THE EU PROMOTES RESPONSIBLE RESEARCH AND INNOVATION IN PRINCIPLE IMPLEMENTATION LEAVES MUCH TO BE DESIRED

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Recent research shows that while the EU promotes social and ethical values in research and innovation, such values are not well integrated in research policy or practice. Responsible research and innovation principles have been designed to enhance an inclusive and democratic approach to enabling research and innovation (R&I) to reflect values, needs and aspirations of society. The publication in the July 3 issue of Science Magazine, based on research by 20 institutions and coordinated by the Institute for Advanced Studies in Vienna, however suggests a lack of integration of ethics and public engagement in European research projects.

As new disruptive technologies are accompanied with persistent and growing societal concerns about their social and ethical impacts, failing to take the social and ethical values in research and innovation into consideration systematically, may increase distrust in the democratic institutions we have in place to advance science and innovation investments in responsible ways, the researchers write in Science of this week. The research evaluated the policy integration and implementation in Europe's Eighth Framework Program for research and innovation, dubbed Horizon 2020. The team examined how policies on responsible research and innovation were translated into research and innovation practices funded by the EU. Findings suggest that the integration of responsibility in research and innovation practices has fallen short of stated EU political ambitions. While elements of responsible research and innovation are initially defined by policy makers in strategy documents, they wane in funding call requirements and are largely absent in evaluation criteria used in proposal assessments. In other words, political ambitions and societal expectations embedded in the responsibility principles are not adequately aligned with policy implementation or funding practice in the research instruments. This limits the ability of European institutions and researchers to direct research towards urgent needs and to fully anticipate the social consequences of doing research or innovating new products and services.

Integration of responsibility in research and innovation funding policy and governance must become a strategic concern of EU policy makers to promote social and ethical values and address pressing societal needs. By integrating responsibility in research and innovation the EU must affirm its role as a leader of ethically acceptable and societally robust and desirable research and innovation on the world stage. Otherwise Europe undercuts its ability to fund and promote research that tackles societal challenges compatible with its values.

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POLICY IMPLICATIONS

Science, research, and innovation are central to the European strategy for smart, sustainable, and inclusive growth.[1] The European Commission (EC) supports research and innovation that upholds European values of inclusiveness and democratic politics. It is also committed to directing research toward expanding the scientific and technological base of the European economy and industry, fostering broader benefits for society and tackling the most pressing societal challenges of our time.[2] One of the tactics taken by the EC to create and disseminate socially and economically beneficial knowledge and drive prosperity and social benefit for all is the cross-cutting Horizon 2020 (H2020) commitment to Responsible Research and Innovation (RRI).[3]

The EC is currently designing the 9th Framework Program for Research and Innovation. As stated by the High-Level Group on maximizing impact of EU Research and Innovation Programmes, chaired by Pascal Lamy: "the future EU R&I programme should aim to become the biggest co-created and co-creation programme in the world."[4] In the remainder of this brief, at this pivotal moment in European research and innovation, we draw on the preliminary work of the *NewHoRRIzon* project—commissioned to develop the conceptual and operational basis to integrate RRI into European and national research and innovation (R&I) practice and funding—to present a current state of RRI in H2020. We also delineate opportunities for the EC to better employ RRI as part of its strategy to steer Europe toward smart, sustainable, and inclusive R&I.

Responsible Research and Innovation (RRI)

Foundations of RRI can be seen in the 6th Framework Program of the European Union (EU), when the EC began to pay increased attention to building knowledge on better aligning science and society in research.[5] In Horizon 2020, RRI has emerged as a more advanced "process for better aligning R&I [research & innovation] with the values, needs and expectations of society. It implies close cooperation between all stakeholders in various strands comprising: science education, definition of research agendas, access to research results and the application of new knowledge in full compliance with gender and ethics considerations."[6] The EC has also formulated Responsible Research and Innovation in terms of six key areas: (a) public engagement; (b) gender equality; (c) science literacy and science education; (d) open access; (e) ethics; and (f) governance. EU Commissioner for Research and Innovation, Carlos Moedas further articulated three goals for EU research and innovation policy, summarized as "Open Innovation, Open Science and Open to the World." As Europe continues to experience challenges of trust in democratic and scientific institutions, EC commitments like the Open Agenda and RRI may be more important than ever.

Our approach and Results

The *NewHoRRIzon* project — commissioned to advance the integration of RRI into European and national research and innovation (R&I) funding and practice — is establishing 19 Social Labs, spanning all H2020 programmes, to identify opportunities to evaluate the status quo and suggest improvements to further the implementation of RRI. Our initial work to establish these labs has included an extensive diagnosis, consisting of policy analysis, review of interim evaluation materials, and more than 150 expert interviews, of the current state of RRI in the H2020 research and innovation landscape. This work has revealed a range of ways that the implementation of RRI is currently lagging behind its potential. Here we present the collected results, implications, and recommendations from the initial phase of our research.

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[1] (COM(2010) 2020)
[2] (REGULATION (EU) No 1291/2013)
[3] ibid
[4] European Commission: LAB – FAB – APP — Investing in the European future we want, Brussels, 2017
[5] https://ec.europa.eu/research/swafs/index.cfm?pg=about
[6] Competitiveness Council, 4-5 December 2014; 16505/14, 3353rd Council Meeting

Findings

Strong first steps, but a long distance to travel

Despite laudable first steps of having a vision for RRI in the founding regulation of Horizon 2020, at the programme level, RRI often seems to be included only as a pro-forma set of practices, rather than meeting the spirit of requirements around research ethics, public engagement, and gender equality. As one example, when introducing societal aspects of R&I, most H2020 work programmes speak of technologies as having consequences for society or the environment but fail to mention how the cultural, societal, and human factors help shape and co-produce science and technology. As another example (also covered by the Interim Evaluation of Horizon 2020),[7] projects have made a promising show of improving the gender balance of teams and leadership, but devoted far less attention to addressing more systemic issues of gender bias and dynamics affecting R&I.

Limited inclusion of publics and stakeholders contributes to separation from society

The RRI vision of a socially inclusive R&I framework focuses on, among others, citizen participation, societal impact, fostering solidarity and underpinning horizontal, non-top down thinking.[8] When public or stakeholder dimensions are included in projects, definitions of publics or stakeholders are often very narrow and constraining. For example, projects conducted at lower technology readiness levels (TRLs) often focus on specific technologies void of their societal implications, despite having been funded, in part, on the promise of contributing to some form of economic and broader societal well-being. With low TRLs, a dominant approach of developing technology roadmaps makes it easy for projects to include perspectives only of large institutional actors (for example large multinational industry interests, academic experts, or national policy makers) rather than initiating more inclusive R&I approaches that, supported by RRI, could help projects engage and learn from a wider range of societal actors with diverse identities, interests, and values.

This challenge is reinforced by approaches to communication and dissemination of research outputs in ways that either infantilize nonscientists or pre-determine that citizens and stakeholders exist simply to receive information, rather than also provide knowledge and reflections related to their interests and values. Such a closed view of stakeholder engagement and citizen participation limits Europe's ability to develop new knowledge and pathways of realizing inclusive growth and wellbeing in our complex and interconnected physical and social worlds. Our preliminary findings signal, variously: a lack of awareness, limited motivation or incentives, or mismatches in skills and expertise as challenges to the implementation of RRI at project and policy (national and EC) levels.

Overly conservative impact evaluation criteria may unintentionally hinder RRI adoption

Over the course of the three H2020 Work Programmes, only a small percentage of dedicated projects deeply explore ethical issues associated with R&I, focus on science education, or conduct citizen engagement. Across programme lines, little attention is paid to encouraging deeper engagement with RRI issues. One of the strongest indications of this limited adoption can be seen in the minimal or token inclusion of RRI in many project impact evaluations. The European Research Council, for example, bases its evaluation solely on the concept of peer-reviewed scientific excellence defined by the criterion of bibliometric impact. This limits assessment of a potentially broader range of social impacts of frontier science, in the process hindering such research from engaging with broader values and interests related to the coproduction of socially robust scientific knowledge.

Bright spots of programmes pioneering RRI exist and could be leveraged and strengthened

[7] Available at: https://ec.europa.eu/research/evaluations/pdf/book_interim_evaluation_horizon_2020.pdf#view=fit&pagemode=none

[8] cf.: https://newhorrizon.eu/visioning-conference/

Despite limited adoption of the term and practice of RRI, researchers and stakeholders of some programmes are taking pioneering steps on issues related to gender equality, ethics, and open access.[9] In some programme lines attention to ethical and other human and societal dimensions of research in work programme texts and topics is visible. Societal challenge programs, like HEALTH, FOOD and ENERGY, ensure that many projects are embedded in larger European policy contexts. They also support an inclusive approach to R&I, e.g. through fostering "multi-actor approaches" in agriculture, forestry, and other areas of bioeconomy research and innovation; or multi-disciplinary approaches in health and smart cities research. Further, Open Innovation and Open Science are deeply integrated into some programme lines. This includes the European Institution of Innovation and Technology (EIT) where research and innovation projects take place in "knowledge triangles" involving companies, research institutions, and universities collaborating in Knowledge and Innovations Communities (KICs).

The 'Science with and for Society' (SWAFS) programme line is also a bright spot in Commission efforts to advance RRI. SWAFS has demonstrated an ability to advance conceptual development around, awareness of, and capacities to support embedding of RRI in a variety of settings. Such achievements have been realized despite a very small budget relative to other H2020 lines. Without further commitment by the Commission to advancing knowledge and practice of RRI through dedicated channels like SWAFS, the effectiveness of funded projects and the return on European investments to shape R&I to be more reflective and inclusive of broad societal values and interests may lack staying power.

Possible policy actions co-created with stakeholders in research and innovation

With the intention to analyze and promote the adoption of RRI, NewHoRRIzon has (1) produced a comprehensive analysis of RRI policy integration, analyzing the uptake of responsibility in H2020; (2) engaged hundreds of stakeholders in 19 so-called Social Labs to experiment with new ways and methods of promoting the uptake of RRI; and (3) designed a new tool that offers practical guidance to researchers on how to mature the societal readiness of their research projects: the *Societal-Readiness (SR) Thinking Tool*.

Among the hundreds of stakeholders who joined forces in our Social Labs to design and experiment with applying RRI in their particular research area, there is a great eagerness to engage with societal needs, ethical concerns, and different publics in their research endeavors. In the Social Labs, researchers and other key stakeholders have expressed time and again a need for (a) an operationalizable concept of value-based procedural responsibility in R&I; (b) a policy level operationalization of such a concept that can be applied in research designs and processes, c) a concept sufficiently open to include emerging, contextualized interpretations of RRI ("de-facto RRI").

Considering the consistent political and research practitioners' support for RRI, the main obstacle for RRI integration appears to be the policy integration strategy itself. This is supported by the experiences of stakeholders whose accounts suggest that (a) the RRI framework is not clear to those who are the intended users; and (b) this lack of conceptual clarity hinders the effective operationalization of RRI in research practice. As a result, typically, the RRI framework is present on the declarative policy level, e.g. in the subtheme's general description, yet it 'phases out' on the funding-call level and is absent in the evaluation criteria used to assess proposals. Consequently, researchers are not challenged to

[9] Many projects explicitly fund gold or green open access publications, for example. However, we also observed that private sector actors did note a seeming tension between open access and an essential need for industry to safeguard competitive edges related intellectual property.

incorporate RRI during the design and drafting of their research proposals and they do not employ RRI specific actions and activities to systematically integrate societal needs, expectations, and values into their research when seeking funding.

To better integrate RRI into research funding and governance, the first step is to work towards a joint acknowledgment of the *relevance of responsibility* in R&I among key stakeholders. In order to institutionalize RRI into the subthemes of European research funding it is imperative that RRI, as a policy construct, shifts from a general 'cross-cutting issue' to an explicit policy goal, explicated in clear guidelines for action. Clear and credible RRI policy goals will incentivize researchers and investing parties to formulate attainable, feasible, and desirable aims regarding responsibility issues that are consistent with the views of relevant stakeholders in an R&I ecosystem.

Furthermore, our findings suggest that the EC should develop and actively disseminate information on RRI policy implementation tools that (a) clearly explain the rationale and benefits of RRI in the social uptake of R&I by connecting RRI to a practitioner's context and process; (b) select and train, as well as support, change agents among key stakeholders in the European R&I ecosystem, securing wider organizational acceptance and uptake; and (c) tackle the status quo and current orientation of R&I institutions by offering institutional incentives that support RRI-oriented change.

Implications & Possible Action

Inclusive and responsible R&I are vital aspirations embodied within the EC. Our results highlight steps that the EC has already initiated to advance RRI in H2020 programming, like including commitments in the founding regulation of the programme and establishing devoted activities through SWAFS programming. However, our findings also point to numerous challenges with widespread and sustained implementation across H2020 programming and projects. These findings indicate a range of policies that could be pursued to build capacity of the European research and innovation enterprise to realize RRI.

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. Inclusion of RRI in topic scoping language represents a partial step, but clear requirements for RRI in evaluation criteria—whether for excellence, impact, or quality and efficiency of the implementation—seems to be an essential signal to research and innovation stakeholders.

As immediate action,

(1) the design of FP9 could place increased and strategic emphasis on excellence in terms of transparent, and socially robust knowledge that is inclusive of stakeholder and citizen perspectives. In the General Annexes of the H2020 2018-2020 Work Programme, the general excellence criteria associated with Research and Innovation Actions represents one such example of a change in this direction,[10] although such language can (and often seems to) be removed at the unrestrained discretion of individual programme lines.
(2) criteria-changing policies, our research shows, work best with additional investments in capacity building of programme officers, evaluators, researchers, innovators, and

[10] "Appropriate consideration of interdisciplinary approaches and, where relevant, use of stakeholder knowledge and gender dimension in research and innovation content", European Commission Decision C(2017)7124 of 27 October 2017, page 29.

stakeholders to learn more about ways that science and technology are embedded in society and about the benefits of building more inclusive approaches to R&I.

With the increasing complexity and interconnectedness of markets, societies and regulations, R&I funding needs new instruments, tools and perspectives to support innovators in this process and assure societally desirable outcomes. In this vein, a range of first steps could be continued and strengthened by the EC.

(3) In-person citizen consultations could be organized to complement online citizen consultations at key points in work programme development;[11] commissioned inputs from conventional stakeholder committees of the EC could be supplemented with broader, more diverse stakeholder groups.[12] Such observations are consistent with the short- and long-term areas of improvement identified by the Interim Evaluation of Horizon 2020.[13]

Many other opportunities exist for the EC to leverage existing research policy infrastructure to further advance its mission of RRI.

(4) Existing resources across Europe—like National Contact Point Networks, European Innovation Partnerships, and European Technology Platforms—could be leveraged to raise awareness and build capacity of RRI in researcher and stakeholder communities.
(5) Investments in the development of "Key Performance Indicators" or other methods of monitoring and evaluating RRI implementation (for example developed in the 2015 Expert Group on Policy Indicators for Responsible Research and Innovation,[14] and carried forward by the *MoRRI* project[15]) could provide vital tools and instruments that can be implemented and learned from at a greater scale across Commission R&I programming.

Actions to promote RRi in the 9th Framework Program (FP9 – Horizon Europe)

The conclusions from the NewHoRRIzon project suggest that in order to contribute to the achievement of SDGs via R&I and to systematically integrate ethical, societal, and open access considerations into the 9th Framework Program (FP9 – Horizon Europe), the following must be achieved (1) all research proposals submitted under Horizon Europe should require an attached supplement addressing project-specific RRI-related questions and reflections; (2) every research proposal should incorporate RRI-specific actions in the submissions' tasks, deliverables, milestones, and budgets; (3) every research evaluation process under Horizon Europe should incorporate RRI-informed criteria in the evaluation of research proposals or include RRI experts/expertise in the evaluation panel; (4) the establishment of a specific policy, advocacy and expertise centre for mainstreaming RRI.

Based on these findings[i] we call for the following actions:

(1) To include in the *Orientations document* on Horizon Europe, provided by the EC:

[11] The Citizen and Multi-Actor Consultation on Horizon 2020 (CIMULACT) could be a model here, available at: http://www.cimulact.eu/publications/
[12] Various European Economic and Social Committees, and groups like the Bioeconomy Stakeholders panel or the Circular Economy Stakeholders panel could provide inspiration and examples here, or be specifically engaged at key points of Work Programme development.
[13] Pages 234-237 (footnote 7) of the Interim Evaluation, namely related to enhancing user engagement in R&I agenda setting, and involvement, transparency and inclusivity of stakeholder involvement in co-design of agendas.
[14] Strand R, et al 2015. EUR 26866 EN. Available at: http://ec.europa.eu/research/swafs/pdf/pub_rri/rri_indicators_final_version.pdf
[15] Monitoring the Evolution and Benefits of Responsible Research and Innovation (MoRRI). Available at: http://www.technopolis-group.com/report/public-access-version-final-draft-study-report-d11/

a. a specific call for stronger integration of European citizens into the production of knowledge, technology, and impact by means of adequate participatory or representative approaches, where appropriate, in order to make such integration part of the evaluation criteria for proposals, and
b. guidelines for the integration of all R&I stakeholder groups (researchers, citizens, policy makers, business, third sector organisations, etc.) into the R&I process, in order to better align desired outcomes with the values, needs and expectations of European peoples.

(2) To include *in the grant requirements for research proposal submission* under Horizon Europe a section in Part B that stipulates, in addition to 'Ethics', the inclusion of a PDF supplement, generated with the online Societal-Readiness (SR) Thinking Tool, addressing project-specific RRI-related questions and reflections. This supplement would serve to incite researchers to reflect on their work in relation to societal needs, and publics. It would also offer a basis for further discussions on how to assess the proposal in terms of its potential contribution towards the SDGs and RRI.

(3) To include *in the grant requirements for research proposal submission* under Horizon Europe the request to incorporate RRI specific actions in the submissions' tasks, deliverables, milestones, and budgets. Criteria for assessing RRI, based on previous research actions and approaches (e.g. MORRI, RRI-Tools), must be clearly communicated to applicants, evaluators, and reviewers in both the proposal and in the subsequent delivery.

(4) To include *in research proposal evaluation process* under Horizon Europe a specific set of RRI-related criteria relevant for the R&I domain, as well as include RRI expertise in evaluation panels in order to ensure that RRI specific actions are adequately considered in submissions and projects to be awarded.

(5) As part of the European Commission's Research Executive Agency, establishment of a policy advocacy and expertise centre dedicated to mainstreaming RRI in order to ensure RRI policy integration and delivery in the research supervision process. The interdisciplinary centre should offer advice, training, consultation, and quality control throughout Horizon Europe, drawing on the current and future RRI knowledge-base developed in previous framework programmes. The centre will offer a clearinghouse of information to accommodate the RRI-experts in the evaluation of R&I proposals and project activities. Additionally, the centre will host relevant committees and boards in order to assist the effective, long-term integration and implementation of RRI policies into research funding and delivery.

Creating adequate policies for the integration of RRI into Horizon Europe is relevant to reaching the SDGs, overturning a growing disbelief in science, and mitigating political suspicion towards evidence-based policy making. Inadequately applying responsible and democratic research principles and practices severely limits the ability of European societies to assist its researchers and innovators in tackling societal challenges such as climate change, sustainable transport and energy, demographic change and public health, economic wellbeing, employment and the security of European societies.

Relevant EC documents on RRI:

EC (2006): DECISION No 1982/2006/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 18 December 2006 concerning the Seventh Framework Programme of the European Community for research, technological development and demonstration activities (2007-2013).

EC (2007): COMMUNICATION FROM THE COMMISSION TO THE COUNCIL, THE EUROPEAN PARLIAMENT, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS A lead market initiative for Europe. Online available at: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2007:0860:FIN:EN:PDF (04.09.2012)

EC (2008): COMMISSION RECOMMENDATION of 07/02/2008 on a code of conduct for responsible nanosciences and nanotechnologies research. Brussels, 07.02.2008, C(2008) 424 final. Online available at: http://ec.europa.eu/nanotechnology/pdf/nanocode-rec_pe0894c_en.pdf (04.04.2012)

EC (2009a): COMMISSION STAFF WORKING DOCUMENT accompanying the COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS "Preparing for our future: Developing a common strategy for key enabling technologies in the EU" Current situation of key enabling technologies in Europe {COM(2009) 512/3}

EC (2009b): COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS. Reviewing Community innovation policy in a changing world. COM(2009) 442 final

EC (2009c): "The Lund Declaration: Europe Must Focus on the Grand Challenges of Our Time." European Union.

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pdf#view=fit&pagemode=non

EC (2011b): Snapshot on European Wind Energy. Online available at: http://ec.europa.eu/energy/renewables/wind_energy/doc/2011_wind_snapshot.pdf (17.02.2012)

EC (2011c): Competitiveness and Innovation Framework Programme. http://ec.europa.eu/cip/index_en.htm (16.02.2012)

EC (2011d): Research, Innovation and Competitiveness Package - Proposal for a Regulation of the European Parliament and of the Council establishing a Programme for the Competitiveness of Enterprises and small and medium-sized enterprises (2014 - 2020), Brussels, 30.11.2011, COM(2011) 834 final. Online available at: http://ec.europa.eu/cip/files/cosme/com_2011_0834_proposition_de_reglement_en.pdf (16.02.2012)

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[i] Cf. http://pathways2019.eu/declaration/; https://www.rri-practice.eu/wp-content/uploads/2019/06/Richard-Owen-RRI-Practice-Policy-Recommendations-Presentation-Brussels-June-21.pdf