countries?

The respondent also thought that the ERC is an attractive instrument, but it funds particular topics, and mainstream research. In his own discipline it does not fund the best and most original researchers. The interviewee explained Social Science and Humanities it is not about funding big topics with big budgets but to give researchers time to work on a topic.

There are problems with the evaluation of research projects. In the humanities there are still, for content-related reasons, many different languages apart from English. This is caused by the topic of SH, i.e., society. For content-related reasons English is not the only language, but several languages co-exist. It should remain this way. For these reasons, the command of English cannot be used as a quality criterion in the evaluation (13).

6.6.1.3 Public Engagement

The interviewees' practice of public engagement can be categorized into weak, medium and strong forms of public engagement.

Weak public engagement

Weak public engagement means informing the public only. One applicant, e.g., explained such activities as reporting and explaining his research to laypeople. He experienced this as challenging and fun. The difference between public engagement and science education was unknown to him.

After providing crowd sourcing as an example for public engagement, he believed that such an approach would be interesting for high risk research when traditional research money is hard to get (05). Another interviewee provided an example for weak public engagement when she mentioned, that she plans to write a book which is accessible for a wider readership at the end of her project (10).

Medium public engagement

Medium public engagement also includes engaging in public debates. An applicant perceived public engagement as a means to decide about emerging technologies that profoundly impact society. He considered it important that society gets involved in the development of new technologies, can reflect on their desirability and under which conditions they could be applied. "So we can reflect: 'Okay, we want this new technology, but maybe we want it under different circumstances". Public engagement means in his understanding stakeholder involvement. It means to discuss the best way to implement new technologies: Guiding questions could be like: "What do users think about? What are their preferences? What does (...) industries think? What do developers think?"

As a researcher he wants to have a place in these debates and his papers being discussed by expert bodies and in politics. Engagement means that his work has societal impact. He writes in newspapers and gives public lectures. In his own research he does not involve the general public and lay audiences but stakeholders and experts from different areas. He considered involving lay people into research as too complex (06).

For another applicant public engagement meant interdisciplinary research. She tries to raise public awareness about her research topic which involves a lot of translation work.

She is involved in stakeholder engagement, to generate spaces for reflection in which different groups can think about the common good (07).

Strong public engagement

Strong public engagement means involving practitioners and stakeholders in research itself. A grantee mentioned that she feels responsible in terms of methodology building. She tries to create a core of research practice that will influence and encourage other researchers. In the first two years of her project her team organized in short intervals circles, where practitioners in her research area, discussed interdisciplinary aspects of the project. She also engages the community by creating a website and video tapes of the meetings. This should encourage people to get in touch and to get updates about her research. The network she created includes her team at the university and practitioners in the field (08).

Interviewees from CSOs strongly emphasized the need for public engagement. One CSO tries to get research out of the ivory tower and to connect it with society. They apply action research, as well as participatory and interdisciplinary approaches and contribute to research projects their experience with alternative local business projects. The interviewee was critical about science, which he considered as detached from real life. He is interested in meaningful solutions and started his own projects outside traditional science. Today science should be a space within society of bringing together different kinds of expertise and knowledge to reflect on the challenges we are facing and how we can find solution without violence in a democratic way; solution that empower people because they contributed to their development. In his workshops he encourages participants to

contact people, to go outside the labs and universities. People in research should connect to reality and share their expertise, which are based in everyday life. He thinks it is necessary to implement a fruitful dialogue and to share knowledge and expertise for emancipatory solutions. He thought that more facilitators and mediators were needed that act as bridges between the two spheres. Money would be necessary in projects for these roles. He and his organization connect society with academics (09).

Another CSO representative thought that public engagement is not integrated in the policy cycle yet. Public engagement is a very powerful tool for her organization and herself to place science in the debate about democratization. Ethics is closely related to her concept of democratization of research. It should not only be understood as how to do good or bad research but should be a point of reflection for one's own work. Open Access, science education and gender equality are very important issues for her organization as well and they are aware of it but these keys are not the most important ones they focus on (11).

6.6.1.4 Gender equality

When comparing status and practice of gender equality, interviewees' responses vary between little awareness, individual practices and practice that are supported by their institutions.

Little awareness

One applicant said there are only few women in his department. In his research field there are not many female researchers, though there are more women than men in the beginning of the study program. Later, most women leave into different areas and do not specialize in his field.

He thinks it might be good to split the application process in people who only read the CV and others who read the project. This could help to have more female researchers in the department (05).

Individual practice/Integrated in projects and topics

Several interviewees' practice of gender equality was integrated in their research area and their individual way of organizing and doing research. One grantee always tries to have gender balance in his projects and this is also something that the ERC promotes (04). An applicant mentioned that in his research area more women than men are working as researchers. Because of content related reasons of his research topic he does more interviews with woman than man (06). Another applicant mentioned she never felt the need of particularly bringing woman into her research because she herself is a woman; involvement of female researchers happened by itself (07). Another grantee stated that she has a gender balanced team and that gender equality as a topic is part of her research (10).

Established institutional practice

One applicant mentioned institutional support from her universities for the gender equality. Program exists to promote female researchers (07).

6.6.1.5 Open Access

Most interviewees reported that institutional policies for OA are in place at their research organizations (04, 05, 06, 07, 10).

One interviewee problematized the use of Open Access in qualitative research. Audio and video records as well as transcripts are sensitive because of the need to protect anonymity and because of

the sensitivity of data interpretation (06). Another problem stated in the context of Open Access was lack of funding for journal fees (06). An applicant stated that Open Access was not her first criteria of RRI to look at. The university has an agreement with journals; otherwise she would not do Open Access, because of the costs. Open access activities must be part of the funding (07).

6.6.1.6 Science Literacy and Science Education

Many interviewees were involved in SLSE activities (see a previous chapter on public engagement). An applicant reported that she tries to disseminate her research results beyond the circle of her own peers. She sees this activity as raising awareness outside her own discipline. Furthermore, she tries to publish in journals that go beyond her discipline (07). A grantee reported that she used to give presentations or used to participate in discussions outside academia, if invited, but she doesn't do it proactively. She also gives interviews for radios or newspapers (10).

An applicant remarked that most of the researchers don't know where and how to start to engage with society. In addition, not everyone is made for such engaging activities. There are lots of brilliant researchers but they are very bad in teaching. It's important to accept and realize that and make sure that at universities are not hierarchies about what activities (research/teaching/public engagement activities) are better and worse. In addition, there is not enough money for such engaging activities most of the time.

He thinks we need more flexible money for engaging activities which are not planned from the beginning. Furthermore, an engaged university would be needed on a macro level. Sustainability and responsibility have to be recognized on institutional level. In his experience, universities don't perform in a very responsible way. Promoting responsibility and social impact issues is only worth about 5% of your total score of how your performance as researcher is evaluated at your university; and that's not very much. He thinks that this should be changed. Years ago, the mission of universities was education, research and societal service but because of the pressure to publish the importance of social engagement has disappeared and it's not even taken into account in evaluation processes anymore. Universities should take RRI (again) into account (06).

In order to foster SLSE it is important, this applicant also remarked, to provide institutional support. Moreover, enthusiastic people are needed. Logistics and management support from universities e.g. is also very important. In addition, you need enablers, people who bring people together. Most of the time people are interested in SLSE activities but they do not want to take care of it. Therefore, people are needed who launch ideas and push things through (6).

6.6.1.7 Ethics

Interviews show a broader understanding of ethics than research ethics and integrity. They include:

- Responsibility towards society and the environment
- Research Integrity
- Governance of ethics
- Responsibility towards research team

Responsibility towards society and the environment

Responsibility towards society included to select research topics that are relevant for society. Many researchers mentioned societal relevance such as sustainability and climate change, to foster liberal

democracy, to promote justice and equal access to justice, equality as well as to reflect on the impact of technological development. Responsibility towards society also meant, as already mentioned, that science should become more relevant to society and that it should bridge the gap between the Ivory Tower and the “real” world.

One applicant remarked that picking a social relevant research subject plays a big role in her research. It is about the question of common good. She always did research on societal and ethical implications of technological development. For her, responsibility is linked to these research topics anyway. She doesn't design her research within the RRI concept but she maps out societal challenges raised by new technologies. She is interested in the question how to embed new technologies into the society (07).

A grantees' idea of responsibility was to change, or rather first to raise awareness for her research problem, the people she is studying, to think about the new roles they are fulfilling and creating a stronger link between scientific theory and every day practice. For her, working at the university and being an academic is a very isolated experience. She has her tasks, has to teach and to publish; to have her own complex world and to write books and papers and a few people will read them. For here, research is not only about doing her little work and writing a few books and papers and having her academic life of teaching and writing. Instead, it is about creating some change in society and academia. Having impact to her means engaging in society, which means engaging in reality. As a researcher she can contribute to changing the discourse and raising awareness for topics of real life. As a researcher she should spotlight a topic in a legitimate frame and in legitimate scientific wording (08).

Another grantee felt responsible to society by selecting her research topic as well, by informing society about the topic without fear mongering and to raise awareness for its political implications (10).

For a CSO representative the question of responsibility is linked to societal challenges. Science should take a role in translation and transition (11).

A RFO representative stated that social sciences and humanities should address society. A researcher should be to 90% an excellent scientist, but also a public intellectual. That means to make topics intellectually fruitful. In doing that they should limit themselves to their field of expertise. To bring together expertise and public engagement is a thin line. Responsibility also means responsibility in selecting a research topic. What, e.g., is the impact of commercial use of drones on society? Responsibility in the selection of research topics is also an issue in social sciences and humanities, e.g., research on minorities or repressed nations. What is being research? How is research carried out? To what extent are single researchers aware of their role within the broader societal and political setting? How can their research be politically used and abused? This is also an issue in contract research. What does this mean for the research subject, for society? To what extent do researchers reflect their role in this system? Do they have the necessary capabilities to do that? Is the question of selecting a topic discussed? To what extent are researchers aware of their own positions and presuppositions? Do they reflect these presuppositions? Do they strive for objectivity and neutrality? Researchers are part of and influenced by society. Responsibility in this sense also means: in what position am I speaking on behalf of what? (13).

The field of responsibility towards society and the environment also included researchers' accountability towards tax payers, whose money they use for research. A grantee perceived it as his responsibility not to waste this money (04, 07). A CSO representative mentioned researchers' responsibility towards society and taxpayers who fund research. In research it is important to deal with societal challenges. It is also about interacting with the people and to reflect and be aware of the societal challenges and use privileged positions to deal with it and find solutions for (09).

Research Integrity

Interviewees mentioned research integrity, e.g., towards participants of research. An applicant tries to be responsible in data management because she feels responsible for research participants. She thinks it is important to discuss these issues and make students aware of acting collegial, being honest in reporting your data, particularly when interpreting qualitative data (07).

For an applicant Ethics also means to be collegial in terms of authorship of publications. He teaches his students ethical awareness. Transparency about authorships in publications is important. He tries to be collaborative and to engage and involve in his work as many people as possible (06).

Interviewees related research integrity also to honesty, i.e., staying within the limits of one's competence. One interviewee emphasized that one should be honest about one's claims in relation to the public, not raising hopes of, e.g., time machines and teleportation. It also means to inform journalists honestly. Researchers should not oversell in publications and not hype their work. It is also important to stay within the realm of one's competence and if one enters into another field to recognize and know the relevant work by others (05).

Responsibility towards research team

An issue beyond the six key is responsibility towards one's research team in guiding their career, creating an inspiring environment and safeguarding their safety when they are in the "field" (e.g. investigating sensitive areas in society that might pose a threat to their health and well-being).

One grantee explained she perceives herself as project leader and mentor for younger researchers. She wants to create working conditions and an atmosphere of people working together which is new in her research field. Leadership means for her to understand that you reached a point in your life in which your role is to help and guide and be responsible for other people (08).

Another grantee mentioned she feels responsible for her research team and to her profession. Before she received her ERC grant she did not have a research team. Now she is leading a team and feels responsible. Taking care of junior researchers' career is paramount for her. She said that senior researcher care too little about junior researchers. After receiving her Starting Grant, she experienced an extreme shift from precarious employments to becoming a highly prestigious researcher. Suddenly she was offered tenure track and membership in an Academy of Science. She wants to do this differently. She feels responsible for her team's safety during fieldwork and for providing spaces to reflect the topics she and her team are working. These, as she called them, toxic topics necessitate the provision of supervision and spaces to reflect so that juniors can cope and stay objective and neutral (10).

6.6.1.8 Governance of ethics

Interviewees mentioned a variety of issues regarding governance of ethics. One grantee reported great problems with the concept of researchers' responsibility. He thinks that the question of responsibility is a long term social, economic and ecological process. It is difficult as a researcher to be or to be held directly responsible during research, because it is unpredictable what will happen in the next 20 or 30 years. He argued that each innovation could be used for bad purposes and provided the example of laser that can be used for good things or as weapon. The interviewee did not perceive it within his role as a researcher to make predictions about developments he cannot perceive. In order to deal with these questions, the interviewee was in favour of interdisciplinary research. To assess ethical issues of research natural scientists would need better training in RRI issues. In addition, social scientist should be more involved in project in natural science. He was also sceptical about research ethics committees. He does not want to be limited at the stage of developing a research question because nobody knows what will be in 30 years. Responsibility should be based on the researcher's individual assessment. This includes his personal decision not to get involved in animal testing (04).

An applicant stated that ethics is not static. Instead, we must be open for ethical innovation. We are facing new challenges like big data and data collection. The old frameworks don't work any longer for these new questions. For instance, we need new governance models in privacy protection. The interviewee mentioned her experience that private industry acts in a way more ethical than medical scientists. So, in conclusion it is about prudently going on and be open for ethical innovations from actors and areas we don't expect. (07).

One grantee reported that ethical standards of the ERC are extremely strict. She needed help from the data protection manager of the university to answer all these difficult questions such as "what happens with the recorder after the interview on the way back to the hotel, for example". She realized that the ethic standard of the ERC is very high and that she has to handle the data in a very responsible way. It was very much work and delayed the start of the project but it was helpful to think about all such things in advance (10).

6.6.2 Beyond RRI

6.6.2.1 Responsibility of funding organization

Interviewees also mentioned issues of responsibility the funding organization possesses towards applicants and grantees. This involved fair evaluation, respecting time and effort applicants invest into their proposals. They should not be fobbed off by token arguments. Furthermore, some interviewees mentioned that differences across Europe should be recognized. This also involved recognizing evaluation biases, e.g. differences in availability of financial resources, difference in the availability of supporting institutions,⁶⁹ non-conformity with „standard career“, avoiding using hard

⁶⁹ One applicant mentioned that there is an industry for preparation for the interviews. They train you, they record you and they criticized her very hard. Furthermore, there is an external expert who the university hires and pays quite a lot to train for the speech. The research authority people hire someone to submit the proposal and help you in preparing for the interview. You have like ten test interview before you go to the ERC (08). Another research criticized that too much money goes into the salary of the machinery which helps researchers to get grants. It would be necessary that the money goes directly to the researchers. However, this is a structural problem and cannot be solved only at one university (07).

impact factors only, various gender biases, recognizing the challenge and importance of inter- and transdisciplinarity and that English is not the only language of science and research. Some interviewees mentioned a language bias which would favour native speakers and researchers from old Member States (01). It also should be taken into account that an ERC grant means a change of roles. Particularly Starting Grant recipients overnight turn „from precarious positions to superstars” from „from solitary researchers” to “team leaders”. Another grantee feels celebrated, but isolated. Exchange with the ERC would be mainly about administrative matters and little about content (08).

6.6.3 Assessment of RRI based on interviews

In summary, the concept of RRI is little known by the interviewees except by a few applicants and the interviewees from RFOs. Interviewees have different understanding of responsibilities and practice the various keys of RRI in different ways and in different depth of institutionalisation.

Table 14: Assessment of RRI (based on interviews)

Category	Value	Description
A	High awareness: <ul style="list-style-type: none"> • Ethics⁷⁰ • Open Access⁷¹ • Gender⁷² 	<ul style="list-style-type: none"> • RRI as concept well understood by all stakeholders; • RRI keys and O's are used and referred to by most stakeholders; • Operationalization of RRI already present
B	Some awareness <ul style="list-style-type: none"> • Public Engagement⁷³ • Science Education and Science Literacy⁷⁴ • Reflexivity / anticipation as responsible innovation concepts beyond the RRI keys⁷⁵ 	<ul style="list-style-type: none"> • RRI as concept understood by some stakeholders; • Some RRI keys and O's are referred to by some stakeholders; • The need for mainstreaming through operationalization is referred to by some stakeholders
C	Limited awareness <ul style="list-style-type: none"> • Governance⁷⁶ 	<ul style="list-style-type: none"> • Vague awareness of RRI as concept by a few stakeholders; • Any RRI key referred to by some stakeholders; • Some ideas of operationalization of RRI present
D	No awareness <ul style="list-style-type: none"> • Open Innovation 	<ul style="list-style-type: none"> • RRI as concept is not present; • No RRI key is mentioned; • No reference to or explicit refusal of societal embeddedness or civic engagement;

6.7 Case briefs

- Extreme Citizen Science: Analysis and Visualization (ECSAnVis)⁷⁷
- Meeting Great Expectations Through Democratic Innovations (NEW_DEMOCRACY)⁷⁸
- Toxic Expertise: Environmental Justice and the Global Petrochemical Industry⁷⁹

⁷⁰ Variety of understanding ethics: research ethics, research integrity, responsibility towards society and the environment, the research team. In addition, there is also responsibility of the funding organisation towards applicants and grantees.

⁷¹ Most interviewees reported that at their organizations institutional policies are in place.

⁷² Only a few respondents were little aware of gender equality. Many interviewees perceived it as embedded in their individual practices, research projects and topics. Some respondents mentioned established institutional practices in their research organisations and the ERC.

⁷³ Some researchers were involved in weak public engagement (information). However, a number of them also practiced some forms of medium public engagement (involvement in debates). Several researchers involved stakeholders in their research (co-creation). CSO representatives strongly demanded public engagement in research.

⁷⁴ Many interviewees were involved in Science Literacy and Science Education practices; however, they are often based on individual interest and initiatives, there seems to be little institutional support, recognition and lack of funding.

⁷⁵ Explanation: see ethics

⁷⁶ Explanation: Varied level of governance mechanisms in various keys.

⁷⁷ <http://www.ucl.ac.uk/excites/projects/excites-projects/ECSAnVis> (10.7.2018)

⁷⁸ <https://www.kuleuven.be/onderzoek/portaal/#/projecten/3H180199?lang=en&hl=en> (10.7.2018)

- Social and Physical Urban Environment and Cardiovascular Health: The Much Needed Population Approach⁸⁰
- Intentional stance for social attunement⁸¹

6.8 Conclusions

In this last section we return to the questions mentioned in the beginning of this paper.

The ERC as a research funding organisation is committed to several key principles: open for all researchers and all disciplines; strictly bottom up, curiosity driven research without thematic priorities; providing long-term, individual grants for ground breaking, high risk research. In its definition funding decisions are based on peer review evaluation and scientific excellence as sole criterion. The ERC stresses its autonomy from the EC.

In the literature and reports the ERC is in many ways considered a successful institutional innovation. This includes its attractiveness for research applicants, its recognition and prestige within the scientific community, its ability to identify cutting edge research and its scientific impact. However, the ERC is not unchallenged because of potential conservatism and gender biases in peer review, skewness of grantees towards prestigious institutions and a few countries, problems to address interdisciplinary research and little societal impact.

Although the ERC in its documents never uses the term RRI, it deals with all RRI keys to different degrees and uses lesser or stronger means of governance to address them (see Table 15).

The comparison of ERC documents and interviews (Table 15) shows similarities and differences how various keys of RRI are addressed:

- Both, ERC documents and interviews show a high awareness for **Open access**. ERC documents and interviewees also show some awareness for **Science Education and Science Literacy** and no awareness of **Open Innovation**.
- There is higher awareness in interviews than in ERC documents for the topics of **Ethics, Gender Equality, Public Engagement** and **reflexivity/anticipation**
- There is higher awareness in ERC documents than in the interviews for **Governance**.

The central question, whether, how and to what extent the ERC is ready to take up RRI issues is a highly political one. There is a serious friction between, on the one hand, the ERC's self-image and its tasks, its understanding of how to do proper science, of what constitutes a right relationship between science and wider society, about the autonomy from the European Commission it strives for, and, on the other hand, its understanding of RRI and its perceived implications for science and the ERC.

Table 15: Comparison Assessment of RRI ERC documents and interviews

Category	ERC Documents and Literature	Interviews
A	High awareness: <ul style="list-style-type: none"> • Open Access 	High awareness: <ul style="list-style-type: none"> • Open Access

⁷⁹ <https://warwick.ac.uk/fac/soc/sociology/research/currentresearch/toxicexpertise/> (10.7.2018)

⁸⁰ https://cordis.europa.eu/project/rcn/111524_en.html (10.7.2018)

⁸¹ <https://instanceproject.eu/> (10.7.2018)

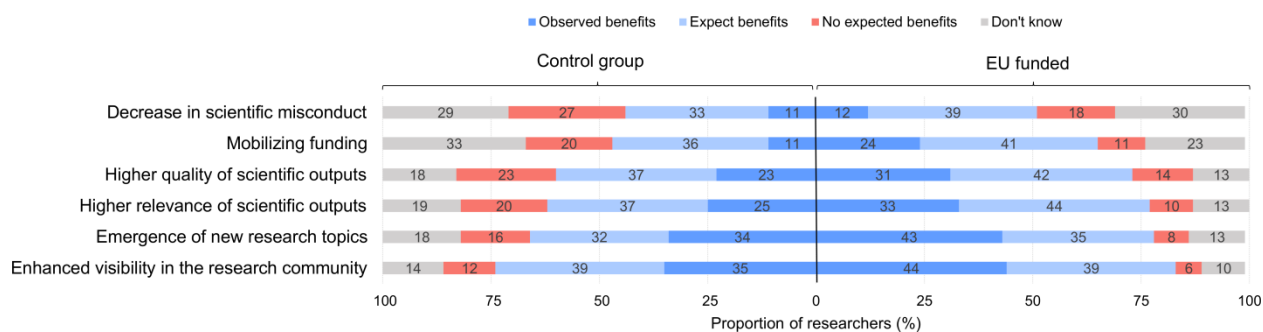
Category	ERC Documents and Literature	Interviews
		<ul style="list-style-type: none"> • Ethics • Gender
B	Some awareness <ul style="list-style-type: none"> • Gender • Ethics • Governance • Science Education and Science Literacy 	Some awareness <ul style="list-style-type: none"> • Public Engagement • Science Education and Science Literacy • Reflexivity / anticipation as responsible innovation concepts beyond the RRI keys
C	Limited awareness <ul style="list-style-type: none"> • Public Engagement 	Limited awareness <ul style="list-style-type: none"> • Governance
D	No awareness <ul style="list-style-type: none"> • Open Innovation • Reflexivity / anticipation as responsible innovation concepts beyond the RRI keys 	No awareness <ul style="list-style-type: none"> • Open Innovation

A strong call for “excellence only” is frequently used in basic research funding – and this is not limited to the ERC - to reject the call for RRI; this is in particularly the case deeper forms of Public Engagement, Gender Equality that is not limited to counting numbers of staff and ethics assessment that is not only understood as research ethics and research integrity but looks at the societal and environmental impact of research and its applications. Elements of RRI such as Gender Equality, Public Engagement, and Ethics are at times interpreted as in in conflict with the concepts of “excellence only” and “autonomy of science”. They lead also to the delicate question of ownership of the ERC. The former president made her position clear: “The ERC has been a unique and bold experiment to put the scientific community in charge. It must safeguard this position” (Nowotny 2017: 997). Other elements of RRI such as Science Literacy and Science Education, Ethics, Governance are considered at times as burden for researcher.

Analysis showed numerous openings for RRI:

RRI can contribute to scientific excellence. As case study research showed, introducing RRI into research can have a positive impact on science, e.g., PE and asking gender sensitive research questions can lead to new research questions and insights, PE can provide access to previously unavailable data, diversity in research groups might increase performance (Wuketich et al. 2017). A survey of European researchers showed a high share of researchers who either observed or expected scientific benefits of applying RRI keys in their work (Figure 3).

Figure 3: European researchers’ perception of scientific benefits of RRI (ERC Input)



(Source: Bühner et al (2017): 37)

Evaluation shows that interdisciplinary research can be a way to increase societal impact. Interdisciplinary research can also be a means to assess societal impact of research. However, challenges to evaluate interdisciplinary research mentioned in interviews and the literature should be addressed.

At the ERC, several initiatives exist that address keys of RRI (Table 13). There are Thematic Working Groups for Gender Balance and Open Access (including respective plans). Furthermore, there are guidelines for Science Literacy and Science Education and, in addition, assessment tools and governance mechanisms for Ethics.

There already exist a number of projects which deal with the question of Public Engagement (Citizen Science, stakeholder engagement). There are signs for certain awareness for citizen science within the ERC on institutional level.

Already today, applicants and grantees are engaged in Public Engagement activities such as lecture, interviews, and popular articles. These are already supported by the ERC. These efforts could be strengthened, receive support by research institutions and recognition in evaluation. RRI should not create additional pressure and burden for researchers (who are already heavily burdened by administration and teaching) and funders.

6.9 Literature, links, resources for ERC Diagnosis Input

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European Research Council (2018d): Mission. <https://erc.europa.eu/about-erc/mission> (2.7.2018)

European Research Council (2018e): Ethics Self-Assessment step by step. <https://erc.europa.eu/sites/default/files/document/file/EthicsSelfAssessmentStepByStep.pdf> (6.7.2018).

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6.10 Appendix to ERC Diagnosis Input

6.10.1 List of abbreviations

CoIME	Standing Committee on Conflict of Interests, Scientific Misconduct and Ethical Issues
COMETS	Comité d'éthique du CNRS
CORDIS	Community Research and Development Information Service
CSO	Civil Society Organisation
CWTS	Centre for Science and Technology Studies
ERACEP	Emerging research areas and their coverage by ERC-supported projects
ERC	European Research Council
ERCAREER	Capturing career paths of ERC grantees and applicants: Promoting sustainable excellence in research careers
ERCEA	European Research Council Executive Agency
ET	Ethics
GE	Gender Equality
GendERC	Gendered dimension in ERC grant selection
GOV	Governance
NCP	National Contact Point
OA	Open Access
PE	Public Engagement
RFO	Research Funding Organisations
RPO	Research Performing Organisations
SLSE	Science Literacy Science Education

7. Annex: NewHoRRizon Diagnosis Report, Social Lab 2, Future and Emerging Technologies (FET)

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7.1 Executive Summary

This report provides information on a diagnosis of the state of responsible research and innovation (RRI) in European Commission (EC) programming related to the Future and Emerging Technologies (FET) programme. FET is an EUR 2.69 billion programme of the EC Horizon 2020 (H2020) research and innovation (R&I) framework programme 8 (FP8). The FET programme line sits within the Excellent Science pillar of H2020, and aspires, “To foster radically new technologies with the potential to open new fields for scientific knowledge and technologies and contribute to the European next generation industries, by exploring novel and high-risk ideas building on scientific foundations” (EC 2013a, L347/127).

FET programming is divided into three main lines of activity: Open, Proactive, and Flagship. These three activities are supplemented by calls devoted to the topic of High-Performance Computing (HPC). FET Open projects foster early-stage investigation into new ideas set to challenge scientific and technological paradigms. FET Proactive projects support more mature but still emerging research communities, with the goal of helping consolidate “a European pool of knowledge” on science and technology topics (EC 2011b, p. 36). FET Flagships are large-scale initiatives to address major science and technology grand challenges to provide “a strong and broad basis for future technological innovation and economic application...plus novel benefits for society” (EC 2011b, p. 35). A major motivating justification underlying FET programming, according to the Interim Evaluation assessment of FET logic models, is economic application and scientific capacity building (EC 2017c, p. 77, Figures 36 and 37).

In this context, the FET programme seeks to implement responsible research and innovation practices (RRI)⁸² and Open Science, Open Innovation, Open to the World (Open Agenda) approaches, as required by REGULATION (EU) No 1291/2013 (EC 2013a). At the policy level, FETs most visible implementation of RRI can be seen in an emphasis on science education and science literacy to build the scientific workforce of Europe. Over time, FET attention to RRI in work programmes (WPs) has increased, from being barely mentioned apart from reference to gender dimensions open science, and open innovation in WP 2014-2015; to having several paragraphs devoted to RRI in introductory texts of WPs 2016-2017 and 2018-2020. Emphasis on RRI may also be found in call texts, most prominently in FET Open and Proactive coordination and support actions (CSAs) topics, and FET Flagship Core Projects. In some cases, again most commonly in CSAs and Flagships, emphasis on RRI in FET is further reinforced through changes to evaluation criterion. For example, the FETPROACT-01-2016 Impact criterion considers, “structuring effects on multidisciplinary communities of researchers and stakeholders ... innovation potential and leadership from the emergence of a new innovation ecosystem, the empowerment of new and high potential actors and from public

⁸² Unless otherwise stated, use of RRI in this report refers to an umbrella term that encompasses concepts and activities related to six European Commission RRI keys: gender, ethics, open access, public engagement, science education and science literacy, and governance.

engagement” (EC 2017d, p.26). In conclusion, several recommendations are offered on ways to advance RRI and Open Agenda activities in support of core FET interests: connecting new and emerging technology research with commercial and broad societal wellbeing.

7.2 Scope of this document

This diagnosis report is not an official deliverable. It is for internal use only and unless otherwise indicated, for Social Lab 2, the leader of the NewHoRRizon Work Package 2 on Excellent Science, or for members of the NewHoRRizon Consortium carrying out duties related to the grant agreement (741402). The scope of the report is to provide necessary information for diagnosing the state of responsible research and innovation (RRI) in programming activities related to Future and Emerging Technologies (FET). Research conducted to develop the diagnosis further served to support the development and initiation of Social Lab 2 in the project. By presenting systematically collected research input and data, this document provides grounds for comparison across Horizon 2020 (H2020) Programmes within the Excellent Science pillar, across other H2020 pillars, as well as at other levels of interest to project consortium members.

7.3 Methods

Diagnosis of FET programming consisted of desktop and interview research. Desktop research began with investigation of the founding regulation of Horizon 2020 (EC 2013a), and narrowed to scoping documents of H2020, paying specific attention to texts mentioning FET (EC 2011a; 2011b; 2011c; 2011d). Additional input for initial analysis was the European Commission Interim Evaluation of Horizon 2020 (EC 2017a). To support analysis of how responsible research and innovation is enacted by FET, these policy-level documents were reviewed for a) indications of research and innovation goals; b) research and innovation structures; c) general funding levels; and d) mentions and measures of responsible research and innovation (with dimensions of public engagement, open access, gender, ethics, science education and science literacy, and governance (RRI keys)); responsible innovation beyond the keys (denoted by procedural elements of inclusion, anticipation, reflexivity, and responsiveness) (Stilgoe et al. 2013); and reference to Open Innovation, Open Science, and Open to the World (Open Agenda) (EC 2016a). Information on FET activity (proposals funded, levels and types of participation, money committed) was gathered from Commission staff working documents, including interim evaluation of Horizon 2020: Annex 1 (EC 2017b) and Annex 2 (EC 2017c), as well as the Europa Webgate dashboard on H2020 projects.⁸³

Next, 2014-2015; 2016-2017; 2018-2020 FET Work Programme documents were reviewed (EC 2014a; 2017d; 2017e). Each document contained a general introduction to the two-to-three-year vision for the programme; specific solicitation texts across programme elements; evaluation guidelines; and budget information. Supplementary inputs were gathered from the European Commission’s online research manual (various proposal templates, ethics guidelines, gender FAQs, proposal templates and evaluation guidance, etc). Project-level information for case studies was gathered from periodic project reports submitted by FET-funded projects (posted on the EC CORDIS website), as well as by reviewing project website and publicly accessible deliverable documentation.

In addition to desktop research, a total of 19 (7 female, 12 male), 45- to 60-minute interviews were conducted with various stakeholders of and participants in FET programming (see Table 1 for a

⁸³ Europa Webgate available at: available at: <https://webgate.ec.europa.eu/dashboard/sense/app/93297a69-09fd-4ef5-889f-b83c4e21d33e/sheet/erUXRa/state/analysis>

further breakdown of participants). Interviews were semi-structured, taking an interview protocol (please see [Annex: Interview Protocol](#)) developed by the NewHoRRizon Consortium as a point of departure. Interviews were recorded, for future reference in order to validate findings and quotations indicated as important, but not transcribed; notes were taken in the course of the interview to guide subsequent review and analysis. All interviews were conducted with informed consent of participants, in accordance with the General Data Protection Regulation, EU Regulation 2016/679 (GDPR), using a consent form reviewed and approved by the Norwegian Centre for Research Data.

Table 16: country and type of organizations of interview participants in the diagnosis

Country	Number of participants	Organizational type	Number of participants
Germany	5	Higher or Secondary Education Establishments	5
Denmark	1	Other	0
Norway	2	Private for-profit entities (excluding Higher or Secondary Education Establishments)	2
Sweden	2	Public bodies (excluding Research Organisations and Secondary or Higher Education Establishments)	6
France	2	Research Organisations	6
Portugal	1		
United Kingdom	2		
Switzerland	1		
Italy	1		
Belgium	1		
Slovenia	1		

Participants interviewed ranged from FET project coordinators; programme committee members; advisory group members; business stakeholders; national contact points; and European Commission officers. In the context of their home country organization, individuals interviewed included research council officials, research organization managers, professors, artists, labour and industry representatives, policy officials, and business persons. Difficulty recruiting interviewees from the “Other” category of organizations involved in H2020 (e.g., CSOs and NGOs) reflects in part the very limited number of such organizations involved in or engaged by FET programming (see below—only 1% of participations in FET come from OTH). The small number of OTH participants makes members of this group difficult to identify and recruit—a difficulty shared by FET interviewees in the context of their own work, and across H2020 more broadly (as indicated by the Interim Evaluation (EC 2017a)).

7.3.1 General scope of the program

The specific objective is to foster radically new technologies with the potential to open new fields for scientific knowledge and technologies and contribute to the European next generation industries, by exploring novel and high-risk ideas building on scientific foundations. By providing flexible support to goal-oriented and interdisciplinary collaborative research on various scales and by adopting innovative research practices, the aim is to identify and seize opportunities of long-term benefit for citizens, the economy and society. FET will bring Union added value to the frontiers of modern research. (EC 2013a, L347/127)

FET sits within the “Excellent Science” arm of Horizon 2020 (H2020), the European Commission’s 8th research and innovation framework program. The Commission’s rationale for “Union level

intervention” in research and innovation are diverse, including: supporting trans-national mobility, career training and development; initiating high-risk long-term research and development; raising the profile of excellent research; addressing identified societal challenges; and fostering economic and commercial gains (EC 2011c, p. 3). The goals of the Excellent Science programme arm include “focusing on the next generation of science, technology, researchers and innovations and providing support for emerging talent from across the Union and associated countries, as well as worldwide” (EC 2013a, L347/123). Together with the Industrial Leadership, Societal Challenges, and other parts of H2020, Excellent Science and FET comprise a response to stabilizing the financial and economic systems of Europe following an economic recession in 2008, as well as a measure to open up future economic opportunities (EC 2011a). Within Excellent Science, FET can be described as the “high-risk idea catalyst” and “community building instrument” of H2020 with a clear logic of aspiring to seed science and technology projects as long-term “investments” critical to societal and economic advancement (EC 2011a; EC 2017a).

All FET activities are expected to integrate a range of research players, and people from a range of stakeholder communities, including “civil society, policymakers, industry and public researchers” (EC 2013a, p. 24). This expectation aligns with general guidance in the regulation, which stipulates all work programs to devote attention to cross-cutting actions. Cross-cutting actions identified by the Commission (2013a) include integrating interdisciplinary and cross-sector research; addressing climate change and sustainable development issues; and enhancing research profession mobility, attractiveness and networks. Of particular relevance to this diagnosis is the requirement for cross-cutting action on responsible research and innovation (EC 2013a, II.1.14.1.I) (RRI).

In Work Programme 2014-2015, FET set out to enhance the diversity of disciplines involved in its research portfolio, and to integrate European-level strategies, such as High-Performance Computing and Public Private Partnership, and the European Technology Platform. The program continued to develop upon Flagship-level projects, started in Framework Programme 7 (FP7) as a “new instrument for large scale European science and innovation” (EC 2017c, p. 75; EC 2014a). With Work Programme 2016-2017, FET more advanced a more aggressive industrial strategy for science and technology innovation, as well as to leverage topics of common interest to EU Member States and Associated Countries (MSACs) into extra resources (EC 2017c, p. 75). FET Open—set at 40% of programme funds (EC 2013a)—became more strongly branded as funding, “novel ideas for radically new technologies,” with Proactive as “boosting emerging technologies” (EC 2017d). ERA-NET Co-fund actions from this second work package sought to further encourage MSACs to reinforce FET Flagship initiatives at regional and national programme levels.

In the Interim Evaluation of H2020, FET was lauded for being adaptive to emergent research needs (among other Excellent Science pillar funding programmes). As an example, the report praised a responsive research project on economic and societal needs from privacy, security, and financial concerns of emerging biotechnologies (EC 2017a). The Interim Evaluation also noted that FET has been true to its open, non-prescriptive calls, fostering a range of “approaches and solutions” to future and emerging technology research (EC 2017c).

Several FET programme aspects were, nonetheless, flagged by the Interim Evaluation as of particular concern. One point of feedback regarded broad topical dispersion of FET projects. While not surprising given the bottom-up nature of a programme with a significant portion of investigator-

driven funding (e.g., FET Open), the Interim Evaluation remarked that such dispersion may impede cross-fertilization of experience with R&I funding. By contrast, FET was compared with the less open, more directed foci of LEIT programming (EC 2017a). While such comments seem to stand in opposition to the nature of FET as part of the investigator-driven Excellent Science arm of H2020, additional comments include:

- FET was praised generally for focusing on technologies with high potential economic impact (according to a McKinsey study cited by the report EC 2017a). FET Flagships were praised specifically for supporting academic-private partnerships, often with “high-tech research-intensive SMEs” (EC 2017a, p. 122). The Graphene Flagship, for example, has been specifically designed to forge partnerships for industrial development across the entirety of the potential commercialization value chain.
- FET was praised as a “hallmark” of interdisciplinary projects. The Flagships were again noted for leading partnerships across 100+ organizations each. The Human Brain Project alone has six central “ICT Platforms” linking 750 scientific and engineering collaborators from some 114 institutions across 24 European Countries (EC 2017a, p. 126).
- FET was noted for making a large percentage contribution to the Europe 2020 Digital Agenda for Europe and the “Digital Single Market Strategy” (EC 2015). FET spending on digital research and innovation tracked in H2020 shows that as of 1/1/2017, 68% of FET funding was flagged as progressing the Digital Agenda (EC 2017a).

The Work Programme for 2018 - 2020 was developed with input from the H2020 Interim Evaluation (EC 2017e). In addition, the Proactive line held a consultation focused on specific technologies for the programme to cultivate. These external inputs were further combined with results of the OBSERVE horizon scanning CSA funded ([See section 4.4.2](#)).

7.3.1.1 What is your program about?

FET functions as the “high-risk idea catalyst” and “community building instrument” of H2020. The FET aspiration is to seed science and technology projects as long-term “investments” enabling societal and economic advancement. FET has three main goals related to knowledge generation, capacity building, and commercialization:

- **Knowledge generation:** As an investigator-driven science and technology initiative, scientific objectives for FET are paramount, and measured in terms of high-impact peer-reviewed journal publications and patent applications. The scientific “return on investment” expected is 25 publications per EUR 10 million in funding, and 1 patent application per EUR 10 Million in funding (EC 2011b, p 89). As of 1/1/2017, FET had generated 372 peer-reviewed publications. Evaluators responsible for these data note the two FET Flagships had only started in 2016, and as such their respective research products from the 2.5 year ‘ramp-up phase funding’ (EUR 54 million per Flagship, from Framework Program 7 (FP7)) were not counted (782 and 272 publications for Graphene and Human Brain Project Flagships, respectively) (EC 2017a; 2017c).

- **Capacity building:** Along with other elements of Excellent Science, like Marie Curie actions, FET actively supports “training, mobility and career development for young talent” (EC 2011a).
- **Commercialization:** FET seeks to combine knowledge generation and capacity building for the long-term purpose of commercialization: to “provide *patient funding* [emphasis original] that serves to build up confidence in new ideas, in those having them and the teams collaborating on them. According to the relevant unit at DG CNECT, it thus grows innovation capacity for the future, both in terms of ideas, the possibilities they create and the people taking them forward” (EC 2017c, p. 113).

Overall, FET specific aspirations align with H2020 objectives by attempting to mobilize networks of scientists and engineers; boost innovation and industrial potential of innovation ecosystems; and contribute to science and technology in service of addressing economic development. Interim evaluation results note, however, that the potential of FET to deliver on these aspirations will require longer-term analysis and follow up (EC 2017c).

7.3.1.2 What is the size and structure of your program in terms of budget, applications and projects?

FET positions itself very strongly as an investigator-driven program. An advisory board of predominately life and physical scientists and engineers provide input to FET work programmes (EC 2011d), with input supplemented from expert advising contracts and the results of Coordination and Support Actions (CSAs) ([see for example OBSERVE in section 4.4.2](#)). FET’s investigator-driven position within Excellent Science contrasts with “top-down” programming found in Industrial Leadership (business-driven) or Societal Challenge arms (EC 2013a). Under the premise of its investigator-driven status, FET focuses on “the needs and opportunities of science, without pre-determined thematic priorities” (EC 2011c, p 6).

FET has three different active call areas: FET Open; FET Proactive; and FET Flagships, in addition to a complementary range of networking and community-based activities to support future FET developments, and research and innovation (RIA) and coordination and support (CSA) actions related specifically to the topic of High-Performance Computing (HPC) (EC 2011d, p. 29). FET Open projects are mandated to comprise 40% of the programme, for an allotted total about EUR 1 billion, and to foster very early-stage new ideas that challenge scientific and technological paradigms (EC 2013a). FET Proactive projects (circa EUR 300 million) support more mature but still emerging research communities, with the goal of helping consolidate “a European pool of knowledge” on science and technology topics (EC 2011b, p. 36). FET Flagships (circa EUR 828 million) are large-scale, ambitious scientific projects to provide “a strong and broad basis for future technological innovation and economic application...plus novel benefits for society” (EC 2011b, p. 35), and to “tackle grand science and technology challenges required cooperation among a range of disciplines, communities and programs” (EC 2011d, p. 29). Additionally, FET HPC initiatives (circa EUR 354 million), are designed to support Europe’s future high-performance computing ecosystem to provide “innovative, usable and competitive solutions that will upraise Europe’s scientific capabilities and industrial competitiveness” (EC 2017g, p. 24).

The initial proposed FET budget, listed in COM(2011) 809 (EC 2011b, p. 85) was EUR 3,505 million, of which 40% had to be devoted to FET Open (EC 2011d, p 25). Final budget allocated to FET is EUR

2.69 billion, of which 40% must still go to Open projects (EC 2013a). According to the Europa Webgate, a total of 26,686 applications have been submitted to FET as of 9 July 2018; 4,180 of which deemed eligible requesting a total of EUR 13.97 billion (more than 12 times the amount funded). Of those eligible, 240 have been signed (a success rate of 5.7%) for a total of EUR 1.09 billion.⁸⁴

A table of FET H2020 expenditures and number of signed grants, by FET programme line, can be found in Table 2. Geographically, EU-28 countries receive 88.7% of FET funds; of this group, the EU-15 countries receive 85.6% of funding, with non-EU countries receiving 11.3% of funds (almost four times greater than the 3.1% to “new member states” of the EU). Top participating countries by share of FET projects are: Germany (15.2%), United Kingdom (14.2%), France (13.7%); Italy (10.9%), and Spain (9.9%).⁸⁵

Table 17: Number and proportion of grants; amount and share of EU contribution to FET projects as of 9 July 2018.⁸⁶

FET Programme Line	Number of Signed Grants	Share of Signed Grants	EU Contribution (EUR, millions)	Share of Expenditures
FET OPEN	171	71%	426.2	39%
FET PROACTIVE	27	11%	133.7	12%
FET FLAGSHIP	8	3%	362.4	33%
FET High-Performance Computing	34	14%	171.5	16%

As of 9 July 2018, there have been 888 unique participations in FET programming and a total of 2228 FET participations overall. Approximately half of FET participations come from higher or secondary education establishments (HES) (49.8%); some 26.2% from Research Organisations (REC); some 20.3% from Private for-profit entities (PRC) (excluding HES); 2.7% from Public Bodies (excluding REC and HES); and just over 1% from other sectors.⁸⁷ In the Graphene Flagship, where industrial partnership receives greater emphasis, 34% of participating organizations are constituted by PRCs (29 large corporations and 22 SMEs) (EC 2017c).

Oversubscription of “high-quality” projects proposals to FET is the highest of H2020, with a success rate of 5.7%. By comparison, the average success rate in H2020 (as of early 2017) was 11.6%; the FP7 average was 18.5%, and the new-and-emerging-technology-focused LEIT average success rate is 15.7% (EC 2017c). FET has a “low share of high-quality proposals retained for funding” (8.8% against an H2020 average of 26.4%) (EC 2017c, p. 87). While the FET budget is “backloaded,” with 75% of the FET Open budget, for example, set to be spent in the second half of H2020 (effectively increasing

⁸⁴ Information from Europa Webgate, accessed 9 July 2018, available at: Europa Dashboard <https://webgate.ec.europa.eu/dashboard/sense/app/93297a69-09fd-4ef5-889f-b83c4e21d33e/sheet/erUXRa/state/analysis>

⁸⁵ Information from Europa Webgate, accessed 9 July 2018, available at: Europa Dashboard <https://webgate.ec.europa.eu/dashboard/sense/app/93297a69-09fd-4ef5-889f-b83c4e21d33e/sheet/PbZJnb/state/analysis>

⁸⁶ Information from Europa Webgate, accessed 9 July 2018, available at: Europa Dashboard <https://webgate.ec.europa.eu/dashboard/sense/app/93297a69-09fd-4ef5-889f-b83c4e21d33e/sheet/erUXRa/state/analysis>

⁸⁷ Information from Europa Webgate, accessed 9 July 2018, available at: Europa Dashboard <https://webgate.ec.europa.eu/dashboard/sense/app/93297a69-09fd-4ef5-889f-b83c4e21d33e/sheet/PbZJnb/state/analysis>

the amount of funding each year by almost 50%) it is unclear whether the additional funding will alleviate oversubscription issues (EC 2017a; 2017c). As an example of early program oversubscription, out of 815 proposals submitted to the third round of FET Open 2014-2015 calls, 11 RIAs were concluded with grant agreements, a success rate of just 1.4%. By comparison, the first round of funding calls in FET from the 2016-2017 Work Programme yielded a success rate of 4%, (22 awards made from 544 submissions).⁸⁸ Concerns about program oversubscription and low success rates make for some of the major issues that programme stakeholders have expressed in evaluation consultations (EC 2017c). Not explicitly linked, but potentially related: the interim evaluation of FET noted dissatisfaction on the part of applicants with the quality of feedback given, as well as application, evaluation, and selection and reporting procedures (EC 2017c).

Between 2014 and 2016, FET claimed 75% of its allocation as related to ICT. For comparison, 15.7% was claimed as related to sustainable development topics; 14.7% to climate related topics, and 0.5% to biodiversity (EC 2017c). Approximately 9.4% of projects were flagged as relevant to the social sciences and humanities (SSH). Despite making up almost two-thirds of FET project coordinators in this period, women made up only one-quarter of FET participants. Project foci, based on keyword analysis of project abstracts, focused mostly on market orientation and commercialization compared to other societally relevant areas such as health, environment, community, etc (EC 2017c, p. 93). Interdisciplinary research within FET was found to be hampered by a “pro-forma” inclusion of SSH in technology projects (EC 2017c, p. 119). Beyond researchers, stakeholders targeted by FET most commonly include technology providers, young scientists and engineers, high-tech SMEs, and, less commonly, potential users of new ideas or developments (EC 2017c, p. 88), suggesting far less inclusion of CSOs, SSH, general publics, and non-commercial partners.

7.4 Current situation of RRI in the program

7.4.1 RRI in brief

The Future and Emerging Technologies programme line should stand to benefit from RRI and Open Agenda approaches. FET programming is well positioned as a proving ground for addressing concerns with gender inequality in STEM fields, given the strong technology focus of the programme. Addressing aspirations of open access and Open Science also seem endemic to FET, as rapid and early access to knowledge could be of great value across the chain of Open, Proactive, and Flagship activities. Further, concerns about education and science literacy would be natural for the FET programme, as it states an interest in cultivating a curious, capable, and responsible pool of future researchers in Europe. A general FET culture of pushing against technology paradigms in radical ways could open up room for rich public engagement; broader reflection on social values and paradigms associated with technologies; and anticipation of potential consequences of blue-sky technology development (two dimensions of RRI beyond the keys).

⁸⁸ Data from FET webpage, available at:

<https://ec.europa.eu/programmes/horizon2020/en/news/grant-agreements-signed-13-new-fet-open-projects>; and <https://ec.europa.eu/programmes/horizon2020/en/news/25-new-fet-open-ideas-breakthrough-technologies>

7.4.2 Desktop findings

7.4.2.1 Role of RRI on

Policy document level

No	
Yes	<p>Keys:</p> <p><u>Gender</u>: <i>Nothing different than what is expected of other H2020 Programme Lines.</i></p> <ul style="list-style-type: none"> • “The activities developed under Horizon 2020 should promote equality between women and men in research and innovation, by addressing in particular the underlying causes of gender imbalance, by exploiting the full potential of both female and male researchers, and by integrating the gender dimension into the research and innovation content as well as by paying particular attention to ensuring gender balance, subject to the situation in the field of research and innovation concerned, in evaluation panels and in other relevant advisory and expert bodies in order to improve the quality of research and to stimulate innovation” (EC 2013a, L347/107). <p><u>Public Engagement</u>: <i>Nothing different than what is expected of other H2020 Programme Lines (e.g., most commonly with regard to dissemination and communication of results).</i></p> <ul style="list-style-type: none"> • “The engagement of citizens and civil society should be coupled with public outreach activities to generate and sustain public support for Horizon 2020” (EC 2013a, L347/106). <p><u>Open Access</u>: <i>Nothing different than what is expected of other H2020 Programme Lines</i></p> <ul style="list-style-type: none"> • “To increase the circulation and exploitation of knowledge, open access to scientific publications should be ensured. Furthermore, open access to research data resulting from publicly funded research under Horizon 2020 should be promoted, taking into account constraints pertaining to privacy, national security and intellectual property rights” (EC 2013a, L347/107). <p><u>Ethics</u>: <i>Nothing different than what is expected of other H2020 Programme Lines</i></p> <ul style="list-style-type: none"> • “All the research and innovation activities carried out under Horizon 2020 shall comply with ethical principles and relevant national, Union and international legislation, including the Charter of Fundamental Rights of the European Union and the European Convention on Human Rights and its Supplementary Protocols. ... Particular attention shall be paid to the principle of proportionality, the right to privacy, the right to the protection of personal data, the right to the physical and mental integrity of a person, the right to non-discrimination and the need to ensure high levels of human health protection” (EC 2013a, L347/114). <p><u>Science Education and Science Literacy</u>:</p> <ul style="list-style-type: none"> • “The activities [of the ‘Excellent Science’ priority] are inherently forward-looking, building skills in the long term, focusing on the next generation of science, technology, researchers and innovations and providing

	<p>support for emerging talent from across the Union and associated countries, as well as worldwide” (EC 2013a, L347/123).</p> <p><u>Governance:</u></p> <ul style="list-style-type: none"> • “FET shall address the entire spectrum of science-driven innovation: from bottom-up, small-scale early explorations of embryonic and fragile ideas to building new research and innovation communities around transformative emerging research areas and large collaborative research initiatives built around a research agenda aiming to achieve ambitious and visionary goals. These three levels of engagement each have their own specific value, while being complementary and synergistic” (EC 2013a L347/127). <p>O’s:</p> <p><u>Open Science:</u> <i>See open access, above.</i></p> <p><u>Open Innovation:</u></p> <ul style="list-style-type: none"> • “They may involve a wide range of research players, including young researchers and research-intensive SMEs, and stakeholder communities (civil society, policymakers, industry and public researchers), clustered around evolving research agendas as they take shape, mature and diversify” (EC 2013a, L347/127). <p><u>Open to the World:</u></p> <p>Implicit:</p> <p><u>Reflexive:</u></p> <p><u>Inclusive:</u></p> <p><u>Anticipatory:</u></p> <p><u>Responsive:</u></p>
<p>Explanation</p>	<p>Policy level support for RRI in FET devolves mostly from overarching requirements in the establishing EC regulation for H2020 (EC 2013a). In this founding regulation, all H2020 research projects have expectations for addressing gender dimensions of research, public engagement, open access, science education, ethics, and governance—combined under the cross-cutting consideration of RRI.</p> <p>As part of the Excellent Science pillar, FET attends to forward-looking capacity building of the scientific workforce of Europe. This attention connects to RRI dimensions of science education and science literacy. Further the programme attempts to diversify governance (RRI key) mechanisms of research and innovation through differentiated programme lines devoted to projects of varying size and scope, and topical provenance.</p>

Scoping level

<p>No</p>	
<p>Yes</p>	
<p>Explanation</p>	<p><i>See analysis of adopted Work Programme documents</i></p>

Work program level

No	
Yes	<p>Keys:</p> <p><u>RRI in General</u></p> <ul style="list-style-type: none"> • WP 2016-2017: “The approach of FET is in line with the Horizon 2020 Responsible Research and Innovation (RRI) cross-cutting issue, engaging society, integrating the gender and ethical dimensions, ensuring the access to research outcomes and encouraging formal and informal science education (EC 2017d, p.4). • WP 2016-2017, OPEN: “The FET-Open call also seeks for coordination and support activities to turn Europe into the best place in the world for responsible collaborative research and innovation on future and emerging technologies that will make a difference for society in the decades to come (EC 2017d, p. 6). • WP 2016-2017, PROACTIVE, Area 2: Biotech for better life: “A Responsible Research and Innovation approach, including aspects of ethics, as well as social science and humanities should be taken into account” EC 2017d, p.20). <p><u>Gender:</u></p> <ul style="list-style-type: none"> • WP 2014-2015: “FET will pay attention to issues such as gender, age and culture, in the research topics and teams it promotes as well as in its public engagement, aware that this can offer new perspectives, posing new questions, and opening new areas of investigations in, for instance, life sciences, engineering and technological development, environment, food and nutrition, health and medicine, or transport” (EC 2014a, p. 5). <p><u>Public Engagement:</u></p> <ul style="list-style-type: none"> • WP 2016-2017: “More generally, public engagement aims to bring on board a wide diversity of actors (researchers, industry, policy makers, civil society organisations, teachers, artists, citizens etc.) to participate in and/or deliberate on the directions taken by science, research, technology and innovation” (EC 2017d, p. 5). <p><u>Open Access:</u> <i>see open science, below</i></p> <p><u>Ethics:</u></p> <ul style="list-style-type: none"> • WP 2016-2017: The ethical dimension of the activities undertaken through FET should be analysed and taken into account. This implies respect of ethical principles and related legislation during the implementation of the action (data protection and privacy, consent and protection of participants, potential misuse of the research results, fair benefit sharing, environment protection, etc.). Beyond this, the ethical considerations should also address the desirability of the action's potential long-term implications (i.e., socioeconomic, climate, sustainable development) (EC 2017d, p.5). <p><u>Science Education and Science Literacy:</u></p> <p><u>Governance:</u></p>

O's:

Open Science:

- WP 2014-2015: “The silo-breaking research collaborations in FET will also improve readiness across Europe to take up new research and innovation practices for making leading-edge science and technology research more open, creative and closer to society, especially through 'digital science', promoting for instance open scientific data, advanced simulation, and the use of platforms for open collaboration or for better involvement of the general public in research (EC 2014a, p.5).
- WP 2014-2015: “The projects funded under the Future and Emerging Technologies part of the Work Programme 2014-15 will participate in the Pilot on Open Research Data in Horizon 2020 in line with the Commission's Open Access to research data policy for facilitating access, re-use and preservation of research data. Projects have the possibility to opt out of the pilot” (EC 2014a, p.5; Similar inclusion in Pilot on Open Research Data in WP 2016-2017, and in WP 2018-2020, engaging in research data sharing by default).
- WP 2016-2017: “Silo-breaking research collaborations are a hallmark of most FET actions. They improve readiness across Europe to take up new research and innovation practices that make leading-edge research more open, creative and closer to society, for example through 'open science', the use of advanced modelling, simulation and open collaboration platforms” (EC 2017d, p. 5).

Open Innovation:

- WP 2014-2015: “FET promotes dialogue and cooperation between science, industry, citizens and policy makers on how to turn new technological possibilities into an opportunity for industry and a benefit for society. This will boost long-term innovation potential in Europe both from the abundance of novel ideas and the diversity of actors ready to take them forward” (EC 2014a, p. 5).

Open to the World:

- WP 2014-2015: “FET research is well placed for global collaborations that can raise the level of excellence and accelerate the impact from global alliances. Thus, participation of excellent non EU partners in FET activities, whenever necessary and essential, is welcome” (EC 2014a, p.5).
- WP2016-2017: “FET research is well placed for global collaborations that can raise the level of excellence and accelerate the impact from global alliances. Thus, participation of excellent non EU partners in FET activities, whenever necessary, is welcome” (EC 2017d, p. 5).

Implicit:

Reflexive:

Inclusive:

Anticipatory:

	<u>Responsive:</u>
Explanation	<p>Support for RRI in FET has increased over the course of three Work Programmes. Such an increase is evidenced in more explicit and more prominent inclusion of RRI text in introductory, scoping, and impact sections of work programme introduction and topic text. WP 2016-2017 represents a particular watershed for inclusion of RRI as an explicit phrase, in addition to attending to each dimension of RRI explicitly.</p> <p>Regarding the Open Agenda, a commitment to Open Science is present consistently. Open Innovation, while never explicitly mentioned as such, is readily visible in the increasing levels of funding over each successive WP to coordination and support actions, and “Innovation Launchpads” that seek turn “results from FET-funded projects into genuine societal or economic innovations.” The encouragement of interdisciplinarity, while far from a full embrace of cross-sector collaboration, is a nascent form of Open Innovation encouraged in the program. Open to the World is expressed more marginally, but also consistently, as an interest in global collaboration related to excellent research.</p> <p>Presence of RRI beyond the keys is more difficult to detect in FET Work Programmes. While dimensions of inclusion are hinted at in interdisciplinary and cross-sector collaborations for excellent research—with strong market orientation—reflexivity about the direction, “ethical acceptability, social desirability, and sustainability” (von Schomberg 2013) are not visible. There is some consideration of anticipation, specifically related to sustaining the research capacity of the communities funded by Excellent Science, but this is at once general, related to the labour force, and not attentive to the potential consequences and considerations of technology in society (Barben et al., 2008).</p>

Call level

No	
Yes	<p>Keys:</p> <p><u>RRI in General</u></p> <ul style="list-style-type: none"> • FET Flagship Core Projects: Graphene, and Human Brain Project: “Proposals should detail activities in areas such as education, dissemination, ethics and societal aspects” (EC 2014a, p. 30 & 31; EC 2017d, p. 41 & 43; EC 2017e, 45 & 46). • FET Flagship Core Projects, Human Brain Project: “This covers in particular progress in key areas such as ... as well as ethical and societal aspects” (EC 2014a, p. 31). • WP 2018-2020, FETOPEN-02-2018: FET-Open Coordination and Support Actions—Improved readiness across Europe to engage in interdisciplinary research collaboration and to take up new, open and responsible research and innovation practices, with due attention to aspects such as education, gender differences and long-term societal, ethical and legal implications (EC 2017e, p. 8). • WP 2018-2020, FETFLAG-01-2018: Preparatory Actions for new FET Flagships— “At the end of the action, the design and description of the candidate Flagship should include the following elements: ... An approach to address responsible research and innovation, in particular aspects such as education, gender aspects and societal, ethical and legal implications” (EC 2017e, p. 31 & 32).

Gender:

- FETPROACT-01-2016: FET Proactive: emerging themes and communities – “Area 1: Future technologies for societal change: Being human in a technological world: critical interdisciplinary explorations of potentially game-changing impacts of future technologies on humanity, in plausible as well as in extreme scenarios. This can include individual, gender, organisational, economic, cultural and societal impacts, for instance from changes to self- or social perception, to our narratives, or to human development (e.g., cognitive, physical) or evolution” (EC 2017d, p. 18).

Public Engagement:

- FETOPEN-03-2017: FET-Open Coordination and Support Actions: “This topic should include public engagement processes as discussed in the introduction of this FET Work Programme” (EC 2017d, p. 11).
- FETPROACT-01-2016: FET Proactive: emerging themes and communities: “...to foster the emergence of a broader innovation ecosystem for a new technology as well as a fertile ground for its future take-up (e.g., through public engagement processes when relevant, or through formal and informal education) (EC 2017d, p. 19).
- *See science education and science literacy in FETFLAG-03-2018, below.*

Open Access:

Ethics:

- *Various WP 2018-2020 Proactive calls include language like, “Work on ethical implications should be included”; “Work on ethical implications and gender should be included (EC 2017e, p. 16 & 17).*

Science Education and Science Literacy:

- *See public engagement in FETPROACT-01-2016.*
- FETFLAG-03-2018: FET Flagship on Quantum Technologies—B. Coordination and Support Action: Proposals should aim at coordinating the relevant stakeholders, notably academia, RTOs and industry participating in the Flagship initiative. In particular, it is expected to establish a communication platform, facilitate dialogue, promote the objectives of the Flagship and monitor the progress, support the governance structure, organize outreach events (including addressing the impact of technology development on economy and society), identify training and education needs and promote European curricula in quantum engineering, identify and coordinate relevant standardisation, IPR actions, and international collaboration and help networking of respective national and international activities in the field.

Governance:

- WP 2016-2017: Call - FET FLAGSHIPS – Tackling grand interdisciplinary science and technology challenges: They require cooperation among a range of disciplines, communities and national, regional and European programmes. The implementation model of the Flagships and their

governance structure are described in the Commission Staff Working Document on FET Flagships (EC 2017d, p. 34)

- WP 2018-2020, FETFLAG-01-2018: Preparatory Actions for new FET Flagships— “An effective scientific leadership and governance structure based on lessons learned from the present Flagships, describing the coordination and decision-making structures of the Flagship, the role of industry and the relations with Member States and countries associated with Horizon 2020, with the Commission and with the relevant funding agencies and national research initiatives” (EC 2017e, p. 31 & 32).

O’s:

Open Science:

Open Innovation:

- FETPROACT-01-2016: FET Proactive: emerging themes and communities; Area 4: New technologies for energy and functional materials; Expected impact, “Emergence of an innovation ecosystem around a future technology in the theme addressed from outreach to and partnership with high potential actors in research and innovation, and from wider stakeholder/public engagement” (EC 2017d, p. 22).

Open to the World:

Implicit:

Reflexive:

- FETPROACT-01-2016: FET Proactive: emerging themes and communities; Area 1: Future technologies for societal change—Being human in a technological world—“The work should provide fresh perspectives that challenge current thinking, include ethical and social aspects, reflecting on the purposes, impacts and motivations for the research and innovation activity, the associated uncertainties, areas of ignorance, assumptions, questions and dilemmas; and by this crystalize through active stakeholder engagement concrete options for shaping a worthwhile and responsible future” (EC 2017d, p. 19).
- WP 2018-2020; FETPROACT-01-2018: FET Proactive: emerging paradigms and communities – Time – “Technologies in, for instance, extreme electronics/photonics, data-streams analytics, time aware artificial intelligence, virtual and augmented reality, bio-engineering or neuroprosthetics could demonstrate new ways to represent, modulate, duplicate or differently experience and use time, thus altering our relationship with time (at individual and collective but differentiated level – e.g., according to gender or culture) and with impacts on, for instance, quality of life, therapy, learning, productivity, social and environmental awareness or the better understanding and management of natural hazards” (EC 2017e, p. 16).

Inclusive & Anticipatory:

- FETOPEN-03-2017: FET-Open Coordination and Support Actions: “FET Futures [2017] 3: identifying strategy options, challenges and opportunities to stimulate and organise interdisciplinary research and innovation towards new and visionary technologies of any kind. Actions

	<p>should rely on evidence from FET activities (e.g., portfolio, constituency, results) and from other sources (including other funding bodies or private initiatives worldwide, like those using prize schemes or challenges). They should aim at open and dynamic stakeholder participation using creative methods and on-line tools/social networks” (EC 2017d, p. 10-11).</p> <ul style="list-style-type: none"> • WP 2018-2020, FETFLAG-01-2018: Preparatory Actions for new FET Flagships— “At the end of the action, the design and description of the candidate Flagship should include the following elements: ... A strategic long-term research roadmap, showing how the unifying goal can be realised and what the major milestones are, situating the Flagship in the global landscape and demonstrating a credible path towards societal impact, technology development, innovation and exploitation” (EC 2017e, p. 31 & 32). • (& Reflexive) WP 2018-2020: FETOPEN-02-2018: FET-Open Coordination and Support Actions—FET Observatory: “Ongoing and systematic identification of new and emerging technologies from FET portfolio analysis, trends analysis (using for instance bibliometric tools, media watch, consultations and workshops) and broader horizon scanning (beyond research), including also consideration of ethical implications, gender differences and long-term impacts on society and humankind” (EC 2017e, p. 8). <p><u>Responsive:</u></p>
Explanation	<p>Inclusion of RRI becomes increasingly robust at the call level in FET over the course of each work programme. In 2016-2017, Open and Proactive calls include language that calls for reflection on trends, implications, and fundamental assumptions associated with science and technology development. Flagship calls are consistently supportive of including consideration of gender and ethical dimensions. The inclusion of these cross-cutting social and ethical dimensions is notable, despite the most common placement of these considerations being at the end of call texts.</p>

Project level

No	
Yes	
Explanation	<i>Please see “Case Briefs” in section 4.4</i>

Proposal Template level

No	
Yes	<p><i>See analysis shared on the VSL:</i> https://vsl.newhorizon.ihs.ac.at/?page_id=137&view=topic&id=14.</p> <ul style="list-style-type: none"> • Of relation to RI/RRI/OOO, following proposal template attributes are of note: elements of anticipation (e.g., related to commenting on obstacles and critical risks to delivering expected impacts); sections requiring consideration of gender; opportunities to expound on ethical issues related to research integrity and responsible conduct of research, and also to more macro-ethical issues (e.g., the section on impact of research); and information on open access considerations.
Explanation	<p><i>See analysis shared on the VSL:</i> https://vsl.newhorizon.ihs.ac.at/?page_id=137&view=topic&id=14. Excerpts of</p>

	<p><i>overarching points, drawing from EC 2014; 2016b; 2017h; 2017i; 2017j; 2017k:</i></p> <ul style="list-style-type: none"> • RIA and CSA templates are nearly identical to each other and remain stable over time. Differences between the CSA templates from 2014 and 2017 mirror those identified in the RIA 2015 and 2017 templates. Small additional changes were made thought the templates for the 2018-2020 work program. • Note that in the guidance on completing ethical self-assessments, the role of the ethicist in the pre-proposal stage is described as follows: “From the beginning of your project, an ethics adviser can help you deal with ethical issues and put in place the procedures to handle them appropriately. If your research includes several ethical concerns or involves several significant or complex ethical issues (such as participation of children from developing countries, ‘non-human primates (NHPs)’, potential misuse or vulnerable populations) we suggest you appoint an ethics adviser or an ethics advisory board comprising several experts from different backgrounds. The Commission/Agency may also make this an ethics requirement during the selection procedure.” • Changes between 2014-2015 and 2016-2017 versions of the templates reveal the kinds of minor modifications that can be carried out in proposal templates. For example, in the ethics tables, addition of language related to Environment & Health and Safety (beyond just the environment); in section 2.2., greater prominence to inclusion of business plans where relevant; more abundant notes to submitters regarding the Pilot on Open Research Data in Horizon 2020; greater specificity on articulate where, who, and how impact will be disseminated and followed-up; in section 3.3, prompts to articulate the specific contributions of project partners to the project. • These differences seem to show how proposal templates can be meaningfully updated in ways that encourage specificity of plans regarding prospective risks, managerial dimensions, and engagement plans. Importantly, several of these changes may be also tied to evaluation guidelines—specifically, the criterion: “quality and efficiency of implementation” that is common to most RIA and CSA actions. While this is often a minority weight in evaluation, it seems one of the few points of leverage for influencing “non-research-content” related change. • For WP 2018-2020, the templates do seem responsive to feedback from the H2020 evaluation related to gender. In addition, the template seems to reflect an increased awareness that ‘public/societal engagement’ can be central to the conceptual underpinnings of a project, beyond a tack-on to a communications plan. <p>How the above changes identified actually affect proposal submissions, evaluation scores, and project implementation requires research and analysis beyond the scope of the NewHoRRizon project, a coordination and support action.</p>
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Evaluation level

No	
Yes	<p>Keys:</p> <p><u>RRI in General, specific to FET:</u></p> <ul style="list-style-type: none"> • WP 2014-2015, FET Flagship FPA, “excellence criterion”: Quality and relevant experience of the individual participants and the consortium as

a whole with regards to non-scientific aspects (e.g., ethics, dissemination, societal engagement and gender issues) (EC 2014a, p.28).

- WP 2014-2015, FET Flagship Core Projects, “impact criterion”: “Approach to address societal benefit and potential ethical and legal implications, including engagement with authorities and end-users” (EC 2014a).
- WP 2018-2020, FET PROACTIVE-01-2018 Expected impact, evaluated in Impact criterion: “Emergence of an innovation ecosystem around a future technology in the theme addressed from outreach to and partnership with high potential actors in research and innovation, and from wider stakeholder/public engagement, with due consideration of aspects such as education, gender differences and long-term societal, ethical and legal implications” (EC 2017e, p. 19).
- WP 2018-2020, FETFLAG-01-2018, Excellence criterion, “Degree of adherence to the FET Flagship concept as specified in the work programme.” Referenced text: “An approach to address responsible research and innovation, in particular aspects such as education, gender aspects and societal, ethical and legal implications” (EC 2017e, p. 32 & 40).

RRI in General, in General Annex H criterion:

- WP 2014-2015, RIA, Impact Criterion “Any other environmental and socially important impacts (not already covered above)” (EC 2013b, Section H).
- WP 2014-2015, All types of actions, Impact Criterion “The expected impacts listed in the work programme under the relevant topic” (NOTE, only relevant for RRI if a key is mentioned in work programme impact sections) (EC 2013b, Section H).
- WPs 2016-2017 and 2018-2020, All types of actions, Impact Criterion “The extent to which the outputs of the project would contribute to each of the expected impacts mentioned in the work programme under the relevant topic” (NOTE, only relevant for RRI if a key is mentioned in work programme impact sections) (EC 2017f, Section H).
- WPs 2016-2017 and 2018/2020, Framework partnership agreements, “The extent to which the action plan of the FPA would contribute to each of the expected impacts mentioned in the work programme under the relevant topic” (NOTE, only relevant for RRI if a key is mentioned in work programme impact sections) (EC 2017f; 2017g, Section H).

Gender: (in general Annex H criterion)

- WP 2018-2020, RIA, Excellence Criterion, “Appropriate consideration of interdisciplinary approaches and, where relevant, use of stakeholder knowledge and gender dimension in research and innovation content.” (EC 2017g, Section H).
- In the case of ties, the third-level rule is stated as: “If necessary, any further prioritisation will be based on the following factors, in order: size of budget allocated to SMEs; gender balance among the personnel named in the proposal who will be primarily responsible for carrying out the research and/or innovation activities” (EC 2013b, p. 31; 2017f, p. 34; 2017g, p. 32).

Public Engagement: (in general Annex H criterion)

- WP 2014-2015, RIA & CSA, Impact Criterion, “Effectiveness of the proposed measures to exploit and disseminate the project results (including management of IPR), to communicate the project, and to manage research data where relevant.” An argument could be made for communication relating to Public Engagement (EC 2013b, Section H).
- WPs 2016-2017 and 2018-2020, RIA & CSA, Impact Criterion, “Quality of the proposed measures to: Exploit and disseminate the project results (including management of IPR), and to manage research data where relevant; Communicate the project activities to different target audiences” (EC 2017f, Section H). An argument could be made for communication relating to Public Engagement.

Open Access:

Ethics:

Science Education and Science Literacy:

- WP 2018-2020: FETFLAG-01-2018: Impact criterion, “Long-lasting structuring effect on research efforts in Europe, anchor point for international cooperation and the nurturing of talent through the training of a new generation of researchers” (EC 2017e, p. 40)

Governance:

O’s:

Open Science:

Open Innovation: (in general Annex H criterion).

- WP 2014-2015, RIA, Excellence Criterion “Soundness of the concept, including trans-disciplinary considerations, where relevant” (note, removed in later WPs) (EC 2013b, Section H).
- WP 2014-2015, All types of actions, Quality and efficiency of the implementation, “Complementarity of the participants within the consortium (when relevant)” (EC 2013b, Section H).
- WP 2016-2017, RIA, Excellence Criterion, “Appropriate consideration of interdisciplinary approaches and, where relevant, use of stakeholder knowledge” (EC 2017f, Section H).
- WP 2018-2020, RIA, Excellence Criterion, “Appropriate consideration of interdisciplinary approaches and, where relevant, use of stakeholder knowledge and gender dimension in research and innovation content” (EC 2017g, Section H).
- WPs 2016-2017 and 2018-2020, Framework partnership agreements, “Complementarity of the partners, and balance of expertise; Potential for long term cooperation among the partners” (EC 2017f; 2017g, Section H).
- FETPROACT-01-2016, Impact criterion: “structuring effects on multidisciplinary communities of researchers and stakeholders ... innovation potential and leadership from the emergence of a new

	<p>innovation ecosystem, the empowerment of new and high potential actors and from public engagement” (EC 2017d, p.26).</p> <p><u>Open to the World:</u></p> <p>Implicit: <u>Reflexive:</u></p> <p><u>Inclusive:</u></p> <ul style="list-style-type: none"> • For projects that identify / are flagged for social science and humanities (SSH) contributions, evaluators are given the explicit guidance, in the evaluation section of the European Commission Online Manual: “A proposal without a sufficient contribution/integration of SSH research and competences will receive a low evaluation score.”⁸⁹ <p><u>Anticipatory:</u></p> <p><u>Responsive:</u></p>
Explanation	<p>In H2020, each programme has specific remit to modify proposal evaluation criteria to suit the interests and needs of the programme. Regarding RRI, FET has made changes to criterion that are supportive of RRI—particularly in Flagship programming, where the Excellence criterion for core projects and specific grant agreements reinforces RRI interests. Flagship criteria also provide incentive for science education and science literacy keys. FET emphasizes RRI in the Impact Criterion for Proactive in 2016-2017, as well. Each of these modifications demonstrate that programme lines are able to change evaluation criteria to encourage implementation of cross-cutting activities in H2020.</p>

7.4.2.2 General use of RRI

Horizon 2020 has three main priorities—to generate excellent science, spur economic growth, and respond to societal challenges related to energy, food, security, climate, and other domains (EC 2013a, L347/105.11). This founding legislation of H2020 stipulates a variety of ways to integrate science with and for broader society in order to realize these priorities. H2020 programmes have a requirement to attend to a variety of cross-cutting issues and other mechanisms to foster “the informed engagement of citizens and civil society in research and innovation” (EC 2013a, Annex I). Further, programs have a requirement to pay particular attention to “responsible-research and innovation including gender” as a cross-cutting issue (EC 2013a, sec. 14.1.I). Under a section on “external advice and societal engagement,” the Commission further notes that programmes must take account “of advice and inputs provided by independent advisory groups of high level experts set up by the Commission from a broad constituency of stakeholders, including research, industry and civil society, to provide the necessary inter-disciplinary and cross-sectoral perspectives, taking account of relevant existing initiatives at Union, national and regional level” (EC 2013a, II.1.12.1).

The notion of Responsible Research and Innovation (RRI) helps to advance the above objectives of the Commission. As articulated in the founding regulation of H2020, RRI consists of attending to six

⁸⁹ European Commission Online Manual, The SSH In the Research and Innovation Chain, Evaluation, available at: https://ec.europa.eu/research/participants/docs/h2020-funding-guide/index_en.htm

cross-cutting issues: gender, ethics, science literacy, stakeholder and public engagement, open access, and governance (EC 2013a). In addition to these RRI dimensions, the Commission has prioritized a broader means of fostering alignment among science and society through the ideas Open Innovation, Open Science, Open to the world (Open Agenda) (EC 2016a). The EC Open Agenda describes these dimensions, respectively, as:

- Open Innovation — “co-creation” that unfolds across innovation ecosystems and requires knowledge exchange and innovation capacity of all actors involved, be they financial institutions, public authorities or citizens, businesses, or academia (EC 2016a, p.12).
- Open Science — a concept of transformed scientific practice, wherein the foci of researcher activity shifts from “publishing as fast as possible” to “sharing knowledge as early as possible,” in manners that are accessible to as many parts of the innovation ecosystem as possible (EC 2016a, p. 34).
- Open to the World — “Fostering international cooperation in research and innovation” to enable access to “the latest knowledge and the best talent worldwide, tackle global societal challenges more effectively, create business opportunities in new and emerging markets, and use science diplomacy as an influential instrument of external policy” (EC 2016a, p. 59).

FET activities, as with all H2020 programme lines, implement RRI and the Open Agenda in different ways. Per the establishment of H2020, FET work programmes “contain a section which identifies the cross-cutting actions as referred to in Article 13 of Regulation (EU) No XX/2012 [Horizon 2020], across two or more specific objectives both within the same priority and across two or more priorities. Those actions shall be implemented in an integrated manner” (EC 2011d, p14). As reviewed above, the implementation of RRI language into FET WPs, calls, evaluation criteria, and projects changes over time. Work programmes 2016-2017 and 2018-2020 see the introduction of explicit use of the term RRI in general text. This is in contrast to the 2014-2015 programme wherein gender and public engagement are mentioned explicitly (EC 2014a, p.5), but not in the context of RRI. The 2016-2017 WP also includes greater detail on public engagement and ethics keys.

Over time, RRI gets included not only in FET programme introductory text, but also in topic-specific texts. For example, in 2016-2017, Open and Proactive calls mention responsibility in research and innovation explicitly. RRI has been consistently advanced in FET Flagships across work programmes; calls on FET Flagship Core Projects, Graphene, and Human Brain Project each consistently state: “Proposals should detail activities in areas such as education, dissemination, ethics and societal aspects” (EC 2014a, p. 30 & 31; EC 2017d, p. 41 & 43; EC 2017e, 45 & 46). In 2018-2020, FETFLAG-01-2018: Preparatory Actions for new FET Flagships, the text also explicitly mentions RRI: “At the end of the action, the design and description of the candidate Flagship should include the following elements: ... An approach to address responsible research and innovation, in particular aspects such as education, gender aspects and societal, ethical and legal implications” (EC 2017e, p. 31 and 32).

Perceived benefits to the programme from RRI are visible in the way FET justifies these requirements in WP 2016-2017. An entire paragraph explicitly states that the programme aspires to align with RRI cross-cutting issues, attending to gender, ethics and education dimensions, “being convinced that this can offer new perspectives, pose new questions and open new areas of investigations” (EC 2017d, p. 4). Similarly, a paragraph in the introduction expresses a commitment to Open Science via open collaboration platforms. In this same paragraph, the program makes a commitment to

artistically and creatively exploring visions of technology and exploring, “social acceptance” of technology (EC 2017d). More generally, the introduction continues, there is an aspiration to conduct public engagement “to bring on board a wide diversity of actors (researchers, industry, policy makers, civil society organisations, teachers, artists, citizens etc.) to participate in and/or deliberate on the directions taken by science, research, technology and innovation” (EC 2017a, p. 5).

Work Programme 2016-2017 also encourages exploration of ethical issues at micro (data protection, privacy, consent, misuse) and macro (desirability, socioeconomic issues) dimensions (see Herkert 2005 for a discussion of differences between micro and macro ethics). Further, by WP 2018-2020, projects are by default included in the Open Research Data pilot of Horizon 2020, allowed to opt-out only with justification (EC 2017d; 2017e).⁹⁰

Beyond calls for RRI in the way projects are implemented, there is evidence that FET is open to practicing RRI in the shaping of FET programming, opening up to more inclusive and participatory processes for gathering input to Work Programme 2018-2020. This third FET WP builds off of several inputs to the programme, including a public consultation process for the Proactive call;⁹¹ results of a horizon scanning coordination and support action; the H2020 Interim Evaluation; and advisory board input.

The majority of consultation input (for Proactive funding) focused on physical science and engineering topics. Almost half of all consultation input focused on spin-based technologies (12 / 59 comments) and biomedical technologies (11 / 59), with the rest distributed among topics on information and engineering of complex systems; energy technologies; high-performance computing; ‘smart textiles;’ and soft robotics. A small number of comments encouraged greater inclusion of arts, humanities and other social science perspectives. RRI topics seemed absent both from the consultation process, and the OBSERVE project CSA horizon scanning ([see section 4.4.2](#)).

Introductory text of the 2018-2020 FET Work Programme is suffused with language related to responsible research and innovation and orienting research to address societal challenges. According to this third WP text, FET “activities aim to create in Europe a fertile ground for responsible and dynamic multi-disciplinary collaborations on future technologies and for kick-starting new European research and innovation ecosystems around them. These will be seeds for future industrial leadership and for tackling society's grand challenges in new ways” (EC 2017e, p.2).

This third work programme is also responsive to feedback from the interim evaluation. In response to interim evaluation feedback (EC 2017c; 2017e), the programme in 2018-2020 sought to:

- Increase budget and provide clearer, “enforced scoping, and advice on resubmission” to deal with oversubscription and underfunding issues.
- Increase FET Innovation Launchpad to further leverage FET results.

⁹⁰ Note, it is unclear whether opting out or remaining in the Open Pilot carries evaluative weight. Presumably carrying evaluative weight would be difficult because open access when it comes to industry get entangled with intellectual property rights topics—a subject beyond the control of a given research team, or DG RTD.

⁹¹ Information on FET public solicitation process available at: <https://ec.europa.eu/digital-single-market/en/news/analysis-fet-proactive-consultation-preparation-fet-work-programme-2018-2020>).

- Increase coherent implementation of programming related to Proactive and Flagship efforts around HPC and Quantum strategies, emphasizing cooperation across projects and with national/regional programmes (*relation to coordination, beyond RRI keys (Foley et al. 2016)*).
- Promote more data sharing (*relation to open access and open science*).

Of relevance to RRI, the specific challenge text for 2018-2020 WP explicitly calls for, “including the social sciences and humanities” in interdisciplinary collaborations (new language compared to 2016-2017) (EC 2017e, p. 7). This position reflects guidance by the advisory board (FET Advisory Group 2016). Language about RRI is, however, remains absent from the “Gatekeepers” for FET Open projects.

With regards to FET Coordination and Support Actions, one of three 2018-2020 FET Observatory calls includes in its scope anticipatory, horizon scanning activities, “Including also consideration of ethical implications, gender differences and long-term impacts on society and humankind” (EC 2017e, p. 8). Such a position aligns with the aspiration for anticipation as an activity associated with RRI beyond the keys. The expected impact for this and other Open CSAs reflects expectations that these types of activities can contribute to Open Innovation, as well as RRI keys of ethics, gender, and science education: “Improved readiness across Europe to engage in interdisciplinary research collaboration and to take up new, open and responsible research and innovation practices, with due attention to aspects such as education, gender differences and long-term societal, ethical and legal implications” (EC 2017e, p. 9).

The 2018-2020 Proactive calls embody the many interests of FET in the EC: prioritizing R&I that can deliver commercial potential, while also addressing dimensions of RRI. The third WP specific challenge text for Proactive RIAs states that a core desire behind fostering interdisciplinary communities and extending consortia to a “wider pool of expertise” (i.e., Open Innovation) in the first place is to be able to secure “the best 'first mover' position to capitalise rapidly and effectively on emerging societal and industrial opportunities” (EC 2017e, p. 16). Still, only two of six sub-topics for Proactive RIAs state, “Work on ethical implications and gender should be included” (EC 2017e, p. 17). Promisingly, in this third WP, the expected impact from Proactive RIAs includes “due consideration of aspects such as education, gender differences and long-term societal, ethical and legal implications” (19 p. 19).

Priorities for commercialization through industrial application co-exist with priorities for RRI in Flagship calls of the 2018-2020 WP. A specific challenge for FET Flagships is to “provide a strong and broad basis for future innovation and economic exploitation, as well as novel benefits for society of a potential high impact” (EC 2017e, p. 30). Further, industry is called out as vital partner in call text for what a Flagship should entail: “**Support from and involvement of industry**, giving a view on avenues for exploitation and further strengthening of European industry in the global landscape, including stimulating the emergence and growth of innovative value chains” (EC 2017e, p. 32). This statement, in part related to Open Innovation (“in part” because it singles industry out among other actor groups like CSOs and public bodies) is immediately followed by calls for Flagships to also have: “An approach to address responsible research and innovation, in particular aspects such as education, gender aspects and societal, ethical and legal implications” (EC 2017e, p. 32). The impact criterion for Flagships stands to reinforce each of these dimensions: “key benefits for economy and society based on significant advances on science and technology” (EC 2017e, p. 40). Singling out of industry

suggests that, at times, interests in commercialization could be broadened and supported by considering RRI dimensions.

7.4.2.3 RRI beyond the keys

Evidence for RRI beyond the keys in FET programming can be found most prominently at the call level. There is some evidence that advisory group input is inclusive of diverse expertise and disciplines—for example the FET Advisory Group (FETAG) traditionally has included one social scientist (c.f., FET Advisory Group 2016). However, overall input to FET programming from the FETAG comes most strongly from life and physical scientists and engineers. Further, industry groups are the primary external expert shapers of major FET initiatives: to take one example, FET established a committee of 12 industry experts to advise the strategic agenda of the nascent Quantum Technology flagship.⁹² There is little evidence of efforts to include CSOs, public interest groups, or public bodies in the process of shaping nascent Quantum programming at a similar level.

FET Coordination and Support Actions seem to be the most common vehicle for opening FET programming to anticipatory or reflexive activities (two other aspects commonly held by RRI beyond the keys; c.f., Stilgoe et al. (2013)). For example, the 2017 FET Open Futures CSA topic states an interest in “identifying strategy options, challenges and opportunities to stimulate and organise interdisciplinary research and innovation towards new and visionary technologies of any kind” (EC 2017d, p. 10). Similarly, the 2018-2020 Work Programme introduces a request for a new FET Observatory to support, “Ongoing and systematic identification of new and emerging technologies from FET portfolio analysis, trends analysis (using for instance bibliometric tools, media watch, consultations and workshops) and broader horizon scanning (beyond research), including also consideration of ethical implications, gender differences and long-term impacts on society and humankind” (EC 2017e, p. 8).

FET Research and Innovation Actions only rarely engage with RRI dimensions beyond the keys. This is especially true of FET Open RIAs, which focus on research geared toward fundamental scientific advances or technology development. Proactive RIAs, on occasion, broaden the scope of inquiry for research projects to reflect on possible social, ethical, and legal dimensions of paradigm-breaking science and technology. For example, the FETPROACT-01-2016 topic on future technologies for societal change, being human in a technological world states: “The work should provide fresh perspectives that challenge current thinking, include ethical and social aspects, reflecting on the purposes, impacts and motivations for the research and innovation activity, the associated uncertainties, areas of ignorance, assumptions, questions and dilemmas; and by this crystalize through active stakeholder engagement concrete options for shaping a worthwhile and responsible future” (EC 2017d, p. 19). The main exception to limited attention to RRI beyond the keys in RIAs is the Human Brain Project flagship, which explicitly designed its ethics and society subgroup around a framework of anticipation, inclusion, reflexivity, and responsiveness—core elements of RRI beyond the keys ([see section 4.4.1](#)).

In FET Open, with the exception of novelty and interdisciplinary, each of the “Gatekeepers” from 2016-2017 has an explicit future orientation. Such attention to the future is commensurate with the

⁹² European Commission, Digital Single Market news article, 13 October 2016, “12 industrial members join the Expert group on Quantum Technology Flagship,” available at: <https://ec.europa.eu/digital-single-market/en/news/12-industrial-members-join-expert-group-quantum-technology-flagship>

“anticipation” dimension of RRI beyond the keys (Stilgoe et al., 2013). However, it should be noted that the most common focus of anticipation in FET is on probable, high-risk technologies and technological paradigm disruption, rather than on societal forces shaping, or concerns with said R&I pursuits. The gatekeeper of interdisciplinary research speaks to an interest in having a diversity of perspectives inform Open work (commensurate with the inclusive approach to RRI beyond the keys), however, as evaluation results show, most interdisciplinary collaboration in FET occurs within life and physical sciences and engineering, and industry (EC 2017a; 2017c).

7.4.2.4 Theoretical framework of RRI applied in the program line

Linear perspectives on technological transitions

FET brands itself an investigator-driven, basic-research arm of European R&I investments. FET must commit 40% of its EUR 2.69 budget to “bottom-up” high-risk, “early explorations of embryonic and fragile” science and technology ideas of FET Open (EC 2011b, p. 25; EC 2013a). Adherence to this basic-applied division of types of science relates closely to the work of Stokes (1997). Beyond Open projects, FET funds Proactive, a “critical-mass” building program to aggregate talent and capacity in specified science and technology domains; and Flagships, massive, scientific “grand-challenge” level initiatives to be supported at large scale (more than 100 partners per flagship) over the long-term (10+ years) (EC 2011c).

This three-part division of FET activity closely aligns with a technological transitions perspective of innovation (Geels 2002), in which niches are matured into regimes, which can be further advanced into landscapes. Each level—niche, regimes, landscapes—implies greater organizational complexity and sectoral inclusion in R&I systems. Such increasing complexity is seen as well in the scale-up in consortium size—and consolidation but greater depth into topics—from Open to Proactive, to Flagship-level initiatives.

The technological transition ontology of FET strongly aligns with a linear model perspective innovation (c.f., Douglas 2009)—that science discovers, technologies applies, and society benefits as a result. Despite FET’s notable deference to investigator-driven initiatives, there is a strong and visible push for funded projects to funnel toward industrial partnerships in support of commercialization (and, less so, to addressing societal challenges). Indeed, FET “positions itself as a bridge between excellent science and technology innovation” creating cross disciplinary collaborations and fostering new ways “of linking science and innovation” (EC 2011c, p. 74). Such emphasis on a bridging function for commercialization increases in strength over each successive WP: in the second and third WPs, FET devotes increasing levels of funding to CSAs and “Innovation Launchpads” with the express purposes of turning, “results from FET-funded projects into genuine societal or economic innovations” (EC 2017e, p. 2). A linear view of research and innovation development is also visible in regulation for how Open, Proactive, and Flagships “should” deliver in terms of technology readiness levels: FET Open is primarily considered projects at TRL2, Proactive from TRLs 2-3, and Flagships up to (but not including) TRL 5 (EC 2013a, p. 195).

A further example of the linear model perspective of FET may be found in the logic model of programming in information and communication technologies and Flagship domains. As the Interim

Evaluation of H2020 revealed (2017c), beyond mention of the European Digital Single Market⁹³ and being part of the Innovation Union⁹⁴ strategies, FET programming seems—by design—to exist in isolation from broader socioeconomic, cultural, and political strategies. By contrast, societal challenge programs like Food security, sustainable agriculture and forestry, marine and maritime and inland water research and the bioeconomy (FOOD) have connections to more than a dozen European policy strategies and initiatives (EC 2013a).

Second, at no point do the FET logic models reference RRI or constitutive cross-cutting keys like gender or ethics. Mention of Open Science, Open Innovation, or Open to the World is also absent. Links in the chain of FET logic all revolve around advancing basic scientific research and knowledge development mechanisms, scientific capacity, or economic and business interests.

Third, despite a stated intention of FET advancement toward societal *and* economic innovations, the majority of attention in the logic model discussed in the Interim Evaluation focuses on impact in terms of economic interests or scientific capacity (EC 2017c, p. 77, Figures 36 and 37). Absence of attention to concrete societal benefit and specific attention to economic and scientific interests are visible at every level of each intervention logic. Examples (all taken from EC 2017c, p. 77, Figures 36 and 37) include:

- Strategic objectives to “maintain strong global prominence of EU ICT industry”;
- Specific objectives to create “world class science” to help “found future technologies”;
- Operational objectives to foster high-risk, multidisciplinary research, aligning with national and international research and innovation agendas;
- Outputs listed are high-impact journal publications, future and emerging technology patents, research clusters, and human capacity to work on ICT science and technologies in research clusters;
- Outcomes revolve around science and technology research network prominence, researcher prominence, science and technology breakthroughs, and increased “public and private R&D funding”;
- Impacts boil down to “European leadership” in emerging science and technology areas, and the availability of more, higher profile, research positions in Europe.

Emphasis on technology development and linear models of innovation are visible in work programme documents, as well. In Work Programme 2014-2015 the desirability of technology development closer to society is mentioned, but no specifics are offered. By contrast, the programme expresses major interest and more clearly specifies impact directed toward commercialization to advance proof of principle of new technologies and to kick-start innovation ecosystems (EC 2014a). These points are not made to suggest that RRI and Open Agendas are incompatible with economic objectives for R&I. Rather these observations point the potential need for economic objectives of H2020 to pursued in ways more strongly aligned with RRI, Open Agendas, and broad societal interests.

⁹³ European Commission, Priorities, Digital Single Market, available at: https://ec.europa.eu/commission/priorities/digital-single-market_en

⁹⁴ European Commission, Research and Innovation, Strategy, Innovation Union, About, Action Points, available at: <https://ec.europa.eu/research/innovation-union/index.cfm?pg=action-points>

In Work Programme 2016-2017, CSAs and HPC topics focus further on a linear prioritization of economic and market benefits of research. Desired impact aspirations of the EUR 89 million budget for HPC, for example, focuses almost exclusively on driving technology transitions across regional and national zones, boosting proof of concept, market connection, and fostering capacity development of the EU ecosystem for exploiting computing advances (EC 2017d), with no mention of reflection on social, ethical, or legal concerns.

In Work Programme 2018-2020, the underlying logic of the program, according to the revised introductory text for the FET Open activity, seems even more focused on instrumental notions of linear progress. The work programme notes, “In spite of the high initial risk, the long-term impact can be enormous: these new technologies can become the core for new high-growth companies, for new industries, or for radically new ways of tackling societal challenges” (EC 2017e, p. 6). The 2018-2020 Open topic speaks of “shattering” the frontiers of current thinking and “inspiring entrepreneurial minds” without regard or concern for ethical or broader societal considerations, as would be engendered by RRI approaches. WP 2018-2020 notes that activities like Innovation Launchpad are designed to “assist in the first steps to accelerate the real-world impact of a result from FET research —a win-win for both research and innovation,” a strongly linear view of science and technology development (EC 2017e, p.6).

Republic of Science

While presence of RRI terminology increases in WPs 2016-2017 and 2018-2020, so too does the fencing-off of FET Open projects with language of technological determinism and linearity (c.f., Douglas 2009). The second work package sees the introduction of new FET Open “gatekeepers,” which express a distillation of FET Open’s vision of itself with the tagline “novel ideas for radically new technologies” (EC 2017d, p. 6). In the second work programme, Gatekeeper qualifications call for projects to have long-term vision; a breakthrough scientific and technological target; novelty; and be high-risk and interdisciplinary (EC 2017d). Absent from Open gatekeepers in 2016-2017 is any connection to RRI or the Open Agenda (beyond a weakly-arguable case for interdisciplinarity as being related to Open Innovation).

FET Open’s commitment to “unfettered,” “investigator-driven” projects strongly aligns with a perspective of scientific autonomy in research agenda-setting championed by Polanyi (1962). The underlying perspective on parts of FET as bastions of self-correcting and governing “Republic of Science” can be viewed in the third WP’s exclusionary approach to categorizing Open gatekeepers. FET WP 2018-2020 unequivocally states, when it comes to Open proposals:

- “Research to advance on the roadmap of a well-established technological paradigm, even if high-risk, will not be funded” (EC 2017e, p. 7).
- “Blue-sky exploratory research without a clear technological objective will not be funded” (EC 2017e, p. 7).
- “Projects with only low-risk incremental research, even if interdisciplinary, will not be funded” (EC 2017e, p. 7).

The emergence and modification of FET Open topic gatekeepers, however, does illustrate a key point: programmes take on the authority to create principle-based exclusion criteria to delimit the identity of programmatic identity.

Deficit models of communication and engagement

A narrow view on public understanding of science is also visible in FET programme text. In the rare instances where FET programming mentions communication with and understanding of publics, it is written about as a unidirectional, deficit-based endeavour (c.f., Sturgis and Allum 2004). Project dissemination is spoken about as serving a function, “to disseminate the project results, and to attract large public support” (EC 2017d p. 40), rather than to spur genuine bi-directional engagement to learn public values and values related to new and emerging technologies.

Another prime example of this perspective can be found in the introduction to WP 2016-2017, where the aspiration to conduct public engagement is mentioned according to the following justification: “to bring on board a wide diversity of actors (researchers, industry, policy makers, civil society organisations, teachers, artists, citizens etc.) to participate in and/or deliberate on the directions taken by science, research, technology and innovation” (EC 2017a, p. 5). On one hand, such a position does demonstrate a marked improvement in facility with ideals connected to science with and for society (like RRI). This position is also a promising amendment to programme direction after WP 2014-2015. On the other hand, sections about using artistic practices to explore “social acceptance” of novel technologies, and speaking of the public as needing to be brought “on board” (EC 2017d, p.5) suggests a form of determinism that places the public in the linear position of waiting to receive technologies, with no voice to object. A position of seeking to promote social acceptance ironically seems to disregard how the programme itself is part of the larger cultural, social, and political infrastructures that shape programmes like FET in the first place.

FET Technological determinism is embodied, too, by the perspective of the FET Advisory Board (2016), which notes, “the larger the scale of the EU funded S&T project, the greater the need for the SSH component” (p5). Such a finding is seemingly at odds with the disruptive, high-risk, paradigm-breaking projects FET seeks to pursue at the Open level of the programme: namely, should not the implications of disruption be examined in conjunction with and reflective of the earliest stages of scientific and technological research (i.e., at the Open inception)? Given that the FET Advisory Board position rests in part on the position: “SSH must be involved throughout the whole process, including the problem formulation phase, the drafting phase of work programmes, the design of topics, and the final evaluation phase. The ultimate goal is for SSH to be an integral part of the development process for new research questions” (FET Advisory Board 2016, p. 2). Based on such a perspective, it is precisely the more early-stage work of Open and Proactive programs that SSH could be included, not just when FET initiatives scale to Flagship-level projects.

7.4.2.5 Overall assessment of RRI in programme (from desktop research):

Category	Value	Description
A	High awareness <ul style="list-style-type: none"> • Science Education and Science Literacy • Open Science / Open Access • Open Innovation 	<ul style="list-style-type: none"> • RRI as concept is (implicitly or explicitly) present in most documents on all levels; • RRI keys and O’s are used and referred to in several documents; • Governance structures reflect societal embeddedness; • Upstream/Downstream engagement is present on multiple

		levels
B	Some awareness <ul style="list-style-type: none"> • Gender • Ethics • Anticipation (beyond the keys) • Public Engagement • Open to the World 	<ul style="list-style-type: none"> • RRI as concept is (implicitly or explicitly) present in some documents; • Some RRI keys and O's are used and referred to in any document; • There is some process of better social embeddedness through governance or engagement
C	Limited awareness <ul style="list-style-type: none"> • Governance • Reflexivity, responsiveness (beyond the keys) 	<ul style="list-style-type: none"> • Responsibility or ethical awareness is referred to in any document • Any RRI key is mentioned; • There is reference to the need for social embeddedness of the research at hand.
D	No awareness	<ul style="list-style-type: none"> • RRI as concept is not present in any document; • No RRI key is mentioned implicitly or explicitly; • There is no reference to societal embeddedness or civic engagement;

7.4.3 Interview findings

7.4.3.1 Shared understanding of RRI

This section reports on the perspectives synthesized from interviews described in section 3, Methods, above.

Awareness of responsible research and innovation (RRI) six keys was relatively high among FET stakeholders consulted through interviews (this group included expert advisors, member state representatives to FET committees, project coordinators, researchers, business stakeholders, and Commission officials). An overall perception seems to be that larger projects, like Flagships, and projects that include larger consortia, like certain Proactive projects, are more amenable to including RRI considerations. This perception seems to be related to the higher technology readiness levels of the systems involved in these projects, and as such the perceived proximity of the research and innovation system to end-user audiences.

By contrast, the investigator-driven, FET Open projects (comprising some 40% of the FET budget), seem less inclusive of RRI dimensions, raising the question—as one interviewee put it: “at which point in the development of a new or enabling technology should citizen and stakeholder interactions occur in a way that allows for meaningful exchange, discussion and interaction?” For example, the WP 2016-2017 and 2018-2020 “gatekeeper” criteria associated with Open projects have no mention of RRI (EC 2017d, 2017e).

For those projects adopting RRI, activities associated with gender equality are more focused on the balance of teams, work package, and task leaders, rather than gender dimensions of research. Interviewees were aware, too, that the gender equality dimension of RRI is a systemic issue that

requires action before undergraduate and graduate education (i.e., at the point of project funding)—and that this facet may be beyond the scope of any individual research project in FET.

Ethics, especially related to data management issues, are often viewed as necessary compliance activities. In addition, some FET projects address micro ethical issues related to researcher integrity, and macro ethical issues related to topics like dual-use technology (c.f., Herkert 2005). Issues with dual-use seem more salient to interviewees as the TRLs of funded projects increase. Open Access requirements, especially as TRL levels advance and industry stakeholders are involved, present a challenge with regard to intellectual property rights regimes. Public engagement activities attempted range from in-person and web seminars, to country-by-country stakeholder consultations, depending on the focus and need of a given project.

RRI integration in FET projects, particularly Flagships and Proactive projects, is realized through a range of means: from sophisticated organizational integration (e.g., in management committees); to expert consultations (e.g., ethics advisory boards); to siloed work and task efforts; to basic compliance work; or not at all.

7.4.3.2 Beyond RRI

FET Coordination and Support Actions on occasion perform functions associated with the AREA approach to responsible innovation (Stilgoe et al., 2013; von Schomberg 2013), for example the OBSERVE CSA working to support anticipatory and foresight, and TRACES reflection. The OBSERVE CSA and other observatory actions often place a high value on interdisciplinary efforts, including societal dimensions. Such activities devoted to inclusion, and especially coordination align with expanded definitions of RRI beyond the keys (c.f., Foley et al., 2016). Several interviewees expressed a strong feeling there was ample room for “keys” and “other” approaches to RRI to work in concert. For example, foresight exercises might help identifying ethical issues; inclusive engagement commitments could support gender equality efforts. The limited inclusion of RRI in Open (more investigator-driven) programming dovetails with this larger question raised by interviewees of whether RRI should be expected of all projects of all programme lines all the time, or if more limited and targeted combinations—for example through CSAs working across project portfolios—would be more feasible and desirable.

An area of ongoing difficulty in FET (and H2020 at large) is broader involvement of CSOs in projects and agenda setting. This challenge is often framed as a difficulty identifying relevant societal stakeholders when it comes to future technologies. Interviewees actively engaged in RRI components of FET projects noted that cultures of RRI take time, consistent interaction, and capacity development of teams to develop. Programme activities that foster connections of internal (to project members) and external (to larger networks) resources can support capacity building over time.

7.4.3.3 Assessment of RRI based on interviews

Category	Value	Description
A	High Awareness	<ul style="list-style-type: none"> • RRI as concept well understood by all stakeholders; • RRI keys and O’s are used and referred to by most stakeholders; • Operationalization of RRI already

		present
B	Some awareness <ul style="list-style-type: none"> • RRI as a concept • Gender • Ethics • Public Engagement • Open Science/Open Access • Open Innovation 	<ul style="list-style-type: none"> • RRI as concept understood by some stakeholders; • Some RRI keys and O's are referred to by some stakeholders; • The need for mainstreaming through operationalization is referred to by some stakeholders
C	Limited awareness <ul style="list-style-type: none"> • Governance • Open to the World • Science literacy and science education • RRI beyond the keys 	<ul style="list-style-type: none"> • Vague awareness of RRI as concept by a few stakeholders; • Any RRI key referred to by some stakeholders; • Some ideas of operationalization of RRI present
D	No awareness	<ul style="list-style-type: none"> • RRI as concept is not present; • No RRI key is mentioned; • No reference to or explicit refusal of societal embeddedness or civic engagement;

7.4.4 Case briefs

Four cases of FET projects are presented below. Each case presents the project title, corresponding topic, and presence or absence of RRI in said topic. Cases also briefly review how the project situates itself relative to RRI and the Open Agenda—either explicitly or implicitly. Data sources for each case draw from the CORDIS database, the Europa Webgate, and immediately available project web-pages. Cases were selected based exemplifying different dimensions of RRI at the project level, or for contributing to larger research and innovation infrastructure conducive to RRI more generally.

7.4.4.1 Human Brain Project Flagship

The Human Brain Project (HBP) is a Flagship Research Innovation Action started in 2013, at the end of FP7, with plans to continue ten years and potentially beyond. The consortium is funded through periodic (biennial) Specific Grant Agreements (SGAs). Project participations draw mainly from HES (73% of participations), with the remaining quarter from REC (26%), and the final 2% from PUB (1%) and PRC (1%) respectively.⁹⁵ In the course of H2020, EU Net Contribution to the HBP has been EUR 177 million, with EUR 89 million through SGA1 (from April 2016 through March 2018) and EUR 88 million through SGA2 (*information not yet available on CORDIS*).^{96, 97} The Impact evaluation criterion for SGA1 explicitly called for approaches, “to address societal benefit and potential ethical and legal implications, including engagement with authorities and end-users” (EC 2014a, p. 32). FET calls for each Flagship Core Project to: “detail activities in areas such as education, dissemination, ethics and societal aspects” (EC 2014a, 31; EC 2017d, p. 43; EC 2017e, 46).

⁹⁵ Participation information from Europa Webgate, accessed on 9 July 2018, searching for “HBP,” available at <https://webgate.ec.europa.eu/dashboard/sense/app/93297a69-09fd-4ef5-889f-b83c4e21d33e/sheet/PbZJnb/state/analysis>

⁹⁶ Project entry for HBP SGA1 in CORDIS available at: https://cordis.europa.eu/project/rcn/205371_en.html

⁹⁷ Funding information from Europa Webgate, accessed on 9 July 2018, searching for “HBP,” available at: <https://webgate.ec.europa.eu/dashboard/sense/app/93297a69-09fd-4ef5-889f-b83c4e21d33e/sheet/erUXRa/state/analysis>

The HBP has a robust infrastructure to support RRI dimensions of the project. The landing page includes a dedicated tab on “Social, Ethical, Reflective” sub-project activities; the “about” tab offers an immediate option for a “gender equality” page; there is a dedicated “education” tab. The landing page on “overview” includes the following text in the, “Short Overview of the Human Brain Project”: “In addition, the Project studies the ethical and societal implications of HBP’s work.”⁹⁸

Beyond the project webpage, social and ethical reflection is built into HBP governance. One of the 12 subprojects is “Ethics and Society” (E&S) advancing not just RRI within the project (relating to governance key of RRI), but also neuroethics and philosophy as subjects in-and-of themselves. The project has a dedicated Ethics Advisory Board, and the leader of the Ethics and Society team has a seat on the Directorate of the project, managing the Core Project of the Flagship (relating to governance key of RRI),⁹⁹ as well as the Science and Infrastructure Board dedicated to research planning and road-mapping.¹⁰⁰ HBP address not only RRI as established by the EC keys, but also beyond the keys, as embodied by the procedural dimensions of anticipation, inclusion, reflection, and responsiveness.

- **Anticipation:** The “Foresight Lab,” “focuses on identifying and evaluating the future impact of new knowledge and technologies generated by the HBP.”¹⁰¹ Foresight lab activities have included a range of seminars, webinars, and trans-disciplinary workshops on issues ranging from neuroscience modelling to RRI, as well as reports on topics such as “future computing and robotics”, “future medicine,” and “future neuroscience.”¹⁰²
- **Reflection:** The “Neuroethics and Philosophy Work Package,” focuses on “conceptual, social, ethical, and regulatory issues, from potential privacy threats to understanding consciousness and the meaning of human and personal identity.”¹⁰³ The work package maintains an active “ethics blog,”¹⁰⁴ and publishes on issues of neuroethics and neurophilosophy, as well as dual-use.¹⁰⁵
- **Inclusion (and Public Engagement key):** The “Public Engagement and Dialogue” work package organises and facilitates public dialogues on issues of potential controversy and relevance to the HBP to “broaden the debate on the ethical, legal and societal issues arising

⁹⁸ HBP website page available at: <https://www.humanbrainproject.eu/en/about/overview/>

⁹⁹ HBP, The Directorate, available at:

<https://www.humanbrainproject.eu/en/about/governance/boards/directorate/>

¹⁰⁰ HBP, Science and Infrastructure Board, available at:

<https://www.humanbrainproject.eu/en/about/governance/boards/science-and-infrastructure-board/>

¹⁰¹ HBP Foresight Lab, About Us, available at: <https://www.humanbrainproject.eu/en/social-ethical-reflective/foresight-labs/>

¹⁰² King’s College London, HBP Foresight Lab: Events and Outreach, available at:

<https://www.kcl.ac.uk/sspp/departments/sshm/research/Research-Groups/BIOS/BIOS-Projects/HBP/HBP-events-and-outcomes.aspx>; HBP Foresight Lab: Publications & Working documents, available at:

<https://www.kcl.ac.uk/sspp/departments/sshm/research/Research-Groups/BIOS/BIOS-Projects/HBP/HBP-Publications-&-Working-documents.aspx>

¹⁰³ HBP, Neuroethics and Philosophy, Why neuroethics and philosophy in the HBP, available at:

<https://www.humanbrainproject.eu/en/social-ethical-reflective/neuroethics-and-philosophy/>

¹⁰⁴ Available at: <https://ethicsblog.crb.uu.se/tag/neuroethics/>

¹⁰⁵ Publications available at: http://www.crb.uu.se/digitalAssets/445/c_445284-l_1-k_neuroethics-philosophyofhtebrain2017.pdf

from the project.”¹⁰⁶ In-person and online consultations with publics and stakeholders (including scientists, other experts and decision makers), led by the Danish Board of Technology Foundation (DBT), constitute the majority of this work. DBT meetings for HBP have occurred all over Europe, and covered topics from privacy and data, among a range of other issues. Extensive documentation for these events is available online.¹⁰⁷

- **Responsiveness (and Ethics RRI Key):** HBP has a dedicated Ethics Support Team to help collect, address, and circulate best practices related to ethical R&I. The Ethics Support team conducts research on ethics, governance, and RRI; provides public outreach resources; supports data management; and coordinates with the independent Ethics Advisory Board. The team is also responsible for data privacy and protection.¹⁰⁸ Two particular mechanisms for engaging ethical issues encountered in the course of HBP work include the PORE registration site, to “register and identify these issues and keep track of how they are dealt with.”¹⁰⁹ PORE issues (listed on the website) have ranged from ethics approval of research with human data to dual-use and consent. Second is the “Ethics Rapporteur Programme” which involves, “an academic, a scientist, a technologist or an administrator engaged in the work of the HBP who is designated with the responsibility to communicate with the Ethics and Society programme about the ethics, science and technology work of the SubProject. Ethics Rapporteurs include senior and junior members, each possessing a unique set of competencies in science and ethics.”¹¹⁰ Issue arising from ethics rapporteur conversations have led to direct changes in HBP project structure and practice, for example establishment of the Data Protection Officer position and activities (*diagnosis interview sources*).

HBP publications and deliverables are, for the most part, shared openly (see for example pages on publication and deliverables). HBP has devoted initiatives for RRI keys on Gender and on Education:

- **Gender:** HBP has a devoted set of Gender Equality Activities, including development of a Gender Action Plan, career building opportunities for female PhDs and Postdocs, and sharing best practices and stories about career models and considerations.¹¹¹ The Executive Director of the HBP is an active participant of the Gender Advisory Committee.
- **Education:** HBP has dedicated efforts related to interdisciplinary brain science curriculum development, short-courses, an annual student conference, as well as other young researcher events.¹¹² Educational materials are available after events on an e-library.¹¹³

¹⁰⁶ HBP, Public Engagement and Dialogue, about us, available at:

<https://www.humanbrainproject.eu/en/social-ethical-reflective/citizen-engagement/>

¹⁰⁷ Danish Board of Technology Foundation, Citizen Meetings in the Human Brain Project, available at:

<http://www.tekno.dk/article/citizen-meetings-in-the-human-brain-project/?lang=en>

¹⁰⁸ HBP, Ethics Support, available at: <https://www.humanbrainproject.eu/en/social-ethical-reflective/ethics-support/>

¹⁰⁹ HBP; Social, Ethical, Reflective; Register an Ethical Concern, available at:

<https://www.humanbrainproject.eu/en/social-ethical-reflective/register-ethical-concern/>

¹¹⁰ HBP; Social, Ethical, Reflective; Ethics Support; Ethics Rapporteur Programme, available at:

<https://www.humanbrainproject.eu/en/social-ethical-reflective/ethics-support/ethics-rapporteurs/>

¹¹¹ HBP, About, Gender Equality, available at: <https://www.humanbrainproject.eu/en/about/gender-equality/>

¹¹² HBP, Education, available at: <https://education.humanbrainproject.eu/>

¹¹³ HBP, Education, E-Library, available at: <https://education.humanbrainproject.eu/web/hbp-education-portal/documents>

7.4.4.2 OBSERVE Project Case

OBSERVE, full project title, Observing Emergence, was a Coordination and Support Action from FETOPEN-2-2014, funded for approximately EUR 410,000.^{114, 115} The topic announcement explicitly called for proposals to help, “make Europe the best place in the world for collaborative research on future and emerging technologies that will renew the basis for future European competitiveness and growth, and that will make a difference for society in the decades to come,” as well as more specifically to identify “new opportunities and directions for interdisciplinary research towards new and visionary technology of any kind, combining evidence from FET (e.g., portfolio analysis) and other sources, as well as by broad and open stakeholder engagement, in particular through on line tools.”¹¹⁶ As such, the call implicitly relates to Open Innovation through broad stakeholder engagement, as well as anticipation as a form of RRI beyond the keys.

OBSERVE sought explicitly to, “Combine this process with a broadly based participatory multi-stakeholder dialogue in a tailored sequence of face to face anticipatory dialogues which will result in a list of candidates for “Hotspots” i.e. potential topics for “new opportunities and directions for interdisciplinary research towards new and visionary technology of any kind” thus ensuring exploration of radically new avenues on the one hand and sensitivity to society’s needs on the other.”¹¹⁷ As such, project ambitions, as well as the apparent motivations from the FET programme for the project, align with dimensions of inclusion and anticipation of RRI beyond the keys. On the project website, details for Steps 2 & 3 of the OBSERVE process, “Multi-stakeholder Dialogue for Sense Making” and “Assessment” each implicitly align with ideas of Open Innovation: the first supporting face-to-face workshops, the second a series of broad, expert dialogues online.¹¹⁸

Public deliverables include a “Deliverable 4.3 OBSERVE Toolkit: Deck of Cards and Manual for using them.”¹¹⁹ Several of the materials in the toolkit explicitly engage with dimensions of RRI. These include a “Global Ethics” card introducing the challenge of integrating ethical issues into projects; a “gendering in research innovation” card to promote reflection on “awareness for the need for gender specific approaches in research and innovation domains.” Further, one set of cards used in the observe process focused explicitly on “social practice” dimensions to promote reflection on issues beyond science and technology when horizon scanning for FET Programming. These more reflexive components of RRI beyond the keys (in addition to gender and ethics consideration of the keys), showcase the way the FET Programme has, and continues to have the potential to use Coordination and Support Actions to accelerate realization of RRI aspirations of H2020.

Still prioritization of RRI by the stakeholders engaged by OBSERVE seems limited. The OBSERVE CSA horizon scanning activity, was billed as a way to help the FET program grasp new and emerging

¹¹⁴ Project entry in CORDIS available at: https://cordis.europa.eu/project/rcn/197125_en.html

¹¹⁵ Funding information from Europa Webgate, accessed on 9 July 2018, available at: <https://webgate.ec.europa.eu/dashboard/sense/app/93297a69-09fd-4ef5-889f-b83c4e21d33e/sheet/erUXRa/state/analysis>

¹¹⁶ Topic text available at: https://cordis.europa.eu/programme/rcn/665160_en.html

¹¹⁷ Award page for OBSERVE, available at: https://cordis.europa.eu/project/rcn/197125_en.html

¹¹⁸ OBSERVE project information from the website, available at: <https://www.horizon-observatory.eu/radar-en/sensemaking.php> (Step2); <https://www.horizon-observatory.eu/radar-en/assessment-wp3.php> (Step 3)

¹¹⁹ OBSERVE Toolkit deliverable available at: https://www.horizon-observatory.eu/radar-wAssets/docs/WP-4_Deliverables/Deliverable-4-3_OBSERVE-Toolkit.pdf. Full list of deliverables for OBSERVE available at: <https://www.horizon-observatory.eu/radar-en/downloads/>

technology areas for European competitiveness and growth. For this, as noted, the project employed four horizon scanning methods related to web and literature data extraction, and two ‘sense-making approaches; one a multi-criteria assessment online, another a ‘creative workshop.’¹²⁰ The project sought input from a range of professional, gender, age, disciplinary backgrounds, but did not provide full information on participants or recruitment to in-person events, making it difficult to learn more about public or stakeholder inclusion in the program (i.e., beyond the conventional FET-interest base). Deliverables including stakeholder input reflect limited reference to any dimensions of RRI, either the keys or beyond, in the horizon scanning for “hotspots” presented by OBSERVE.¹²¹ Keyword searches in the OBSERVE topics list for terms related to RRI and the Open Agenda reveal scant awareness or concern with cross-cutting RRI issues on the part of the FET community engaged:

- 1 mention of gender in 35 clusters (related to research practice, rather than gender dimensions);
- 1 mention of responsibilities, in relation to algorithms, not humans;
- 1 reference to education, in relation to a global challenge of learning and the brain;
- No mention of ethics
- No mention of “open access”
- No explicit mention of any aspect of the Open Agenda

7.4.4.3 EXDCI & EXDCI-2 Project Case

EXDCI and EXDCI-2 full project title, European eXtreme Data and Computing Initiative (and European eXtreme Data and Computing Initiative-2), are, respectively closed and ongoing Coordination and Support Actions (CSA) of the FET High-Performance Computing Program, funded first for EUR 2.55 million between 2015 and February 2018, and for EUR 2.44 million between March 2018 and August 2020.^{122, 123} The topic announcements, *FETHPC-2-2014 - HPC Ecosystem Development* and *FETHPC-03-2017 - Exascale HPC ecosystem development* each explicitly called for proposals to help develop and strengthen the European HPC Strategic Research Agenda and corresponding ecosystem and activities.¹²⁴ The programme topics are heavily involved in coordinating not only across FET HPC projects, but also HPC projects across LEIT and other H2020 Societal Challenge domains, and as such implicitly relates to the coordination element of RRI noted by Foley et al. (2016). Each EXDCI reinforces “cooperation in international endeavours on HPC software and systems towards exascale,” speaking to an Open to the World dimension of programming.

¹²⁰ OBSERVE Deliverable 1-3: Methodology Report, page 7, available at: https://www.horizon-observatory.eu/radar-wGlobal/wGlobal/scripts/accessDocument.php?wAuthIdHtaccess=359096634&document=/radar-wAssets/docs/WP-1_Deliverables/Deliverable-1-3_Methodology-Report.pdf&display=1&forceDownload=0

¹²¹ Deliverable 2.1, OBSERVE Potential Hotspot Report, available at: https://www.horizon-observatory.eu/radar-wAssets/docs/WP-2_Deliverables/Deliverable-2-1_OBSERVE-Potential-Hotspot-Report.pdf

¹²² Project entries in CORDIS available at: https://cordis.europa.eu/project/rcn/197935_en.html (EXDCI) and https://cordis.europa.eu/project/rcn/215826_en.html (EXDCI-2)

¹²³ Funding information from Europa Webgate, accessed on 5 July 2018, available at: <https://webgate.ec.europa.eu/dashboard/sense/app/93297a69-09fd-4ef5-889f-b83c4e21d33e/sheet/erUXRa/state/analysis>

¹²⁴ Topic texts available at https://cordis.europa.eu/programme/rcn/665165_en.html and https://cordis.europa.eu/programme/rcn/702034_en.html

According to the first period of EXDCI reporting, the CSA's two primary accomplishments were forging a community and common European HPC Strategy through the multi-stakeholder European Technology Platform arena, and wider community.¹²⁵ The website provides links to various HPC projects and stakeholders in the wider HPC community ecosystem.¹²⁶ The website also posts a revised, third version of the HPC Strategic Research Agenda (SRA), released in 2017 after a (procedurally limited) public comment.¹²⁷ While the SRA3 itself presents a detailed summary of the expert and business and research stakeholder groups that provided input to the process, no indication of broader civil society, social science and humanities inclusion was made. Similarly, no mention was made of the public comment, nor whether and how public comments were used in the SRA update.

The primary visible connection between the SRA3 and RRI can be found in section 9.3 for the plan, related to education and training (part of a larger section 9 on "Non-technical Recommendations and Priorities."¹²⁸ The first two-thirds of this section are devoted to SME and industry development interests. The Education and training section identifies needs for "talent generation," "public engagement," and promoting career opportunities, as well as integrating HPC in to undergraduate and post graduate education. One mention is made of promoting recruitment of women in HPC (and link to an external volunteer-based organization: Women in HPC).¹²⁹ These dimensions of the SRA create implicit connections to gender and public engagement keys of RRI, without mention of RRI within or beyond the keys.

7.4.4.4 Levitate Project Case

Levitate full project title, "Levitation with localised tactile and audio feedback for mid-air interactions," is a FET OPEN Research and Innovation Action funded from 2017 through December 2020 for approximately EUR 3 million.^{130, 131} The topic announcement was *FETOPEN-01-2016-2017 - FET-Open research and innovation actions*, and explicitly calls for public engagement, Open Science, and gender dimensions in the call text, "Impact is also sought in terms of the take up of new research and innovation practices for making leading-edge science and technology research more open, collaborative, creative and closer to society.[[See also the discussion on public engagement in the introduction to this FET work programme]]."¹³²

Levitate positions itself as a project that will be, "The first to create, prototype and evaluate a radically new human-computer interaction paradigm that empowers the unadorned user to reach into levitating matter, see it, feel it, manipulate it and hear it."¹³³ The project website gives no indication of any RRI keys of ethical reflection, open access planning, science education initiatives,

¹²⁵ Periodic reporting for period 1 – EXDCI, available at: https://cordis.europa.eu/result/rcn/196222_en.html

¹²⁶ See for example this overview page on the EXDCI website: <https://exdci.eu/activities/overview-of-coe-fet-hpc-production>

¹²⁷ Public all for comments made on survey monkey. <https://www.surveymonkey.de/r/ETP4HPC-SRA3-Public>

¹²⁸ Strategic Research Agenda available at: <http://www.etp4hpc.eu/pujades/files/SRA%203.pdf>

¹²⁹ Women in HPC website: <https://womeninhpc.org/about-us/>

¹³⁰ Project entry in CORDIS available at: https://cordis.europa.eu/project/rcn/207474_en.html

¹³¹ Funding information from Europa Webgate, accessed on 9 July 2018, searching for project acronym "levitate," available at: <https://webgate.ec.europa.eu/dashboard/sense/app/93297a69-09fd-4ef5-889f-b83c4e21d33e/sheet/erUXRa/state/analysis>

¹³² Topic text available at: https://cordis.europa.eu/programme/rcn/700831_en.html

¹³³ Project entry in CORDIS available at: https://cordis.europa.eu/project/rcn/207474_en.html

gender, or governance. Videos of participation at science festivals, publications, and a Twitter account constitute visible efforts at public dissemination.¹³⁴

7.5 Conclusions

Bright Spots

Future and Emerging Technologies programming has adopted RRI and Open Agenda approaches to R&I to varying degrees of success. Through its commitment to building European capacity in research and innovation, the programme excels at science literacy and science education activities. Through contributions to open data pilots and major investments in high-performance computing projects, FET also leads on open access initiatives. Language referencing RRI keys of ethics, gender, and public engagement gain increasing prominence in the course of FET Work Programmes. FET Open and Proactive coordination and support actions (CSAs), and FET Flagship Core Projects are especially attentive to social, ethical, and legal dimensions of research practice. Evaluation criteria for CSA and Flagship actions help to reinforce a growing culture of RRI in FET. RRI awareness in these areas manifest especially as strong awareness of gender balance issues, and ethics related to data management and issues of dual-use technology.

FET uses coordination and support actions strategically to enhance programme-level reflection and horizon scanning when it comes to Proactive topics. Through Flagships, FET stands to benefit from diverse organizational forms and modes of R&I governance, providing a rich proving ground for learning, experimentation, and research management innovation. Because of programme ambitions to advance breakthrough research and shepherd technological innovations closer to market, FET fosters strong experiences with interdisciplinarity and cross-sector involvement in R&I (although the majority of disciplinary collaboration draws from physical and life sciences and engineering; and cross-sector collaboration most commonly takes the form of industry involvement). Finally, through initiatives like FET Open “gatekeepers” and changes to evaluation criteria, FET has a strong practice of shaping programming to achieve desired ends of R&I.

Challenges

Despite the strong progress of FET to start adopting and integrating RRI and Open Agenda practices into programming, several limitations and challenges are apparent. Programme-level shaping of FET, and stakeholder engagement in FET projects is dominated by physical and life science, and engineering research communities, and industry sectors, with very little active inclusion of CSO, NGOs. While CSOs and NGOs have opportunities to comment on public consultation, the absence of these interests on Advisory Boards, High-level Steering Committees, Board of Funders, and other levels is noticeable. Greater attention to these issues of inclusion could support Open Innovation approaches in the programme, as well as public engagement.

When it comes to implementation of RRI, some aspects of keys are emphasized more than others. Gender diversity of teams is more commonly addressed, while gender dimensions of FET research subject areas is rarely engaged. Issues of ethical compliance with regards to privacy and data management are more commonly addressed; issues of dual-use are becoming increasingly common. Broader reflection on the potential social ordering effects (c.f., Jasanoff 2004) of technologies

¹³⁴ Levitate project page; Videos, available at: <https://www.levitateproject.org/videos/>

pursued by FET, however, is often lacking. When it comes to issues of open access, FET experiences tensions with industry participation with regards to intellectual property rights.

Adoption of RRI into FET programming is also highly conditional on activity line. FET Open demonstrates far less adoption of RRI concerns; the same is true of most Proactive and HPC research and innovation actions (RIAs)—the exception being Flagships. Opportunities for programme-level reflection, in the spirit of RRI seem lacking, too: there are few chances to reflect on programme aspirations vis-à-vis claiming to be investigator-driven but strongly aligned to advancing commercialization; and questions of when and how to integrate RRI into RIAs, Launchpad, and other FET actions. Further, promoting learning across Flagship experiences to advance RRI (and experiences with R&I governance (RRI key) more generally) have yet to be fully realized. Finally, and not unique to FET, EC guidance on RRI are incomplete and difficult to access (one must search for keywords associated with topics of gender, ethics, and dissemination to find RRI keys), presenting a missed opportunity for the EC to leverage major and robust investments in research on RRI from the Science with and for Society (Swafs) programme of H2020.

Recommendations

This diagnosis report closes with three general approaches to consider for fostering RRI in FET:

- 1) **Support RRI over the long term by taking a portfolio approach.** Cultures of RRI take time to develop—they require time, consistent interaction, and capacity development of teams. Programme activities that foster connections of internal (to project members) and external (to larger networks) resources can support capacity building over time. Organizational flexibility of projects helps RRI components of projects to adapt to evolving needs of science and engineering project components. Agile, responsive structures (for example decision processes rather than narrow deliverables) can help provide a balance of flexibility and effective work. FETs diverse organizational forms in Flagship and Proactive projects present a vehicle for greater learning on implementation of RRI. FET might consider a ‘portfolio approach’ to RRI, where all projects may have to consider certain dimensions (e.g., gender equality, open access, and ethics) as part of eligibility requirements...but other RRI activities might be more efficiently realized as part of cross-programme activities (e.g., communication and dissemination CSAs). FET could consider a series of collaborative workshops with Open, Proactive, and Flagship stakeholders, as well as RRI and SSH collaborators to strategize such a portfolio approach.
- 2) **Connect RRI efforts in FET to RRI efforts across H2020 and other parts of the Commission.** Several issues associated with RRI are tied to systemic challenges facing Europe. For example, gender equality in FET projects is contingent national education systems at early childhood, primary, and secondary education levels. Rather than expecting all projects of each H2020 Programme line to struggle with this topic individually, larger networks and resources could be mobilized across H2020 and other EC activities to address the issue. Existing EC R&I management infrastructures such European Innovation Partnerships, National Contact Point Networks, Coordination and Support Actions, individual tenders, and ERA-Net Co-funds provide robust examples to learn from, modify, and / or tailor to the purpose of tackling systemic issues related to RRI.

Now that H2020 has invested in an RRI Toolkit,¹³⁵ Responsibility Navigator,¹³⁶ and RRI Indicator System,^{137, 138} H2020 could make available funds to sustain and augment capacity built with these tools, as well as studies of the wider implementation efforts. Incentives could be designed to encourage participation across all three major arms of H2020 and future framework projects (e.g., contingent appropriations; supplemental awards; proposal review mechanism, etc.). These and other activities to support cross-H2020 coordination align with a long-term action item for H2020 effectiveness, from the Interim evaluation: “Focus investments in areas of strategic interest for the EU which are relevant to society, and where multiple impacts are expected, for example through focus areas” (EC 2017a, p. 236).

- 3) **Include more diverse stakeholders of FET at higher levels.** If and as expectations of impact from FET increase, the programme might consider ways of engaging more stakeholders from a range of societal sectors (beyond industry, to include NGOs, CSOs, labour and consumer groups, as well as public regulatory bodies) when shaping agendas, work programmes, projects, evaluation, and assessments of societal concerns/relevance. Given that technologies exist within social contexts, and R&I is increasingly mobilized to face complex and interdependent social, ethical, cultural, economic, environmental, and technical challenges, extending the peer community involved in shaping FET could help to generate more socially robust knowledge (Funtowicz and Ravetz 1993; Stilgoe et al., 2013).

Opening up Science and Innovation processes in the ways listed above can avoid ‘closed-loop’ feedbacks of scientists, engineers, and ethicists rating their work as societally relevant, without more open feedback from a more diverse and representative range of societal actors. Such a review could be tied to larger reflection on what qualifies as a gatekeeper / excellence criteria when it comes to FET projects. This recommendation aligns with several Interim Evaluation action items for relevance and effectiveness of long-term R&I framework programming, for example: “Involve end-users and citizens in co-designing the R&I agenda and co-create solutions, which should also stimulate user-driven innovation” (EC 2017a, p. 235).

7.6 Literature, links, resources for FET Diagnosis Input

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¹³⁵ RRI Tools project, available at: <https://www.rri-tools.eu/>

¹³⁶ Res-AGorA project, Responsibility Navigator, available at: <http://responsibility-navigator.eu/>

¹³⁷ Indicators for promoting and monitoring Responsible Research and Innovation; Report from the Expert Group on Policy Indicators for Responsible Research and Innovation, 2015, available at: https://ec.europa.eu/research/swafs/pdf/pub_rri/rri_indicators_final_version.pdf

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7.8 Appendix to FET Diagnosis Input

7.8.1 Interview Protocol

The rationale behind the questions

The interview schedule provides a guide for the interviews and a framework that allows comparable information/data to be collected. The interview focusses on the 4 domains that are of interest to the diagnosis of RRI in the programme lines: the challenges they face regarding social-ethical issues, the current practices in dealing with these challenges, and the drivers and barriers they experience in dealing with these challenges. The questions are framed in an open manner to encourage a more open responses. Moreover, by not using RRI terminology (except for the last section) respondents are neither implicitly accused of not being responsible, nor required to have background knowledge of RRI.

Opening prompt/ Briefing

- A brief introduction/briefing specifying why the interviewee has been recruited for the interview (i.e. in what role at which organization, and as an expert of what?).
- A brief clarification of what we mean by societal and ethical challenges:

By societal challenges we mean major society-wide concerns that an individual (or organisation) may encounter such as climate change, and the aging population. These may overlap with the 7 societal challenge that receive specific attention in R&I policy and funding programmes by the EC: 1) health 2) food security 3) energy 4) transport 5) climate and environment 6) inclusive societies 7) secured societies.

By ethical challenges, we refer to two general kinds of situations. First, where an individual (or organization) faces a dilemma, for example in professional practice. These are cases where someone may be asked to balance conflicting thoughts and feelings about what he or she “should” do in a situation, and what he or she is being asked to do. Second, when we as a society face a dilemma in allocating resources or making policy choices. These are cases where different courses of actions seem to force a shifting balance among values that a society holds. A classic example here is balancing basic rights and freedoms with security and privacy needs.

Challenges

1. What are the main societal and ethical challenges of relevance to your work as [fill in]?

Current Practice

2. How do you address these ethical and societal challenges in your [project/organisation]?
 - What strategies or methods do you deploy/are in place?
 - With whom do you collaborate on such challenges?
 - Stakeholders engagement/ ethics/ gender/ forecasting/ scenarios/ etc.

Enablers

3. Are there any resources that you find helpful in dealing with such challenges in your [project/organisation]?
 - Support / resources / guidelines / skills, expertise, experience / financial / etc.

Barriers

4. Are there any factors that prevent you from dealing with such challenges in your [project/organisation]?
 - Lack of time, incentive or expertise / not an issue / not a requirement / etc.

Application of RRI Keys

5. Can you comment on the application of the following features of Responsible Research and Innovation in your [project/organization]?
 - Do you apply ... in your [project/organization]?

Key	Elaboration on how/where	
K1-Public engagement	<input type="checkbox"/> No	<input type="checkbox"/> Yes, ...
K2-Gender equality	<input type="checkbox"/> No	<input type="checkbox"/> Yes, ...
K3-Science Literacy/Education	<input type="checkbox"/> No	<input type="checkbox"/> Yes, ...
K4-Open Access (open science)	<input type="checkbox"/> No	<input type="checkbox"/> Yes, ...

K5-Ethics	<input type="checkbox"/> No	<input type="checkbox"/> Yes, ...
K6-Governance	<input type="checkbox"/> No	<input type="checkbox"/> Yes, ...

Closing question

6. Is there anybody you would recommend for us to contact concerning the topic if this interview?
 - Thanks for the interview and the valuable points you have raised. We would very much like to stay in touch with you in further course of our project.

8. Annex: NewHoRRizon Diagnosis Report, Social Lab 3, Marie Skłodowska-Curie Actions (MSCA)

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8.1 Executive Summary

In place since 1996, Marie Skłodowska-Curie Actions (MSCA) is now part of the Excellent Science Pillar of Horizon2020. It seeks to strengthen career opportunities of promising academics, by enabling worldwide and cross-sector mobility, and supporting research training, training in innovation and in other skills. MSCA is comprised of five support schemes: 1. Individual Fellowships (EF / GF), 2. Innovative Training Networks, (ITN) 3. Research and Innovation Staff Exchange (RISE), 4. Co-funding of regional, national and international programmes (CO-FUND), and 5. European Researcher's Night (NIGHT). Responsible for MSCA is a Unit within the European Commission Directorate-General for Education, Youth, Sport and Culture (Dir C), Innovation, International Cooperation and Sport. During H2020, MSCA will mobilize E6.1 billion. The programme is highly competitive, with a threshold score of about 80%, and success rate for applicants of about 15%. Successful applications are of Higher or Secondary Education Institutes (67.3% of the total budget), Research Organisations (19,1%), Private for Profit (10,3%) and Public Bodies (10,8%).

This report presents the results from a diagnostic inquiry into the current status of RRI in MSCA. The analysis is based on document study and interviewing (see Appendix 1). It concludes that aspects of the 6 'keys' by which the EC operationalizes RRI are traceable in the leading documents outlining the programme. RRI is explicitly mentioned from the second H2020 Work Programme onward, while Gender equality, Science Literacy and Open Access as well as attention for Ethics have been integrated in the formal application procedures. In addition, there is increasing attention for Public engagement in particular in MSCA based training schemes. Furthermore, while as an Excellent Science programme MSCA does not address a particular 'societal challenge', global/societal/sustainability and economical challenges are increasingly mentioned in MSCA-related documents. A specific mention is made of the Migration-issue, which is related to the programme's focus on enhancing mobility. MSCA is the best ranking programme within H2020 in regard to gender (47% of its grantees are female). The logic capture in the 3 O's abbreviation (Open Science, Open Innovation and Open to the world) permeates the MSCA programme entirely, from policy documents to evaluation criteria. Openness in this sense is viewed as MSCA's *raison d'être*, with its focus on stimulating the circulation of knowledge notably via stimulating the mobility of knowledge (via knowledge producers) from an inter-/transdisciplinary, inter-/cross sectoral and trans/international perspective.

The relative high extent of institutionalisation of RRI-related aspects does not produce consensus among MSCA related stakeholders about the concept's exact meaning, nor does it produce a high level of awareness. Awareness of RRI varies greatly between types of actors involved. Officials in the EC Unit and individual researchers, among them individuals involved with the Marie Curie Alumni Association express a genuine interest in RRI and RRI-related issues. However, the impression is that among evaluators and grantees awareness is little awareness to absent. Furthermore, the report concludes, the various forms in which RRI has been institutionalised in MSCA may actually form a barrier in further integrating RRI in the programme line. The current focus on Gender Equality may

hide from view the experience of gender based discrimination that grantees report to experience; the focus on Science Literacy and Public Engagement is currently interpreted from a ‘knowledge deficit’ perspective, implying that engagement with non-scientists involves the dissemination of information about the scientific process and scientific findings mainly; and the integration of ethics in the MSCA grant application forms may in practice reduce attention to the issue to a tick-box exercise.

RRI is present in MSCA, in other words, but the way it is interpreted and acted upon varies widely across the funding scheme. Furthermore, there appears to be a discrepancy between the paper reality of RRI in MSCA and RRI in MSCA-related practices. For a further integration of RRI in the programme line, incentives should be in place that urge a reflection on standing interpretations of RRI-keys and the notions of responsibility, excellence and impact, in order to question their current institutionalisation in the programme line. Given the active network of grantee alumni (MCAA), of NCPs and dedicated evaluators, and the keen interest at EC-level among the actors responsible for the programme line in RRI (and in the developments in the NewHoRRIZon project), MSCA is potentially well set to further integrate RRI. Moreover, as a major programme in the Excellent science pillar, and given the wide spread of MSCA grantees in knowledge institutes around the globe, MSCA may serve as a catalyst in inciting reflection within academia per se on responsibility/society-oriented Research and Innovation.

8.2 Scope of this document

This report is not an official Deliverable. It is for internal use and informs Social Lab 3 on the Marie Skłodowska-Curie Actions (MSCA) that is an integral part of the Excellent Science Pillar of Horizon2020. It provides insight into the programme line and related activities and stakeholders and explores how they relate to RRI. Moreover, it may provide a baseline for evaluation. The report also provides the members of the Consortium with research input, providing data collected in a systematic and therefore comparable way.

8.3 Methods

The diagnosis report is based on desk research on relevant programme documents and online materials. It incorporates work programmes and calls, a scoping paper, evaluation guidelines, proposal templates and other relevant materials from EU websites. Using qualitative analysis software (Atlas.ti), these documents have been coded with codes referring to the 6 keys of RRI (public engagement, gender equality, science education, open access (open science), ethics and governance), process dimensions such as (anticipation, inclusiveness, reflexivity and responsiveness) and societal (including ethical), technological and economic challenges.

Next to desktop research, semi-structured in-depth interviews have been held through online communication channels with experts and other stakeholders related to the programme line of MSCA. Among the respondents were a member of the EC Unit responsible for the programme line, (former) representatives of MSCA related Associations and NCPs. We have also made use of the CORDIS key word analysis and manual validation of presence of RRI and sustainable development goals related key words in MSCA related projects to describe some RRI-case briefs of MSCA related projects.

8.3.1. General scope of the programme

General scope

Along with individual fellowships, the MSCA funding helps develop training networks, promote staff exchanges and support mobility programmes with an international flavour. (EC, 2018i)

8.3.2. What is the programme about?

Objectives

The main organisational objective of the MSCA is the following:

‘The main objective of the MSCA is to invest in the people who drive research and innovation in Europe, to enhance the skills and competences of the researchers and to deliver on innovation, growth and competitiveness. Highly-trained researchers are necessary to advance science and business competitiveness, which, in turn, are important factors in attracting and sustaining investment in Europe’ (EC, 2017d, p. 133)

More concretely, this boils down to the following objectives:

Awarding €6.16 billion in the period to 2020, the MSCA support research training and career development focused on innovation skills. The programme funds worldwide and cross-sector mobility that implements excellent research in any field (a "bottom-up" approach). There are MSCA grants for all stages of a researcher's career, from PhD candidates to highly experienced researchers, which encourage transnational, intersectoral and interdisciplinary mobility. The MSCA will become the main EU programme for doctoral training, financing 25,000 PhDs. Endowing researchers with new skills and a wider range of competences, while offering them attractive working conditions, is a crucial aspect of the MSCA. In addition to fostering mobility between countries, the MSCA also seek to break the real and perceived barriers between academic and other sectors, especially business. Several MSCA initiatives promote the involvement of industry etc. in doctoral and post-doctoral research. (EC, 2018i)

For whom

The programme seeks to promote the careers and cross-sectorial international mobility of promising academics. In other words, the programme gives promising academics from all types of scientific sectors the opportunity to conduct research inside and/or outside academia and to develop themselves as researchers.

What purpose

The purpose is to improve mobility and skills to further careers, increase exchange of scientific personnel and cooperation between European knowledge institutes and even private firms (in some of the funding programmes). As described in detail:

Because they encourage individuals to work in other countries, the MSCA make the whole world a learning environment. They encourage collaboration and sharing of ideas between different industrial sectors and research disciplines – all to the benefit of the wider European economy. MSCA also back initiatives that break down barriers between academia,

industry and business. In addition, they reach out to the public with events that promote the value – and fun side – of science. (EC, 2018i)

8.3.3. What is the size and structure of the programme in terms of budget, applications and projects?

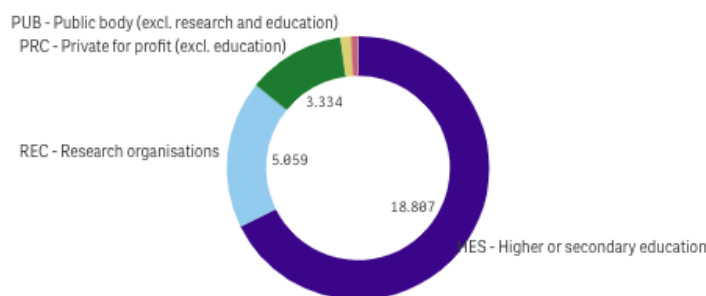
General size, budget and proposals

MSCA-like funding possibilities are *de facto* in place since 1996 when the first frontrunner programmes were there. Since 2014, it is an integral part of Horizon2020, as part of the Excellent science pillar. The DG expects that a total of 6.1 billion euros will be spent within the current Horizon2020-programme. There have been 134.030 applications (24,40% of the total applications of Horizon2020) for a total of 27,35B Euros. Only 26,59% (41,632) of these proposals were eligible. Of these, only 6.061 were retained, which leads to a success rate of just 15% of the eligible proposals (EC, 2018l). In total, thus far, the EU has contributed 3,35B Euros (10.29% of the total budget of H2020 now spent) to about 6.154 projects (32,49% of the total) that are comprised of 17.477 participants (19,82% of the total).

As you can see in figure 1, the largest share was requested by Higher or Secondary Education Institutes (67.3% or 2.253 Million Euros) followed by Research Organisations (19,1% or 640 Million), Private for Profit (10,3% or 345 Million) and Public Bodies (10,8% or 62 Million). Relevant to observe is that quite some proposals do reach the threshold score of about 80% but are not funded because of a lack of funds.

Figure 4 Requested EU Contribution for RI related Projects by Type of Organisation (Million EUR) (EC, 2018l) (for MSCA)

Requested EU Contribution by Type of Organisation (Mil EUR)



As can be seen in figure 2, most eligible proposals come from Western Europe, with Poland as the first Eastern European country on the 18th place.

Figure 5 Top applying countries in MSCA (EC, 2018)

Top Applying Countries - Regions ✕				
Country 🔍	Eligible Proposals	Retained Proposals	Requested EU Contribution (EUR)	Applicati...
Totals	41.263	5.910	27.792.294.719 €	132.497
United Kingdom	13.705	2.118	5.053.661.691 €	21.788
Germany	7.649	948	3.216.236.561 €	14.990
France	7.349	901	2.560.613.199 €	11.520
Spain	7.571	895	2.481.352.962 €	11.984
Italy	6.137	672	2.200.656.645 €	10.386
Netherlands	5.021	679	2.002.145.391 €	8.681
Denmark	3.026	417	1.194.134.649 €	4.271
Belgium	3.386	405	1.078.284.943 €	4.928
Sweden	2.888	341	973.793.423 €	4.227
Switzerland	3.193	406	861.918.730 €	4.121
Austria	1.946	256	620.806.379 €	2.688
Portugal	1.893	198	580.635.927 €	2.781
Ireland	1.663	238	559.450.114 €	2.241
Greece	1.612	163	532.456.726 €	2.476
Norway	1.426	156	529.724.269 €	2.035
Finland	1.338	138	462.220.421 €	1.939
United States	3.798	556	375.011.511 €	4.524
Poland	1.135	109	309.450.815 €	1.567
Israel	970	109	242.654.974 €	1.164
Czech Republic	892	85	230.046.485 €	1.187
Turkey	857	70	164.802.999 €	994
Slovenia	605	46	162.773.585 €	872

Structure and particular sizes

As said, the MSCA seeks to promote the careers of promising academics, by supporting research training and career development, training in innovation and other skills, and by funding worldwide and cross-sector mobility. To that end there are five main types of MSCA:

- **Innovative Training Networks (divided into ETN/EID and EJD)**
- **Individual Fellowships (EF and GF)**
- **Research and Innovation Staff Exchange (RISE)**
- **Co-funding of regional, national and international programmes (COFUND)**
- **European Researcher’s Night (NIGHT).**

The unit responsible for the policy of the MSCA - Marie Skłodowska-Curie Actions - falls under the European Commission Directorate-General for Education, Youth, Sport and Culture – Dir C – Innovation, International Cooperation and Sport (EU Publications Office, 2018). The policy is executed by the Research Executive Agency and implemented with the help of external disciplinary-specific evaluators and (sometimes) ethics experts.

We will now discuss how MSCAs differ in terms of potential applicants, topics and what is covered exactly.

Innovative Training Networks

First of all, there are the **Innovative Training Networks (ITN)**. Innovative training networks bring together employees of universities, research institutions, research infrastructures, businesses (among them SMEs) and relevant others from different countries. The funding is supposed to boost scientific excellence and business innovation, and should enhance young promising researchers' career prospects through developing skills in entrepreneurship, creativity and innovation.

The ITN actions are multi-beneficiary actions and are differentiated in three separate actions which can take the form of networks and/or doctoral programmes for early-stage researchers:

- **European Training Networks (ETN):**
‘help researchers gain experience of different working environments while developing transferable skills. They must involve at least three partners from inside and outside academia. Organisations managing such a network should be established in at least three different EU or associated countries, though additional participants can join from across the world’ (EC, 2018m). These networks are set-up so that multiple researchers can be trained to doctorate level.
- **European Industrial Doctorates (EID):**
These doctorates allow PhD candidates to step outside of academia and develop skills in industry and business. The joint doctoral training is delivered by at least one academic partner entitled to award doctoral degrees, and at least one partner from outside academia, primarily enterprise. Each participating researcher is enrolled in a doctoral programme and is jointly supervised by supervisors from the academic and non-academic sector, where they spend at least 50% of their time. The final aim is for the doctoral candidates to develop skills inside and outside academia that respond to public and private sector needs. The organisations should be established in at least two different EU or associated countries. A wider set of partner organisations from anywhere in the world may also complement the training (idem).
- **European Joint Doctorates (EJD):**
A minimum of three academic organisations form a network with the aim of delivering joint, double or multiple degrees. Joint supervision of the research fellow and a joint governance structure are mandatory. The aim is to promote international, intersectoral and multi/interdisciplinary collaboration in doctoral training in Europe. The organisations should be from different EU or associated countries. The participation of additional organisations from anywhere in the world, including from the non-academic sector, is encouraged (idem).

All research areas can apply, except EURATOM. This action is meant primarily for organisations such as universities, research centres or companies, that propose a research training network. Individuals can apply for the specific positions created by these networks. These are advertised on Euraxess.

The proposed research training or doctoral programme should respond to well-identified multi- and interdisciplinary needs in scientific and technological research areas, expose the researcher to different sectors, and offer a comprehensive set of transferable skills (such as entrepreneurship and communication). Proposals should reflect existing or planned research cooperation among the partners, involving the researchers through individual, personalised research projects. Mobility across borders is a must. Grants cover recruitment and training per researcher up to four years, research costs and management and overhead costs. The researcher is hired under an employment

contract and benefits from a monthly living allowance, social security cover, plus a mobility and family allowance.

In total 548 ITN's have been funded (2,89% of the total of Horizon 2020) with 7,335 participants (8,32% of the total) and a contribution of 1,77B Euros (5,44% of the total). The bulk of this is comprised of the ordinary ETN's (486 projects or 1,65B Euros) (EC, 2018k).¹³⁹

Individual Fellowships

The **second distinct** part of MSCA consists of the **Individual fellowships (IF)**: these Fellowships offer support for experienced researchers to move between countries, with the option to work outside academia. These are advertised as being 'a great option if you are an experienced researcher looking to give your career a boost by working abroad. They offer exciting new learning opportunities and a chance to add some sparkle to your CV' (EC, 2018h).

There are two types of **IFs**, dependent on the geographical location of the host organization:

- **European Fellowships (EF):**

These are open to researchers moving within Europe, as well as those coming in from other parts of the world. They can allow for the restart of a research career after a break, such as parental leave, or can help researchers coming back to Europe to find a new position. They can be held in the EU or associated countries (sixteen in total, among them Norway, Albania, Switzerland, Israel and Ukraine) and last for one or two years. Grantees are awarded the title of MSCA Fellow. Moreover: within the European Fellowship, recently there has been a differentiation between **Standard European Fellowships**, a **Society and Enterprise Panel**, a **Reintegration Panel** and a **Career Restart Panel**.

- **Global Fellowships (GF):**

These are open to fund positions outside of Europe for researchers based in the EU or the earlier mentioned associated countries and may last from two to three years. They have the requirement that the researcher has to come back for one year to an organization based in the EU or one of the associated countries.

Both Fellowship-types can include a secondment period of up to three or six months in another organisation in Europe. As opposed to the earlier mentioned doctoral training networks, only experienced researchers (from across the world) can apply: applicants need a doctoral degree and at least four years full-time research experience by the time of the call deadline (idem).

All research areas are funded and the funding provides allowance to cover living, travel and family reunion costs. In addition, the grant provided by the EC contributes 'to the training, networking and research costs of the fellow, as well as to the management and indirect costs of the project. The grant is awarded to the host organisation, usually a university, research centre or a company in Europe' (idem) The research proposal is therefore written jointly with the chosen host organization.

¹³⁹ These figures seem to exclude the last round of funding in which 442 million euros were spent to support 123 networks benefitting 1271 participating organizations and 1600 PhD candidates (with a success rate of a mere 7.4% (EC, 2018d)

In total, 5.140 IF's have been funded (27,13% of the total of Horizon 2020) with 5.761 project participants (6,53% of the total) and a contribution of 943,5 Million Euros (2,9% of the total) and the bulk being European Fellowships (EC, 2018k).

Research and Innovation Staff Exchanges

The **third distinct** type of action under the MSCA funding scheme is comprised by the **Research and Innovation Staff Exchanges (RISE)** for international and inter-sectoral cooperation. It 'funds short-term exchanges of personnel between academic, industrial and commercial organisations throughout the world. It helps people develop their knowledge, skills and careers, while building links between organisations working in different sectors of the economy, including universities, research institutes and SMEs' (EC, 2018n).

At least three partner organizations (academic and non-academic from three different countries) must be included in the proposal and at least two of these should be from the EU or associated countries. Exchanges between organizations in the EU/associated countries must be inter-sectorial but worldwide exchanges may be intra-sectorial. According to the advertisement, proposals should pay ample attention to 'knowledge creation, sharing know-how and skills development' (idem).

What sets this action apart from the previous ones is that 'Staff members working in managerial, technical or administrative roles can also take part' (idem).

'The grant supports the secondment of staff members for one month to one year. They must be engaged in or linked to research and innovation activities at their home organisation for a certain time prior to the secondment. They return to their home organisation after the secondment, to pass on their knowledge. Funding for a RISE project can last up to four years' (idem).

In total, 355 RISE projects have been funded (1,87% of the total of Horizon 2020) with 3.526 project participants (4% of the total) and a contribution of 308,3 Million Euros (0.95% of the total) (EC, 2018k).¹⁴⁰

Co-funding of regional, national and international programmes

The fourth distinct MSCA scheme is called **Co-funding of regional, national and international programmes (COFUND)** and is set up to co-finance doctoral research training or fellowships for experienced researchers. The extra funds are made available for new or existing schemes for training researchers abroad and across various sectors. Each COFUND proposal is written by one main participant such as a 'government ministry; regional authority; funding agency; university research organization or an enterprise' (EC, 2018f).

Researchers may directly apply to the organization through job offers posted on Euraxess. Again, all research areas can be funded, and the funding covers a part of the living allowance (a fixed amount per researcher) as well as management costs. If a programme is selected, the co-funding may last up to five years and for a maximum total amount of 10 million euros (idem).

¹⁴⁰ These figures seem to exclude the last round of funding in which 80 million Euros were spent benefitting a total of 741 organizations (EC, 2018l).

In total, 111 COFUND projects have been funded (0,59% of the total of Horizon 2020) with 855 project participants (0.97% of the total) and a contribution of 324,1 Million Euros (1% of the total) (EC, 2018k).

European Researchers' Night

The final action under the MSCA scheme is called **European Researchers' Night** or **NIGHT** and has the goal to 'promote science' (EC, 2018g). It involves coordination between regional, national or international partners and any legal entity that is capable to organize events and hails from an EU Member State or associated country can apply 'For example: private and public research organisations, companies, public authorities, schools, science museums, parent-teacher organisations, EU mobility centres for researchers, foundations or the media may apply' (idem).

The main goal is to show the positive impact of European funded research on the daily lives of citizens: 'Any event that boosts **public awareness of the positive role of research in society**, especially among **young people**, can be supported. European Union funded researchers should interact as much as possible with visitors and show how their research has an impact on people's daily lives' (idem).

The grants can cover up to two years, with actual value depending on the scale of the events proposed and are put out every two years. Funding covers expenses related to the organization of a research outreach event and can be spent on preparations, advertisement, the event and later evaluation of the impact. Some activities that are eligible to be supported are: 'hands-on experiments conducted by researchers; science shows with public participation; debates; "researchers' dating" (meet researchers and ask them questions); competitions (science quizzes, games, puzzles, photo and art contests, etc.); workshops for children and guided visits of labs, research institutes, and other relevant places that are usually closed to the public' (idem). Applicants are however encouraged to be creative in their approach and go beyond suggestions.

If proposals pass the evaluation threshold but cannot be funded because of insufficient budgets, they are encouraged to associate their events with NIGHT so that they will be advertised on the event page. NIGHT has been taking place in September since 2005; in 2017 about 1.1 million citizens and over 21000 researchers took part (idem).¹⁴¹

As it is advertised on the EC website: 'The events showcase what researchers really do for society in interactive and engaging ways, promoting research careers to young people and their parents. Fight cancer, stop global warming, prevent hunger and drought, invent devices for disabled people, and make human life easy in space! This could be the fascinating, life-changing daily work of the faces behind science who you can meet at the European Researchers' Night 2017. With family, friends, your school or on your own, become a scientist for the evening and participate in science activities – great entertainment is guaranteed!' (idem).

¹⁴¹ This year (2018), events will take place on Friday 28 September in over 340 cities across Europe and in neighbouring countries. In Brussels, the European Commission and the European Parliament will organise a special event from Tuesday 25 to Wednesday 26 September called "Science is Wonder-full - European Researchers' Night."

In total (not including the last round), 89 NIGHT projects have been funded (0,47% of the total of Horizon 2020) with 399 project participants (0,45% of the total) and a contribution of 15,93 Million Euros (0.05% of the total) (EC, 2018k).¹⁴²

Marie Curie Alumni Association

As concerns the structure of the programme, the Marie Curie Alumni Association (MCAA) deserves mentioning here too. This association run by volunteers of former and current beneficiaries of the programme line plays a notable role contributing to the MSCA's various objectives. It is an international not-for-profit organization that 'envisions a future in which knowledge will be used to benefit society' (MCAA, 2018). Moreover, its strategy is to 'connect researchers throughout Europe, and around the world, to enable international transdisciplinary collaborations' (idem). The goals are stipulated as follows: 'Enhance the flow of knowledge across different countries, sectors of the economy, and scientific disciplines; Encourage networking, cooperation, and mutual understanding among MCAA members, and external stakeholders; Serve as a forum of debate for researchers and citizens' (idem). The current association is in effect since 2014, supported by the EC (with which it closely co-operates), replacing the earlier Marie Curie Fellows Association (MCFA, 2018) for which funding stopped some time ago. Interesting about the composition of its membership is that only 13,7% of the members come from the Social Sciences, something that equally is the case with MSCA beneficiaries according to a former vice-president of the MCAA (Int. 7). As we will see, this association plays an interesting role in furthering particular aspects in MSCA-related research that could be subsumed under the label 'RRI'.

¹⁴² These figures seem to exclude the last round of funding in which 55 projects received a total of 12 million euros (EC, 2018c).

8.4 Current situation of RRI in the programme

8.4.1 RRI in brief

MSCA seems to offer a promising context for expanding and mainstreaming RRI. It is one of the most diverse and bottom-up programme lines of Horizon 2020. Moreover, it is one of the few European funding schemes that educate young and promising researchers to become the academics of tomorrow. It has produced, over the years, a network of scholars that are, because of the funding arrangements, relatively independent from their respective institutional work environments, which might prove instrumental in inciting a change in academic culture to reflect RRI-related views on responsibility issues. Vice versa, ‘RRI’ promises to offer a suitable label to integrate various developments within the context of MSCA, which speak of a keen awareness of societal and ethical issues among involved researchers. Because of these two interrelated dynamics, the MSCA programme line seems to provide fertile ground for (further) integrating (discussions on) the RRI concept. As will be discussed below, indeed there are many on-going developments related to Gender Equality, Science Literacy and the ‘three O’s’: Open Science/Open Innovation/Open to the world.

8.4.2 Desktop findings

In our analysis of the current status of RRI(-related aspects) in MSCA, we aimed at comprehensiveness in regard to the level of discussion. In the desktop analysis, we have analysed the MSCA part of the regulation that establishes Horizon 2020 on policy level. This has been complemented with an analysis of three Work Programme documents for MSCA, including the calls related to the last two Work Programmes. We have furthermore included related available proposal templates, for ITN (2018); IF (2018); RISE (2018), COFUND (2018) and NIGHT (2018). In addition, we have looked at the available evaluation criteria for the same calls.¹⁴³ Finally, we have incorporated the CORDIS analysis and manual validation from CWTS for MSCA, so as to include MSCA on project level in the analysis.

8.4.2.1 Role of RRI on MSCA programme levels¹⁴⁴

Policy document level: Regulation of Establishment of H2020 – MSCA section

Yes	<p>Explicit:</p> <ul style="list-style-type: none"> • Keys: some awareness • O’s: some awareness <p>Implicit: some awareness</p>
Explicit	<p>Summary - Keys:</p> <p>On policy document level, there are a few mentions of specific keys. Of these, <i>Gender equality, dissemination (Open Access/Science Literacy) and Governance</i> are centre stage in MSCA on policy (document) level. Given the absence of the other keys, on average, we assess explicit awareness of RRI on policy document level as ‘modest’.</p>

¹⁴³ With the exception of NIGHT, for which the evaluation criteria could not be traced.

¹⁴⁴ The WP Leader may want to focus only on the bold text for synthesizing purposes because these explain and summarize the content. Underneath the bold texts are illustrative quotes that illuminate the basis on which conclusions were reached.

Gender equality:

‘Marie Skłodowska-Curie actions will ensure effective equal opportunities for the mobility of male and female researchers, including through specific measures to remove barriers. [...] Gender equality, high-quality and reliable employment and working conditions and recognition are crucial aspects that must be secured in a consistent way across the whole of Europe.’ (European Parliament & the Council of the EU, 2013, p. 347/129).

Open Access/Science literacy:

‘The activity shall further aim at raising awareness of the importance and attractiveness of a research career and at disseminating research and innovation results emanating from work supported by Marie Skłodowska-Curie actions.’ (idem, p.347/131)

Governance:

‘All the activities under this challenge will contribute to creating a whole new mindset in Europe that is crucial for creativity and innovation. Marie Skłodowska-Curie funding measures will strengthen pooling of resources in Europe and thereby lead to improvements in coordination and governance of researchers' training, mobility and career development.’ (idem, p.347/130).

3 O's:

Inter-sectoral and transnational mobility, which are key to MSCA, can be understood as core issues of Open Innovation which as a policy goal seeks to stimulate the free circulation of knowledge and to foster a culture of entrepreneurship. As such what is central to MSCA can be considered de facto manifestations of *Open Innovation* and *Open to the world* .

Open innovation/ Open to the World:

‘the best researchers in Europe and in the world need to work together across countries, sectors and disciplines. Marie Skłodowska-Curie actions will play a key role in this respect by supporting staff exchanges that will foster collaborative thinking through international and intersectoral knowledge-sharing that is so crucial for open innovation.’ (idem, p. 347/129).

Huge amount of constantly repeated references to intersectoral and transnational mobility (Open Science/Open to the World), e.g.:

‘Significant involvement of businesses, including SMEs and other socio-economic actors, will be needed to equip researchers with the cross-cutting innovation and entrepreneurial skills demanded by the jobs of tomorrow and encourage them to consider their careers in industry or in the most innovative companies.’ (idem, p.347/128)

‘It will also be important to enhance the mobility of these researchers, as it currently remains at a too modest level: in 2008, only 7 % of European doctoral candidates were trained in another Member State, whereas the target is 20 % by 2030’ (idem).

<p>Implicit</p>	<p><u>Summary - Implicit understandings of RRI</u></p> <p>There are indications of an implicit understanding of (anticipation of) <i>Societal/Sustainability/Economical Challenges</i>, interdisciplinarity and cooperation with third countries. These come into play notably in the interpretations in MSCA context of the Principles of Innovative Doctoral Training, the European Charter for Researchers and the Code of Conduct for the Recruitment of Researchers.</p> <p><i>(Anticipation of) Economical challenge:</i> ‘Although Europe hosts a large and diversified pool of skilled human resources for research and innovation, this needs to be constantly replenished, improved and adapted to the rapidly evolving needs of the labour market. [...] This, combined with the need for many more high-quality research jobs as the research intensity of the European economy increases, will be one of the main challenges facing European research, innovation and education systems in the years ahead’ (idem, p. 347/127).</p> <p><i>(Anticipation of) Societal/sustainability challenge:</i> ‘The human factor is the backbone of sustainable cooperation which is the key driver for an innovative and creative Europe able to face societal challenges, and key to overcoming fragmentation of national policies. Collaborating and sharing knowledge, through individual mobility at all stages of a career and through exchanges of highly skilled R&I staff, are essential for Europe to re-take the path to sustainable growth, to tackle societal challenges and thereby contribute to overcoming disparities in research and innovation capacities’ (idem, p.347/129)</p> <p><i>(Anticipation of) Societal challenge:</i> ‘the societal challenges to be addressed by highly skilled R&I staff are not just Europe's problem.’ (idem, p.347/130)</p> <p><i>Interdisciplinarity and cooperation with third countries:</i> ‘Key activities shall be to provide excellent and innovative training to early-stage researchers at post-graduate level through interdisciplinary projects, including mentoring to transfer knowledge and experience between researchers or doctoral programmes, helping researchers to develop their research career and involving universities, research institutions, research infrastructures, businesses, SMEs and other socio-economic groups from different Member States, associated countries and/or third countries.’ (idem, p.347/130)</p> <p><i>Principles of Innovative Doctoral Training</i> (idem, p.347/129)</p> <p><i>Reference of the European Charter for Researchers and the Code of Conduct for the Recruitment of Researchers</i> (idem, p. 347/129).</p>
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	<p><i>Mention of other relevant policy agendas:</i> ‘Innovation Union’, ‘Youth on the Move’ and ‘Agenda for New Skills and Jobs’ [...]’the Erasmus+ programme and the KICs of the EIT.’ (idem, p.347/130).</p>
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Work programme level – Work programmes 2014-2015/2016-2017/2018-2020

Yes	<p>Explicit:</p> <ul style="list-style-type: none"> • Keys: growing awareness through the years • O’s: high awareness <p>Implicit: some awareness</p>
Explicit	<p><u>Summary - Keys:</u></p> <p>Work programme 2014-2015</p> <p>From the start, there was a high awareness of <i>Gender</i> as a key issue, both in terms of gender equality as well as in the sense of gender dimensions of research and training on these aspects. There is some use of language (‘dissemination’) related to <i>Science Literacy/Public Engagement and Open Access</i>.</p> <p><i>Gender:</i> ‘Marie Skłodowska-Curie actions pay particular attention to gender balance. In line with the Charter and Code, all Marie Skłodowska-Curie proposals are encouraged to take appropriate measures to facilitate mobility and counter-act gender-related barriers to it. Equal opportunities are to be ensured, both at the level of supported researchers and that of decision- making/supervision. In research activities where human beings are involved as subjects or end-users, gender differences may exist. In these cases, the gender dimension in the research content has to be addressed as an integral part of the proposal to ensure the highest level of scientific quality. As training researchers on gender issues serves the policy objectives of Horizon 2020 and is necessary for the implementation of R&I actions, applicants may include in their proposals such activity.’ (EC, 2014, p. 3)</p> <p><i>Open Access/Science education/public engagement</i> ‘To further enhance dissemination and public engagement, beneficiaries of the Marie Skłodowska-Curie actions are required to plan suitable public outreach activities’ (idem, p. 4)</p> <p><i>Open Access:</i> ‘A novelty in Horizon 2020 is the Open Research Data Pilot which aims to improve and maximise access to and re-use of research data generated by projects. While certain Work Programme parts and areas have been explicitly identified as participating in the Pilot on Open Research Data, individual actions funded under the other Horizon 2020 parts and areas can choose to participate in the Pilot on a voluntary basis. The use of a Data Management Plan is required for projects participating in the Open Research Data Pilot’ (ibid., p. 4).</p>

Work programme 2016-2017

An explicit mention of all keys of RRI and the concept itself has now been added. Science Literacy and Public Engagement are now phrased in terms of coping with Sustainability Challenges and Public Engagement is seen in a more differentiated way, even mentioning citizen science as an option. Research integrity is also added, which points to Ethics.

All:

‘The Marie Skłodowska-Curie actions endorse the Horizon 2020 Responsible Research and Innovation (RRI) cross-cutting issue, engaging society, integrating the gender and ethical dimensions, ensuring the access to research outcomes and encouraging formal and informal science education. All applicants to the Marie Skłodowska-Curie calls are encouraged to adopt an RRI approach into their proposals’ (EC, 2016, p. 5).

Gender:

Same as in previous WP.

Open Access:

Same.

Science education/public engagement:

Has been coupled more to sustainability challenges:

‘To further enhance dissemination and public engagement, beneficiaries of the Marie Skłodowska-Curie actions are required to plan suitable public outreach activities. In this way, they can also contribute to the cross-cutting objectives of Horizon 2020, such as climate action, sustainable development and biodiversity’ (idem).

Public engagement:

‘This can include participation of MSCA fellows in the European Researcher's Night (NIGHT), presenting their work and personal experience in schools (e.g. within the 'Researchers at school and at university' [Re@ct] initiative), creating blogs, participating in radio or TV programmes, setting-up exhibitions or other engagements and dialogue with the general public, such as through citizen science’ (ibid.).

Open Access:

Rephrased into:

‘A novelty in Horizon 2020 is the Pilot on Open Research Data which aims to improve and maximise access to and re-use of research data generated by projects. Applicants to the Marie Skłodowska-Curie actions may participate in the Open Research Data Pilot on a voluntary basis. Participation in the Pilot is not taken into account during the evaluation procedure. In other words, proposals will not be evaluated favourably because they are part of the Pilot. More information can be found under General Annex L of the work programme. A further new element in Horizon 2020 is the use of Data Management

Plans (DMPs) detailing what data the project will generate, whether and how it will be exploited or made accessible for verification and re-use, and how it will be curated and preserved. The use of a DMP is required for projects participating in the Open Research Data Pilot. Other projects are invited to submit a DMP if relevant for their planned research. Only funded projects are required to submit a DMP' (ibid.).

Ethics:

'Principles of research integrity - as set out, for instance, in the European Code of Conduct for Research Integrity – will apply throughout all Marie Skłodowska-Curie actions' (idem, p. 4)

'The ethical dimension of the activities undertaken should be analysed and taken into account, including relevant socio-economic implications. This implies the respect of ethical principles and related legislation during the implementation. Whenever possible, the activities should also include in their objectives a better understanding and handling of the ethical aspects as well as the promotion of the highest ethical standards in the field and among the actors and stakeholders' (idem, p. 5).

Work Programme 2018-2020

Extra attention to *Science Literacy*, but – please note – it is explicated that this should not hurt the research.

Science Education:

'Both early-stage and experienced researchers may choose to lecture, tutor, and supervise students, and follow training in order to perform such tasks. Time spent on these activities should be of a reasonable amount which, in the opinion of both the researcher and his/her supervisor would not jeopardise the execution of the research project and is considered to be part of the MSCA action similarly to dissemination and communication activities, including public outreach' (EC, 2017e, p. 5)

Others:

Same.

Summary - 3 O's:

Work programme 2014-2015

Some references to opening up to people from different institutes, socio-economic actors and industry and cross-border, cross-sector mobility pointing to *Open Science, Open Innovation and Open to the world.*

Adding to what's already been said:

Open Science/Open Innovation/Open to the world:

'The Marie Skłodowska-Curie actions are open to researchers and innovation staff at all stages of their career, as well as to universities, research institutions, research infrastructures, businesses, and other socio-economic actors from all countries, including third countries under the conditions defined in Horizon 2020 Rules for Participation and in part A of the General Annexes to the Work Programme. Attention is paid to encouraging the strong participation of industry, in particular SMEs, for the successful

Implicit	<p>implementation and impact of the Marie Skłodowska-Curie actions’ (ibid., p.3). The Marie Skłodowska-Curie actions ensure excellent and innovative research training as well as attractive career and knowledge-exchange opportunities through cross-border and cross-sector mobility of researchers’ (ibid).</p> <p>Work programme 2016-2017 Civil Society Organisations is now included as potential beneficiary. <i>Open Innovation/Open to the world:</i> This has been added: ‘including civil society organisations’ (idem, p. 4)</p> <p>Work programme 2018-2020 What has been achieved until now is now also discussed in terms of addressing international and cross-sectoral mobility (Open Science/Open Innovation/Open to the world). There is an extra emphasis on entrepreneurial activities. <i>Open Innovation/Open to the world</i> and MSCA contributing to <i>Societal Challenges</i> stays the same but is elaborated upon by showing what has been achieved until now: ‘The MSCA account for more than half of all third country participations in Horizon 2020 and one in four MSCA fellows are researchers attracted to Europe from countries outside the EU Member States or Horizon 2020 Associated Countries. An estimated 45% of fellows benefit from some form of cross-sectoral mobility out of or into an academic setting.’ (idem, p. 65).</p> <p><i>Open Innovation:</i> ‘Experienced researchers may opt to work part-time on their MSCA action in order to pursue supplementary activities. These might include creating a company, pursuing another research project, or engaging in advanced studies not related to the MSCA grant’ (ibid.).</p> <p>Rest is the same.</p> <p><u>Summary - Implicit:</u> Work programme 2014-2015 There is mentioning of <i>Societal Challenges</i>, the European Charter for Researchers and the Code of conduct for the Recruitment of Researchers. <i>(Anticipation of) Societal challenges:</i> ... to better prepare them for current and future societal challenges’ (idem, 2014, p.3)</p> <p><i>Other relevant policies:</i> ‘The principles of the European Charter for Researchers and Code of Conduct for the Recruitment of Researchers¹ (Charter and Code) promoting open recruitment and attractive working and employment conditions are recommended to be endorsed and applied by all the funded participants.’ (ibid, p. 3)</p>
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<p>Work programme 2016-2017</p> <p>Same.</p> <p><i>(Anticipation of) Societal challenges:</i> Same as in the previous WP.</p> <p><i>Other relevant policies:</i> The same as in the previous WP.</p> <p>Work programme 2018-2020</p> <p>There is now an emphasis on the <i>Societal Impact</i> that the programme has generated yet this seems to be viewed in terms of publications. <i>Sustainable Development Goals</i> are mentioned. <i>Inclusiveness</i> towards migrants and Widening countries is added.</p> <p><i>Societal impact (but from a very particular perspective):</i> ‘there is also strong evidence of the longer-term scientific value and societal impact of the programme. To date, there have been 1 114 publications in MSCA projects, of which 740 in peer-reviewed journals. This is the highest number of all areas in the Framework Programme’ (ibid.).</p> <p><i>Societal Challenges and Sustainable Development Goals:</i> ‘Although a bottom-up programme, the Marie Skłodowska-Curie Actions also significantly contribute to achieving the Sustainable Development Goals (SDG) as evidenced by the H2020 interim evaluation: "MSCA funding addresses societal challenges to a significant extent, above the Horizon 2020 average and well ahead of the other areas in the excellence pillar: 62% of the budget in 2014-2015 was awarded to projects related to sustainable development, 23% to climate change and 6% to biodiversity’ (idem, p. 6).</p> <p><i>Inclusiveness:</i> ‘The MSCA will increase support to providing conducive framework conditions to integrating researchers displaced by conflict outside the EU and Horizon 2020 Associated Countries into the European research and innovation landscape on a long-term basis’ (ibid.).</p> <p><i>Widening participation:</i> ‘Therefore, specific Widening Fellowships in line with the high quality standards of the MSCA Individual Fellowships will be implemented through Work Programme part 15 (Spreading Excellence and Widening Participation)’ (p. 6)</p> <p><i>Other relevant policies:</i> Same.</p>
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Scoping level – Scoping paper WP 2018-2020

Yes	<p>Explicit</p> <ul style="list-style-type: none"> • Keys: high awareness • O's: high awareness <p>Implicit: high incorporation</p>
Explicit	<p><u>Summary - Keys:</u></p> <p>There seems to be a high awareness of <i>all keys</i> except <i>Governance</i>. Especially <i>Science Literacy</i> (of both doctoral students as well as towards the general public) is valued and there is even an explicit mention of RRI as an approach/concept.</p> <p><i>Explicit mention RRI together with Open Science:</i> ‘Common introductory training for all MSCA-fellows should be arranged [...] This will enable fellows to receive specific training in dimensions that will empower them to become leaders of the new generation of researchers (such as training in open science and responsible research and innovation), and to be directly informed about their rights and obligations as MSCA-researchers. This will foster a common sense of identity and further strengthen the already successful brand name’ (EC, 2016b, p.7)</p> <p><i>Open Access/Science:</i> ‘Open Science. Research training must ensure that researchers develop the key skills to be able to implement open science in their daily work and become active contributors to the digital era in research. Researchers shall hence acquire the digital skills that will allow for optimal research data management and data sharing with the rest of the research community, through opening access to their publications and to their research data. They shall also develop the knowledge and the communication skills, using new digital (social) media [...]’ (idem, p. 2).</p> <p><i>Science literacy:</i> ‘...1) to reach out efficiently to the general public, 2) to explain their research results to them in an easily understandable fashion, and 3) to emphasise how their work may contribute to improve their lives and/or to provide a better understanding of the world they live in’ (ibid.). ‘The European Researchers' Night (NIGHT) will continue its successful outreach activities communicating science to youth and the general public, highlighting both the results of research and the attractiveness of a research career’ (idem, p. 4). ‘The possibility for researchers to become involved - and supported through appropriate pedagogical and didactic training - in teaching up to a reasonable amount of time should be made more explicit, as teaching can create synergies between education and research and allows researchers to gain valuable transversal skills’ (idem, p.4) ‘For instance, further efforts are needed to ensure the structural embedding of research in teaching and learning to help students develop an inquiring mind. Best practices in combining H2020 and ESIF funding should be highlighted more strongly to increase their uptake’ (idem, p. 7/8). ‘encouraging more young people to embark on a career in research’ (idem, p.8).</p>

Public engagement:

‘a training in how to best include citizens in the research design and processes (when relevant) and in how to engage with them in citizen science projects for example, will allow researchers to empower their research and maximise its impact, while strengthening the trust built with the general public’ (idem, p. 3).

Ethics:

‘Training in ethics will naturally be essential in this setting to best accompany and guide researchers in the appropriate use of all the digital and communication competencies acquired to promote and implement open science’ (ibid.).

Gender equality:

‘Under H2020 so far, a total of 40.9% of MSCA-supported researchers are women. This is higher than the average percentage of female researchers in Europe and shows the openness of the programme to women. The MSCA will ensure that their participation will remain at a high level, hence evaluators will be sensitised to unconscious gender or other biases. The attractiveness of the Individual Fellowships' Career Restart Panel will be further increased. [...]In addition, the conditions for benefitting from the family allowance should be made more flexible in order to ensure that researchers with dependent family members are appropriately financed. The family allowance can only truly fulfil its purpose if it is fully accessible to all researchers eligible for it, at all stages of their career’ (idem, p. 5)

Summary - 3 O's:

There appears to be a high awareness, considering the explicit mention of the booklet on *Open Science* and a lot of mentions of inter-sectoral and transnational mobility (which are here seen as de facto applications of *Open Innovation* and *Open to the world*).

Explicit mention of the booklet: "Open Innovation, Open Science, Open to the World – a vision for Europe", European Commission, 2016, p.59.” (idem, p.3, footnote 1).

Open Science:

‘Finally, assessment of researchers for career progress and during evaluation processes for funding should also take into account these new dimensions of researchers' work in order to best promote and expand open science practices’ (idem, p. 3).

Open Innovation:

‘The Innovative Training Networks (ITN) will provide support for innovative doctoral training of researchers in the academic and the non-academic sector.’ (ibid)

‘Part-time fellowships [...] will allow researchers to work on their research project, while at the same time giving them the opportunity to become entrepreneurs and start a company, work in a different sector, or embark on further advanced training or studies’

<p>Implicit</p>	<p>(idem, p. 4). ‘Therefore the MSCA will continue to promote and support mobility between the academic and the non-academic sector and training in entrepreneurship. In line with the country-specific recommendations of the European Semester 2016, the MSCA will also continue to strengthen intersectoral cooperation to turn research results into future products and services and contribute to the exploitation of Europe's innovation potential. 887 enterprises already receive funding within 1 050 MSCA projects, which represents 37% of the total number of beneficiaries’ (idem, p.6) ‘The Society and Enterprise Panel under Individual Fellowships was created in 2016 to support researchers training in the non-academic sector specifically’ (idem., 7) ‘Also, intersectoral mobility is not an end in itself but should lead to genuine innovation. [etc.]’ (ibid.).</p> <p><i>Open Innovation/to the World:</i> ‘the Research and Innovation Staff Exchange (RISE) scheme will provide support for international and intersectoral cooperation and transfer of knowledge through the exchange of staff’ [...] ‘the Research and Innovation Staff Exchange (RISE) scheme will provide support for international and intersectoral cooperation and transfer of knowledge through the exchange of staff’ (idem, p. 4).</p> <p><i>Open to the World:</i> ‘The Global Fellowships will be reinforced to enable more researchers to gain new skills and knowledge abroad which they bring back to Europe from leading centres in any country. This will also foster new partnerships between outgoing fellows, their European employers, and their host organisations around the world. [...]The MSCA will more actively target European researchers abroad with the aim of reintegrating them in Europe on a long-term basis by strengthening the Reintegration Panel as part of the Individual Fellowships’ (idem, p. 5/6)</p> <p><u>Summary - Implicit:</u> There appears to be a high implicit incorporation (since awareness is hard to discern when it comes to implicitness) of dimensions of <i>anticipation, responsiveness and inclusiveness</i>. Mostly, these relate to the research system and not so much to society as a whole. There are references to <i>Global/Societal Challenges</i> (migration) and important events/networks.</p> <p><i>Anticipation (but of future research related positions):</i> ‘The Marie Skłodowska-Curie actions (MSCA) under Horizon 2020 (H2020) contribute to these goals by equipping researchers with the right knowledge, skills and international and intersectoral exposure to fill the top research positions of tomorrow, both in the</p>
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academic and the non-academic sector’ (idem, p.1)

Responsiveness (towards a changing R&I landscape):

‘The resulting Strategic Advice Report recommends building on the existing strengths of the MSCA and continuing the bottom-up, excellence-driven approach, while reflecting the changing landscape of research and innovation to better equip researchers with the right skills and competences to thrive in a changing environment’ (ibid.).

Societal/technological challenges and multidisciplinary:

‘Inter/Multidisciplinary reflects the complexity of societal challenges, the conversion of enabling technologies and the emphasis placed by funders of research (which increasingly includes the non-academic sector) on innovation as an outcome. It is estimated that more than one-third of all references in scientific papers now point to other disciplines and a similar proportion of MSCA fellowships are inter/multidisciplinary’ (idem, p. 3)

Open to the world/global challenges:

‘Strengthening international cooperation in research and innovation is a strategic priority for the European Union to access the latest knowledge and the best talent worldwide, tackle global challenges more effectively, create business opportunities in new and emerging markets, and use science diplomacy as an influential instrument of external policy. Increased efforts are also needed to attract and retain researchers in Europe as well as to open mobility paths for European researchers elsewhere in the world’ (ibid.).

Societal challenge: (anticipation of) migration

‘Migration is likely to remain considerable in the coming years, as a result of the instability in Europe's neighbourhood and beyond. Research can help to evaluate and respond to these migration streams through expertise and foresight, addressing the challenges and root causes of migration. EU-funded research can also support displaced researchers to integrate into the European research landscape, which often involves intra-European mobility and building links with economic and social actors’ (ibid.).

Inclusiveness (related to career restart and migration):

‘The MSCA will continue to support displaced researchers to integrate into a research position in their European host country. The mobility rule will continue to apply to refugees only from the moment in time when the refugee status has been obtained. It is also intended to strengthen the Individual Fellowships' Career Restart Panel that is promoted to displaced researchers who may have been forced to interrupt their career. The capacity of the Reintegration Panel to support displaced researchers who previously worked in Europe and now wish to come back will be increased and communicated. The possibility of providing specific support to displaced researchers through e.g. COFUND will also be highlighted’ (idem, p.6).

Inclusiveness (related to disability):

‘Specific support should also be provided to researchers living with a disability: Mobility is

	<p>often far more difficult and more expensive for them due to special needs when travelling, finding a suitable residence, and working abroad. Nevertheless, disabled researchers should be able to enjoy the same opportunities as their peers to participate in the MSCA, therefore a distinct disability allowance for such researchers should be introduced’ (idem, p. 4).</p> <p><i>Societal and economic challenges (and visibility of contribution to benefits):</i> ‘a strengthened community of MSCA researchers and higher visibility of the programme as well as its contributions that benefit both society and economy’ (idem., 8).</p> <p><i>Widening participation:</i> ‘The results from the first three years of MSCA implementation reveal the existence of a research and innovation gap across Europe. [...] supporting measures will be introduced to stimulate higher quality applications from potential beneficiaries in under-represented countries’ (idem, p.4).</p> <p><i>Other policies:</i> ‘Synergies and complementarity with other EU policies, funding programmes and bodies will be emphasised, notably the European Structural and Investment Funds (ESIF) as well as education-focused initiatives such as the European Institute of Innovation & Technology, the New Skills Agenda for Europe, and a renewed framework for cooperation on the Modernisation of Higher Education’ (idem, p.7).</p> <p><i>Events and network:</i> Mention of the MCAA and the NCP network (idem, p.8).</p>
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Call level – Calls for ITN, IF, COFUND, RISE and NIGHT in WPs from 2016-2017/2018-2020

	This assessment of RRI on call level is organized per MSCA funding scheme
Yes	<p>Explicit:</p> <ul style="list-style-type: none"> • Keys: low awareness but growing over the years in COFUND • O’s: high awareness <p>Implicit: low awareness</p>
	<p><u>Innovative Training Networks (ITN)</u></p> <p><u>Summary keys/3 O’s/implicit:</u></p> <p>In the ITN calls related to Work Programme 2016-2017, there is minor awareness of the necessity to do something on <i>Science Literacy</i> and <i>Open Access</i>. <i>Open Science</i> and again international and inter-sectoral mobility (which could be viewed as <i>Open to the World</i> and <i>Open Innovation</i>) are more central. More specifically and implicitly, the ITNs are seen as contributing to the knowledge-based economy and society, EU competitiveness and growth. There’s a mention of the European Charter and Code and the EU principles for Innovative Doctoral training. In Work Programme 2018-2020 there is increasing attention to the possibilities for <i>Open Science/Open Access/Public Engagement</i>.</p>

ITN calls related to Work Programme 2016-2017:

Keys:

Science Literacy

'[expected impact at system level:] stronger links between the European Research Area (ERA) and the European Higher Education Area (EHEA), notably through supporting the knowledge triangle between research, innovation and education [...] Increased societal and economic relevance of European higher education' (EC, 2016a, p. 9)

Open Access (related to the anticipation of changing research landscape):

In order to reflect on the changing nature of research, training should prepare early-stage researchers for an increased research collaboration and information-sharing made possible by new technologies (e.g. collaborative tools, open access, raw data, etc.).

' (idem, p. 8)

3 O's:

Open Science:

'Incorporating the elements of Open Science and equipping researchers with the right combination of research-related and transferable competences' (idem, p. 7).

'Substantial training modules, including digital ones, addressing key transferable skills common to all fields and fostering the culture of Open Science, innovation and entrepreneurship will be supported' (ibid.).

Open Innovation/Open to the world:

'It will provide enhanced career perspectives in both the academic and non-academic sectors through international, interdisciplinary and intersectoral mobility combined with an innovation-oriented mind-set. [...] implemented by partnerships of universities, research institutions, research infrastructures, businesses, SMEs, and other socio-economic actors from different countries across Europe and beyond' (idem, p. 7)

'In order to increase the employability of the researchers, the research training should be complemented by the meaningful exposure of each researcher to the non-academic sector' (idem, p. 7).

'[Expected impact at organisational level]: Enhanced cooperation and better transfer of knowledge between sectors and disciplines' (idem, p. 8).

'[expected impact at system level]: Increase in international, interdisciplinary and intersectoral mobility of researchers in Europe' (idem).

Implicit:

Challenges related to economic and societal benefit:

Objective: The Innovative Training Networks (ITN) aim to train a new generation of creative, entrepreneurial and innovative early-stage researchers, able to face current and future challenges and to convert knowledge and ideas into products and services for economic and social benefit (idem, p. 7)

Higher impact in R&I output/greater contribution to the knowledge-based economy and

society, EU competitiveness and growth:

[expected impact at researchers level]: Increased set of skills, both research-related and transferable ones, leading to improved employability and career prospects both in and outside academia (leading in the longer- term to more successful careers); Increase in higher impact R&I output and more knowledge and ideas converted into products and services; Greater contribution to the knowledge-based economy and society [...] [expected impact at system level:] Better quality research and innovation contributing to Europe's competitiveness and growth' (idem, p. 8)

European Charter and Code and the EU principles for Innovative Doctoral training:

'Training responds to well identified needs in defined research areas, with appropriate references to inter- and multidisciplinary fields and follows the EU Principles for Innovative Doctoral Training' (idem, p. 7)

'More structured and innovative doctoral training, enhanced implementation of the European Charter and Code and the EU Principles for Innovative Doctoral Training' (idem, p. 9)

ITN calls related to Work Programme 2018-2020:

3 O'/Keys:

Open Science/Public engagement/Open Access:

'In order to reflect the new modus operandi of research supporting the development of open science, training should prepare early-stage researchers for increased research collaborations and information-sharing made possible by new (digital) technologies (e.g. collaborative tools, opening access to publications and to research data, FAIR2 data management, public engagement and citizen science, etc.) (EC, 20172, p. 9).

International Fellowships (IF)

Summary keys/3 O's/implicit:

In the calls related to Work Programme 2016-2017, there a few mentions of RRI keys (only Science Literacy/Open Access). Open Innovation and Open to the world keep playing a crucial role as does the greater contribution to the knowledge-based economy and society. Inclusiveness towards researchers that want to reintegrate is emphasized. In IF calls related to Work Programme 2018-2020, there are no relevant changes.

IF calls related to Work Programme 2016-2020:

Keys:

Science literacy/open access:

'Better communication of R&I results to society' (EC, 2016a, p. 13).

3 O's

Open innovation/open to the world:

The same mentions of expected impact at organisational level and system level of more international and intersectoral mobility and improving the attractiveness of research outside of academia. Thereby contributing to an increase in R&I output and greater contribution to knowledge-based economy and society (idem, p. 12/13)

Implicit:

Inclusiveness in terms of reintegration of researchers:

'Return and reintegration of researchers into a longer term research position in Europe, including in their country of origin, is supported via a separate multi-disciplinary reintegration panel of the European Fellowships. For the reintegration panel, there shall be mobility into Europe. Support to individuals to resume research in Europe after a career break, e.g. after parental leave, is ensured via a separate multi-disciplinary career restart panel of the European Fellowships' (idem, p. 12).

Higher impact in R&I output/greater contribution to the knowledge-based economy and society:

Same (idem, p. 13)

RISE

Summary keys/3 O's/Implicit:

In the calls related to Work Programme 2016-2017, we see the same story as with the IF scheme only adding a specific focus on SME's. In RISE calls related to Work Programme 2018-2020 there are no relevant changes.

Keys:

No mention or reference.

3 O's:

Open innovation/open to the world:

Same ideas about inter-sectoral and international mobility with particular reference to small and medium enterprises (SME's) (idem, p. 16).

Implicit:

Higher impact in R&I output/greater contribution to the knowledge-based economy and society:

Same (idem, p. 17)

COFUND

Summary keys/3 O's/Implicit:

In the calls related to Work Programme 2016-2017 we see a similar story as in the IF/RISE scheme. There are however some relevant changes in the 2018-2020 call with an added focus on *Science Literacy, Open Science* and *implicit integration in the socio-economic system*.

COFUND calls related to Work Programme 2016-2017:

Keys:

No mention.

3 O's:

Open innovation/open to the world:

Same ideas about inter-sectoral, interdisciplinary and international mobility with particular reference to small and medium enterprises (SME's) (idem, p. 16).

Implicit:

Higher impact in R&I output/greater contribution to the knowledge-based economy and society:

Same (idem, p. 21)

European Charter and Code and the EU principles for Innovative Doctoral training:

Same (idem, p. 21).

COFUND calls related to Work Programme 2018-2020:

Keys:

Science education

Added: 'Enhance networking and communication capacities with scientific peers, as well as with the general public, that will increase and broaden the research and innovation impact' (EC, 2017e, p. 23).

3 O's

Open Science:

'supporting the practice of Open Science through targeted training activities' (idem).

Implicit

Integration in the socio-economic system:

'Strengthening of international, intersectoral and interdisciplinary collaborative networks that will reinforce the organisation's position and visibility at a global level, but also at a regional/national level by helping them become key actors and partners in the local socio-economic ecosystems' (ibid.).

NIGHT

Summary keys/3 O's/implicit:

In the calls related to Work Programme 2016-2017, there is a very explicit focus on *Science Literacy* and/or what one would call (one-way) *Public Engagement*. The *Gender dimension* is also mentioned, as is the emphasis on the *European dimension*. The latter is emphasized even more in the 2018-2020 calls.

NIGHT calls related to Work Programme 2016-2017:

Keys

Science education/public engagement:

'Objective: The European Researchers' Night aims to bring researchers closer to the general public and to increase awareness of research and innovation activities, with a view to supporting the public recognition of researchers, creating an understanding of the

impact of researchers' work on citizen's daily life, and encouraging young people to embark on research careers' (EC, 2016a, p. 29).

'it is the occasion for a Europe-wide public and media event for the promotion of research careers, in particular towards young people and their families. Supported events can start on Friday and last until early morning the following day.

Activities focus on the general public, addressing and attracting people regardless of the level of their scientific background, with a special focus on pupils and students. Activities can combine education aspects with entertainment, especially when addressing young audience. They can take various forms, e.g. hands-on experiments, science shows, simulations, debates, games, competitions, quizzes, etc.' (idem).

'[Expected impacts:] increased awareness among the general public of the importance of research and innovation and more favourable general attitude towards its public funding; Better understanding of the key benefits that research brings to society; Reduction in the stereotypes about researchers and their profession; Increase, in the long term, of people taking up research careers' (ibid.).

Gender equality:

'[they should promote] gender balance in research and innovation' (ibid.).

3 O's:

Open to the world/open science:

"Each proposal should set up at least one European corner. Activities should be organised with researchers actively involved and directly in contact with the public. They should promote the European dimension' (ibid.).

'Involvement of researchers funded by Horizon 2020, including the Marie Skłodowska-Curie actions, is encouraged' (ibid.).

Implicit:

No mentions.

NIGHT calls related to Work Programme 2018-2020:

3 O's:

Open to the world

Better understanding of the European Union among the general public (EC, 2017e, p. 23).

Other calls and actions:

In the other calls and actions related to the Work Programme 2016-2017, there are some mentions of training for NCPs on RRI and outreach activities towards the general public by the programme line. In the 2018-2020 Work Programme a call is written for the development of an optional training for starting fellows on Open Science and RRI.

MSCA National Contact Points:

	<p>Keys: ‘Support will be given to a consortium of formally nominated NCPs in the area of MSCA. The activities will be tailored according to the nature of the area, and the priorities of the NCPs concerned. Various mechanisms may be included, such as benchmarking, joint workshops, enhanced cross-border brokerage events, training sessions linked to MSCA as well as to Responsible Research and Innovation, twinning schemes, etc.’ (EC, 2016a, p. 47).</p> <p>Events and outreach</p> <p>Keys: <i>Science literacy/(open science):</i> ‘During 2016 and 2017, the Commission intends to organise several events (conferences and workshops) dedicated to the Marie Skłodowska-Curie actions, and to contribute to leading research conferences. Moreover, a dedicated campaign will be organised to take a novel approach in communication of research and to disseminate results of the Marie Skłodowska- Curie-funded projects to the general public’ (idem, p. 51).</p> <p>In other calls and actions related to Work Programme 2018-2020: one relevant change.</p> <p>Keys: <i>RRI mentioned as a concept</i> ‘5. Introductory Training: Optional introductory training for all MSCA fellows will be organised through an online training module, including explanatory videos. This will enable fellows to receive specific training in areas that will empower them to become leaders of the new generation of researchers (such as training in open science, responsible research and innovation) and provide them with useful information regarding their careers as MSCA researchers (rights and obligations as fellows, EU support to innovation, possibilities for international collaboration in research and innovation)’ (EC, 2017e, p. 48).</p>
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Proposal Template level¹⁴⁵ - ITN, IF, COFUND, RISE and NIGHT (Call 2018)

	The assessment of RRI on proposal template level is organized per MSCA funding scheme
Yes	<ul style="list-style-type: none"> • Keys: some awareness (differs per proposal template: some more than others) • O’s: high awareness <p>Implicit: low awareness</p>
	<p><u>ITN</u></p> <p><u>Summary keys/3 O’s/Implicit:</u></p> <p>The ITN Proposal template exhibits a high awareness of the <i>Ethics</i> of research even though it seems to view it in a ‘tick box’- way (with, as we will see in the interviews, a strong focus on concepts related to the life sciences and military research). Applicants are, furthermore, asked to reflect on <i>Gender</i> aspects (where appropriate) and to reflect on</p>

¹⁴⁵ Since we have already demonstrated the changes on the level of the Work Programmes and calls, and since most of the templates (except IF) are updated versions with changes tracked by the EC, we will, for the sake of brevity, focus on the last available versions of both the proposal and evaluation templates of the different calls.

communication/dissemination (*Science Literacy/Open Access-language*) and *Public Engagement* measures. The incorporation of inter/multi-disciplinary, inter-sectoral aspects are also mentioned as something the applicants should reflect on (*Open Science/Open Innovation*).

Keys:

Ethics:

Upfront, participants should declare that the ‘proposal complies with ethical principles (including the highest standards of research integrity — as set out, for instance, in the European Code of Conduct for Research Integrity — and including, in particular, avoiding fabrication, falsification, plagiarism or other research misconduct)’ (EC, 2017a, p. 4)

Participants need to fill in the standard ethics issue table that every H2020 participant needs to fill out (idem, p. 10/11).

Under 6. Ethics issues, applicants are required to read and apply the following:

‘All research activities in Horizon 2020 must respect fundamental ethics principles, including those reflected in the Charter of Fundamental Rights of the European Union. These principles include the need to ensure the freedom of research and the need to protect the physical and moral integrity of individuals and the welfare of animals.

Ethics is an integral part of research from beginning to end, and ethical compliance is seen as pivotal to achieve real research excellence. There is a clear need to make a thorough ethical evaluation from the conceptual stage of the proposal not only to respect the legal framework but also to enhance the quality of the research. Ethical research conduct implies the application of fundamental ethical principles and legislation to scientific research in all possible domains of research. All proposals considered for funding will be submitted to an Ethics Review procedure. The Ethics Review is the core of the H2020 Ethics Appraisal procedure, which concerns all proposals and actions, and also includes the Ethics Checks and Ethics Audit that can be initiated during the action implementation. In this context, please be aware that it is the applicants’ responsibility to identify any potential ethics issues, to handle the ethical aspects of their proposal, and to detail how they plan to address them. Should the applicant identify any ethics issues in the Ethics Issues table in Part A of the proposal, then an ethics self-assessment must be included in part B2 Section 6 (Ethics Issues) of the proposal.

The self-assessment in part B2 Section 6 must:

- 1) Describe how the proposal meets the national legal and ethics requirements of the country or countries where the tasks raising ethics issues are to be carried out.
- 2) Explain in detail how the consortium intends to address the ethics issues raised in the Ethics Issues table from part A, in particular as regards:
 - a. Research objectives (e.g. study of vulnerable populations, dual use, etc.)
 - b. Research methodology (e.g. clinical trials, involvement of children and related consent procedures, protection of any data collected, etc.)
 - c. The potential impact of the research (e.g. dual use issues, environmental damage, stigmatisation of particular social groups, political or financial retaliation, benefit-sharing, malevolent use, etc.)
 - d. Should the proposal be selected for funding, before the beginning of an activity raising an ethics issue, each beneficiary must have obtained: any

ethics committee opinion required under national law and any notification or authorisation for activities raising ethics issues required under national and/or European law needed for implementing the action tasks in question.’ (ibid.).

Gender:

Under Excellence 1.2, participants should reflect on ‘where appropriate, gender aspects’ (ibid.).

Science literacy/public engagement:

Under 2.4 Quality of the proposed measures to communicate the activities to different target audiences, applicants are required to reflect on ‘Quality of the proposed measures to communicate the activities to different target audiences. Required sub-heading: Communication and public engagement strategy’ (ibid.).

The difference between the obligation to disseminate results and public engagement is explained. *Public engagement* is explained as having two components: ‘Researchers should ensure that their research activities are made known to society at large in such a way that they can be understood by non-specialists, thereby improving the public’s understanding of science. Direct engagement with the public will help researchers to better understand public interest in priorities for science and technology and also the public’s concerns’ (ibid.).

3 O’s/Implicit:

Open Innovation/Open to the world:

Under 1.2 Quality and innovative aspects of the training programme, participants are required to reflect on the ‘transferable skills, inter/multi-disciplinary, inter-sectoral [...] aspects’ (ibid.).

Under 2.2a applicants are required to write about the ‘Meaningful contribution of the non-academic sector to the doctoral / research training (as appropriate to the implementation mode and research field’ (ibid.).

Individual Fellowships

Summary keys/3 O’s/Implicit:

There’s a lot of attention for *Gender* (under Excellence) and *Ethics*. *Science Literacy/Open Access*, in the form of communication and dissemination of results also plays a big role (under Impact). *Open Science* is mentioned and the interdisciplinary, intersectoral and international elements are also found in the template) (*Open Innovation/Open Science*).

Keys:

Gender:

Under Excellence 1.1 Quality and credibility of the research/innovation project; level of novelty, appropriate consideration of inter/multidisciplinary and gender aspects, applicants are required to ‘Discuss the gender dimension in the research content (if relevant). In research activities where human beings are involved as subjects or end-users, gender

differences may exist. In these cases the gender dimension in the research content has to be addressed as an integral part of the proposal to ensure the highest level of scientific quality' (EC, 2018b, p. 2).

Under Excellence 1.2 Quality and appropriateness of the training and of the two way transfer of knowledge between the researcher and the host, applicants are required to consider discussing 'Training dedicated to gender issues' (idem, p.3).

Ethics:

Under Excellence 1.2 Quality and appropriateness of the training and of the two way transfer of knowledge between the researcher and the host, applicants are required to consider 'Hands-on training activities for developing scientific skills (new techniques, instruments, research integrity, 'big data'/'open science') and transferable skills

Under Section 6 – Ethical issues, a format similar to the ITN is given (idem, 12/13/14).

Science literacy:

Under Excellence 1.2 'Organisation of scientific/training/dissemination events, Communication, outreach activities and horizontal skills' (ibid.) are discussed.

Science literacy/open access/ (open science):

Under Impact 2.2 Quality of the proposed measures to exploit and disseminate the project results, applicants are asked to

'Describe how the new knowledge generated by the action will be disseminated and exploited, and what the potential impact is expected to be. Discuss the strategy for targeting peers (scientific, industry and other actors, professional organisations, policy makers, etc.) and to the wider community. Also describe potential commercialisation, if applicable, and how intellectual property rights will be dealt with, where relevant. For more details refer to the "Dissemination & exploitation" section of the H2020 Online Manual. Concrete planning for exploitation and dissemination activities must be included in the Gantt chart.' (idem, p.4).

Science/literacy/public engagement:

Under Impact 2.3. Quality of the proposed measures to communicate the project activities to different target audiences, applicants are asked to

'Demonstrate how the planned public engagement activities contribute to creating awareness of the performed research. Demonstrate how both the research and results will be made known to the public in such a way they can be understood by non- specialists. The type of outreach activities could range from an Internet presence, press articles and participating in European Researchers' Night events to presenting science, research and innovation activities to students from primary and secondary schools or universities in order to develop their interest in research careers.

For more details, see the guide on Communicating EU research and innovation guidance for project participants as well as the "communication" section of the H2020 Online Manual. Concrete planning for communication activities must be included in the Gantt chart' (idem).

3 O's/Implicit:

Open science:

See ethics.

Open Innovation/Interdisciplinary aspect:

Under Excellence 1.1 Quality and credibility of the research/innovation project; level of novelty, appropriate consideration of inter/multidisciplinary and gender aspects, applicants are required to reflect on the interdisciplinary aspects (where relevant) (idem, p. 2).

Under 1.2 training on 'Inter-sectoral or interdisciplinary transfer of knowledge (e.g. through secondments)' (idem, p.3) is discussed.

COFUND

Summary keys/3 O's/Implicit:

For this particular action, there is an explicit requirement for applicants to reflect on possibilities for training on *all aspects of RRI except Governance*. Moreover, the exploitation and dissemination of results to all kinds of stakeholder groups, *Open Access* and communication of the implications of the work of science for society are all included. A deliverable in *Ethics* should be included. Interdisciplinarity, intersectoral and international development are mentioned (*Open Science/Open Innovation/Open to the world*).

Keys:

Several of the keys:

Under Excellence 1.3. (Quality of career guidance and training, including supervision arrangements, training in transferable skills), applicants are asked to reflect on training on non-research oriented skills:

Describe the training on research skills within the appropriate discipline(s) and/or to gain new skills; Support and/or additional training in non-research oriented transferable skills (i.e. grant writing, project management, IPR, entrepreneurship, training for job interviews), 'open science skills' (i.e. learn researchers how to open access to their publications, manage and share their research data, be trained in ethics and research integrity, on gender balance in teams and research content, learn to communicate with the general public and to even integrate citizens in research design and processes including through citizen science)' (EC, 2018a, p. 2).

Science literacy/open access/ (open science):

Addressed under Impact 2.3:

'Quality of the proposed measures to exploit and disseminate the Results. Describe plans and procedures for exploitation and dissemination of results towards the research and innovation community and other relevant stakeholders (e.g. industry, other commercial actors, professional organisations, policy makers) in order to achieve and expand potential impact of the programme. This includes the strategy to be adopted to ensure open access to publications and to research data (when appropriate) as well as promoting FAIR data management' (idem, p. 3).

Science literacy/public engagement:

Under Impact 2.4 (Quality of the proposed measures to communicate the results to different target audiences), applicants are asked to describe: 'Communication and public engagement strategy of the programme; in particular the approach envisaged to create awareness among the general public of the research work performed under the programme and its implications for citizens and society should be described' (idem, p.3).

Ethics:

Next to the requirement of an explicit deliverable on ethics per call, a whole paragraph is devoted to ethics:

'All research activities in Horizon 2020 must respect fundamental ethics principles, including those reflected in the Charter of Fundamental Rights of the European Union² and the relevant ethics rules of H2020. These principles include the need to ensure the freedom of research and the need to protect the physical and moral integrity of individuals and the welfare of animals.

Ethics is important for all research domains. Informed consent and confidentiality are as important for a sociological study as they are for clinical research.

In this context, please be aware that it is the applicants' responsibility to identify any potential ethics issues, to handle the ethics aspects of their proposal, and to detail how they plan to address them.

COFUND programmes often follow a bottom-up approach and it is often not known in advance if the fellowships to be funded will raise ethics issues. Therefore, it is important to describe how the proposal meets the European as well as the national legal and ethics requirements of the country or countries where the tasks raising ethics issues are to be carried out. In particular, applicants should take care to describe the ethics procedures that they will enforce in the execution of the programme (at application phase, selection and evaluation phase, monitoring and follow-up of projects, and the trainings on ethics). A report on ethics issues will be produced by the beneficiary for each call it organises.

In practice, this means that the successful COFUND programmes, when opening their calls for proposals, will have to detail the procedure to be followed for addressing proposals raising ethics issues' (idem, p. 7).

3 O's:

Open Innovation/Open to the world:

Reflection under Excellence 1.2. Quality of the research options offered by the programme in terms of science, interdisciplinarity, intersectorality and level of transnational mobility on 'interdisciplinarity, intersectorality and level of transnational mobility' (idem, p. 2).

Implicit:

Equal opportunities:

Under Excellence 1.1 Quality of the selection/recruitment process for the researchers (transparency, composition and organisation of selection committees, evaluation criteria, equal opportunities the applicants are asked to reflect on how they ensure equal opportunities (idem, p. 1).

Human resources development:

Under Impact '2.2 Aligning practices of participating organisations with the principles set out by the EU for human resources development in research and innovation. Describe how the programme will contribute to the implementation of principles set out by the EU for the human resources development in R&I (such as Charter and Code1, or the Principles for Innovative Doctoral Training for DPs) at the participating organisations; Any other relevant point' (idem, p. 2).

RISE

Summary keys/3 O's/Implicit:

Here too, attention is paid to *Ethics* in a similar way. Participants are explicitly asked to partake in the Open Research Data pilot (*Open Access*) and dissemination of results (in relation to addressing societal needs/challenges) are discussed. *Science Literacy/Open Access* by reaching out to society and disseminating results and the *Gender* dimension are also part of the Proposal template. Interdisciplinarity, intersectoral and international development are mentioned (*Open Science/Open Innovation/Open to the world*) as are the European Charter for Researchers and the Code of Conduct for their Recruitment.

Keys:

Ethics:

Same requirement on complying with ethical principles as with ITN (EC, 2017a, p. 5).

Same ethics table at the start.

Under a separate paragraph, ethics issues are discussed in the same way as in COFUND (idem., p. 29).

Open Access:

Participants are asked whether or not they want to partake in the Open Research Data Pilot (idem, p. 15).

Open Access/Science literacy/ (Open Science):

'Impact 3.3 Quality of the proposed measures to exploit and disseminate the action results.

Please develop your proposal according to the following lines: Describe the dissemination strategy about the results - targeted at peers (scientific or the action's own community, industry and other commercial actors, professional organisations, policymakers) and to the wider research and innovation community - to achieve the potential impact of the action.

Please provide adequate details and sufficient arguments for the choices of your planned activities. Elaborate on how results (when available) will be taken up/used. Also the expected impact of the proposed exploitation, commercial application and dissemination measures.

Expected impact of the proposed measures (e.g. addressing societal needs/challenges).

Indicate intellectual property rights aspects (if applicable) and exploitation of results' (idem, p. 19).

Science literacy/public engagement:

'Impact 3.4 Quality of the proposed measures to communicate the action activities to different target audiences

Please develop your proposal according to the following lines: Describe the communication strategy of the project and its results, outreach plan and the activities envisaged to engage the public. Please provide adequate details and sufficient arguments for the choices of your planned activities. Consider how activities will be targeted at multiple audiences, beyond the action's own community (including the media and the public). From the beginning of the project, indicate which channel(s) will be used to inform and reach out to society, and to show the benefits of research.

Elaborate on the expected impact of the proposed activities (idem, p. 20).

Gender:

Under Excellence

2.1 'Gender aspects in research activities where human beings are involved as subjects or end-users, gender differences may exist. In these cases, the gender dimension in the research content has to be addressed adequately' (idem, p. 18).

3 O's:

Open Innovation:

Under Excellence

'2.1 Quality and credibility of the research/innovation action; level of novelty and appropriate consideration of inter/multidisciplinary, intersectoral and gender aspects a focus on inter-/multidisciplinarity and intersectoral cooperation' (ibid.).

Open Innovation/Open to the world:

Under Impact

'3.2 Developing new and lasting research collaborations, achieving transfer of knowledge between participating organisations and contribution to improving research and innovation potential at the European and global levels

Please develop your proposal according to the following lines: Describe the development and sustainability of new and lasting research collaborations resulting from the intersectoral and/or international secondments and the networking activities implemented. Describe the contribution of the action to the improvement of the research and innovation potential within Europe and/or worldwide' (ibid.).

Implicit:

European Charter for Researchers and Code of Conduct for their Recruitment.

Under Implementation:

'In all cases, the Beneficiaries must take all specific steps and measures to implement the principles set out in the European Charter for Researchers and the Code of Conduct for their Recruitment' (idem, p. 20).

NIGHT

Summary keys/3 O's/Implicit:

Interestingly, this action is focused on *Science Literacy and Public Engagement*.

Furthermore, *Public Engagement* is seen predominantly in terms of bringing science to the

	<p>general public and improving the attitude of the public towards science and research, the public funding thereof and the European character of it. Bringing ideas and insights <i>from</i> the public <i>to</i> research practice (in the form of agenda setting or e.g. ‘citizen science’) is not included.</p> <p><u>Keys:</u> <i>Science literacy/public engagement:</i> Under Excellence: ‘1.1 Clarity and pertinence of the objectives Describe the specific objectives pursued, keeping in mind that the common main objective consists of "bringing researchers to the general public and increasing awareness of research and innovation activities, with a view to supporting the public recognition of researchers, creating an understanding of the impact of researchers' work on citizen's daily life, encouraging young people to embark on research careers"' (EC, 2017b, p. 5). Under Impact 2.1.The extent to which the outputs of the project would contribute to each of the expected impacts mentioned in the work programme under the relevant topic. These are: Increased awareness among the general public of the importance of research and innovation and more favourable general attitude towards its public funding; Better understanding of the key benefits that research brings to society; Reduction in the stereotypes about researchers and their profession; Increase, in the long term, of people taking up research careers; Better understanding of the European Union among the general public (idem).</p> <p><i>Open access/public engagement:</i> Under Impact ‘2.1 Quality of the proposed measures to exploit and disseminate the project results (including management of IPR), and to manage research data where relevant and to communicate the project activities to different target audiences’ (idem). Moreover, pre-structured Work packages are involved that elaborate on the Awareness campaign, activities during the night, impact assessment and management.</p> <p><u>3 O’s:</u> Not mentioned.</p> <p><u>Implicit:</u> None.</p>
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Evaluation level

Yes	Keys: some O’s: some Implicit: some
	<u>ITN</u>

Summary - keys/3 O's/Implicit:

A focus on *Gender, Open Access*-related language and *Science Literacy/one-way Public Engagement*. Moreover, *interdisciplinarity and transdisciplinarity* and *intersectorality* are also valued, thereby pointing to the *Open Science/Open Innovation*.

Keys:

Gender equality

Under Excellence:

'Quality, innovative aspects and credibility of the research programme (including inter/multidisciplinary, intersectoral and, where appropriate, gender aspects)' (EC, 2017e, p. 67).

'Quality and innovative aspects of the training programme (including transferable skills, inter/multidisciplinary, intersectoral and, where appropriate, gender aspects)' (idem).

Open Access (open science):

Under Impact:

'Quality of the proposed measures to exploit and disseminate the project results' (ibid.).

Science literacy/public engagement:

Under Impact:

'Quality of the proposed measures to communicate the project activities to different target audiences' (ibid.).

3 O's:

Open Innovation:

Under Impact:

'Meaningful contribution of the non- academic sector to the doctoral/research training, as appropriate to the implementation mode and research field' (ibid.).

Open Science/Innovation:

Under Impact:

Mention of inter/multidisciplinary, intersectoral (see quotes under gender).

Implicit:

Governance conditions:

'Appropriateness of the management structures and procedures, including quality management and risk management' (idem).

'Appropriateness of the infrastructure of the participating organisations' (idem).

IF

Summary keys/3 O's/Implicit:

***Gender Equality, Open Access* and *Science Literacy/one-way forms of Public Engagement* are addressed. Again, language related to *Open Science/Open Innovation*. Implicit**

mention of the governance conditions needed to implement the IF.

Keys:

Gender equality:

Under Excellence:

'Quality and credibility of the research/innovation project; level of novelty, appropriate consideration of inter/multidisciplinary and gender aspects' (idem, p. 68).

Open Access (open science):

'Quality of the proposed measures to exploit and disseminate the project results' (idem).

Science literacy/public engagement:

'Quality of the proposed measures to communicate the project activities to different target audiences' (idem).

3 O's:

Open Science/Open Innovation:

Under Impact:

Mention of inter/multidisciplinary, intersectoral (see two quotes under gender).

Implicit:

Governance conditions:

'Appropriateness of the management structure and procedures, including risk management' (idem).

'Appropriateness of the institutional environment (infrastructure)' (idem).

Knowledge transfer:

"Quality and appropriateness of the training and of the two way transfer of knowledge between the researcher and the host' (idem).

COFUND

Summary keys/3 O's/Implicit:

Open Access and Science Literacy/one-way forms of Public Engagement are addressed. Again, language related to Open Science/Open Innovation and now also Open to the world. Implicit mention of the governance conditions needed to implement COFUND.

Keys:

Open Access (open science):

Under Impact:

'Quality of the proposed measures to exploit and disseminate the results' (idem).

Science literacy/public engagement:

'Quality of the proposed measures to communicate the results to different target audiences' (idem.).

3 O's:

Open Science/open innovation/open to the world:

Under Excellence:

'Quality of the research options offered by the programme in terms of science,

interdisciplinarity, intersectorality and level of transnational mobility' (idem).

Implicit:

Inclusiveness:

'Equal opportunities' in the recruitment process are mentioned (ibid.).

(Governance of) human resources:

'Aligning practices of participating organisations with the principles set out by the EU for human resources development in research and innovation' (ibid.).

RISE

Summary keys/3 O's/Implicit:

Gender Equality, Open Access and Science Literacy/one-way forms of Public Engagement are addressed. Again, language related to Open Science/Open Innovation. Implicit mention of the governance conditions needed to implement RISE.

Keys:

Gender equality:

Under Excellence:

'Quality and credibility of the research/innovation project; level of novelty and appropriate consideration of inter/multidisciplinary, intersectoral and gender aspects' (idem, p. 69).

Open Access (open science):

Under Impact:

'Quality and appropriateness of knowledge sharing among the participating organisations in light of the research and innovation objectives' (idem).

Open access/science literacy:

'quality of the proposed measures to exploit and disseminate the project results'

Science literacy/public engagement:

'Quality of the proposed measures to communicate the project activities to different target audiences' (idem).

3 O's:

Open Science/Open Innovation:

Under Impact:

Mention of inter/multidisciplinary, intersectoral (see two quotes under gender).

Implicit:

Under Impact:

Lasting collaboration (governance):

'developing new and lasting research collaborations, achieving transfer of knowledge between participating organisations and contribution to improving research and innovation potential at the European and global levels' (ibid.).

Governance:

	<p>‘Appropriateness of the management structures and procedures, including quality management and risk management’ (ibid.).</p> <p>‘Appropriateness of the institutional environment (hosting arrangements, infrastructure)’ (ibid.).</p> <p><u>NIGHT</u></p> <p><u>Not available.</u></p>
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Project level

	<p>The assessment of RRI in MSCA on project level is based on the data provided by CWTS.</p>
Yes	<ul style="list-style-type: none"> • Keys: low/some awareness • O’s: n.a. <p>Implicit: n.a.</p>
Explicit	<p><u>Keys:</u></p> <p>Low/some awareness on the project level, mostly in terms of <i>Science Literacy</i>, (<i>‘sending’</i>) <i>Public Engagement</i> and <i>Gender Equality</i>.</p> <p>Of the 4527 MSCA projects from CORDIS that were processed by CWTS, 1170 mentioned one or more terms related to RRI with an average score of 2,2 RRI-related key words. According to the analysis, all top-8 RRI projects are in the field of the social sciences. Only 6 out of the top 8 could be discussed since the two others did not have a project website.</p> <p>The top-scoring project is <i>AGenDA</i>, with a high score in <i>gender</i> key words and <i>Public Engagement</i>. 4 out the top-6 projects have high scores on <i>Science Literacy</i> and have creative ways of educating their research to all users. For example: the <i>SCILIFE</i> project (NIGHT) uses a <i>Science in the city</i> format and the <i>CLOSER</i> project (NIGHT) uses a combination of games, activities in schools, seminars and workshops.</p> <p>Moreover, 3 of the top-6 projects bring science to the public through different events: workshops, lectures, talks and seminars (thereby leading to a high <i>Public Engagement</i> score; whether this is full blown two-way engagement remains to be seen).</p> <p>All top-6 projects have achieved <i>Gender Equality</i> status and therefore equal participation of men and women in project teams. There were minimal to zero scores on <i>Open Access</i> in the top-6. Only one project, <i>SCILIFE</i>, has all materials online and accessible.</p> <p>Another interesting find was that among the 29 EC-flagged RRI projects, 5 should receive a high RRI-score given its activities in RRI-dimensions. 6 out of top-8 RRI projects are applied research, whereas most EC-flagged RRI projects are mostly basic research Funding Finally: most EC-flagged RRI projects are from the Marie-Curie Innovative Training Networks.</p>

8.4.2.2 General use of RRI

- ***Is RRI (in any form) traceable as a vision in the programme line?***

Aspects of the 6 keys of RRI are traceable as a vision in the programme line and the concept of RRI seems to gain momentum (in a way). In the founding text of Horizon 2020, RRI is not mentioned in relation to MSCA and neither is it mentioned in the first Work Programme. In the second and third Work Programme, it is already mentioned as something that all researchers should take into account. In contrast, the latest scoping document has (elements of) RRI written all over it. This being said, parts that could be subsumed under RRI, such as *Gender equality* and language related to *Science Literacy* and *Open Access* have already been present from the start of the programme line. Increased attention to these aspects and other aspects of RRI like Public engagement can also be discerned.

- ***Is RRI reflected in the challenge to be addressed? (As opposed to looking for a “technology fix” to the challenge?)***

There is no central challenge since MSCA is by definition a bottom-up programme line. What can be noticed is that there are a few mentions of global/societal/sustainability and economical challenges (notably in the legal text founding the MSCA and in the last scoping paper.) The only specific challenge that was mentioned related to the Migration-issue and this may be coupled to the fact that MSCA is one of the few programmes that has Mobility as its prime focus. What can be said based on the data and analysis above, is that, next to the Gender-aspects, interdisciplinary, cross-sectoral, international aspects of the projects answering calls are really valued in addressing current and/or future said challenges (see also 4.2.3). This might not be a *technology fix* per se, but it may point us towards how the programme line (and the actors behind it) conceive of this particular implementation of scientific practice as a *fix* to tackle future challenges (whether they be societal, economical or related to the topic sustainability).

- ***Is RRI (or any other underlying principle thereof) reflected in the theoretical considerations of the work programme or the calls? (Theoretical framework of RRI applied in the programme)***

The later Work Programmes (2016-2020) mention RRI as something that all researchers should take into account, when filing an application for the MSCA-programme line. The theoretical considerations that have led MSCA-related policy actors to include RRI in their programme line are not explicated, nor is it clear to which extent these considerations permeate the actual calls, templates and evaluation criteria. The fact is that RRI is mentioned and elaborated beyond what is stipulated as requirements by the European Charter for Researchers, the Code of Conduct for the Recruitment of Researchers and the European Code of Conduct for Research Integrity. Both the Rome declaration and the standard EC webpage on RRI are made part of the MSCA Work Programme information from 2016 onwards, and all applicants are encouraged to ensure that the idea of responsibility in research is well elaborated throughout the proposal.

- ***Is RRI (via keys) present only as a tick-box exercise or is it more substantial? If yes, how? Is RRI substantially influencing the way R&I in the programme line carried out?***

The above analysis brings us to the question whether the incorporation of RRI in MSCA is merely a ‘tick-box exercise’ or whether it is substantially influencing the way R&I that get funded in the programme line is carried out. This differs per key, per level and per call (or so

it appears) and therefore it is hard to make general statements. Moreover, it is difficult to make any statements on the actual implementation (save what we know from the CORDIS analysis from CWTS and heard in interviews which will be discussed below). What can be done is to look at how the 6 keys are referred to (or not) in the policy documents and whether or not they ‘trickle down’ to the Work Programmes, calls, proposal templates and evaluation criteria.

Gender equality, as already mentioned, is explicitly mentioned in the legal founding text as well as receiving elaborate mentions in the latest Scoping Paper. Interestingly, in most documents the both sides of Gender Equality (so balance of gender in the make-up of a team as well as related to the content of the research itself) are addressed. On the call level, the key doesn’t seem to be addressed, except for a very short mention in the NIGHT call. In the proposal template it is mentioned under Excellence in the calls for ITN, IF, COFUND, and RISE. In the evaluation criteria it is mentioned as something that should be addressed ‘when relevant’ under the Excellence-criterion for ITN, IF and RISE. A prime case of a concept actually trickling down.

A second concept which manifested itself throughout the programme line is *Science literacy*. It is also there already in the legal founding text (in terms of ‘communication’ and ‘dissemination’) when the necessity to disseminate and communicate results of the research is discussed. It is shortly mentioned in the first Work Programme and in later Work Programmes even seen as necessary for tackling Sustainability Challenges. In the latest Scoping Document and Work Programme it is emphasized that applicants may spend more of their time on teaching. On the call level it is present in all calls and most prominently in the NIGHT call. As with the Gender-aspects it seems to be well integrated in the proposal templates as well as the Impact-evaluation criterion for all calls. The interesting thing is that Science Literacy in NIGHT is not just about sharing results but also seems to be focused on convincing people of the importance and meaningfulness of a scientific career and, in later calls, to show the European character of the funding.

Open Access is present since the first Work Programme and seems to be predominantly phrased in terms of ‘exploiting’ and ‘disseminating results’. Moreover, in reaction to the changing research landscape, young researchers are required to develop new digital skills related to Open Access. One of the possibilities that is consistently offered throughout the programme is the Open Research Data Pilot. Interestingly enough this is something that can be opted out of without having consequences for evaluation. Open Access-related language can be found in the Work Programmes, calls (ITN/IF/RISE/COFUND) and proposal templates with COFUND and RISE notably discussing communication of the implications of science for society and dissemination of results in relation to addressing societal needs and challenges respectively.

Public engagement is there since the beginning of Horizon 2020, but on the outset seems to be predominantly viewed in terms of a one-way engagement akin to a *public understanding of science* perspective. In later Work programmes and the last scoping paper possibilities to engage in more extensive ways are added (e.g. mention of citizen science as a possibility).

On the call level it is notably absent, except for in the latest ITN calls and NIGHT, and most proposal templates do not reserve a lot of words for this, if at all. The evaluation criteria have integrated engagement under Impact, but mostly in terms of a unidirectional engagement with the public to communicate results.

Ethics is well covered in MSCA as will be seen in the interviews discussed below. What can be deduced from the documents is that the topic of Research integrity is added to the Work programme 2016/2017. On the call level, it is notably absent, but on the proposal template level, it is part of every call except NIGHT. It takes the form of a formalized ethics issue table that, as we will see in the interviews, has relations with concepts from life sciences and military research and is coupled loose from the actual template. When he/she answers the questions in the template in a certain way, the applicant is required to use an extra paragraph to address issues related to ethics. Notably, the RISE scheme has a special Ethics deliverable as a requirement.

Governance is never explicitly mentioned except for in the founding legal text in which it is stipulated that the MSCA should help the coordination and governance of researchers' mobility etc. Even on the scoping level all keys are mentioned except governance. The only time when governance returns in an implicit way is when under the Implementation-criterion of the evaluation for the IF, COFUND and RISE schemes applicants are required to reflect on the appropriateness of the management structures and procedures, including quality management and risk management and appropriateness of the infrastructure of the participating organisations.

8.4.2.3 Beyond the keys/RRI

- **Three O's**

The idea of the “three O's: Open Science, Open Innovation and Open to the world” permeates the whole MSCA programme line, from policy documents to evaluation criteria. The ideas captured in the three O's may be seen as MSCA's *raison d'être*, and therefore play a major role in the policy documents. All actions in MSCA context and the way they are made operational aim at contributing to the knowledge-based economy and, consequently, to society by stimulating the circulation of knowledge notably via stimulating the mobility of knowledge producers and their training. The adjectives 'inter-/transdisciplinary', 'inter-/cross sectoral' and 'trans/international' coupled to the noun 'mobility' or 'cooperation' are well spread throughout the different levels of the programme's implementation: from the programme line's legal founding text (the Scoping Paper) and the Work Programmes, to the Proposal Templates and the Evaluation criteria. Over the past years, furthermore, SME's and CSO's are included as partners a grantee is allowed to work with ('opening up' the programme further to include societal stakeholders). This is reflected in the self-understanding of people working in and on the programme line, who try to initiate cooperation across all sorts of boundaries in order to help European R&I practitioners, practices and systems to become more connected.

- **Societal challenges/impact**

When moving ‘beyond the keys’ to focus on RRI as a way of dealing with societal challenges, the following can be observed. In MSCA, societal challenges are only superficially discussed in the programme line’s documents. There are a few mentions of societal/economic and sustainability-related challenges in the legal founding text, and every now and then they are mentioned in one of the Work Programmes. Most notably, there is a concrete reference to the problem of Migration in the most recent Scoping paper. In the most recent Work Programme, there is a mention of the societal impact the MSCA programme has had until now, listing the number of funded projects that focused on climate change and biodiversity next to a listing of the number of publications in (amongst others) peer-reviewed journals that MSCA-funded projects have produced.

- **Other important implicit mentions**

Last but not least, there are a few other implicit mentions worth noting. The European Charter and Code and the EU principles for Innovative Doctoral training are recurrently mentioned and these relate to the responsibility that host organisations have for their doctoral students. Other references are made to being inclusive towards researchers and staff working in/coming from Widening countries, and to being responsible for researchers that want to reintegrate after a break (either because they left Europe or because of parental leave through Reintegration panels).

8.4.2.4 Overall assessment of RRI in the programme line, based on desktop research

Based on the previous discussion, we conclude that the awareness of RRI in the programme line can be assessed as ‘Some awareness’ (B). RRI is present in most documents as a concept, and specific aspects of it are present throughout the various levels of programme implementation. Among these, notably Gender Equality, Science Literacy and the three O’s as related concepts stand out as being fully integrated in the programme line’s documents on all levels. However, we cannot assess the RRI-awareness as ‘high’ (A) because of the dominant reading of public engagement as unidirectional; there is no focus on upstream engagement and on multiple levels there appears to be a lack of attention to the social embeddedness of research.

Category	Value	Description
A	High awareness: <ul style="list-style-type: none"> • Gender Equality; • Science Literacy/Open Access (in terms of ‘communication’/ ‘dissemination’); • Three O’s (in terms of ‘cross-sectoral’/‘inter’/‘transnational’/ ‘inter/transdisciplinary’ ‘mobility’). 	<ul style="list-style-type: none"> • RRI as concept is (implicitly or explicitly) present in most documents on all levels; • RRI keys and O’s are used and referred to in several documents; • Governance structures reflect societal embeddedness; • Upstream/Downstream engagement is present on multiple levels
B	Some awareness <ul style="list-style-type: none"> • RRI as a concept gaining momentum • Open Access; 	<ul style="list-style-type: none"> • RRI as concept is (implicitly or explicitly) present in some documents; • Some RRI keys and O’s are used

	<ul style="list-style-type: none"> Public engagement (predominantly unidirectional); Ethics (tick-box). 	<ul style="list-style-type: none"> and referred to in any document; There is some process of better social embeddedness through governance or engagement
C	Limited awareness <ul style="list-style-type: none"> Very limited awareness of societal embeddedness research (only mentioned once.) 	<ul style="list-style-type: none"> Responsibility or ethical awareness is referred to in any document Any RRI key is mentioned; There is reference to the need for social embeddedness of the research at hand.
D	No awareness <ul style="list-style-type: none"> No real writing on upstream engagement. 	<ul style="list-style-type: none"> RRI as concept is not present in any document; No RRI key is mentioned implicitly or explicitly; There is no reference to societal embeddedness or civic engagement;

8.4.3 Interview findings

For the diagnosis, we conducted semi-structured in-depth interviews with 12 stakeholders. We selected stakeholders that we deemed crucial for understanding a range of different perspectives from within the ‘ecosystem’ of MSCA and outside of it (for an overview, see Appendix 1). The selection ranged from central policy actors from the EC Unit responsible for MSCA, to MSCA- alumni (included representatives from the alumni association), a former representative from the MCFA, 2 MSCA-focused NCPs, a MSCA IF proposal evaluator, two Open Science experts and a science journalist.

8.4.3.1 Shared understanding of RRI

Level of awareness of RRI as a concept

Apart from a very strong awareness of the six keys-interpretation of RRI at the level of the EC DG (Int. 1), *awareness of the concept of RRI and the several elements* varies highly amongst participants. Many of the (former) grantees and grantee representatives (MCAA as well as MCFA) that we interviewed indicated that it was unclear to them what the concept entails precisely. As one of them stated: ‘It was an interesting exercise to discuss this issue [with members of the Policy WG]. I think the feedback I can give you is that most people do not know at all what RRI is. The name, designation doesn’t tell them anything. [...] It is not that people are not aware of the issues that are [grouped] under the RRI label. But as a whole, they do not know’ (Int. 10). Another alumnus echoes this when saying: ‘Perspective I get from people is that it is not very clear what it means exactly. We can have a set of values but there is not a list we can check on the Internet to see if we are actually working inside these values. I believe we need to define this first’ (Int. 5). There is a growing awareness of topics resorting under the RRI label, states the MSCA evaluator we interviewed (Int. 4), but this does not mean that the concept is well understood.

As to the reasons why, interviewees suggest that among researchers, there may be a general disinterest in the topic. See e.g. the following statement: ‘What I notice is that it is a very small minority of scientists who are interested in these topics. The rest are just interested in their

experiments, which is not good I think' (Int. 7). An expert on Open Science put it as follows: 'One of the drawbacks is, [the concept of RRI] is kind of flimsy' (Int. 3). One of the NCPs claims that RRI is not something that a lot of people think about. The NCP states that she only thinks about RRI because she, and her colleagues, knows it may influence their funding advice practice (Int. 6). Another NCP summarizes this as follows:

[Compared to FP7], I do see a change, but regarding the RRI label, I am not sure that the concept as a whole, that you would see very many people who would just says: 'I know exactly what it means'. So it is a kind of an umbrella label that has very many components. So when you talk about public engagement and gender issues and science education and open science and ethics, then of course these are the issues that are more central and prominent, so people will know about it. But I am not sure that the concept/label as such is also known. People would still have to Google it. (Int. 9)

Some see advantages in the RRI label as an umbrella concept, as it puts everything together. According to a policy actor: 'No, I think the principles were more or less there, but indeed it puts everything together in one label and it reinforces the different principles that we were trying to implement' (Int. 1). Consequently, according to a funding and Open Science expert, the keys are essential: 'The keys are essential of course [...]. Most people don't have a clue of what [RRI] means so the keys provide some structure' (Int. 8). He issues a warning however that the label should not be taken too seriously as a classification scheme, but rather be used as a heuristic to operationalise efforts at implementing it.

Now that we have considered the *de facto* understanding of RRI in MSCA context, we continue with a discussion of the various interpretations per key, and of responsibility as such, in the programme line according to the interviewees.

Various interpretations per key

Public engagement: mostly understood in terms of a Public Understanding of Science

Public engagement, in addition to being a central part of the NIGHT funding scheme as was observed above, forms arguably part of the evaluation criteria by which MSCA research proposals are assessed. One could argue that public engagement is implied in the Impact-criterion. This is underlined by a policy actor responsible for MSCA: 'we encourage [applicants] to communicate to industry, policy makers, civil society; we really encourage them to move outside of their ivory tower' (Int. 1). As a consequence of this opening up, so policy actors are told, researchers 'open their minds and horizon individually (through engagement with people outside of their laboratories) [and] that this is slowly changing too the organizations that are working with us' (Int. 1).

While NCPs observe an increasing emphasis on *public engagement* – a theme that they offer trainings on for grantee candidates so as to improve chances of proposal selection on the basis of the Impact-criterion (Int. 6, int. 9) – public engagement is predominantly understood in terms of a *public understanding of science*. A reading of public engagement that fits, as a critical science journalist observes, the deficit model paradigm ("we [researchers] know, and we will let you, the public, [know]") without acknowledging that there is expertise among the public, that there are all kinds of questions coming from the public' (Int. 2). This point of view is reflected in many responses

that we received when asking to explain the meaning of public engagement, e.g.: ‘We ask several researchers to discuss [their work in front of an audience and] explain to the general public what they are working on, showcase their work’ (Int. 1). As an NCP states: ‘In the Guide for applicants, there is something on public engagement, but in practice what I see – and proposals get accepted on the basis of this – is that proposals [under this heading] mainly discuss communication. Involvement is more of an activity of communication than actually letting stakeholders influence research. The latter does not happen often’ (Int. 6)

This is also reflected in the way in which the criteria are phrased, and most importantly perhaps, interpreted by both applicants as well as evaluators according to the evaluator: ‘If you look very strict in terms of the evaluation criteria coming from the Commission, you could understand it as a one way thing, the researcher does her research, then there’s results and then they communicate it to the outside world’ (Int. 4). However, the evaluator has the feeling that some of ‘the researchers have understood that that’s kind of old fashioned and too simple’ (idem). He and other evaluators also criticize proposals for such a narrow conceptualisation of public engagement: ‘Actually that is something that shows up quite often in these evaluation reports, that proposals are being criticized on being too narrow on where they want to communicate’ (idem).

More extensive public engagement is however still a sensitive issue in some countries and for some researchers. According to one interviewee, in the North Western European countries, it is far more accepted to involve people in the research process beyond the dissemination phase. But in the South: ‘There is trying to disseminate the results to the scientific community but they do not try so much to involve the general public. That kind of suggestion becomes polemic [...] letting the people decide on the orientation of research is a very sensitive issue’ (Int. 5).

Concrete examples of engaging with the public also speak of a *public understanding of science* perspective among several of our interviewees. For example, when asked after *public engagement* actors affiliated with the MCAA mention cooperation with *Sense about Science* that ‘engage[s] with non-scientists, to tell them: ‘ “don’t believe any news you receive before asking for the evidence behind it”. This is something we love from the beginning and we supported it’ (Int. 7), and cooperation with the *Voice of Young Science*. Other examples given are the participation in the *March for Science* by local MCAA chapters (Int. 7), participation in the ESOF event *Science in the City* (showing citizens how research is fun and contributing to the quality of urban live) and the publication of a book for children on the life and works of Marie Skłodowska-Curie (first of a ‘*My Super Science Heroes*’ book series) to inspire young kids to think about the struggle and fun of a scientific career (Ints. 7/10). In other words, the connotation of ‘public engagement’ is with initiatives that aim to improve public debate by disseminating scientific results and/or make research practices more transparent to outsiders. Upstream engagement, such as in citizen science or citizen informed agenda setting in science, is not referred to.

Someone affiliated with the MCAA suggests that upstream engagement may critically hinge on the time and/or skills among researchers and that not many may feel they are properly equipped to initiate that (Int. 10). Likewise, an NCP reflects that upstream engagement is not something that applicants have in mind when applying for an MSCA grant (Int. 6). This issue is taken up below, under the heading ‘barriers for RRI’.

Gender Equality: extensive efforts do not prevent experiences of discrimination

Concerning *gender equality*, the programme line scores highest within H2020 in balancing women and men applicants. More specifically: according to numbers from the EC, from April 2017, a total of 40.9% of MSCA supported researchers are women: 44.1% in ITN, 41.7% in IF, 34.2% in RISE and 48.2% in COFUND (Sauer, 2017). Next to that, ‘around 41% of MSCA grants funded take into account the gender dimension in research and innovation, compared to 25% of all grants funded during the same period across Horizon 2020’ (idem).

As observed, gender is mentioned under the Excellence-evaluation criterion. A policy actor explains this success: ‘we check the gender balance in the projects. Not only quantitatively but also qualitatively, so that there is no bias in that regard’ (Int. 1) Next to that, there are also ‘some actions in particular helping women come back into research thanks to Career Restart’ (Int. 1.) The evaluator concurs that evaluators critically observe the Gender-aspect when evaluating the Excellent-part of proposals to see whether it is elaborated in way that it is ‘actually relevant’ (Int. 4). An NCP observes that the emphasis on gender in the evaluation process really helps to make people think through how it might affect their research (Int. 6). However, another NCP states that the applicants that she meets are often not sure about how to integrate gender issues in their research: ‘The gender issues relating to their research ... when they are dealing with people [ok] but [when they are dealing with] animals, this is not clear to them. And I am not always sure that they understand me [when I talk about it]’ (Int. 9). She describes how amongst her predominantly Northeastern European client base ‘the gender issues are not taken as seriously as they should be. People are thinking of them as not serious issues or not relevant to their work. [...] They often have to be educated in what it is’ (Int. 9).

The MCAA has a specific Working Group working on Gender Equality and Diversity for Mobile Researchers, which is actively visiting conferences and partaking in debates about gender issues (Int. 7). Despite the attention paid to gender in MSCA, there are signals of gender discrimination. A grantee representative states that: ‘on our last survey, there was a lot of feedback by our female members about being discriminated against. That was interesting because I think that there is the general idea that gender equality is ... a problem that has been solved’ (Int. 10). Others concur: ‘I have heard many stories about gender discrimination sometimes, even from female supervisors’ (Int. 7). Specific examples of the discrimination of women were given a representative from the MCAA: ‘A colleague [told me] that [she was] one of the few females in the group, and the boss was stating openly that he would send a man to [a] meeting because the impact would be bigger if it is a man talking. [...] Or some more subtle discrimination [...] when one has kids’ (Int. 10). The fact that a fellowship does not last long enough to provide grantees in their host country with the right to parental leave is also recurrently stated as a problem.

Science education: predominantly understood as sharing research results to inspire the young

Science Education is among the most prominent themes addressed by policy actors and (former) grantees alike when discussing RRI. The aforementioned cooperation with the *Sense about Science* initiative, VoYS, the book on Marie Curie and the involvement with ESOF were associated with *public engagement*, yet can equally be understood in terms of science education. The same holds for the NIGHT projects as they too are framed in terms of dissemination and unidirectional forms of science communication. In general, science education is valued highly. The policy actor remarked that a central goal for FP9 is to be ‘that we should be better at making use of the results of research in society, and make sure that there is a real impact and that this impact is known’ (Int. 1). This is

evidenced by a two-day Satellite Event organised by the Unit together with REA and the MCAA on communication and dissemination, discussing topics like ‘How and where to best present your research’ and ‘How to engage with policy makers’ (EC, 2018j). It is expected that the link between research and education in MSCA will be strengthened even more in the future: ‘We now explicitly allow [grantees] to spend up to 50% of their time on something else than their research [...] We are very keen in reinforcing links between European education and European research. This is one of the major objectives for the next years’ (Int. 1).

In the context of talking about the Marie Curie book, a former representative of the MCAA explains that science literacy for him is not just about ‘being literate in science. It is a broader picture; the idea is that kids understand... The first book about Marie Curie is not only on what she did and discovered as scientist and, this is the background, but the real message that we want to get through is that scientists contribute to society, and that thanks to their inventions they can improve the living conditions for example’ (Int. 7).

Reflecting on dynamics like these, the science journalist voices his concerns: ‘My main concern [...] is that RRI becomes one other form of science popularization. It is a more participative way of communicating and popularizing science. [...] It is not something you can just add at the end of a research project as a communication action: it is something that should be there from the beginning’ (Int. 2).

Open Access (open science): mandatory and often seen as a tick-box exercise

The interviewees often mention *Open Access*, since they are obliged by a standard requirement in the grant agreement in Horizon2020 to provide some form of open access to their research articles. The actual implementation of the Open Access rule is of interest, as discussed by the interviewees.

It turns out, so interviewees relate, that Open Access to research articles is, while a given, still something that can be opted out of, as it cannot be penalized in the evaluation (Int. 6). Open Access to research data thus can be reduced to a tick-box exercise. There are other problematic sides to the idea and practice of Open Access. Especially when working with business partners, for example in the ITN’s, COFUND and RISE, it collides with commercial aspects: ‘Especially companies don’t see it as their responsibility. [...] It is complicated because they want to protect data from a commercial point of view.’ (Int. 6). Related to the latter point, an interviewee voiced how different cultures might value the relationship between capitalist notions of intellectual property and open access differently: ‘you might see in a certain region that they think that capitalizing on research or the scheme where you have to pay for some article is something that has economic value and is part of the capitalist system where you’re going to have better research’ (Int. 5). Furthermore, interviewees observe a tension between Open Data and privacy requirements (int. 2).

Various awareness-raising activities are undertaken by the MCAA in view of *Open Science*. There is an active Open Science Task Force at the Policy Working Group that prepared a position paper in the context of FP9 talks, and that organises events, discussions and even sessions at the ESOF on Open Science that includes someone from the EC, members of the MCAA and publishing (Int. 10). Moreover, there has been a series of webinars on Open Science where a lot of members signed up and were interested in follow-up webinars on parts of Open Science (Int. 2/7/8/10). Finally, there is a specific Working Group on Science to Business at the MCAA (Int. 7).

The Open Science experts we spoke with gave concrete reasons why one wishes to care about Open Science, and how Open Science now is in danger of becoming a term that signifies everything therefore nothing at the same time. Someone working on Open Science as a way to improve proposals with the use of Open Science ideas, mentioned that it is a form of opening up pipelines for reproducibility, reusability and essentially increasing the knowledge transfer from academia to society (Int. 8). Another expert reflected how there have been quite some different interpretations of the term (just as with RRI): ‘The general thing of people that come together under the [Open Science] umbrella label is just that since we have digital infrastructures now, we should use them to make parts of science more transparent. But there isn’t “one open science”. For some people, this could mean “talk to stakeholders”, for some this is “make the underlying data visible” so you can do replication studies. Which are completely different streams of thought but under the same broad work’ (Int. 3).

Ethics: institutionally integrated but perceived as a niche by some

The *ethics* key appears to be well integrated on an institutional level. According to one of the NCPs, who deals with this in the training and information events, the self-assessment template and guidelines are sometimes really helpful in that they are ‘user-friendly’ and they give applicants ‘already a good idea of what is expected of them’ (Int. 9). According to her this is already a major improvement in H2020 compared to FP7. At the NCP trainings she ‘highlights that [applicants] shouldn’t leave it at the last moment because people have the tendency of filling in the administrative forms at the last step in their proposal preparation and then of course it is far too late’ (Int. 9). The other NCP describes how there are specific Ethics Work Packages linked to ITNs and how they are sometimes required to produce Data Management Deliverables and appoint external Ethics advisors after acceptance of the grant proposal (Int. 6).

Interestingly, policy actors and representatives from the MCAA (Int. 1/7/10) recurrently mention that *concerns about research integrity* are considered a central question of responsible research and innovation. As the central policy actor mentioned as a first reaction: ‘In all our work programmes, we really set out the principle of research integrity, so we refer to the European Code of Conduct for research integrity, we refer to Open Science and to the Horizon 2020 Responsible Research and Innovation principles’ (Int. 1). The concern for research integrity as a form of responsible research and innovation is reiterated by a former representative of the MCAA: ‘I hear of other fellows that say there is a lot of pressure to publish and again that is mostly on the supervisors: they have all the power and so they put so much pressure and eventually they do some light or less light research misconduct and it is not denounced many times’ (Int. 7). The need for more information on research integrity under members was reflected in the oversubscription of members to the sponsored web courses provided by the MCAA. People that applied were asked to fill in a survey and what came out was that ‘There were some serious cases where people said that they had experienced ethical related, research integrity issues. They were worried, didn’t know what to do. [...] A lot of general curiosity. Mainly the people were worried about not knowing how to deal with these issues’ (Int. 10).

Next to that, the evaluator described how his part of the ‘ordinary’ evaluation process doesn’t really touch upon the ethical issues in the sense that he is explicitly instructed not to look at ethical issues: ‘there’s a whole ethics review board that I was never really informed about when I was briefed as an

evaluator [...] I don't have to look at these ethical issues as they are conditioned at the moment with these ethics issue tables' (Int. 4). This ironically points to the fact that, although ethics seems to be well taken care of from a bureaucratic/institutional perspective, ethics is treated as something that can be functionally differentiated/separated from the research itself. Moreover, the questions seem to be focused on specific topics and 'have a strong linkage to biomedical research and certain biological fields like stem cell research' (Int. 4). Also, there's no direct mentioning of the word responsibility.

Other participants voice different perspectives concerning ethics. For one of the interviewees, ethics is a matter of being responsible towards values of a certain community in which one works (Int. 5). For another, ethics can be linked to tracing the research process through the use of open data (Int. 8).

According to an NCP, ethics 'for applicants are usually the least of their worries. I think they are thinking about their research project as such and less about the [...] ethics aspects.' (Int. 9). This was echoed by a representative of the MCAA: 'the people see ethics as kind of a niche of interest in research. So not all researchers think that ethics is applied to them. People in life sciences are more aware of ethics, especially if it involves a medical related project [or] social sciences related projects' (Int. 10). Moreover, she explained that researchers are mostly focused on ethics only when it is required by law: 'it is mostly when there's some regulation, that it is demanded by law that you pay attention to certain aspects, because you deal with patients or participants in a survey or something like that' (idem). She specifically emphasized that 'if there is no specific regulation, the people do not think of any ethical aspects' (idem). Furthermore, the GDPR was given as an example of how that works in practice and how researchers were afraid that this might harm their research (Int. 10).

Governance: not explicitly mentioned

Governance as a key was not explicitly mentioned. Only in an indirect manner, a policy actor spoke about it, asking: 'So how can we help mainstream [RRI] principles in individual organisations?' (Int. 1). The general lack of attention for governance, among researchers, NCPs and others is interesting as one could argue that every attempt at integrating (aspects of) RRI will inevitably be influenced by governance structures.

8.4.3.2 Enablers and barriers for integrating RRI in MSCA

From the interviews, information can be inferred about aspects of the programme line that may prove conducive to mainstreaming RRI in MSCA, and about aspects that may hamper its further integration. In this chapter, we list several of these 'enablers' and 'barriers'.

Enablers: existing requirements, practices, networks and changing attitudes

The awareness of, and/or dedication to, RRI among policy actors in the EC DG responsible for MSCA is noteworthy. This seems to make RRI stand a fair chance of getting fully integrated (e.g. as compared to other excellent science programme settings). According to an NCP, the reason could be that in MSCA, political considerations of the EC, such as a focus on impact, play a bigger role compared to, for example, the ERC (which is run by scientists and where excellence in terms of research output is the sole ambition, cp. Int. 6). The MSCA grantee association MCAA, which presents a very strong player in the field, is also highly motivated to consider RRI. The organisation is

responsible for setting up a series of Webinars, together with Euroscientist, in which, among other issues, RRI or RRI-related issues (open science, research integrity) are addressed. These webinars are well attended, which to some can be understood as an indication of ‘sheer interest ... [showing that]... many people, young people, are ready and open to do science in different ways’ (Int. 2). This interest is also manifested in on-going discussions on what ‘impact’ of science means. According to an Open Science expert, many feel that ‘output alone shouldn’t be the end goal of research, we should have a goal behind it’ (Int. 3). He observes this idea to take root also among people in more senior actors who partake in working groups: ‘The higher you go up in the hierarchy, the more understanding they are of the issue. If you talk to people that actually run these research organisations, they see it as a problem. What they want to have is some kind of societal impact. [M]aybe also academic impact but they want to have a greater impact’ (Int. 3). According to him also ‘many [young] people are interested in the topic of responsibility in some form. [People] want to create something: if the things that they create have the form of sustainability or responsibility in itself it is not only created to be created but also has a purpose that talks to many people’ (idem).

These developments, inside of MSCA and in its context, promise to present concrete footholds for furthering RRI. (Former) representatives of the MCAA, furthermore, have voiced their willingness to cooperate with the NewHoRRizon-project (Int. 7/10).

Barriers: powerful actors, narrow research excellence and lack of structural incentives

But why then does RRI not show a massive uptake? What are the bottlenecks? Among the barriers are the aforementioned lack of skills, knowledge, time, and intrinsic motivation among grantees, as well as more subtle barriers like envisioning RRI as something which can easily be separated from research (e.g. in the case of ethics and understanding public engagement primarily in terms of science communication/dissemination of results). In addition, some systemic barriers can be discerned.

According to some, it is hard to implement RRI understood as an attempt at democratizing science because ‘Actors with political and economic power have already now a major influence on shaping science’ (Int. 2). This might keep them, as well as the scientists they influence, from accepting additional actors from exerting influence on research (agenda’s). This is not counteracted by democratic dynamics within the scientific system: ‘Usually labs are very vertical and undemocratic. Maybe universities aren’t vertical and different research institutes are. In different countries there are different traditions. How can you expect the institution to become more democratic towards an external actor if they don’t even hear their PhDs?’ (idem).

In addition, some claim that researchers fear that an extensive involvement of the public in research might prove dangerous and counterproductive: ‘Some people believe it is important to involve the general public because it is their money and the research is for their benefit, but some other people believe that that will cause only damage because they don’t understand how research works’ (Int. 5).

A policy actor mentioned the expectations of supervisors and the host organisations in which they work as a crucial factor: ‘We also get feedback from supervisors: “we want researchers spending 100% of their time on their research, rather than going to spend time giving lessons or participating in communication events” etc. Even if we ask supervisors to be fully aware of these principles, for

some of them it is harder than for others' (Int. 1). An MCAA representative echoes this dependence on the willingness of supervisors (Int. 10). The change of cultures like these is slow according to the MSCA policy unit actor.

Maybe more crucial, and underlying the previous comments, is the narrow notion of *research excellence* that came up in a lot of the interviews and that can be found amongst the earlier named supervisors, (young) researchers, policy makers and therefore in the way in which the programme line has been set-up. This can partly be blamed on the fact that 'there's no education. If you look at the education of PhD-students, all of them do classes on scientific publishing [...] They don't have classes on impact. Basically, the end goal is always publication' (Int. 3). According to an Open Science expert 'Applicants tend to be trained at academic excellence and rarely trained at what impact is other than research impact. People don't understand what societal impact of research is, they don't know how to look at their outputs in another way than research publications' (Int. 8). An NCP echoes this: 'I know that for some researchers it is an eye opener but others are not really open to it because for a lot of them Excellence is what it is about [...] Researchers find it difficult. If you're used to always first think and write in terms of the content' (Int. 6).

The evaluator shows how the particular notion of excellence also permeates evaluation practice: 'a lot of fellow evaluators are kind of strongly geared towards this understanding of traditional excellence. Many co-evaluators put a lot of emphasis on academic excellence. So I have seen comments coming from others criticizing these young researchers that they haven't published enough in high-ranking journals, that they haven't been in excellent schools' (Int. 4). He adds that this thought permeates the set-up of the programme line: 'The whole set-up of the funding line Marie Curie is primarily focusing on a certain understanding of excellence. That is in my view the main barrier for an opening towards societal responsiveness' (Int. 4). He speaks of how it is still the dominant paradigm in quite some research policy networks 'I think it is still the understanding of high level policy makers that this narrow understanding of excellence is the way to go. That it is the best way to go, to make sure that Europe is academically competitive compared to other regions' (Int. 4).

According to another Open Science expert, this has to do with how research output has been evaluated in the past decades. The mono-focus on output of oft-cited articles in high-impact peer-reviewed journals has led to 'a complete disregard for anything that isn't high quality in these measures. Which means that people wouldn't even pursue something that doesn't score high. As a consequence, there is little output but the output scores in this indicator well because that's the only thing that gets you further in your career' (Int. 3). He continues: 'It is like a pendulum and the pendulum swung to an extreme where now article outputs are on a complete pedestal and if you did two great articles, basically you're made and nobody cares about whether they're not great' (idem). Another second-order effect is that it has created virtual colleges of academics publishing for each other and 'a system [that] is very much revolving around itself, there is no feedback mechanisms what that means outside of the academic system' (idem). In his eyes this has led to 'a monolithic researcher: everyone kind of is the same. [...] For teaching, for outreach, for society it is horrible because we only have one perspective: they all talk about the same things, they all read the same things, they all publish in the same outlet' (idem). He clarifies that this doesn't mean that there should be as little publishing as possible, but that it shouldn't be the only valued format: 'It is not necessarily wrong to have people that want to have impact in the academic community, that really

want to focus on publishing high quality articles. I think it is a valid position to have but I don't think it is a valid position to have for everyone. [...] The system crowds out its most creative people. [...]' (idem).

Peripherally related is the idea that some PhDs are just used as resources by departments: 'they see PhDs just as a tool to have some work done. [...] This then affects how the research is used in terms of ethics or in terms of societal values. If you are just paying someone to do some mental work or some work that gives a PhD, you are not interested in promoting that researcher and that researcher is just going to do work to finish the PhD and that's it' (Int. 5). Finally, with some NCPs, there is a general fatigue noticeable when it comes to the introduction of 'extra' requirements (Int. 6).

The lack of uptake of elements of RRI is echoed by another interviewee who does see that a lot of people want to do something but do not feel empowered: 'If we go to all of these stakeholders, the one recurrent comment is, well, all of these practices are good, we believe them, we do have the conviction that they are ethical, right and moral and they should be part of the system, but the system is not built for them, the system doesn't allow for them or the incentives for them or the resources for them' (Int. 8). He unpacks the micro-dynamics: 'If a researcher performs RRI to a 100%: they are not getting the career credit and tenure. The colleague next to them who only publishes gets the tenure. [...] So, the system itself is not built to encourage and incentivize RRI-behaviour' (idem). There is in other words a lack of structural incentives and/or indicators: 'The discussion we're having most frequently is that the indicators of research excellence are a little bit simplistic towards what RRI expects' (idem). There's a lack of 'pragmatic, measurable and concrete indicators that can incentivize if someone is spending time on not only publishing the next paper but putting it into context and breaking it down for societal understanding, education, awareness, literacy but also proactive transfer' (idem). Many scientists do this already in their own time, but it is not recognized and rewarded by the system. The other Open Science expert concludes that there's the need for a 'more nuanced [less] one-dimensional' understanding of excellence (Int. 3).

Possible enablers: awareness, education, criteria and gatekeepers

Next to the enablers that are already there, we also asked interviewees to envision how elements related to the MSCA programme line could be leveraged and what kind of enablers could be envisioned that might further the discussion on and possible uptake of (elements of) RRI in the programme line. One of the primary interesting responses was that 'Enablers could be stronger: in the end you want to increase consciousness of these things in the scientific system so that it becomes more normal to think about them instead of being forced by a Framework Programme' (Int. 6).

A first thing that could be done in this regard is to create awareness of RRI, voiced by almost all, and show more the value of including aspects of RRI. For example, 'some researchers have already learned the value of including stakeholders in their research [...] Even some natural scientists think more easily about involving stakeholders. [...] I think it is also because they see the value for their own research, instead of thinking: "oh yes, I also have to do something with communication"' (Int. 6). This could be achieved by showcasing examples (Int. 3), by showing how it adds to the quality and therefore chances of acceptance of their proposals (Int. 2/6/9) or by rewarding behaviour through awards: 'On a funding scheme level, low hanging fruit would be [...] to give one of them the award

for best outreach after the end of the grant. [...] In academia you have to have to stand out from the masses and if the masses all publish in the same journals it gets more complicated just by pure academic excellence just to stand out' (Int. 3).

Secondly, the educational aspect of MSCA, which really sets it apart from the other programme lines could be leveraged: 'the role of MSCA is to educate. If they have not yet, in the environment where they have done their previous research work, helped them to understand the concepts of RRI, it is the role of the project preparation phase and during the implementation it is high time that they learn about it' (Int. 9). This is already partly and implicitly done in the training by NCPs, but it is 'by far too ambitious to think that this one day where we devote on half an hour on one aspect and on another, would be a life changing moment for them' (Int. 9). More extensive training could be developed in collaboration with the Net4MobilityPlus network of MSCA NCPs, developed in the context of the ITNs or knowledge exchange could be developed on best practices in the context of the RISE and COFUND actions. Moreover, IFs are bound to train some of the academic leaders of the future and this could also be used more to that end.

Another enabler that was mentioned was the need for operationalizable, scalable methodologies or scripts and guidelines (Int. 8/9): if 'they don't have the recipe, they understand the concept, they buy the philosophy but they are paralyzed, they don't feel empowered in a detailed and scripted way of what they should do next' (Int. 8). According to the interviewee that's where operationalization comes in: 'They want everything about Open Science and RRI to be operational so that an applicant comes in and it is immediately clear to them why this particular RRI idea fits in to their grant proposal and they see it immediately' (Int. 8). It also needs to be scalable: 'It needs to be scalable so that, in theory you imagine that every applicant is convinced that is something for them. Then you achieve massive uptake of the practices and everything we advocate. [...] It needs to be [catered to] discipline specific behaviour' (Int. 8).

Fourthly, a change in criteria might actually help applicants to enlarge their perception of excellence. The partly successful integration of the gender-dimension under Excellence is in that sense already an interesting example of how this could work in practice. One of the NCPs suggested that the same could be done with the integration of actual public engagement under the Excellence-criterion (Int. 6). Others reflect how it is essentially about enabling other career paths:

Inevitably it comes down to: are there career paths for different kinds of impact? [...] If there is a career path for someone doing great RRI work and other people see that that is the case 'that is way closer to what I want to do' it will work. But I think as long as a career path is solely dependent on the article outputs you can't blame people to do what their career is based upon. In the Marie Curie example: if the one reason to get the grant is because of the research output; then how to motivate people to do something else?
(Int. 3)

A softer version of this is that funders like the MSCA Unit could require fellows and coordinators to write about it and think it through, either in their proposals or in their career development plans without making funding dependent on it (Int. 5).

Finally, to build leverage for actions like these, we could learn from a project working on Open Science in the context of MSCA by looking at the ecosystem and who's influencing the researcher of the future. In first instance these are the Graduate Schools, however

the young researcher of the future will walk out the Graduate School and then who applies pressure on them, who moulds them, shapes them? That's going be their supervisor and their project manager. We're walking out of strict academia where they will have secondments in the private sector, in policy. [...] So we argued that all of those key essential actors in the academic ecosystem could both a be a barrier or an enabler of those RRI practices. We try to target that ecosystem in terms of various degrees, to make sure that they are aware how the best practices we advocate for are actually helping the future career of young researchers. [...] As a minimum so that they don't impede.
(Int. 8)

Research Managers (united in associations like EARMA) are also important gatekeepers that need to be convinced of what the researcher is standing to gain or lose from it: 'The sooner they have the answers, the sooner they will be able to multiply' (idem). This all inevitably leads to funding and the funders (Int. 8/9), because 'at the end things only change if it comes down to funding' (Int. 3). A more concrete comment in this respect comes from a former representative of the MCAA who recommends that RRI should be more integrated in FP9: 'My perception is that it is there in H2020 that the EC would like that something goes on there, but there's not being much push for the integration of these topics. So it was kind of laid over. It would be great if FP9 has it more integrated as one of the pillars' (Int. 7).

8.4.3.3 Beyond the keys/RRI

As we can infer from the previous descriptions, societal impact has been a recurring theme with multiple interviewees (Int. 1, 3, 6, 8, 9). The way in which this was seen was predominantly in terms of an improved knowledge transfer from science to society through talks with policy makers or disseminating results to the general public or making them accessible for more actors with the help of improved digital infrastructures. Only one person explicitly saw RRI as an opportunity to democratise science and involve less powerful actors in the research process and decisions made there, but he also voiced the caveat that this should be done by keeping core values of science intact (Int. 2)

Interestingly enough, there were *no shared central societal or ethical challenges* mentioned, even though this was one of the first questions asked to interviewees. The only things that came near these notions were the example of a group of MCAA members uniting to work on climate change and even sending in a proposal together for an ITN (Int. 7). Another example was the question about what scientists can do for the refugee crisis which was also discussed in one of the webinars organised by the MCAA (Int. 2).¹⁴⁶

¹⁴⁶ Further desk research has shown that 62% of the budget in 2014-2015 was awarded to projects related to sustainable development, 23% to climate change and 6% to biodiversity (EC, 2017d, p. 158). This leads the EC to conclude that 'The bottom-up approach taken by MSCA has allowed a large majority of institutions to train

Related to this was the mention of responsible research as a form of research that takes into account the *conditions under which researchers do their work in different countries*. As one of the interviewees said: ‘Certain countries don’t value how the research should be done according to some human resource values’ (Int. 5). It is therefore crucial, according to this researcher, to see subsumed under the ‘problem of responsible research in the European Union the [different social] conditions in which the researchers have to work [...] Important to tackle this issue and to include in responsible research also the conditions of the research fellow in which they have to work’ (Int. 5).

A final interesting take comes from the same interviewee. This former representative of the MCFA mentioned that responsible research and innovation should be responsive *towards local societal values*: ‘Responsible research is not a fixed set of principles but the worry that research must benefit society and therefore society has to be involved in the orientation of the research. It is up to a community or specific society to say which values should be more well defined. Some countries will say: one of the values is family. So we should researchers must have a better support for family and research should not be oriented to the single individual but to solve problems in family matters and so on. In other societies you may have other values. [...] There are many values according to different countries and regions that have different weights. It is up to them to say what’s responsible research in their own case’ (idem). There shouldn’t, in other words, be a mono-culture of values: ‘So I think it is important that the EU sets the values they want to make as a whole but leave room for other regions and countries to change or add in terms of values that are not on this list that we created’ (idem).

How the latter comment links to the general EU objectives and the mobility requirement of MSCA will be an interesting tension to explore further in the future. Adding to this, we may conclude that any subsequent discussions on RRI in MSCA should take account of these different interpretations of what RRI is and try to connect to them in some way.

8.4.3.4 Assessment of RRI based on interviews

Because of this variety in levels of awareness among actor groups, as reported by our interviewees, we refrain from presenting a generic assessment. Awareness ranges between ‘high’ (A) (at policy level and at NCP level) to ‘limited’ (C) at grantee level while, moreover, awareness varies greatly among grantees, including ‘no awareness’ (D). *Governance* as a key is an outlier in all account (‘no awareness’, D), although its manifestations are recognised in terms of enablers and barriers to promoting the integration of RRI. The wide range of interpretations of the keys, especially of the meanings of Public Engagement and Ethics, is striking. It is also interesting to see how interviewees bring in new conceptions of responsible research and innovation that are either science centred (conditions under which researchers work) or that problematize the notion of RRI (different values per community).

and upgrade the skills of a new generation of researchers able to tackle a broad range of current or expected societal challenges. Moreover, MSCA funding addresses societal challenges to a significant extent, above the Horizon 2020 average and well ahead of the other areas in the excellence pillar’ (idem). Examples are given of ‘including the fight against diseases such as cancer, Alzheimer’s and Multiple Sclerosis, providing safer food, developing solutions for improved road safety, reducing noise pollution, preserving cultural heritage and shaping the development of key policies such as migration, climate change and energy’ (idem).

8.4.4 Case briefs

8.4.4.1 Project 1 – NextGenVis

Training the Next Generation of European Visual Neuroscientists for the benefit of innovation in health care and high-tech industry also known by its acronym **NextGenVis** (NextGenVis, 2018) has an RRI score of 0 according to the CWTS analysis. It is an ITN that is coordinated in the Netherlands and funded through the 2014 ETN call and provides 15 Fellows with a place to do their doctoral studies in a network of organisations located in Germany, the UK, Denmark, Italy, The Netherlands and Israel with organisations from both the public and the private sector. The total costs are 3 886 818,12 Euros and it runs from 2015 until February 2019.

According to the analysis of CWTS the ITN uses university courses and workshops to enhance Science Literacy. Analysis of the mid-term report shows that ESRs and PIs have contributed to various local and international outreach and dissemination activities such as presentations to patient groups (with vision loss and from vision support organisations) and participation in the Long Night of the Sciences in Germany (NextGenVis, 2017). Based on the available documentation it can be deduced that most activities don't go further than one-way engagement.

Even though the project appointed an external Equal Opportunities Coordinator, there are more males than females taking part in the network (which means that Gender equality is absent). Next to this, all publications are online (which means it should score on Open Access). Moreover, a quick search in the midterm report showed that Ethics are not only taken care of by the appointment of a special Ethics Adviser, but also in interesting novel ways. E.g., it is taking place at the Lundbeck in Denmark where 'general policy is to have high focus on the 3Rs – For example every year a price is awarded to the group that has implemented new routines that reduce the number of animals used and/or implemented better methods to reduce the number of animals. In general all animals at Lundbeck are housed according to Danish law with ad libitum access to water and food. Animals are provided wooden blocks and nest material' (idem.).

Responsible Research and Innovation as a concept was not addressed in the available report.

8.4.4.2 Project 2 - CLoSER

The Italian project Cementing Links between Science and society toward Engagement and Responsibility also known by its acronym **CLoSER** (CLoSER, 2018a) has an RRI score of 7,45 according to the CWTS analysis. It scored a 1,39 on Public Engagement, a 3,03 on Gender Equality, a 1,52 on Ethics and a 1,52 on Governance. It was a NIGHT project funded by a CSA in 2016 and funded 5 Italian organisations working together to organise a Researchers' NIGHT

which aims at establishing an alliance between researchers and the various societal actors by bringing them closer to one another, using the RRI approach to encourage them to take responsibility and work together to design a sustainable, ethically acceptable and socially desirable future. For this purpose, specific actions will be devised to actively engage citizens, schools and young people, policy makers and industries, who won't be just the audience but the protagonists of each of the proposed action. A special programme will particularly target young people to foster their interest in scientific careers. In addition, CLoSER aims at

strengthening the European citizenship feeling of the public involved as well as increasing their awareness of the importance of the European dimension in research through specific activities such as the ‘European Stage for Research and Innovation’, ‘A talk with young research!’ and ‘The Human Face of Research’. To realise such an ambitious programme, the engagement of a large, trans-disciplinary, gender-balanced community of researchers committed to public engagement will be vital: CLOSER will provide them with innovative, creative formats of communication that will strengthen their capability of communicating their research. (CORDIS, 2018)

Interestingly enough, real RRI-themed questions were asked like ‘Who should communicate the research’s results, to empower citizens and all the societal actors and let them take part in the R&I process?’ (CLOSER 2017). Most activities were however still of the *public information of science* type which was displayed in the kind of activities undertaken (idem).

8.4.4.3 Project 3 – COINS

Complex and Open Innovation for Networked Society also known by its acronym **COINS** is an ITN EID funded through the 2015 call. It runs from 2015 until 2019 and has an RRI score of 4,3, with Public Engagement at 16,6 and Open Access at 9,9. It is coordinated from the UK and houses 5 ESRs that are

accompanied by experienced, interdisciplinary and intersectoral group of supervisors will study development of innovation capabilities required for organizations of different types to effectively respond to institutional, social and technological complexity in innovation ecosystems. Fellows will benefit of rich and unique complementary training programme, which will enable them to pursue variety of professional careers in academia, industry, consultancy and public policy. They will especially benefit from competency and skills for professional innovation management and technology entrepreneurship. An ambitious outreach programme will equip all fellows with appreciation of the role of business, entrepreneurship and technology in society. They will become responsible researchers and leaders capable of finding solutions for some of the greatest challenges facing our planet. (CORDIS, 2018b).

The language used above is reminiscent of the focus on intersectoral and interdisciplinary cooperation that was earlier found to be of great importance for the evaluation. It is also interesting to see that the ESRs, despite the high score on Public Engagement, have had courses on how to perform ‘dissemination to lay audience (for societal outreach)’ (COINS, 2017) and are working together predominantly with business actors. They do write blogs and plan to visit a secondary school to ‘explain the research topics and how this contributes to the social and economic landscape’ (idem). Gender is also not addressed in the technical report that was

available. Still, the project has already produced an ethics deliverable (Ethics) and a data management plan (Open Access).

8.5 Conclusions

This diagnosis presents a very nuanced image of RRI in MSCA as it is currently in place, and of the challenges and opportunities to further the notion within the programme line. A first observation worth noting is that there is certainly no silence around RRI in MSCA, but the way it is addressed and acted upon varies widely across the funding scheme. A second observation is that there appears to be a discrepancy between the paper reality of RRI in MSCA and RRI in MSCA-related practices. Thirdly, what strikes the eye is the sheer variety of interpretations of RRI and its constitutive concepts, including the 5 ‘keys’ and the 3 O’s. Below we will elaborate on these general conclusions in some detail, in order to outline (1) the main challenges for RRI in MSCA, (2) current stories and practices of RRI, and (3) possible RRI-imbued futures or MSCA and associated actions.

8.5.1 Challenges for RRI in MSCA

The variety of interpretations of, and ideas on, responsibility and RRI in MSCA as such does not have to present a challenge as such. On the contrary, the diversity of approaches and interpretations in fact speaks of fertile ground in which the notion may well come to full blossom. After all, it is for good reason that a fixed definition of the RRI-concept is still lacking: the open nature of the notion allows for an interpretive flexibility by which it can not only be made to fit a variety of research and funding practises but also inspire a wide range of actors to reflect on their current practices. What is a challenge however, is that adopting RRI in the full meaning of the word arguably implies the need to question and reflect upon standing interpretations of responsibility and excellence that are currently dominating MSCA-relevant practices. While concerted action does not presuppose an agreement on a fixed definition of what RRI might entail, it does require the willingness – even a sense of urgency – to reflect on standing practices, including on the value schemes that dominate these.

Currently, RRI-related perspectives only limitedly inform the criteria by which grantees are selected. Stronger, where that is (seemingly) the case (regarding gender, science literacy/open access to publications and research data, and ethics), this institutionalisation might hamper the further integration of RRI in MSCA. The analysis shows that a narrow reading of the Excellence and Impact criteria, with their focus on the (career) opportunities for grantee and host organisation that is typical for MSCA does not challenge the received view on the division of labour between Science and Society, precluding elaborations of the notion of mutual responsiveness as a core aspect of RRI. To the extent that that is indeed the case, barriers for the furthering of RRI in MSCA practice include:

- The lack of incentives to stir reflection on
 - The idea of excellence as it is now used in the evaluation criteria, namely as mostly defined in terms of excelling in getting published in peer-reviewed journals and/or having attended excellent institutes;
 - The interpretation of public engagement solely as unilateral science education (Public Understanding of Science), and its equation to ‘impact’ and the associated emphasis on (ex-post) dissemination of research findings;

- The equation of ‘ethics’ in research (and of ‘responsibility in research’ / RRI) with ‘research integrity’, and the associated institutional incentives to make grantees act on that topic.
- The reassuring idea that many keys have been ‘taken care of’ already in MSCA, that is, their integration on an institutional level, may turn RRI into a blind spot:
 - The formal integration of ‘ethics’ in the grant application procedure may feed into the limited perspective on ethical issues in research as observed above. But it also may bring along the idea that it is sufficient to deal with ethics in a ‘tick-boxing’ manner. The current way the ethics issues are now incorporated in the application forms (‘user-friendly’!) seem to offer an incentive to make the topic a final capstone in the submission of a proposal, as a ‘last’ step in a merely administrative procedure. This does not provide an incentive to prospective applicants to think through the very idea of their research proposal from the perspective of ethics;
 - The success rate of MSCA in gender terms, understood in terms of the female:male ratio in successful applications. This may, however laudable, hide from view that female grantees report discrimination in their working practice. The focus on success in terms of numbers may present a blind spot for critically investigating possible discriminatory dynamics in the science system seen from an MSCA perspective.
- The scattered nature of agentic power: not only the awareness of RRI among actor groups is diverse, so is their ability of MSCA-related actors to act on the issue. Grantees and alumni are scattered among a wide range of host institutes all over Europe (and even the world at times) and their power is limited as they are transient guests there. Evaluators and NCPs are equally dispersed and /or operating in relative isolation from one another. Communication and discussion about RRI and related themes is hence quintessential to spur reflection on the current (lack of) institutionalisation and the ‘received views’ on excellence, public engagement, etc. Self-awareness and networking options in regard to RRI and related themes are direly needed. In that light, the lack of awareness of *governance* as a key is a barrier as such.
- The impression that from an EC-perspective RRI has a specific set of meanings: this may pre-empt discussions on what RRI might entail, and thus limited enthusiasm to engage in debate on RRI. Views vary widely on what acting responsible in research entails, and efforts to curb this variety may hamper the articulation of values, which may differ per region or disciplinary community.

8.5.2 Current manifestations of RRI in MSCA

While these barriers can be discerned, a wide variety of MSCA-related dynamics are in observable too that may be considered manifestations of RRI, or of RRI-in-the-making, which may prove relevant points of departure, and/or enablers, by which to develop the issue further. From the NIGHT events to the institutionalisation of ethics requirements (given aforementioned caveats) to the implicit integration of parts of RRI in the evaluation; there are many *de facto* RRI practices that speak of, or enable, the possible integration of RRI in MSCA. Among these, current manifestations of RRI in practice are:

- Evaluators discussing and assessing impact in terms of long-term societal effects and/or early (upstreaming) public engagement;
- The MCAA creating a stage of RRI-related discussions, such as in Webinars;

- The MCAA active involvement in Working Groups on Policy and Gender and participation in, and the organisation of, events on Open Science, and their partnerships on RRI-related issues with organisations like *Sense about Science* and *VoYS*;
- The programme line's efforts to reach an equal gender balance in women and men applicants. The programme's efforts to sensitise evaluators to unconscious gender biases. The growing awareness that an equal balancing in terms of numbers does not rule out or prevent gender discrimination in science;
- The MSCA enabled outreach activities, among them European Researchers' Night (NIGHT) that aim to boost public awareness of the positive role of research in society, especially among young people;
- The ITN trainings on science education/public engagement, and the institutional weight granted to these in the Work Programme;
- The keen awareness of Open Access and related O's; the institutionalisation of this idea in the programme – the fact that grantees are required to ensure Open Access to their peer-reviewed scientific publications of their results;
- Plan of funding agencies' publication platforms to circumvent behind-a-pay wall journal publications ;
- The institutionalisation of the ethics dimension of R&I in the programme line's assessment practice, e.g. visible in the organisation of the assessment on ethics which is evaluated by ethical experts;
- The active network of MSCA-relevant actors, among them the aforementioned MCAA, and the NCP network - Training of ESRs (INT) and Fellows (IF) on RRI aspects. Knowledge exchange in COFUND, and RISE;
- The keen interest at EC-level among the actors responsible for the programme line in RRI (and in the developments in the NewHoRRizon project);
- The diversity of MSCA-grantee projects that seek to implement RRI-related aspects into their design, execution and /or dissemination.

8.5.3 Possible futures of RRI in MSCA and associated actions

Building on the dynamics in place as listed above offers ample opportunities to further RRI within the (context of) the MSCA programme line. Among these are:

- Initiating discussions on various levels, among them EC-level, on the interpretation of the excellence criterion, which counts for 50% of the evaluation of a proposal in order to redesign it to form an incentive for researchers to strive for 'excellent responsibility' that reaches beyond individual scientific terms;
- Initiating discussions about the current unilateral reading of the Impact criterion to explore opportunities to include a broader scope of what *public engagement* in research might entail, taking the EC's definition of RRI as an "interactive process by which societal actors and innovators become mutually responsive to each other" as a point of departure;
- Putting in place incentives that urge or lure host institutions into reflection on excellence and impact, to back up grantees and NCPs who seek to put a discussion about the limits of academia's self-referential system on the agenda; associated communications about these may contribute to establishing the programme line as a bridgehead to make a breach in the publication oriented academic culture;

- Emphasising in discussions and communications about responsibility in MSCA the 3 O's instead of, or in relation to, the 6 keys; these seem to fit the MSCA context better and may form an entrance for discussing RRI in programme-specific terms, given its orientation on interdisciplinary, international and intersectoral research;
- Re-orientating the NIGHT funding scheme towards a more interactive approach to discussing the relation between science and society, and actively supporting those who currently seek to do so;
- Helping NCPs to set up trainings on public engagement and to bring on board a broader scope of interpretations, beyond the public understanding of science;
- Initiating discussions on the ethics of doing research, beyond the mere obligatory administrative aspect, and actively working towards a broader understanding of the notion, undoing its capture in terms of biomedical research;
- Seeing to it that the obligatory Open Access approach to publication is enforced – acknowledging that currently it is found to be something that can easily be opted out of; initiating discussions and decision-making on how to ease the tension between Open Access requirements and commercial interest when working with business partners;
- Strengthening the networks of scholars produced by the MSCA programme line over the years, and calling upon alumni to help reflect on, and redraft calls, templates and criteria in line with the above suggestions, working with the alumni association and NCP networks to raise awareness and achieve leverage for bottom-up perceptions of responsibility.

8.6 Relevant stakeholders to MSCA Diagnosis Input

8.6.1 Interviewees

Stakeholder Group	Organisation	Country	Gender	Relevance to programme line	Interview	Social lab team member	Social lab wider circle
Academia/ research	University	France	Female	High	Yes	Yes	Yes
Governance	European Commission	Belgium	Female	High	Yes	No	Yes
Expert (science journalism)	Freelance	Spain	Male	Low	Yes	No	Yes

Governance	European Commission	Belgium	Male	High	Yes	No	Yes
Expert (open science)	University	The Netherlands	Male	Low	Yes	No	Yes
Innovation	Innovation organisation	Portugal	Male	Medium	Yes	Yes	Yes
Research/academia/funding	University	Denmark	Male	Medium	Yes	Yes	Yes

Funding	Funding related organisation	The Netherlands	Female	High	Yes	Yes	Yes
Funding	Funding related organisation	Estonia	Female	High	Yes	No	Yes
Funding	University	The Netherlands	Female	Low	Yes	Yes	No
Evaluator	Innovation research institute	Germany	Male	Medium	Yes	No	Yes

Business	Self employed	Germany	Male	High	Yes	No	Yes
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8.7 Literature, links, resources for MSCA Diagnosis

8.7.2 Sources and links for MSCA Diagnosis Input

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9. Annex: NewHoRRizon Diagnosis Report, Social Lab 4, European Research Infrastructure (including e-Infrastructures) (INFRA)

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9.1 Executive Summary

European Research Infrastructures (including e-Infrastructures) is a funding programme within the EC research funding scheme Horizon 2020 which follows the objective to foster the development, use and distribution of research infrastructures (RI). The programme is addressing researchers by providing research opportunities and services in many areas. Infrastructures thus contribute to cross-cutting issues of the H2020 program.

This report investigated the current situation of *RRI* (Responsible Research and Innovation) and the concept of the *3 Os* (*Open Science, Open to the world, Open Innovation*) as outlined by the European Commission within the programme, based on a comprehensive document review and expert interviews with different stakeholders in the field.

This diagnosis revealed that basically, and most widely, the *3 Os* are of high relevance for the program line of Research Infrastructures. The *Open Science* principle is reflected in the various approaches applied, including *Open Access*, open source, or open publication principles. *Open to the World* refers to the accessibility of RIs beyond national or continental levels, and offers the possibility for international collaborations. *Open Innovation* is equally enabled through shared RIs, common data bases etc., even more so with regard to e-infrastructures. Due to their accessibility options, e-infrastructures play a crucial role in all of the *3 Os*.

On contrary, *RRI* as overarching concept is only mentioned on Work Program level. There is no call explicitly addressing *RRI* relevant projects. However, many of the six *RRI* keys (*Governance, Ethics, Gender, Public Engagement, Science Education, Open Access*) are addressed in program activities including the project level, *Open Access* being the most relevant of them. Generally, at call level *RRI* loses its overall character as multifaceted concept and is mostly boiled down to its dimension of *Open Access* - the only continuously addressed key.

9.2 Scope of this document

This document is not an official deliverable. It is for internal use only and hence informing the social lab number 4, as other social labs within the NewHoRRizon project. It should give an insight in the extent the current programme line of research infrastructures addresses *RRI*. Building on a comprehensive desk research and a series of expert interviews, the results provide information for preliminary diagnosis. The diagnosis lays out the starting point for the work in the social lab and also provides a baseline for evaluation. Further, by offering research input and data for the consortium, collected in a systematic way, it provides the ground for cross-thematic comparisons on the wider project-level.

The following diagnosis report is based on a substantive desk research. In course of this analysis the most recent H2020 work programmes and calls, scoping papers, evaluation guidelines,

proposal templates and winning projects on research infrastructures and e-infrastructures have been scrutinised. By using qualitative data mining software (MaxQda) these documents have been coded with regards to explicitly mentioning *RRI* in general, the six *RRI*-Keys (*Science Education, Public Engagement, Open Access, Governance, Gender, Ethics*), *RRI* specific process requirements (responsive/adaptive, open/transparent, anticipation/reflection, diverse/inclusive) as well as the 3 *Os* (*Open Science, Open Innovation, Open to the World*). Further, also the reflection of UN Sustainable Development Goals (SDGs) has been explored in the analysis. Thus, both the explicit as well as implicit dimensions of *RRI*'s consideration have been covered.

9.2.1 What is your program about?

European Research Infrastructures (including e-Infrastructures) is a funding programme within the EC research funding scheme Horizon 2020 with an overall budget of € 2.389 M Euros.

The following definition is used in the work programme: “Research infrastructures are facilities, resources and services that are used by the research communities to conduct research and foster innovation in their fields. Where relevant, they may be used beyond research, e.g. for education or public services. They include: major scientific equipment (or sets of instruments); knowledge-based resources such as collections, archives or scientific data; e-infrastructures, such as data and computing systems and communication networks; and any other infrastructure of a unique nature essential to achieve excellence in research and innovation. Such infrastructures may be 'single-sited', 'virtual' or 'distributed'” (EC, 2017b, p. 4).

The objective of this work programme is to foster the development, use and distribution of research infrastructures as they “play an increasing role in the advancement of knowledge and technology and their exploitation”. They “help to structure the scientific community and play a key role in the construction of an efficient research and innovation environment” Additionally, they “contribute to national, regional and European economic development and are “also key in helping Europe to lead a global movement towards open, interconnected, data-driven and computer-intensive science and engineering”. Furthermore, e-Infrastructures are meant to make European researchers “digital, increasing creativity and efficiency of research and bridging the divide between developed and less developed regions”(EC, 2017b).

The programme is addressing researchers by providing research opportunities and services to researchers in many areas also addressed by the H2020 programme. Infrastructures thus contribute to cross-cutting issues of the research programme, such as climate action or sustainable development. In particular, the programme puts an “emphasis on fostering the long-term sustainability of research infrastructures (including through the optimisation of assessment and evaluation procedures), on expanding the role and impact of research infrastructures in the innovation chain and on maximising the exploitation of data produced and/or collected by research infrastructures” (EC, 2017b).

The programme line also supports capacity building at national and regional level by “supporting the development of Regional Partner Facilities” and thus contributes to widening the participation in the programme.

9.2.2 What is the size and structure of your program in terms of budget, applications and projects?

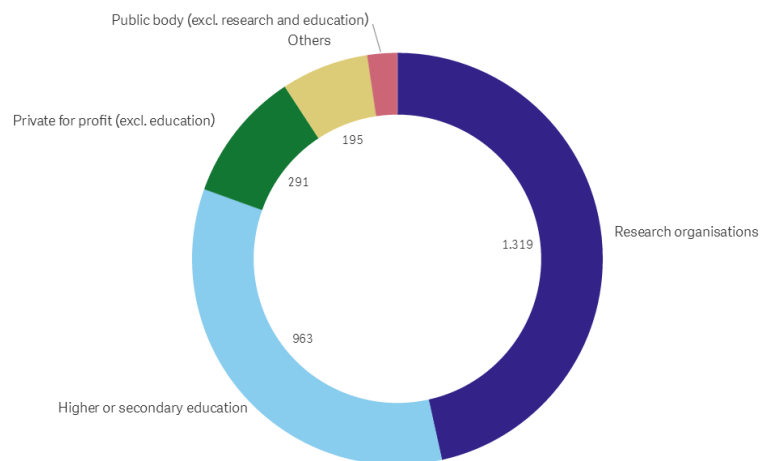
At the European level, the programme line is affiliated to two different Directorate-Generals (DGs) of the European Commission, namely the DG for Communications Networks, Content and Technology (DG CONNECT) and the DG for Research and Innovation (DG RTD).

With regard to financial priority-setting, the annual budget of H2020 for RI has drastically increased from the Work Programme 2016 – 2017 to the most recent one. Whereas there was an estimated budget of € 294.40 and € 317.20 M respectively for the former, the latter attributes €387.15, €404.90 and €419.30 M annual budget. The largest share of these budgets is attributed to the Call ‘Integrating and opening research infrastructures of European interest’ in both periods. In 2016-17, calls on e-infrastructures were the second most financially supported calls. Calls on the development and long-term sustainability of new pan-European research infrastructures ranged third with regard to their financial resources. The 2018-2020 calls pool most of their financial asses on the European

Figure 6: - Requested EU Contribution for RI related Projects by Type of Organisation (Million EUR) (EC, 2017c) (for INFRA)

Open Science Cloud.

Requested EU Contribution by Type of Organisation (Mil EUR)



In sum, 7619 applications were submitted addressing research infrastructures as a thematic priority. Only 23 % percent and hence 549 of these proposals were eligible and requested 2.83 G EUR of EU contribution, which makes up for 1.36 % of the total funding of H2020. The largest share of these contributions, namely 46.5 %, was requested by research organisations (1.319 Mio EUR), followed by Higher or secondary education (34 % - 963 Mio EUR). In comparison, only 10.3 % were requested by private for profit organisations, and 2.3 % by public entities(EC, 2017e). At the beginning of 2017, a quarter (25.5%) of the signed grants was flagged RRI relevant (EC, 2017a, p. 191)

The majority of applications and eligible proposals was submitted by German applicants (1014 applications, of which 42 % are eligible). Hence, Germany also requested the largest share of EU contributions, namely €470,923,269. The United Kingdom is ranging second with 853 applications in total, 45 % thereof were considered eligible proposals, which requested a budget of €383,213,481. With 700 applications, France made up for the third most applications, whereas nearly 52 % thereof were eligible. Overall, most applications were made by countries stemming from Western Europe, whereas Poland, as first Eastern state, ranged eleventh with in total 209 applications and 72 % thereof being accepted. In general, countries that apply less often are more likely to achieve a high share of eligible proposals (EC, 2017e).

Figure 7: Top Applying Countries in RI (EC, 2017c) (in INFRA)

Country Name	Eligible Proposals	Retained Proposals	Requested EU Contribution (EUR)	Applications
Totals	549	174	2.834.205.486 €	7.619
Germany	427	146	470.923.269 €	1.014
United Kingdom	388	131	383.213.481 €	853
France	363	135	338.130.932 €	700
Italy	327	120	255.217.724 €	687
Netherlands	326	107	247.854.808 €	574
Spain	326	114	178.878.901 €	570
Switzerland	169	69	113.420.535 €	236
Sweden	162	62	93.504.710 €	233
Greece	189	75	87.628.423 €	267
Belgium	174	65	80.349.379 €	237
Poland	150	58	70.526.918 €	209
Austria	138	38	62.599.941 €	180
Finland	124	48	62.381.449 €	173
Denmark	102	32	51.979.128 €	125
Ireland	106	46	48.898.738 €	137
Norway	101	42	48.744.971 €	147

At a project level, there are 429 projects listed as related to research infrastructures at the moment. The majority of these projects (40% at a European level) is represented by projects specifically concerned with e-infrastructures. Further, research infrastructure projects often take place in the scientific realm of physical sciences and engineering (17%), environmental sciences (13%) or biological and medical sciences (12%). Yet, less research infrastructure projects take place in social sciences and humanities (7%), research on energy (3%) material sciences and analytical facilities (3%) or cross-domain sciences. Obviously, these shares do not exactly hold for individual nation states (RICH Observatory, 2017b). On the level of individual nation states, Germany participates in most projects (329), followed by the United Kingdom (121) and France (274). With regard to the involved organisations that deal with research infrastructures at a national level, governmental, as well as higher and secondary education, business enterprises and other private non-profit organisations are involved. In most countries, the majority of involved institutions stems from the governmental sector, followed by institutions affiliated with higher and secondary education and businesses. Only a few institutions stem from the private non for profit sector with Belgium being a notable exemption here. Again, most of research infrastructure related organisations are found in Germany (203), followed by the United Kingdom (171) and France (150) (RICH Observatory, 2017a).

9.3 Current situation of RRI in the program

9.3.1 RRI in brief

The **3 Os** are highly relevant for this program line, as RI could potentially contribute to put all of them in practice. *Open Science* implies an opening of the infrastructures not only to the research community, but also to other stakeholder groups, including the general public. In reference to the core idea of Open Science, innovative and societally relevant research infrastructures could also be developed in co-creation processes with extra-scientific communities, such as the public. *Open to the world* does not only refer to the accessibility of RIs beyond national or continental levels, but also offers the possibility for international collaborations in order to address global issues. *Open Innovation* is equally enabled through shared RI, common data bases etc., even more so with regard to e-infrastructures. Due to their accessibility options, e-infrastructures play a crucial role in all of the 3 Os.

Concerning the **keys** – similar to the 3 Os – especially *Open Access* is of high relevance. RIs need to be opened as wide as possible. However, this causes several ethical, legal and social issues (ELSI), which need to be addressed by other keys, such as *Ethics*, *Gender*, *Public Engagement* and *Science Education*. Adequate *Governance* structures need to be applied. Furthermore, RIs could play a central role in *Science Education*, as they could act as gate keepers, offering options of accessibility and stimulate interest in extra-scientific communities and young people in particular.

9.3.2 Desktop findings

9.3.2.1 Role of RRI on

Policy document level

No	
Yes	Keys: limited awareness, mostly concerning <i>Open Access</i> Os: high awareness Implicit: some awareness
Explanation	3 Os: <i>Open Science</i>, <i>Open Innovation</i> and <i>Open to the World</i> At policy document level, a high awareness of the 3Os can be found. <u><i>Open science and Open Innovation:</i></u> “Support to the effective and efficient construction and operation of Research Infrastructures is a key priority in realising the European Research Area and in promoting open science and open innovation” (EC DG R&I Dir B, Unit B4, 2016, p. 6). “Stronger interaction and cooperation between Research Infrastructures, Users and providers from industry and public services builds bridges between the public, commercial and Research Infrastructure worlds” (EC DG R&I Dir B, Unit B4, 2016, p. 6). It “promotes Access to Research Infrastructures in order to conduct innovative research and development, to improve the related methods and skills in the workforce and to foster collaboration” (EC DG R&I Dir B, Unit B4, 2016, p. 8).

	<p><u>Open to the world:</u> RI should be open to “interested member states”, “associated states” and third countries” (EC DG R&I Dir B, 2015, p. Annex, p 23). “Because of their ability to assemble a critical mass of people, knowledge and investment, Research Infrastructures contribute to regional, national, European and global development and are one of the most efficient tools to facilitate international cooperation in science” ...”enabling collaboration among Users across scientific domains and geographical boundaries” ...it should not be burdened by inappropriate taxation” (EC DG R&I Dir B, Unit B4, 2016, p. 6).</p> <p>Keys: Mostly <i>Open Access</i>, but also <i>Governance</i> and <i>Scientific Education</i></p> <p>With regard to <i>RII</i> and <i>RII</i> keys, the awareness is limited. “Generally Open Source and Open Access principles shall be favoured” (EC DG R&I Dir B, 2015, p. 42).</p> <p><u>Open Access:</u> RI should be “effectively open to the European research community at large” (EC DG R&I Dir B, 2015, p. annex 1, page 23). It is on the “move towards open access to scientific publications and data” (EC DG R&I Dir B, Unit B4, 2016, p. 6).</p> <p><u>Governance:</u> The programme line published the European Charta for Access to Research Infrastructures Principles and Guidelines for Access and Related Services (EC DG R&I Dir B, Unit B4, 2016). The charter gives clear access modes, introducing regulations on accessibility of RI.</p> <p><u>Gender</u> is not explicitly mentioned.</p> <p><u>Science Education</u> options are mentioned several times. “Research Infrastructures are encouraged to offer education and training in the areas of their activities and to collaborate with other institutions and organisations that benefit from using the Research Infrastructure for their education and training purposes” (EC DG R&I Dir B, Unit B4, 2016, p. 12).</p> <p>Implicit: <i>Ethics</i>, <i>SDGs</i></p> <p>Implicitly, the charter introduces limitations of access options, addressing national security aspects, privacy, IPR and ethical considerations (EC DG R&I Dir B, Unit B4, 2016, p. 13). Also, the <u>SDGs</u> are implicitly addressed: “Strong investment in research and innovation is needed to address pressing global societal challenges, such as climate change, health and ageing population, and the move towards a resource efficient society. Research Infrastructures play a vital role in addressing these challenges” (EC DG R&I Dir B, Unit B4, 2016, p. 6).</p>
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Scoping level

No	
Yes	Keys: some awareness

	<p>Os: high awareness Implicit: some awareness</p>
<p>Explanation</p>	<p>3 Os: <i>Open Science, Open Innovation and Open to the World</i></p> <p><u>Open Science</u>: It will “provide support to explore appropriate governance and funding” for the envisaged European Open Science cloud and the development of a European Data Infrastructure (EDI) (EC, 2017f, p. 2). “Open science trends, which advocate for a rapid diffusion of the latest knowledge have already launched a shift in the current mind-set. A strong example of such a change is the construction and operation of the Large Hadron Collider (LHC) at CERN, which has been signalled as the place where new businesses and business models must be identified, explored and undertaken.”(EC DG R&I, 2017, p. 22)</p> <p>The European Cloud initiative is explicitly mentioned as service for <i>Open Science</i>. International cooperation on global RIs is being regarded as a tool for the <u>Open to the World</u> strategy.</p> <p>Keys: Mainly <i>Open Access, Scientific Education</i> and training, <i>Public Engagement, Ethics, Gender</i></p> <p><u>Open Access</u>: “a user-driven registry or distributed catalogue of services” (EC, 2017f, p. 3). The European Strategy forum on Research Infrastructures (ESFRI) published a Roadmap in 2016. This roadmap considers “merit-based open access” as the “most effective solution to provide state-of-the-art instruments” (ESFRI, 2016b, p. 18).</p> <p>It foresees steps for its implementation, such as “supranational centres”, which will “ensure international access, improved measurements and data harmonization....” (ESFRI, 2016b, p. 41).</p> <p>The roadmap introduces e-infrastructure “commons”. It describes the ultimate visions, to “reach integration and interoperability in the area of e-infrastructure services, within and between member states, and on the European level and globally” (ESFRI, 2016b, p. 192).</p> <p><u>Scientific Education</u> and Training (but mainly for managers of RI).</p> <p><u>Public Engagement</u> is mentioned in the context of stakeholder consultations for drafting the work programme.</p> <p><u>Ethics</u>: “respecting concerns in relation to privacy and ethics (e.g. for medical data)” (EC, 2017f, p. 5)</p> <p><u>Gender</u>: “build the RI human resources capacity, including an improved gender balance” (EC, 2017f, p. 6)</p> <p>Implicit: diversity, responsiveness</p> <p><i>RRI</i> is included at the scoping level as the program efforts are seen crucial for helping to respond to grand challenges.</p> <p>Further, considering the “cultural dimension” (EC, 2017f, p. 5) and hence addressing diversity, inclusiveness and responsiveness, is implicitly relating to <i>RRI</i>’s core ideas.</p>

	<p>The required “interoperability” as one of the technical dimensions for data sharing and reuse of data, implicates openness and accessibility.</p> <p>Concerning expected socio-economic impact, the “ability to develop an open innovation culture” (ESFRI, 2016a, p. 22) is aspired.</p>
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Work program level

No	
Yes	<p>Keys: High awareness, but mainly of Open Access</p> <p>Os: High awareness, mainly of <i>Open Science</i></p> <p>Implicit: high awareness of openness and transparency</p>
Explanation	<p>WP 14/15 does not explicitly mention <i>RRI</i>, whereas WP 16/17 and WP 18/20 do explicitly refer to <i>RRI</i>: “Activities carried out under this Work Programme should be in respect with the Responsible Research and Innovation policy (<i>RRI</i>) engaging society, integrating the gender and ethical dimensions, ensuring the access to research outcomes and encouraging formal and informal science education” (EC, 2017c, p. 78).</p> <p>3 Os: <i>Open Science, Open Innovation and Open to the World</i></p> <p>Accordingly, the 3 Os are explicitly mentioned, with a high awareness of <i>Open Science</i> and some awareness of <i>Open To The World</i> as well as <i>Open Innovation</i>: “open and interconnected”, “bridging the divide between developed and less developed regions”, “pooling resources”, establishing the “European Open Science Cloud, and to develop a European Data Infrastructures (EDI)” (EC, 2017c, p. 5).</p> <p>The EC will “encourage the integration of research infrastructures into local, regional and global innovation ecosystems”.</p> <p>“The Union actions will also leverage the use of research infrastructures, in particular e-infrastructure, for public services, social innovation, culture, education and training”. “Independent expert groups will be consulted, as well as stakeholders and advisory bodies, such as ESFRI and the e-IRG” (Council of the EU, 2013, p. 987).</p> <p>Keys: mostly <i>Open Access</i>, but also <i>Governance</i></p> <p>Mainly, there is a high awareness of <u><i>Open Access</i></u>:</p> <p>A “seamless and open access to e-science environments and global data resources” is regarded to “help to free the potential of Big Data for the benefit of researchers, innovators and business, and to advance research and innovation” (EC, 2017c, p. 5).</p> <p>“First-class sustainable RIs and services, open to researchers, industry, and other interested groups such as policy makers and the public” should be “progressively established” (EC, 2017c, p. 5).</p> <p>Grant beneficiaries have to engage in “data sharing by default” (EC, 2017c, p.</p>

	<p>6). Within the programme line, a pilot on Open Research Data is launched. This data base (including all projects funded under the Research Infrastructures (including e-Infrastructures) part of Work Programme 2016-2017) aims to improve and maximise access to and re-use of research data generated by projects. “A further new element in Horizon 2020 is the use of Data Management Plans (DMPs), detailing what data the project will generate, whether and how it will be exploited or made accessible for verification and re-use, and how it will be curated and preserved” (European Commission, 2017). However, grant beneficiaries are allowed to opt out of their data sharing activities.</p> <p>There is limited awareness on <u>Governance</u>: The program targets the “long-term sustainability” of infrastructures with “established governance and legal structure” on the basis of the European Research Infrastructure Consortium (ERIC)“.</p> <p>Implicit: Societal Challenges</p> <p>Implicitly, RIs contribute to cross-cutting issues, such as climate change and biodiversity and are thus meant to be responsive to societal challenges. RIs enhance worldwide networking and international cooperation, addressing areas for improvement as identified by the RI specific assessment of the interim evaluation of H2020.</p>
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Call level

No	
Yes	<p>Keys: some awareness Os: high awareness Implicit: some awareness</p>
Explanation	<p>3Os: Mostly <i>Open Science</i>, but also <i>Open Innovation</i></p> <p>The <u>3 Os</u> enjoy a high visibility at a call level. In particular <i>Open Science</i> is important here and prominently features the call level ‘Implementing the European Open Science Cloud’ which has been established in the WP 16/17 and continued under WP 18/20. <u>Open Science</u> is closely linked to aforementioned intentions of <i>Open Access</i> as means for successful and important collaboration across academic and, in case of e-infrastructure, physical borders. Further <i>Open Science</i> is also addressed as means to “EINFRA-22-2016: to increase citizen’s trust in science, bridging the gap between the leading research and education communities and the wider population.” (EC, 2017b, p. 4)</p> <p>The call on INFRAEOSC-02-2019 further particularly refers to “user oriented open science approach” (EC, 2017c, p. 17) as possible means to succeed in innovating digital services.</p>

Whereas the calls of the work programme 16/17 are restricted to references concerning *Open Science*, calls of the work programme 18/20 also tend to include *Open Innovation*, as the call line “Demonstrating the role of Research Infrastructures in the translation of Open Science into Open Innovation’ from WP 18/20 prominently depicts.

Open to the world, however, is not included in WP 16/17 calls and hardly present in the programme of 18/20: „**H2020-INFRAEOSC-2018-2020** *The Call will ensure strong positioning of EOSC in the context of similar initiatives in other world regions to enhance and ‘open to the world’ international collaboration.*” (EC, 2017c, p. 15)

Keys: *Open Access, Governance, Public Engagement, Ethics, Gender*

None of the calls of the two most recent work programmes specifically refers to *RRI* as a concept. However, some of its keys are addressed. This is particularly the case with regard to *Open Access*, which is somewhat addressed in all of the calls of both funding periods. The understanding of *Open Access* is closely tied to the 3 *O*s and in particular to *Open Science*, as crucial condition for a successful collaboration and a possible outreach mechanism. **“INFRADEV-04-2016: Specific Challenge: Research Infrastructures** such as the ones on the ESFRI roadmap and others, are characterised by the very significant data volumes they generate and handle. These data are of interest to thousands of researchers across scientific disciplines and to other potential users via Open Access policies. Effective data preservation and open access for immediate and future sharing and re-use is a fundamental component of today’s research infrastructures and Horizon 2020 actions.” (EC, 2017b, p. 11) Closely aligned with the concept of open-access is the notion of the FAIR-principle and hence the notion of data ideally being “Findable, Accessible, Interoperable and Re-usable” (EC, 2017d, p. 19), or in its extended form “discoverable, accessible, assessable, intelligible, useable, and wherever possible interoperable” (EC, 2017b, p. 30).

The addressees of these respective outreach activities are, however, mainly other research communities and industries. Citizens are hardly specifically referred to: **“INFRAINNOV-01-2017: Fostering co-innovation for future detection and imaging technologies** Scope: The aim is the establishment of an open initiative oriented towards a novel research and innovation collaborative framework engaging both the research communities in Europe using Research Infrastructures and the industry (including SMEs), for the mutual benefit of these stakeholders and the European society at large.” (EC, 2017b, p. 46).

“INFRADEV-02-2019-2020: Preparatory Phase of new ESFRI projects:

A landscape of first-class sustainable RIs and services, open to researchers, industry, and other interested groups such as policy makers and the public,

	<p>is progressively established, which will impact on the acceleration of scientific discovery as well as on innovation and competitiveness.”(EC, 2017c, p. 10).</p> <p>Implicit: sustainability, responsive/adaptive, open/transparent</p> <p>At an implicit level, the calls aim at sustainable solutions which are responsive to researchers’ needs and challenges (i.e. “user-driven” (EC, 2017b, p. 40) and, in line of the call EINFRA-22-2016, attribute to “an open scientific knowledge management infrastructure in which scientific and educational information repositories and publishing platforms form a visible part of an inter-connected and global knowledge system.” (EC, 2017c, p. 41)</p>
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Project level

No	
Yes	<p>Keys: some awareness</p> <p>Os: n.a.</p> <p>Implicit: n.a.</p>
Explanation	<p>Keys: mostly <i>Open Access</i>, but also <i>Gender equality, Ethics, Public Engagement and Governance</i></p> <p>On the basis of the analysis of project data on CORDIS by CWTS there is some awareness of <i>RRI</i> in RI-related H2020 projects. 100 of the 162 analysed projects of the programme line exhibit some <i>RRI</i> awareness. This is particularly the case with regard to the consideration of ‘<i>Open Access</i>’. Nevertheless more than one third of the examined projects lacks any explicit reference to <i>RRI</i>.</p> <p>The highest ranked <i>RRI</i> project of the programme line is OpenAIRE2020 due to its heavy focus on <i>Open Access</i>. Further, also EGI-Engage, VRE4EIC, EOscipilot, ODIP 2, PARTHENOS and THOR achieve above average <i>RRI</i> scores related to <i>Open Access</i>. GGP-EPI is the only project whose high <i>RRI</i>-awareness is not related to <i>Open Access</i> but to its focus on <i>Gender Equality</i>.</p>

Evaluation level

No	
Yes	<p>Keys: limited awareness</p> <p>Os: high awareness</p> <p>Implicit: limited awareness</p>

<p>Explanation</p>	<p>MERIL147 (Mapping of the European Infrastructure Landscape) has established a checklist of questions for self-assessment of infrastructures.</p> <p>3 Os: <i>Open Science, Open Innovation, Open to the World</i></p> <p>Within the MERIL checklist <i>RRI</i> is addressed as follows: There is a high awareness of the <u>3 Os</u>, and all of its three dimensions are addressed in the evaluation guideline.</p> <p>Is the RI “providing access to users outside of the country”, and does it have “more than national relevance”? Does it have “access rules” and an “access point for users on a publicly available web page”? (MERIL, 2017).</p> <p>The RI-chapter of annex 2 of the interim H2020 evaluation explicitly addresses all 3 Os as a connected concept as well as in their individual dimensions (EC, 2017a, pp. 178–220). The overall interim evaluation states that large RI projects have been delivered for EU member states, “attracting participative interest more globally”. “The pan-European e-infrastructures support the networked provision of computing infrastructure and the development of major data-driven research infrastructures” (EC, 2017g, p. 84).</p> <p>Also, “In Research Infrastructures, a Memorandum of Understanding was signed in October 2016 between the CE-RIC-ERIC and SHARE-ERIC networks of research infrastructures to boost regional cooperation and collaboration in different fields (active ageing, transport and connectivity, education, research and innovation) and support scientists from low R&I performing countries to access research infrastructures” (EC, 2017g, p. 92).</p> <p>Keys: <i>Open Access, Scientific Education, Gender</i></p> <p>The MERIL evaluation guideline exhibits a low awareness of <i>RRI</i> keys. Within the EC Model Grant Agreements, “open access” costs are eligible costs under “goods and services” (EC, 2017d, p. 26).</p> <p>The Model GA refers to the Programme Regulation which says that RI, “where relevant, they may be used beyond research, e.g. for education or public services” (EC, 2017d, p. 26).</p> <p>Access to RI must be given under the following conditions: “The access must be free of charge, virtual access to research infrastructure or installations” (EC, 2017d, p. 43), dissemination activities have to ensure “cross-border interoperability” and funded projects have to “disseminate’ its results by disclosing them to the public by appropriate means” (EC, 2017d, p. 68).</p> <p>The EC’s interim evaluation annex 2 mentions the <u><i>RRI</i></u> concept once in the context of ‘Cross-cutting issues’ and shortly deals with <u><i>Gender</i></u> balance of board and research communities throughout the programme line funded projects (EC, 2017a, p. 191). Keys beyond open-access, however, are not addressed in the</p>
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	<p>evaluation.</p> <p>Implicit: <i>SDGs, sustainability</i></p> <p>Implicitly, the <i>SDGs</i> and societal challenges are addressed in both, the MERIL evaluation guideline as well as the EC’s interim evaluation.</p> <p>The ERA priority of “Optimal transnational co-operation and competition on common research agendas, grand challenges and infrastructures” was addressed in H2020 by “Public-Public Partnerships, European Strategy Forum for Research Infrastructures”, addressing “various scientific macro-domains, ranging from health and environment to social and cultural domains” (EC, 2017g, p. 98). Within the projects the expected contribution on societal challenges, research infrastructures “are expected to have particularly impacts on health and food/bioeconomy” (EC, 2017g, p. 128).</p> <p>Further, the interim evaluation annex 2 points to the increased efforts needed to ensure the “long term sustainability of pan European research infrastructures through a life cycle approach” (EC, 2017a, p. 202).</p>
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9.3.2.2 General use of RRI

- ***Is RRI (in any form) traceable as a vision in the program line?***

The projects funded within the programme line of Research Infrastructures have to somehow consider the concept of *RRI* in their procedures as they will also be evaluated against it. The work programmes and the scoping level exhibit a *RRI*-sensitive approach. This vision, however, cannot be fully traced in other levels, such as the policy level, the level of evaluations or the level of individual calls. At these levels *RRI* loses its overall character as multifaceted concept and is mostly boiled down to its dimension of *Open Access* - the only continuously addressed key. With regard to other reflected *RRI*-keys, *Public Engagement, Governance, Science Education* and *Ethics* are addressed at all of the analysed levels. However, none of these are scrutinised in more detail, rather they are tackled in a superficial manner close to key-word dropping.

In contrast, the *3Os* are well reflected at all the analysed levels and fully considered in their different dimensions. In particular *Open Science* is embraced in the analysed levels. The consideration of *Open Innovation* and *Open to the World*, however, seems to be more closely related to the EU’s global and strategic position and hence used as means to stabilise the EU’s leading position in research competition, rather than a tool to redefine the relationship between science and society.

- ***Is RRI reflected in the challenge to be addressed? (as opposed to looking for a “technology fix” to the challenge)?***

The programme line does not directly address one specific challenge of the predefined H2020 grand challenges. Since RIs, however, are a cross-cutting field which is necessarily used in all kinds of research, they ‘naturally’ represent a tool for addressing societal challenges. Recently, RIs are also extending to the field of social sciences and humanities.

Against this background of a more holistic approach, *RRI* itself is no explicit goal to be achieved.

- ***Is RRI (or any other underlying principle thereof) reflected in the theoretical considerations of the work programme or the calls?***

Due to the complexity of RIs, RIs necessarily have to collaborate across national and continental borders, in order to keep up with scientific requirements. This is why, in particular the *3 Os*, mapping activities, user orientation and the key aspect of *Open Access* are well represented in the work programme and the respective calls. The inclusion of these aspects, however, does not happen in close alignment with the multifaceted concept of *RRI* as a whole, but rather as isolated approach required by external forces.

- ***Is RRI (via keys) present only as a tick-box exercise or is it more substantial? If yes, how?***

Most of the mentioned *RRI* keys are not fully considered, but included at a highly superficial level similar to a tick-box exercise. The only *RRI* key that is more substantially addressed is, as already mentioned earlier, the key of *Open Access*, which can be traced in every single analysed document level and tackled in close alignment with the *3Os*. The understanding of *Open Access*, however, again varies. There is no clear interpretation of who should be able to access these resources. The most frequently represented notion, however, applies the idea of a 'merit-based-approach', hence enabling the scientific community as well as industries and SMEs, as only extra-scientific stakeholders, to access these resources. Further, there is no agreement on whether *Open Access* also implies access free of charges and other institutional barriers. Thus, despite being substantially addressed, also *Open Access* leaves room to embrace *RRI* content more fully.

- ***Is RRI (keys, Os etc.) substantially influencing the way R&I in the program line carried out?***

Besides *Open Access*, other dimensions of *RRI* are not included. RIs are expensive and require a lot of financial resources, which is why they require for collaboration in order to be set up accordingly. In order to remain competitive and innovative, *Open Science*, *Open Innovation* and *Openness to the World* are crucial components to use the fullest potential possible. Hence, *RRI* is not substantially influencing the way R&I is carried out in the programme line.

Overall assessment of how Keys, Os and other RRI (societal impact) related concepts are used in the documents of the program line

As a holistic concept, *RRI* is only mentioned at Work Program level, and despite a quarter of all eligible projects being flagged *RRI* relevant, none of the calls explicitly addresses Responsible Research and Innovation.

In contrast, the *3 Os* are guiding principles on all analysed levels of the programme line. The most prominent *O* is *Open Science* which is referred to as important enabler of the efficient collaboration of researchers and industries. *Open Innovation* is most commonly addressed in relation to e-infrastructures. In this context, there are also specific calls such as the call for a user-driven

innovation approach, which reflect the inclusion of this O. The last O, *Open to the World*, is prominent at policy level, however only partly present at call level.

With regard to the specifically addressed keys, *Open Access* is the most present key. In close relation to the prominence of the 3 Os this key is, however, mostly understood as granting merit-based-access for researchers and industries and is not addressing civil society. All H2020 projects are by default open access. The Model Grant Agreements list costs related to open access as eligible costs under ‘goods and services’(EC, 2017d). However, beneficiaries might opt out of this open-access obligation. Within the realm of all H2020 beneficiaries about one third is making use of this clause(EC, 2017g). Also, *Governance* is partly reflected in the analysed material. Its focus remains on a level of coordination and structural aspects. Hence for example the European Charter for Access to Research Infrastructures is addressed along the lines of setting up networks and tackling general issues of data management. *Ethics* are equally dealt with in connection with privacy and data protection issues of Open Science and Open Access material. *Gender* is only addressed in relation to the composition of research teams. *Science Education* is equally only present addressing research communities and industries as only extra-scientific stakeholders and foreseen users of RIs. There is no call related to citizen science. As the last RRI key, *Public Engagement* is not present in the analysed material. One of the analysed calls is addressing the public as addressee of RI. Against this background mostly society is referred to in a general sense rather than specifically referring to particular societal groups which can be engaged in scientific processes. The necessity for engaging with the public, however, is deemed necessary in order to increase the citizens’ trust in science and equally for disseminating final results.

At an implicit level, RRI-relevant concepts are discussed in the context of access-options and limitations thereof in order to address national security aspects, issues of IPR and ethical considerations. Also the concept of *FAIR* – science, implying that the results are to be ‘Findable, Accessible, Interoperable and Re-Usable’ which is to be implemented in order to realise Open-Science and Open-Access, clearly is RRI-relevant. Further, grand societal challenges are partly addressed, without clearly referring to a specific SDG or the SDGs in general. In this regard, sustainability issues are broadly tackled.

9.3.2.3 RRI beyond the keys

RRI is addressed in the context of being one of the EC’s set priorities. As such, *RRI* is seldom mentioned explicitly. Some *RRI* aspects are treated as a tool to cope with societal challenges. This particularly holds true for notions of open-access which are applied, to grant merit-based access for those that pose the most relevant research questions. In line with the need of being *FAIR* (see above), open and transparent, stakeholder engagement is partly seen as a tool for raising public trust in science. Also, anticipation and the reflection of societal challenges are found in the scanned material. Necessarily, RIs need to be responsive to the involved stakeholders – as inclusiveness is neither explicitly nor implicitly aimed at, it is only the researchers’ and industries needs which RIs need to be responsive to. In the context of privacy and data protection, ethical, legal and social implications are partly considered

9.3.3 Interview findings

For this diagnosis, we conducted 13 semi structured expert interviews with different stakeholders in the field, coming from NCPs, RIs, ERICs or ESFRI, or using infrastructures at project level. The

interviewees were 4 women and 9 men. The following section shows results carried out on basis of the interviews which were held from autumn 2017 to spring 2018.

9.3.3.1 Shared understanding of RRI

Open Access

Open Access as the main RRI key is understood in different ways:

Physical access: First of all according to the interviewees, the *physical access to research infrastructures* should be as open, wide and useful as possible. Much effort is presently put in making RIs as open as possible, and projects like the European Open Science Cloud (EOSC) are exploring options how to cluster existing RIs and make them interoperable and accessible by a single entry point. The RIs have to be openly accessible to a certain percentage; their openness is, however, limited, especially if the RIs are only financed at a national level. Accessibility is hence strongly related to the funding mechanism and there is a clear difference between nationally funded and internationally funded projects. Researchers of co-financing countries have privileged access to the infrastructures compared to countries which had not acted as financial supporters. “Further, the maintenance of research infrastructures and e-infrastructures is costly, not every operator is able to grant open access due to financial restrictions” (Int. 8).

This implies that *Open Access* is not equated with free access. Open Access is by no means understood as access for the wider public and de facto not possible due to merit based selection processes. Open Access should always be based on peer review to help researchers to improve the research (=merit based approach). There is an established selection process for selecting relevant projects with a peer-review system that should make the process particularly fair and transparent. “If someone is interested in using our RI, s/he has to fill in a brief form. Then we have to see whether it is within our contract, e.g. for education, for a dissertation, etc. It is all described on our website, very detailed” (Int. 3). Clear criteria for selections and a definition on accessibility are written in the European Charta of Access to RI. (EC DG R&I Dir B, Unit B4, 2016).

Open data: Data should be openly accessible as well, but conditionally: “It does not make much sense to make every bit of raw data openly accessible, but there is the ambition to stick to the GO FAIR Initiative Principles (GO FAIR 2018), i.e. to keep data available, compatible and usable” (Int. 8). How to realise these principles is still under negotiation, even more so when it comes to their compatibility and usability across disciplines.

Also, there is a huge ethical concern in the RI community that data is misused – also see the section on *Ethics* below.

Further challenges concern IPR issues: Who are the owners of data? (elaborated within EC funded projects). Another challenge touches upon the handling of enormous amounts of data to make them virtually accessible. In order to enhance the usability of this data, data management plans are required.

EC funded projects also allow for an opt out option on open access. This can be easily applied.

Open publication: There is a strong trend towards open access publications, since open access publications are formally required for all H2020 projects. However, there are still problems which

have to be solved, practical issues, like roles, costs, the rewarding systems etc. To publish only in open access is considered as being problematic and as a kind of “stigmatisation” as well. Researchers have the priority to disseminate their data but once the embargo period is over they have to grant access for all kind of users, researchers as well private users. Academic users have to send a proposal to get access and afterwards only have the obligation to publish in the facility. Private users have to pay in order to access the data and need to keep it confidential. A model of *Open Access* can be found in all facilities. Further, depending on the subject, there are different arrangements in place e.g. co-publications, etc. (Int. 4)

Lastly, accessibility does not, in any way mean access for disabled or impaired persons.

Gender

There is still an imbalanced presence of women in specific scientific fields. Generally, women in research infrastructures seem to be rather underrepresented. No conceptual gender mainstreaming has been observed by the interview partners. Mostly, they address gender topics within H2020 requirements and many pursue gender equality within the project team and among the user base of the RIs. With regard to research topics and researchers themselves, some gender issues remain, as elaborated below.

Project Teams: H2020 calls ask for gender balanced research teams and thereby raise researchers’ awareness for looking into their team composition. For many interview partners, these standards set the bar for the consideration of *Gender* in the programme line of research infrastructures as a whole.

These considerations rarely reach to project level, however, there are country-specific efforts to reach for diversity, the UK being one example for a more attentive approach (Int. 10) As one interviewee (Int. 5) emphasized, *Gender* does not constitute one of the criteria established for evaluating the excellence of science, despite having to apply ‘gender checks’ at several different levels such as projects, resources, platforms or activities (Int. 2).

Institutional Level of Research Infrastructures: Some interviewees stated that they applied a gender equality plan within their institutions. Funding institutions, including ESFRI have to respect gender-based quota regulations in recruitment decisions. While female researchers are underrepresented in the field of research infrastructures and still structural discrimination and glass-ceiling barriers, large infrastructures exhibit the interesting tendency to “prefer women” as directors, since “gender balance is required” (Int. 9). Some NCPs and institutions are offering “gender trainings” (Int. 3), but these trainings merely implicate support for female researchers in organising their work as mothers and other parent leave-options, such as maternity leaves up to 3 -4 years or home office.

User Base: Also the user base of research infrastructures was mentioned to be gendered; research infrastructures exhibiting a gender balanced user base represent a notable exception and are mostly to be found in the realm of social sciences.

Research Topics: At the level of research on research infrastructures and the process of setting up research infrastructures, a gender perspective is mostly not considered to be applicable. In particular

high-tech scientific research infrastructures are not related to gender dimensions. The research area seems decisive whether or not gender perspectives are included, with human-centred research foci in the realm of bio-medicine or social sciences being more likely to look at ‘gender specific differences’. Unbalanced research teams further exhibit the danger of over-investigating particular topics and under-researching others. Due to the glass-ceiling effect and the overarching male researcher base the selection of research areas and research questions respectively runs in the danger of being androcentric, while other dimensions remain under investigated. (Int. 3)

Ethics:

Ethics is the second most prominent *RRI* dimension in the programme line. Its extent is, however, differently understood.

On the one hand, there is an approach that does see research infrastructures merely as ‘tools’ for investigations and hence as distinct from what they actually are and might be used for. Hence they are not perceived as being linked to specific ethical challenges (Int. 9). This view is particularly prominent with regard to non-human related large-scale research-infrastructures in the realm of natural sciences.

Open Access in this regard is the most difficult dimension to deal with – on the one hand, open access to data and research facilities are to be offered and maintained, on the other hand, however, data interpretation needs to be assessed in order to safeguard scientific standards and credibility (Int. 3). Also, financing schemes of research infrastructures result in privileged access options based on financial support, which further raises ethical questions and counteracts the ideal of equally open access.

On the other hand, there also the perspective on RIs not being seen as exempt, but rather embedded and hence as concerned with ethical dimensions as other programme lines is represented in the interviews (Int. 5). This is even more the case for fields related to medical research, social sciences and health care (Int. 5 & 6). Besides data privacy, also the sight selection of large infra-structure projects is mentioned as well as the sustainable use of resources are explicitly mentioned as ethical challenges related to the programme line (Int. 8).

Ethics regulating mechanisms in research: Currently, ethical dimensions are regulated on several levels. On the one hand, there are ethic protocols, which are perceived as setting the base for ethically correct behaviour in the context of Horizon 2020 projects (Int.1). These rules include for example specific codes of conduct or antidiscrimination clause. The mere existence of these rules, is, however, not seen to be sufficient, as one interviewee (Int. 10) put it: “The rules are there – I think so – but they could be broken” (Int. 10). An instrument for safeguarding the rules’ implementation are ethical committees, which, however, are not automatically included in all kinds of research projects, but again differentiated on the basis of the research topic in question and its perceived ethical implications (Int. 10). Further, universities provide for ethics boards to be consulted (Int. 7), there are also helpdesks for ethical, legal and social aspects, as well as homepages, which provide for ethical guidelines (Int. 11; 12). Partly also ethics reviews are required, however, also for researchers involved in the same project, it is not always clear, how they are done and why and whether they conform to other existing standards (Int. 8).

Researchers: Interviewees urge for having more specific ethics training as well as required declarations of interest and peer reviewed promotion decision within the realm of research (Int. 6).

Public Engagement

Public Engagement in the realm of RIs seems to be seen from two contradicting perspectives. While on the one hand no trend towards engaging the public beyond necessity (civil society not regarded as such) was perceived (Int. 1, 2, 13), on the other hand, active reach-outs to the general public seem to take place on multiple levels (Int. 3, 6, 7). Also, research traditions seem to play a role here – young researchers and those being used to specific national contexts are more willing to reach out to stakeholders than others (Int. 10).

Reasons for *Public Engagement*: The motivations to include civil society actors are to be found on different levels. Public engagement clearly seems an important factor for accessing public funds and resources. It hence acts as “fig leave” (Int. 10), and is an important tool for PR and promotion alike (Int. 9). On the other hand, *Public Engagement* is also perceived as a mean to reassure the public opinion in science and more specifically in the context of particular scientific projects (Int. 4). In this regard, a transparent research process which – at least – informs civil society might prevent public protests arising for example in the context of sight selection of RIs and raise the quality of final data obtained (Int. 3). Lastly, inclusive *Public Engagement* is necessary to solve the grand societal challenges we are facing. One interviewee voiced the urge for partnerships between sciences and between science and science communication and advocacy groups in order to combine advocacy work and academic research (Int. 11). The EC could help here by inviting tenders for fostering collaboration in this regard.

Kind of involvement: Civil society actors are also involved in different ways. One common approach in the programme line seems to establish open-access data and information pools (Int. 5), which can be accessed by the general public. In this way, the public is not involved as active shaping members, but rather as passive receivers of information. Against the background of this “superficial level” (Int. 10) deeper forms of engagement take place, with exchange platforms being established (Int. 11), or public lectures at libraries or museums, media activity, exhibitions, provide for open-doors, and even persons who specifically dedicate their work to public debate and who actively search for feedback for outreaching activities (Int. 3). Also difficulties to find a balance between reaching out to individuals and not to overburdening them have been reported (Int. 2).

Science Education:

Science Education in the realm of RI is addressing different stakeholder groups. Equally RIs themselves approach *Science Education* differently than RI related projects.

Research Infrastructure based *Science Education*: *Science Education* activities seem more common for large infrastructures, but become more and more common for medium-sized ones as well (Int. 9). On the one hand, most RIs mainly reach out to academia by engaging students, post-docs and other researchers in order to raise interest in research (Int. 4). Also PHD-programmes seem to be partly supported by RIs (Int.3). Lately there are more efforts to foster cross-disciplinary dialogue and to make RIs usable from an interdisciplinary perspective (Int. 9).

On the other hand, there are also RIs that offer programmes and open-days for schools and partly also the public. This is, however, seen to happen on the basis of local pressure, rather than international standards (Int. 4).

Research Infrastructure Projects: At a project level, *Science Education* seems to be closely related to activities concerned with *Public Engagement* (Int. 2). While in particular NCPs did not feel that *Science Education* activities were going on in the field of the programme line, project managers referred to doing MOOCs, engaging with media and offering trainings. However, as one interviewee pointed out, “they could do more” in this regard (Int. 7).

Governance:

Within the context of Horizon2020 no standardized *Governance of RRI* as a holistic concept can be found, which is why – also with regard to the particular programme line of RIs – national regulations set the baseline. *Governance* is further mostly tied to transparency of the research work such as regular reporting, explanations and justifications (Int. 6), as well as to respecting of ethical guidelines (Int. 1). The UK is a particular positive example of transparent data (Int. 10). Guidelines issued by the European Commission without implementing them, however, do not seem to be a promising way out (Int. 10). With regard to research governance in general a tendency towards a “democratisation of research processes” (Int. 2) was perceived.

Enablers & Barriers for the implementation of RRI:

The lack of enablers simultaneously forms barriers for the implementation of *RRI* in the programme line. Potential enablers might comprise specific actions set by specifically trained persons while at the same time having appropriate financial means to change internal procedures accordingly and be supported therein by the means of networks and appropriate policies. By these means, currently hindering attitudes and research traditions might be overcome. All of them are going to be elaborated in more detail in the following paragraphs.

Current attitudes: Research traditions in the realm of research infrastructures currently seem to be reluctant to change especially when it comes to changing procedures (Int. 10). The ‘old-spirit’ and hence a lack of will to opening science by the means of data sharing, is perceived as major barrier (Int. 1). “There are of course, what I call dinosaurs, both male and female, who do not necessarily embrace *RRI* and who do have various attitudes towards it.” (Int. 6) *Responsible Research* is not perceived as a priority, but rather as a roadblock in setting up programmes (Int. 3). Instead of deeming *RRI* a crucial feature of every scientific undertaking, it is rather seen as optional “accessory” (Int. 5).

Possible actions: Collecting best practice examples was voiced as most important step in order to better integrate *RRI* in the programme line (Int. 7, Int. 10).

Currently, there are no existing *RRI*-guidelines, which specifically refer to particular actions to be set by specific agents in certain contexts (Int. 2). Establishing these guides based on best-practice examples might set an important standard for *RRI* as crucial part of research undertakings. These guidelines also need to provide for context-specific flexibility. In the context of RIs, for example, the specific organisation of the RIs varies between centralised and federalised structures, which require different approaches (Int. 7). Supporting activities can be set with regard to adapting fixed process

designs and thereby automatically include *RRI*-perspectives (Int. 2). At the same time, too strict regulations need to be avoided (Int. 8). It is important to keep an eye on the potential of science and its limits – since science is also always political; reflecting on these underlying motivations is of uttermost importance (Int. 8).

Establishing a platform to link different sources and resources, such as for example, finished *RRI*-specific research projects (Int. 6), was mentioned as possible way to not only establish a virtual, but also a real-life community that engages with *RRI* in its daily habits (Int. 2).

Trained Researchers: Including *RRI* in post-graduate studies was highly recommended, since most researchers currently only gain their knowledge through proactively engaging with this concept in their professional experience (Int. 6). In bridging the current gap between science and public, multidisciplinary becomes ever more important (Int. 10). There is the need for so called “brokers” (Int. 2), hence role models such as trained explainers and science journalists (Int. 10), persons who “really know the many different ‘bubbles’” content wise with regard to discipline specific and cross cutting knowledge, but also geographically, and “who are able to connect them, who can translate and overcome language barriers” (Int. 2).

Further, networking is crucial in order to transform current science-society relations. “Also, in technology based projects and research and innovation process, the personal relationships are key, especially if different communities have to collaborate” (Int. 2). Alliances with key players, who are able to pursue non-mainstream alternatives and to legitimise results thereof are lined out as important stepping stones. The way actors are engaged is deemed crucial (Int. 8) – civil society and industries need to be involved more strongly (Int. 5) – public-private partnerships and joint technology initiatives could provide for usable pathways in this regard (Int. 1).

Resources: Implementing *RRI* in the programme line, and in existing research infrastructures requires additional financial resources, since ELSI-related measures seem to be the first ones that are cut in case of too little financial resources (Int. 11).

However, it is not only “a matter of money. It is a whole cycle which has to be put in place” (Int. 10). In order to keep certain structures alive and to ensure long-term sustainability of infrastructures, updated and hence useful, there is a need for active core groups specifically in charge with supporting and pushing for these activities (Int. 2). Policies setting clear criteria for project assessment could support this process (Int. 8) – similarly to ethic boards, *RRI* boards could be considered (Int. 12).

9.3.3.2 Beyond *RRI*

Besides their awareness on specific *RRI* aspects interviewees were also asked how in general societal impacts are addressed in the program and about their own awareness of the need for a better social embeddedness of R&I and science.

The role of infrastructures in societies and policy making is perceived as contrastingly. On the one hand, there is the kind of systemic perspective of science acting as own system outside of society following its own objective logic and hence needing translation activities to have societal impacts. On the other hand, at an institutional level there have been efforts to include societal challenges in RIs from early on, topics are constantly updated and – if deemed necessary – mainstreamed in

different RIs (Int. 9). Apart from this institutional level, also other RIs see their role as being embedded in society and hence having a clear role in doing their work.

Research Infrastructures / Research as Separate System: For most interviewees, research infrastructures represent important tools to provide for an empirical base for policy makers to address societal challenges (Int. 9, 7, 10). The most important stakeholder group in the realm of research infrastructures are researchers, society ranges second (Int. 8). “Addressing societal challenges or trying to do so is a purely political process and this is only biasing research in the wrong way.” (Int. 10) In this understanding, research does not have a direct impact on society but is rather mediated by political actions, which is also why translation processes are perceived as necessary bridges between scientific findings and real-life actions (Int. 10). Not addressing grand challenges in the scientific realm of research infrastructures is, however, not seen as an option either, since it might be “politically unwise” even for those fields, such as “astronomy [that have] nothing to do with global challenges” .

Research Infrastructures / Research as embedded in society: In contrast, there is also the perspective that a redefinition of the relationship between research and society, as well as strengthening the link between scientific endeavours and well-being are important challenges to be tackled in the realm of research infrastructures (Interview 8, 10). “Public money is spent on research infrastructures, research infrastructures are very expensive, so research infrastructure owes to the society” (Int. 3). In this perspective, RIs do not only represent crucial means to foster research and innovation in a specific discipline, but seen as providing for cross-cutting insights and materials with interdisciplinarity being a buzzword (Int. 4, 9, 11, 13). Systematic and holistic approaches are on their way (Int. 2). Further, also discipline-specific challenges such as inclusive societies, inequalities, delocalisation of food production and consumption as well as data protection and energy security were outlined (Int. 7, 2, 10, 12). Further, also global contexts have to be taken into account, with adaptability of specific approaches to Non-European contexts being outlined as particularly challenging (Int. 11).

These challenges are addressed differently, some institutions set up specific bodies such as multi-stakeholder “communities of practice” (Int. 2) stakeholder fora or common service bodies (Int. 11). Also status quo analyses and thereupon based strategies based on a combination of best practice examples in research and experiences are partly used to better align with societal needs (Int. 2).

To sum up, the general awareness of our interviews ranges between B some awareness and C limited awareness. RRI as concept is understood by most of the stakeholders; and also most of the RRI keys and Os are referred to by some stakeholders; the need for mainstreaming through operationalization is referred to by some stakeholders and some ideas of operationalization of RRI are already present.

9.3.4 Case briefs

The case brief projects have been selected on the basis of the analysis of project data on CORDIS by CWTS. While OpenAIRE 2020 is the highest ranked projects thereof, the projects EGI-Engage and

VRE4EIC have been chosen since their analyses could have been supported by additional insights gained by interviewing contributing researchers.

The highest ranked *RRI* project of the programme line is OpenAIRE2020 due to its heavy focus on *Open Access*. Further, also EGI-Engage, VRE4EIC, EOSCpilot, ODIP 2, PARTHENOS and THOR achieve above average *RRI* scores related to *Open Access*. GGP-EPI is the only project whose high *RRI*-awareness is not related to *Open Access* but to its focus on *Gender* equality. As further elaborated in the following sections, none of these projects integrates ‘Responsible Research and Innovation’ as multifaceted concept as a whole. Instead they merely seem to pick up on specific key-dimensions, with open-access being the key, which could be found the most often.

9.3.4.1 Project 1 – OpenAIRE 2020

OpenAIRE 2020 (OpenAIRE 2018) is the highest ranked project (*RRI* score: 7,4¹⁴⁸).

The project started at the beginning of 2015 and finishes at the end of June 2016. In this period, a large scale initiative has been set up to promote open scholarship and substantially improving the discoverability and reusability of research publications and data. It offers much support and information and services and is thus a key infrastructure itself. The volume is more than 13 million Euros supporting also a pilot on “Gold OA”.

Its high *RRI* score is related to its heavy focus on Open Access (36,4 %), which is the main key word throughout all descriptions and project activities. In its objectives it clearly states its main goal to “support the H2020 Vision of open access” (OpenAIRE website). Accordingly, the project provides a support kit for open research, legal frameworks and services on the portal. Apart from this *RRI* dimension only ethical issues are mentioned, concerning data protection and privacy law.

No reference (process; mention; method) that hints to downstream societal engagement could be identified.

In terms of better embedding the research process into society, one of the project objectives is described as to “support evidence-based decision-making” (website). Furthermore, the project takes the view of *Open Access* as a public good, to open up for society: “The rationale for open access relies in part on the characterization of scientific knowledge as a global public good, which should be disseminated freely for the wider benefit of society” (OpenAIRE D 5.3., p44).

9.3.4.2 Project 2 – GGP-EPI (Evaluate, Plan & Implement)

The GGP – EPI (Evaluate, Plan & Implement) (GGP 2018) – project is an ongoing project (2017-01-01 to 2019-12-31), which has not yet published any reports or deliverables. We could, however, receive some internal documents. The project has a general *RRI* score of 6,1 %, whereas it ranks highest in *Gender* with 36,4 %.

The GGP-EPI project builds on the Generations and Gender Program which was initiated by the United Nations Economic Commission for Europe (UNEE) in 2001. This Social Science Infrastructure for Research on Family Dynamics and Relationships holds micro-level data from 23 countries. The EPI

¹⁴⁸ According to projects assessment by partner 16 (CWTS), explanation: *RRI* score per dimension is the percentage of the keywords that are present in the text. So if 3 out of 10 terms are present, the score is 30%. - Overall *RRI* score: average of all *RRI* dimensions. Details available at: <https://nextcloud.ihs.ac.at/index.php/apps/files?dir=/Consortium%20Meeting%20December%202017&fileid=1582369>

project works on fieldwork strategies and a central model of data collection for an upcoming round of data collection. In order to do so, it conducts an experiment to “Examine the degree to which a push- to web within the new round of GGS data collection can be achieved without adverse effects on response rates and data quality” (ethics report). The project aim is to initiate a transition in GGP’s governance and financial structures from a network of research institutes to a research infrastructure. This transition urges the GGP to continue to provide comparable cross-national data, gathered using innovative and cost effective means.

Concerning references to *RRI* keys or *Os* in the documents, obviously *Gender* is the key aspect. In the survey investigating “what is important in the context of couples, family formation, having children, and relations between younger and older generations” (from invitation letter of ethics report) it focuses on *Gender* aspects.

With regard to Open Access there is a data management and privacy strategy on data accessibility.

Concerning Ethics the project provides a report (with informed consent and data management plan for supervision of the ethics committee). Since the GGP asks ‘sensitive questions’, respondents are allowed to answer in a self-administered way (CASI – computer assisted self-interview).

With regard to references to better embed the research process in society, the GGPs main aim “is to contribute to the broader discourse on societal challenges and demonstrate the extent to which the GGP data can contribute to policy and research agendas” (GGP website). There is however no single reference on moving societal engagement downstream.

9.3.4.3 Project 3 – *vre4eic*

The *vre4eic* project (*vre4eic* 2018) is a “Europe-wide interoperable Virtual Research Environment to Empower multidisciplinary research communities and accelerate Innovation and Collaboration” (from website), and should thus offer a solution for easier collaboration within research communities. *Vre4eic* is also a rather highly ranked project. Its general *RRI* score is 6,1 %, *Gender Equality* 9,1 %, *Open Access* 18,2 % and *Ethics* 9,1 %.

Despite being highly ranked by CWTS, the project related material lacks explicit references to any of the *RRI* keys or the concept of *RRI* at a more general level.

In terms of down-streaming societal engagement, societal involvement is not foreseen. However, for piloting and beta-testing the use of ambassadors and beta users has been set up. This should ensure a ‘pyramid’ approach, inviting project teams and collecting feedback from them by the means of setting up specific user groups. These user groups (end-users) are integrated in impact assessment and usability checking activities. References or methods to better embed the research process into society could not have been identified in the projects’ deliverables and other materials.

With regard to further *RRI* issues, *Open Access* was mentioned in terms of interoperability and open source. Open science for example is explicitly mentioned in the evaluation plan, stating that a “number of countries where the VRE4EIC building blocks are available to users and developers” and also a “number of languages that the e-VRE is available “ (D 2.2., p. 19) . In terms of *Ethics*, the project is also “Trust, Security and Privacy aware”.

9.4 Conclusions

In conclusion, having undertaken the diagnosis activities including document review and expert interviews one can say that the *3 Os* are highly relevant for this programme. This is particularly true with regard to *Open Science*. *RRI* is not regarded as a holistic concept, instead the six keys, and predominantly *Open access* and *Ethics* are addressed separately on all different levels.

On policy document level, in general only limited awareness of the keys can be found, and mostly concerns *Open Access*, *Governance* and *Science Education*. In contrast, there is high awareness for the *3 Os*. Implicitly some awareness on *Ethics* could have been identified, specifically concerning limitations of access options, addressing national security aspects, privacy, and IPR. The SDG goals and pressing global challenges are addressed as well. *Gender* issues are not at all taken into account.

The situation is quite similar on a scoping paper level. Furthermore, international cooperation on global RIs is regarded as a tool for the *Open to the World* strategy. *Scientific Education* and Training is only meant for managers and users of RIs, and *Public Engagement* is only mentioned in the context of stakeholder consultations. Improving *Gender* balance, however, is a set-out goal.

The work programmes WP 16/17 and WP 18/20 do explicitly refer to *RRI*, and require that work should be done taking the concept into account. The six keys get high awareness on their own (again, predominantly *Open Access*), the *3 Os* are equally tackled, *Open Science* being the most explicit one, and there is an implicit awareness of openness and transparency.

At call level, *Open Science* is closely linked to intentions of *Open Access* as means for successful and important collaborations across any kinds of borders. None of the calls of the two most recent work programmes specifically refer to *RRI* as a concept. However, some of its keys are addressed. This is particularly the case with regard to *Open Access*, which is somewhat addressed in all of the calls of both funding periods. The understanding of *Open Access* is closely tied to the *3 Os* and in particular to *Open Science*, as crucial condition for a successful collaboration and a possible outreach mechanism.

Finally, at project level, one can find all keys addressed in different kinds, but the *3 Os* are no longer explicitly addressed. More than one third of the examined projects lack any explicit reference to *RRI*. This is not in line with the evaluation level, which mostly addresses the *3 Os*. The MERIL evaluation guideline exhibits a low awareness on *RRI* keys. Keys beyond *Open Access*, however, are not addressed in the evaluation. To sum up, at call level *RRI* loses its overall character as multifaceted concept and is mostly boiled down to its dimension of *Open Access* - the only continuously addressed key.

The understanding of *Open Access*, however, varies. There is no clear interpretation of who should be able to access resources. The most frequently represented notion, however, applies to the access to infrastructure resources comprising also the physical access to the research infrastructures, which should be as open, wide and useful as possible. However, *Open Access* is by no means understood as access for the wider public and de facto not possible due to a merit based selection processes, which addresses the scientific community as well as industries and SMEs. Secondly another specification concerns open data, which means open research data per default (but allowing for opt-outs). The way this principle might be realised is still under negotiation, even more so when it comes to their compatibility and usability across disciplines. Thirdly, *Open Access* also addresses open access

publications, which are formally required for all H2020 projects. However, there are still problems how to practically fulfil this requirement.

Also the interviews showed that there is a general awareness on *RRI* among interviewed persons, however, *RRI* is not discussed as a holistic concept, but rather in single aspects, again, mainly concerning *Open Access*. *Ethics* is the second most prominent *RRI* dimension in the programme line. Its extent is, however, differently understood. Concerning *Gender*, women seem to be rather underrepresented in research infrastructures. Regarding research topics, most RIs, in particular high-tech scientific research infrastructures are not related to gender dimensions. In the realm of *Public Engagement*, a lot of effort is undertaken to reach out for the public in many different ways. The public is, ultimately, not involved as active shaping members. This goes hand in hand with *Science Education*, which is rather common especially for large infrastructures. However, most RIs mainly reach out to academia by engaging students, post-docs and other researchers in order to raise interest in research. Within the context of Horizon2020 no standardized *Governance* of *RRI* as a holistic concept can be found. *Governance* is mostly tied to transparency of the research work such as regular reporting, explanations and justifications, as well as to respecting of ethical guidelines.

Currently, there are no existing *RRI*-guidelines, which specifically refer to particular actions to be set. Establishing these guides might set an important standard for *RRI* as crucial part of research undertakings. These guidelines also need to provide for context-specific flexibility. Collecting best practice examples seem to be an important step in order to better integrate *RRI* in the programme line.

Establishing a platform to link different sources and resources was mentioned as possible way to support further implementation of *RRI*. But not only to establish a virtual, but also to set up a real-life community that engages with *RRI* in its daily habits is required. Networking, not only across the scientific community, but also beyond, is seen crucial in order to transform current science-society relations. To support this, new roles - brokers, science communicators and practitioners - who could bridge the gap between the communities have to be defined and staff has to be trained accordingly.

Finally, policies setting clear criteria for project assessment could support this process.

9.5 Timeline for Diagnosis

Month	Task(s)
August 2017	Start of Diagnosis
July, August 2017	Get to know the program line
September	Identify relevant stakeholders/experts for interviews
October 2017 – March 2018	Interviews with experts (in total 15-.20)
March – May 2018	Transcribe interviews, analysis
June 2018	Finalizing Report
July 2018	DX.1 due in M15 – ensure you send your reports to WP lead on time

9.6 Literature, links, resources for INFRA Diagnosis Input

- Council of the EU. Council Decision of 3 December 2013 establishing the specific programme implementing Horizon 2020 - the Framework Programme for Research and Innovation (2014-2020) and repealing Decisions 2006/971/EC, 2006/972/EC, 2006/973/EC, 2006/974/EC and 2006/975/EC, 2013/743/EU § (2013). Retrieved from https://erc.europa.eu/sites/default/files/document/file/Specific%20Programme%20Horizon%202020_council_decision_establishing_the_specific_programme_implementing_Horizon_2020.pdf
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