

Lucien von Schomberg and René von Schomberg

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 Introduction: Responsible Research and Innovation and its contemporary significance

Responsible Research and Innovation (RRI) has become increasingly important since it was introduced as a cross cutting issue under the European Union (EU) Framework Programme for Research and Innovation *Horizon Europe (2014-2020)*.

Subsequently, it became an operational objective of the strategic plan for *Horizon*

Europe (2021-2027), the new EU Framework Programme for Research and

Innovation. In EU member states, there are also various initiatives supporting RRI, notably under schemes of national research councils (e.g., the United Kingdom, Norway, and the Netherlands). The concept also resonated outside the EU, including in the United States as well as in China where it became part of the national fiveyear plan for science, technology and innovation.

Responsible Research and Innovation originated against the background of shortcomings of the *Science and Society* research funding programmes of abovementioned countries and regions. These shortcomings were four-fold. First, RRI goes beyond the more conservative ELSA (Ethical, Legal and Social Aspects) studies of emerging technologies by developing approaches that will direct science and innovation towards societal challenges, underpinned by shared European values. Second, RRI involves a change from the evaluative assessments of emerging technologies to an approach based on an ethics of co-responsibility among stakeholders. Third, by focussing on innovation processes rather than on assessment of single emerging technologies, RRI advocates the inclusion and commitment of all stakeholders in the innovation process in order to make innovation manageable and directional. Fourth, RRI addresses market-failures in order to deliver on socially desirable outcomes of innovation processes. It thereby includes forms of anticipatory governance (Guston 2014).

Scholars provide a variety of perspectives and assessments of what RRI need to address. Even so, they generally share the notion that RRI requires a form of governance that will direct or re-direct innovation towards socially desirable outcomes. This initial definition that Von Schomberg (2013, p. 63) provided captures the commonalities of the field:

Responsible Research and Innovation is a transparent, interactive process by which societal actors and innovators 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 (in order to allow a proper embedding of scientific and technological advances in our society).

This definition was not proposed as an end-result but as a starting point for an evergrowing field of research and innovation actions. The definition highlights that conventional public policies only negatively select science and technology-related options, notably by the management of their risks. These conventional public policies assume that all innovations will contribute to common prosperity regardless of their nature. The notion of RRI makes a radical break with this conventional wisdom. Furthermore, RRI takes as point of departure that innovations can be managed into a particular direction and puts the power for socially desirable change through innovations into the hands of stakeholders and engaged citizens. This means that these stakeholders have to be incentivized or even enforced to become mutually responsive to each other in terms of social commitments. The current 'green deal' the EU has embarked on can be seen as such a social commitment and makes directional innovation possible (European Commission 2019). This implies the institutionalization of a form of collective co-responsibility, going beyond the traditional evaluative forms of ethics, which have concentrated on the negative constraints of new technologies (i.e., what we 'should not do') rather than engage with a constructive form of technology development (i.e., which direction we ought to go).

In light of institutional theory (🔗 THE INSTITUTIONALISATION OF SOCIAL INNOVATIONS), social innovation is considered a collaborative or collective action that reshapes interactions between various actors within an institutional environment

(Satalkina and Steiner 2022). Social innovation has also been increasingly associated with responses to societal challenges, including in the form of innovation policies (Grimm et al. 2013). Against this background, the following section accounts for RRI as a social innovation in terms of four institutional changes and social innovative responses to societal challenges by incorporating it in research and innovation policy. This section is followed by a critical reflection and outlook which points to the socio-political dimension of RRI.

Key finding: Four institutional changes of RRI

The first institutional change defines RRI as new paradigm for research and innovation. Currently there is no public governance mechanism which allows for public deliberation and enabling and assigning of responsibilities concerning the type of innovations that are socially desirable. Success on the market may indicate benefits for particular groups of consumers but does not constitute socially desirable outcomes in terms of producing or safeguarding public goods. A first departure point for a vision of RRI is, therefore, to advance governance mechanisms that could drive innovations to societally desirable ends, which helps to constitute, re-new or preserve public goods. This implies that we should not only have professional bodies for risk assessment but also professional bodies that should look into the type of outcomes which we want to get out of research and innovation and the establishment of governance mechanisms that should give steer the innovation process. Authors in the field of RRI have called for inclusive and deliberative governance based on broad stakeholder involvement and early public intervention in research and development leading to responsive public policies (Owen et al. 2013).

The second institutional change of RRI calls for the shift to value driven innovation. Innovations often overwhelm people, and virtually no new transformative technological innovations have been predicted in advance. Even at the early stage of technology development, such as in the case of nanotechnology, the first marketed products were not what experts initially predicted. The first products involving nanotechnology were cosmetics, despite expectations centring on healthcare and environmentally sound applications.

There seems to be a general mismatch between the pace of 'new' products entering the market and the societal significance of those products. Notably in areas where our innovation system relies on a handful of multinational companies such as in the medical and agrobusiness fields, innovations are not delivering on societal expectations. In the pharmaceutical field, the economic rationale results in counter intuitive research and innovation priorities in the private sector – medicines that can treat rather than cure chronic diseases are preferable from an economic point of view.

Although market innovations are very effective when they concern efficiency gains as they immediately reflect an economic rationale that honours better outcomes for lower costs, we cannot expect innovations to come equally quickly to the market when they require transformative changes, such as a change of infrastructure or a transition towards a new energy system which is infringing on vested interests. Such changes are difficult to conceive without heavy public investment. Market failure is accompanied with the non-alignment of innovations with broadly shared public values in specific innovation contexts where transformative change has become socially desirable, virtually across all topics touching on sustainable development and issues that are dependent on knowledge commons.

Under the European Framework programme for Research and Innovation *Horizon*

2020, a number of 'Grand Societal Challenges' have been defined, which followed the call in the Lund Declaration for a Europe that 'must focus on the Grand Societal Challenges of our time' (Lund Declaration 2009, during the Swedish EU presidency). Sustainable solutions are sought in areas such as 'global warming, tightening supplies of energy, water and food, ageing societies, public health, pandemics and security' (ibid, p. 1). The Lund Declaration gave for the first time at European level a justification for investing in research and innovation beyond macro-economic benefits, primarily framing this in terms of responding to Grand Societal Challenges (Lund Declaration 2009, p. 2). Although the Lund Declaration led to the adoption of Horizon 2020, which featured a focus on societal challenges, this Programme still lacked the instruments and mechanisms to direct research and innovation towards these objectives. This changed with the event of Horizon Europe with its features of open science and mission-oriented research. Authors in the field of RRI have articulated on how to proceed with value-driven innovation. For example, the systematic use of normative principles for the design of technologies. 'Privacy by

Design' is the most prominent example of such a normative principle for devising responsible governance of ICT (Stahl 2011). Whenever appropriate, the integration of social science and humanities within interdisciplinary research practices to increase reflexivity (Fisher et al. 2006).

The third institutional change of RRI is the establishment of anticipatory governance in the science policy interface. Anticipatory governance refers to an adequate governance framework to anticipate the intended and unintended impacts of new technologies in economic, environmental, social and ethical terms. This requires extensive use of technology foresight and technology assessment (Karinen and Guston 2010). The issue of unintentional consequences of scientific and technological developments which have pre-occupied various fields

of study (e.g., Science and Technology Studies, Technology Assessment) can be traced back to, amongst others, the limited capacity of the scientific system to know in advance the consequences of scientific discoveries and technological actions. Virtually all complex technological innovations of benefit to society are surrounded by scientific uncertainties and several degrees of ignorance. Anticipatory governance, therefore, requires knowledge assessment mechanisms which will assess the quality of available knowledge for the policy process. Research and innovation policies are currently forced to act upon developments, such as climate change, while at the same time being uncertain about the quality and comprehensiveness of the available scientific knowledge as well as an evolving public opinion. A deliberative approach to the policy-making process itself, would complement and connect with a broader public debate as such. The further institutionalisation of foresight in public policy is thereby an option to implement a form of anticipatory governance allowing for an early identification of knowledge gaps and normative issues of technology governance.

The fourth institutional change refers to a required co-evolution of our social systems (e.g., science, economy, policy), by an institutionalisation of a social system overarching collective co-responsibility. The scientific and public policy sphere can evolve through establishing a science-policy interface which adopts the new function of knowledge assessment and foresight to make anticipatory governance possible. The economic and scientific system can also further evolve by public governance which not only provides constraints for technological developments but also incentivizes research and innovation actions favouring particular socially desirable outcomes. This requires, among others, an alternative funding system for publicly funded research (e.g., incentivising open scientific collaboration) as well as sociopolitical innovations concerning the development of non-legislative actions such as code of conducts and public-private partnerships in order to overcome and compensate for market-failures in delivering socially desirable outcomes (cf. Von Schomberg 2019).

An instrument for directing research and innovation to socially desirable outcomes is the implementation of mission-oriented research (Mazzucato 2018). In such missions, stakeholders and citizens collaborate on open research and innovation agendas with a social commitment to a socially desirable outcome (🎯 NEXT GENERATION INNOVATION POLICY). The key words here are co-creation and codesign of research and innovation trajectories. The new EU framework programme has introduced with its new features of mission-oriented research (where the targets are essentially social, not only scientific-technological) as a means for fostering innovation by co-design and co-creation towards democratically decided main objectives (e.g., as a result of deliberation among stakeholders, the Member States of the EU and the European Parliament). The missions will also all have to feature an essential input from citizens. The instrument can thus be seen as a social innovation in itself.

** The Politicization of RRI: A Critical Reflection and Outlook**

Even though frameworks of RRI are widely adopted at the declarative level, they continue to face structural tensions at the operational level (Novitzsky et al. 2020). In practice, RRI may be instrumentalized to accommodate other policy goals, such as scientific excellence and economic value (Rodríguez et al. 2022, Owen et al. 2021). The antidote to the instrumentalization of RRI – within the European Commission and beyond – is to further politicize it, that is, by genuinely actualizing a plurality of perspectives, values, and possibilities throughout innovation processes (Von Schomberg 2022). Doing so will inspire innovation to break through technoeconomic constraints as well as other organizational, disciplinary, and bureaucratic boundaries. To be sure, narrow configurations of RRI tend to limit deliberation to a small range of mostly internal stakeholders

where 'second-order reflexivity and the political are almost entirely beyond scope, or at least deeply tacit' (Owen and Pansera 2019, p. 41). In contrast, the further politicization of RRI calls for a pluralistic and non-reductive approach of innovation processes (Blok 2019). A pluralistic approach activates the direct involvement of individual citizens beyond representative stakeholders, while a non-reductive approach does not reduce such involvement to 'common stakes' but instead enables individuals to articulate their own position and judgement, aligned with their own interests and value frames (van Huijstee et al. 2007). In this spirit, and by way of example, the NEMO Science Museum in Amsterdam offers an experimental platform of art and science fiction to stimulate citizens to develop and share their own vision of how the future should look like. Another way to activate citizenry in innovation processes is to organize initiatives of 'direct democracy' in which global challenges are publicly discussed, including those that are 'politically' polarized. Precisely because the actualization of plurality comes with different opinions, addresses contextual priorities, and rapidly voices undesirable effects, it ultimately generates political support. Other examples that could potentially contribute to the politicization of RRI include the New European Bauhaus and the implementation of the Green Deal, which excite conversations beyond usual stakeholders from, for example, industry and the government, enabling citizens to deliver insights concerning the priorities and challenges in architecture and urban planning.

While examples as those mentioned above are promising, they could still benefit from further empirical analysis. To what extent do they effectively actualize plurality? Is this really resulting in a more societally desirable future? Research still needs to develop a performance measurement system (cf. Neely et al. 1995) that uses key indicators to monitor how innovation effectively enables citizenry, and to what extent doing so helps tackling the so-called grand challenges of our time.

Also at the conceptual level, the politicization of RRI requires further substantiation. In this respect, it must thoroughly examine the relation between politics and responsibility to safeguard the legitimacy of the values and outcomes it deems societally desirable (Penttilä 2022). In doing so, it also needs to define a balance between under-inclusion and over-inclusion in innovation processes. While the literature mostly points to the problem of under-inclusion in RRI, there are also potential socio-ethical risks with over-inclusion, especially when people foster dishonest and even terrorizing intentions (Popa and Blok 2022). In this respect, it will be a crucial step to discuss and establish criteria which enhances plurality and genuinely helps to reveal each other's blind spots and assumptions, while maintaining respect for each other's differences.

 References

- Blok, V. (2019), 'From participation to interruption: Toward an ethics of stakeholder engagement, participation and partnership in corporate social responsibility and responsible innovation', in R. von Schomberg and J. Hankins (eds), *International Handbook on Responsible Innovation*, Edward Elgar Publishing, pp. 243–58.
- European Commission (2018), *Mission-Oriented Research & Innovation in the European Union: A Problem Solving Approach to Fuel Innovation Led Growth*, Publications Office of the European Union
- European Commission (2019), *Communication from the Commission: The European Green Deal*, accessed 30 November at <https://eur->

lex.europa.eu/legalcontent/EN/TXT/?uri=COM:2019:640:FIN.

Fisher, E., Roop M. and C. Mitcham (2006), 'Midstream Modulation of Technology: Governance from Within', *Bulletin of Science, Technology & Society*, **26** (6), pp. 485- 496.

Grimm, R., Fox, C., Baines, S. and K. Albertson (2013), 'Social innovation, an answer to contemporary societal challenges? Locating the concept in theory and practice', *Innovation: The European Journal of Social Science Research*, **26**, pp. 436–455.

Guston, D. H. (2014), 'Understanding Anticipatory Governance', *Social Studies of Science*, **44 (2), pp. 218–242.**

Karinen, R. and D. Guston (2010), 'Towards Anticipatory Governance. The Experience with Nanotechnology', in M. Kaiser et al. (eds), *Governing Future Technologies. Nanotechnology and the Rise of an Assessment Regime*, Dordrecht: Springer.

Lund Declaration (2009), *Lund Declaration*, presented at the New Worlds – New Solutions. Research and Innovation as a Basis for Developing Europe in a Global Context conference, Lund, 7–8 July, accessed 30 November at <https://www.vr.se/download/18.3936818b16e6f40bd3e5cd/1574173799722/Lund%20Declaration%202009.pdf>.

Mazzucato, M. (2018), *Mission-oriented research & innovation in the European union. A problem-solving approach to fuel innovation-led growth*, Luxembourg: Publications Office of the European Union.

Neely, A., Gregory, M. and K. Platts (1995), 'Performance Measurement System Design: A Literature Review and Research Agenda', *International Journal of Operations & Production Management*, **15** (4), pp. 80–116.

Novitzky, P., Bernstein, M. J., Blok, V., Braun, R., Chan, T. T., Lamers, W., Loeber, A., Meijer, I., Lindner, R. and E. Griessler (2020), 'Improve Alignment of Research Policy and Societal Values', *Science*, **369** (6499), pp. 39–41.

Owen, R. and M. Pansera (2019), 'Responsible innovation: Process and politics', in R. von Schomberg and J. Hankins (eds), *International Handbook on Responsible Innovation*, Edward Elgar Publishing, pp. 35–48.

Owen, R., Stillgoe, J. and P. MacNaughten (2013), 'A Framework for Responsible Innovation', in R. Owen, M. Heintz and J. Bessant (eds), *Responsible Innovation*, London: John Wiley.

- Owen, R., von Schomberg, R. and P. Macnaghten (2021), 'An Unfinished Journey? Reflections on a Decade of Responsible Research and Innovation', *Journal of Responsible Innovation*, pp. 1–17.
- Penttilä, L. (2022), 'Is Responsible Innovation Possible? The Problem of Depoliticization for a Normative Framework of RI', *NOvation: Critical Studies of Innovation*, pp. 107–126.
- Popa, E. and V. Blok (2022), 'Responsible Innovation in the Age of Conspiracism', *Journal of Responsible Innovation*.
- Rodríguez, H., Urueña, S. and A. Ibarra (2022), 'Anticipatory responsible innovation. Futures construction in the face of the techno-economic imperative', *NOvation: Critical Studies of Innovation*, pp. 127–146.
- Satalkina, L. and G. Steiner (2022), 'Social Innovation: A Retrospective Perspective', *Minerva*.
- Stahl, B. (2011), 'IT for a Better Future: How to Integrate Ethics, Politics and Innovation', in *Journal of Information, Communication and Ethics in Society*, **9** (3), pp. 140-156.
- Van Huijstee, M. M., Francken, M. and P. Leroy (2007), 'Partnerships for Sustainable Development: A Review of Current Literature', *Environmental Sciences*, **4** (2), pp. 75–89.
- Von Schomberg, R. (2013), 'A vision of responsible innovation', in R. Owen, M. Heintz and J. Bessant (eds), *Responsible Innovation. Managing the Responsible Emergence of Science and Innovation in Society*, London: John Wiley, pp. 51–72.
- Von Schomberg, R. (2019), 'Why Responsible Innovation?', in R. von Schomberg and J. Hankins (eds), *International Handbook on Responsible Innovation*, Edward Elgar Publishing, pp. 12–32.**
- Von Schomberg, L. (2022), *Raising the Sail of Innovation: Philosophical Explorations on Responsible Innovation*, Wageningen University.