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Steering research and innovation through RRI. What horizon for Europe?

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Abstract   Responsible Research and Innovation (RRI) is gaining momentum worldwide and is envisaged as a needed tool to properly govern controversial innovative technology (i.e. genome editing, AI). Europe is considered a leader in fostering such approach, notably through its institutionalization. Even so, the future of European Research and Innovation (R&I) seems to be designed without a central role for RRI. After long effort and so much public EU money to support projects to ground RRI principles and practices in key contexts for the flourishing of science and technology in Europe, such as the industrial realm and regional settings, this counter-intuitive decision could undermine the leadership of Europe in prioritizing civil and human rights and needs, values and expectations of its citizens when steering science and technology, that European R&I strongly need to go further.

These are the days in which the future of European Research and Innovation (R&I) is about to be designed. The ninth framework programme (Horizon Europe), as proposed by the European Commission [European Commission, 2018], is under discussion and negotiation in the European Parliament and the European Council. In a few months we will know if the horizon for R&I in Europe will be aligned with societal needs, values and expectations, in continuity with the European strong commitment in the current framework programme, Horizon 2020, which renders Europe leader in promoting and fostering Responsible Research and Innovation (RRI).

In this flash commentary, I would like to list some of the most effective projects related to RRI supported by Europe or stemmed from European address in diverse key contexts for the flourishing of science and technology in Europe, such as the industrial realm and local and regional settings. Furthermore, I will also present relevant initiatives in which RRI has been envisaged and invoked as a definitely needed tool to properly govern potential controversial innovative technologies (i.e.

genome editing, AI), also well beyond Europe. These practical examples are intended to provide a set of concrete evidences, so to support the idea that in this very moment Europe needs to keep its leadership in pursuing RRI, putting this approach at the center of the future of European R&I.

RRI in action in Europe

Even if in the previous European Research and Innovation framework programmes some initial and embryonic elements could already be found, RRI has been fully institutionalized in the current Horizon 2020 framework programme. In fact, Responsible Research and Innovation (as such, and not through its acronym) has been enshrined in the Recital 22 of the EU Regulation establishing the programme. Furthermore, the promotion of RRI has been defined as a cross-cutting issue in the related Annex I and mentioned as one of the lines of activity within the part V "Science with and For Society" (SWAFS), which has the aim of "build effective cooperation between science and society, to recruit new talent for science and to pair scientific excellence with social awareness and responsibility" [European Parliament and European Council, 2013]. Under the SWAFS stream, several projects have been supported to bring RRI or Responsible Innovation to innovative industrial ecosystems. Three of them, SMART-map,[1] Compass[2] and Prisma,[3] are approaching their end in the next months and others are in their initial or middle phase (LIV:IN,[4] GoNano[5]). All of them are demonstrating that, all over the European area, companies and firms (SMEs but also major industry leaders), which are active in emerging and key innovation and technology sectors, such as in precision medicine, synthetic biology, 3D printing in biomedicine, nanotechnology, IoT, self-driving vehicles and ICT, are embracing the principles of responsibility, participating in RRI co-design and co-creation initiatives along with all the actors of their innovation ecosystems. Their willingness and interest in embarking on RRI, with an adequate support by the RRI community, is due to the fact that industrial players envision this approach as a driver to: improve their accountability and transparency, implement new strategies to strengthen the quality of their products, enhance the relationship with the stakeholders' community and key opinion leaders, anticipate trends in demands and market response, identify new business opportunities.[6] A further reason to embrace RRI is that it represents an excellent (and perhaps in the next future a mandatory) channel to intercept funding chances, since more and more public funders and private investors, including big names such as BlackRock,[7] are looking for tech companies that have effective social impacts. Also thanks to these pioneering projects, RRI has emerged and is consolidating its potential strength within the industrial context beyond the EU Horizon 2020 funded projects. For instance, the Interreg Central Europe ROSIE[8] project aims at providing skills among entrepreneurs and innovation actors to

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[1]projectsmartmap.eu.

[2]https://innovation-compass.eu/.

[3]http://www.rri-prisma.eu/.

[4]https://www.living-innovation.net/.

[5]http://gonano-project.eu/.

[6]Some of the results of SMART-map project, as mentioned in the text, are available here: http://projectsmartmap.eu/roadmaps/a-smart-map-for-precision-medicine/, http://projectsmartmap.eu/roadmaps/a-smart-map-for-3d-printing-in-biomedicine/, http://projectsmartmap.eu/roadmaps/a-smart-map-for-synthetic-biology/.

[7]https://www.nytimes.com/2018/01/15/business/dealbook/blackrock-laurence-fink-letter.html.

[8]https://www.interreg-central.eu/Content.Node/ROSIE.html.

promote and implement responsible innovation in companies based in 8 countries of Central Europe. At the same time, EU regions and regional policymakers, inspired by the strong commitment at European level, are pursuing concrete approaches to ground RRI at local level, finding suitable solutions according to their regional needs and innovation sectors. To name an ongoing initiative, at the end of 2016 Lombardy Region (in Italy) enacted its new regional law on R&I, in which RRI has been enshrined as one of the founding principles (article 3). An advisory panel of experts in science and society relationship (the Regional Forum for Research and Innovation) has been also established to support the Region in the execution of RRI actions and activities [Lombardy Region, 2016]. RRI will be the guiding light of the regional R&I 3 years' strategic plan and will become a systematic approach to unleash the potential of innovation in Lombardy, according to societal interests and visions. Moreover, as a further case, the Interreg Central Europe funded project MARIE[9] is partnering 8 European regions with the objective of improving regional public policy in the context of their smart specialisation priority sectors, which will support the delivery of RRI to local enterprises.

RRI as a means to govern controversial innovation

As its name entails, RRI embodies what society at large demands and what responsive institutions and industrial actors are addressing: the responsible government of science and innovation that are shaping our world and our future. From genome editing to AI, RRI echoes in different reports and initiatives beyond Europe, as a reliable, effective and proven mechanism to look at. RRI is mentioned as a robust method of "public engagement in science policy" and to "identify the best options for governance with the help of the public", therefore as a likely strategy to be also applied in the responsible government of genome editing. In the report "Human Genome Editing: Science, Ethics, and Governance", edited by the US National Academies of Sciences, Engineering and Medicine [Committee on Human Gene Editing, 2017], RRI is cited as a needed instrument to properly manage the applications of this powerful but controversial technology for manipulating DNA in living organisms.

There are also elements of responsible innovation approach in the IEEE Global Initiative on Ethics of Autonomous and Intelligent System,[10] a global project promoted by the largest international community in ICT, engineering and computing, which comprehends hundreds of participants from academia, industry, civil society and government in the six continents to produce concrete tools for intelligent and autonomous systems and technologies that are aligned with values and ethical principles prioritizing human well-being. RRI is identified as an effective method to enable "solutions-by-design" in evaluating, designing and implementing intelligent and autonomous systems [IEEE, 2018].

Furthermore, after the EU experience, RRI has been addressed in other prominent innovative countries, like China, that has officially inserted RRI in its 13th Five-year National "Science and Technology Innovation Plan (2016–2020)". In section 7 "Strengthening science popularization and construction of innovation culture", under the chapter 24 "Creating a social and cultural atmosphere for encouraging innovation", RRI is formally mentioned: "Promoting responsible research and

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[9]https://www.interregeurope.eu/marie/.
[10]https://standards.ieee.org/industry-connections/ec/autonomous-systems.html.

innovation, strengthening research ethics, enhancing research ethics education, raising science and technology personnel's awareness of scientific research ethics, and guiding enterprises to pay attention to and undertake social responsibility for protecting ecology and ensuring safety in technological innovation activities."[11]

RRI in Horizon Europe: cross-cutting theme and mandatory requirement for missions

This brief list of evidences and examples of the level of penetration and the recognized efficacy of RRI speaks for itself but above all it highlights that, after long effort and so much public European money invested to funding projects that will last beyond the end of Horizon 2020 and throughout the first few years of Horizon Europe, the institutionalization of RRI at European level has had a virtuous effect of rendering all the actors engaged in the research and innovation ecosystems (such as researchers, innovators, local policymakers, intermediaries and society at large) aware and pro-active in pursuing RRI, since each of them can find in this approach concrete reasons to adopt it. In this very moment, in which Europe is considered a role-model in properly steering technology and innovation, prioritizing human and civil rights of their citizens, thanks to outstanding rules as the General Data Protection Regulation (GDPR) [European Parliament and European Council, 2016], putting RRI at the centre of its next framework programme, Horizon Europe, would be the logical continuation of the European commitment in "leading by example" [EDPS, 2015] and the actual accomplishment of some of the objectives of Horizon Europe (as presented in its "Explanatory Memorandum" part), such as "research and innovation (R&I) delivers on citizens' priorities" [European Commission, 2018].

Thus, also in continuity with Horizon2020, RRI in Horizon Europe:

– should be a cross-cutting issue in the programme as well as should have dedicated activities in the part 'Strengthening the European Research Area' under an *ad hoc* "Science, society and citizens" component;

– should be a defined and a mandatory requirement for the Pillar "'Global Challenges and Industrial Competitiveness' and in particular for the missions, in the way they are both selected and executed.

As also emerged from the results of the call for feedback[12] on the Mazzucato's report "Mission-oriented research and innovation in European Union" [Mazzucato, 2018], citizens should be consulted on the choice of the missions. Looking through RRI lens, this means making them co-creators and co-designers of research and innovation agenda. The European Commission has already collected valuable experiences in methodologies in this realm, since it has funded in the past two key projects in R&I agenda co-design with European citizens. Under the Seventh Framework Programme, the project VOICES[13]has been granted to provide a robust methodology to engage citizens across EU so to gather their opinions and ideas

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[11]The original document in Chinese can be retrieved here: http://www.most.gov.cn/mostinfo/xinxifenlei/gjkjgh/201608/t20160810_127174.htm.

[12]The preliminary summary of the call for feedback can be retrieved here: https://ec.europa.eu/info/designing-next-framework-programme/mission-oriented-policy-next-research-and-innovation-framework-programme_en.

[13]http://www.voicesforinnovation.eu/.

about urban waste research. The results of VOICES have then been used to draft the urban waste research topics and calls under Horizon2020. After the success of VOICES, a broader and more ambitious project, since not limited to a specific topic, has been funded under Horizon2020. The CIMULACT project,[14] covering 30 EU countries, has held online and live public consultations for co-creating European research agendas based on real, validated and shared visions, needs and demands. The outcomes have been translated into 23 suggestions for H2020 topics along with policy recommendations. These RRI approaches and similar methodologies of intensive societal participation could be used to identify and co-design the missions or specific targets and objectives of the proposed Mission-Oriented R&I framework. In this way, European R&I agenda can get a greater democratic legitimacy through being really aligned with needs, expectations and values of European citizens. Being responsive to European citizens' views as well as envisioning shared decisions for research and innovation should become the main elements on the horizon of the future responsible Europe.

Competing interests and disclaimer

Angela Simone is currently deputy-coordinator of the SMART-map project, EU Horizon2020 funded project, and executive manager of the Lombardy Region Forum for Research and Innovation on behalf of Bassetti Foundation.

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[14]http://www.cimulact.eu/.

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