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Policy brief on the state of the art on RRI and a working definition of RRI

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RRI Tools. Fostering Responsible Research and Innovation

FP7-project RRI Tools will develop a Training and Dissemination Toolkit for fostering Responsible Research and Innovation. The EC has identified seven so-called Grand Challenges society is facing today, and research and innovation are expected to significantly contribute to meeting these challenges. However, it has been acknowledged that research and innovation practices themselves require modification, for instance because they too often fail to address societal needs, leave open implementation gaps, or spur controversy. Thus, the EC has put forward the notion of Responsible Research and Innovation, or RRI, to simultaneously address both society's Grand Challenges and shortcomings existing in research and innovation practices. This policy brief provides a working definition of RRI and reports on the state of the art in responsible research and innovation.

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RRI Tools – background and aims

Throughout history science and technology have proven to be transformative forces. Today they have granted humans the capacity to alter ecosystems and the Earth's climate and even to manipulate the building blocks of life itself. Research and innovation have changed our world and our lives, and will continue to do so. However, parallel to the large positive impact on human welfare and wellbeing, science and technology have had and probably will have, they also create new risks and ethical dilemmas, do not always succeed in solving the problems they are meant to, and sometimes spur controversy.

Over the last few decades many experiments have been done that aimed at decreasing the distance between science and society. For instance, in various public engagement exercises the public has been involved in discussions and policy decisions regarding science; collaborations between scientists, ethicists and social scientists have been set up; experiments have been done with open source research data, user-driven innovation, citizen science, and much more besides.

These efforts have led to a European-wide approach in Horizon 2020 called *Responsible Research and Innovation*. RRI seeks to bring issues related to research and innovation into the open, to anticipate the consequences of research and innovation, and to involve society in discussing how science and technology can help create the kind of world and the kind of society we want for generations to come.

In three years' time RRI Tools will develop a **Training and Dissemination Toolkit** concerning responsible research and innovation and put it to use through a **Community of Practice**. The toolkit will contain a set of tools intended for a variety of uses: raising awareness about RRI, and training, implementing, and disseminating RRI in Europe. A

Box 1

Facts on RRI Tools - Fostering Responsible Research and Innovation

Goal

Propagating 'responsibility' in the governance of science and technology, public and private, by making and disseminating a RRI Toolkit for policymakers, researchers, innovative industries, CSOs and educators.

Coordinator

"la Caixa" Foundation

Partners

26 institutions, active in 30 European countries

Duration

3 years (01/2014-12/2016)

Budget

6.9 million €

multidisciplinary consortium with 26 partners operating in 30 European countries will develop and continuously optimize the toolkit. RRI Tools will advocate policymakers, researchers, R&I-intensive industries, civil society organizations (CSOs), and science educators at national and regional levels, spreading RRI throughout society.

RRI Tools working definition

Following a survey of the relevant literature and consultation with experts, RRI has been provisionally defined as follows:

Responsible Research and Innovation is a dynamic, iterative process by which all stakeholders involved in the R&I practice become mutually responsive and share responsibility regarding both the outcomes and process requirements.

This means that research and innovation can only be labelled ‘responsible’ in case (1) they are aimed at particular outcomes and (2) certain process requirements are met. These projected outcomes and process requirements will be elaborated below, but in short we can say that:

1. RRI’s aim is to create a society in which research and innovation practices strive towards sustainable, ethically acceptable, and socially desirable outcomes; and
2. RRI does so in such a way that the responsibility for our future is shared by all people and institutions affected by and involved in research and innovation practices.

Outcomes

Based on literature about responsible research and innovation, we have developed a thematic categorization of RRI outcomes. The outcomes of RRI are divided in three categories:

1. Learning outcomes	2. R&I outcomes	3. Solutions to societal challenges
<ul style="list-style-type: none"> • Engaged publics • Responsible actors • Responsible institutions 	<ul style="list-style-type: none"> • Ethically acceptable • Sustainable • Socially desirable 	<ul style="list-style-type: none"> • 7 Grand Challenges (EU)

Figure 1: RRI outcomes

1. Learning outcomes

RRI should lead to empowered, responsible actors across the whole range of our socio-technical systems (scientists, policymakers, CSOs, businesses and innovators, educators). Structures and organisations where these actors function should create opportunities for and provide support to actors to be responsible, ensuring that RRI becomes (and remains) a solid and continuous reality.

2. R&I outcomes

RRI practices should strive for ethically acceptable, sustainable and socially desirable outcomes. Solutions are found in opening up science through continuous, meaningful deliberation with societal actors. In the end, the incorporation of societal voices in R&I will lead to relevant applications of science.

3. Solutions to societal challenges

Today’s societies face several challenges. The European Commission has formulated seven ‘Grand Challenges’ as one of the three main pillars of the Horizon 2020 programme. In order to support European policy, R&I endeavours should contribute to finding solutions for these societal challenges, which are:

- Health, demographic change, and wellbeing;
- Food security, sustainable agriculture and forestry, marine and maritime and inland water research, and the bio-economy;
- Secure, clean and efficient energy;
- Smart, green and integrated transport;
- Climate action, environment, resource efficiency, and raw materials;
- Europe in a changing world - inclusive, innovative and reflective societies;
- Secure societies - protecting freedom and security of Europe and its citizens.

Process requirements

In order to achieve the outcomes as described above, the R&I process has to accord with certain process requirements. We have identified eight process requirements, and divided them in four clusters.

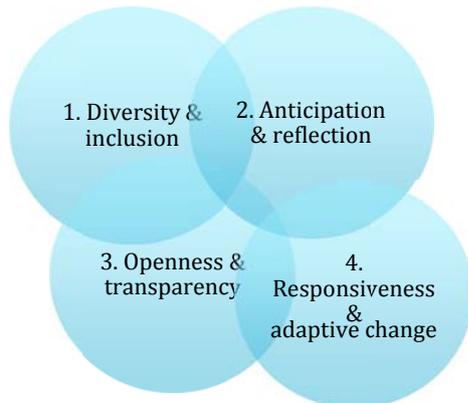


Figure 2: RRI process requirements

1. Diversity & inclusion

Diverse and inclusive RRI processes should call for the involvement of a wide range of stakeholders in the early development of science and technology, both for normative democratic reasons and to broaden and diversify the sources of expertise and perspectives. In this respect, inclusive practices should lead to diverse practices. In reverse, diverse practices are more likely to be inclusive.

2. Anticipation & reflection

Anticipation both concerns understanding how the present dynamics of research and innovation practices shape the future, and envisioning the future. Therefore, one enables oneself to act on future challenges. In order to act adequately and be open to changes in direction, also reflection is required. This reflection concerns both definitions of the problem(s) at issue, commitments, practices, and individual and institutional values, assumptions and routines.

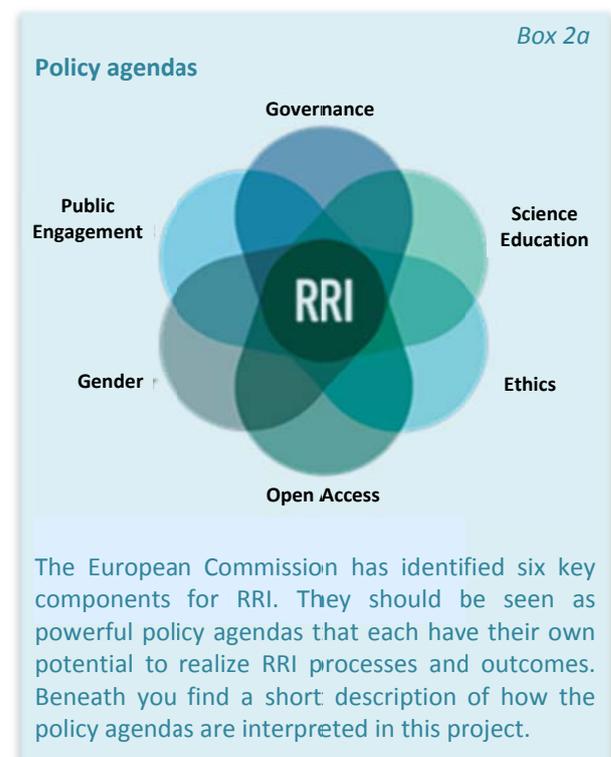
3. Openness & transparency

Openness and transparency are conditions for accountability, liability and thus responsibility. This is an important aspect for publics to establish trust in science and politics. However, more openness does not automatically lead to more trust. The information has to be tailored to the needs of stakeholders in order to make sense to them.

4. Responsiveness & adaptive change

Responsiveness means responding to emerging knowledge, perspectives, views, and norms. Responsiveness is a condition for adaptive change. RRI requires a capacity to change or shape existing routines of thought and behaviour but also the overarching organizational structures and systems in response to changing circumstances, new insights and stakeholder and public values.

RRI is all about anticipating how decisions regarding research and innovation might shape our future (i.e., how they impact on both the environment and the society we live in). RRI requires that we reflect on our actions, that we are open and transparent about the decisions we make, the actions we take and the impacts these might have. It builds on the belief that science and innovation not merely take place in society, but that they take place for society with society.



Box 2b

Policy agendas (cont.)

Ethics: Focuses on (1) research integrity: the prevention of unacceptable research and research practices; and (2) science and society: the ethical acceptability of scientific and technological developments.

Gender: The ideal of gender equality in RRI is a society where the representation of masculine and feminine values in research and innovation are balanced. Issues addressed by this policy agenda challenge people to think about the gendered nature of behaviours, discourse, products, technologies, environments, and knowledge.

Governance: To reach futures that are both acceptable and desirable, governance arrangements have to (1) be robust and sufficiently adaptable to the unpredictable development of research and innovation (de facto governance); (2) be familiar enough to align with existing practices in research and innovation; (3) share responsibility and accountability among a large variety of actors and provide governance instruments to actually foster this shared responsibility.

Open Access: Addresses issues of accessibility to and ownership of scientific information. Free and earlier access to scientific work might improve the quality of scientific research and facilitate fast innovation, constructive collaborations among peers and productive dialogue with civil society.

Public Engagement: The process of R&I is collaborative and multi actor: all societal actors (researchers, citizens, policymakers, industry, educators, etc.) work together during the whole research and innovation process in order to align its outcomes to the values, needs and expectations of European society.

Science Education: Focuses on (1) enhancing the current education process to better equip citizens with the necessary knowledge and skills so they can participate in research and innovation debates; and (2) increasing the

RRI: the state of the art

RRI means experimenting further and improving upon existing practice. It means paying close attention to current developments, be they positive efforts by scientists to take responsibility

for emerging technologies, or institutional and cultural barriers that are stopping progress. RRI also encompasses research ethics, gender and other forms of inclusion, open access to scientific data and publications, and scientific education. Scientists and innovators should be encouraged to take responsibility for the futures they help shape. But the responsibility is not individual, nor is it theirs alone. The challenge is to find collective ways to take care of the future.

To make the translation from such theoretical notions of RRI to practical RRI standards and tools, the consortium will investigate 'real world' experiences with RRI by looking at existing practices that might already exert one or more elements featuring in the RRI working definition. Such experiments can be an inspiration to others and should be encouraged. Future R&I practices can learn from steps that have already been made. The RRI Tools project therefore collects promising RRI practices to analyse them and to draw lessons from them.

Promising RRI practices are defined in the project as practices that excel in one or more of the key features of our definition, are connected both to research and innovation, and promote stakeholder involvement. The nature of these ventures, however, can diverge widely. For example, promising RRI practices can be (1) instruments, (2) projects, (3) programmes, or (4) organisations. For each of these types of RRI practice, an example is given.

1. *Instrument: PlayDecide*

PlayDecide is an online discussion game that stimulates dialogue about controversial issues in a simple and effective way. There are several reasons to engage in dialogue: from providing a direct input to a policy decision, to raising awareness for an issue. This game is developed to strengthen communication between science, policymakers, and society in Europe. This game can be viewed as a promising practice for RRI because it is playful and creative and can be used as co-creation and inclusive tool for subjects that need multi stakeholder perspective.

2. Project: 'Seeking Sociable Swine'

'Seeking Sociable Swine' is a project conducted by Wageningen University, VU Amsterdam, and the Institute for Pig Genetics. Researchers from different disciplines worked together to create a shared solution for the improvement of animal welfare in pig production. In parallel to laboratory research after pig welfare, all stakeholders were involved in a multistakeholder dialogue, facilitating the process of reflecting on one's own perspective in relation to the total diversity of perspectives at stake.

3. Programme: MVI

MVI (Responsible Innovation) is a funding programme by the Dutch Organisation for Scientific Research (NWO), directed at emerging technological developments that presumably have large (both positive and negative) impacts on individuals and societies. The program contributes to socially responsible innovation by broadening and deepening the study of ethical and societal aspects of technological trajectories in both national and international contexts.

4. Organisation: NICE

The UK's National Institute for Health and Care Excellence (NICE) publishes guidelines, amongst others on use of health technologies, clinical practice and promotion of health, and avoidance of ill-health for public sector workers. In addition to scientific rigour and implementation support, NICE has also incorporated various aspects mentioned as RRI process requirements above. For instance, inclusiveness, transparency and review are all essential procedural principles in NICE guideline development.

Box 3

What about 'fundamental' research?

Fundamental research is not aimed exclusively at meeting the immediate, material needs of society. The deep insights into the world where we live – from sub-atomic to universal scales, from the microbionic to the global environment – are a vital part of human culture. RRI applies to all stages and aspects of research, including fundamental research.

Where are we going?

The RRI tools project will develop tools for disseminating, training, implementing and practicing RRI in Europe. The tools will be used by policymakers (with a special focus on them), science educators, R&I-intensive industries, CSOs, and researchers and, therefore, need to be tailored to their motivations and needs. The project will organize stakeholder workshops throughout Europe to give representatives of these stakeholder groups the opportunity to express their ideas and needs in promoting and realizing RRI.

Furthermore, the workshops give stakeholders the opportunity to reflect on and contribute to the working definition presented in this Policy Brief. This definition will be evaluated throughout the project and it might change, for instance in response to contributions from consortium members or stakeholders in research and innovation practices.

Aside from the working definition and stakeholder needs, the workshops will focus on collecting promising practices of RRI throughout Europe. The RRI practices will be compiled in an extensive database that will be analysed to (1) formulate good practice standards, (2) select the most promising ones, and (3) make a distinctive set of showcases to present on the RRI Tools [website](#). Both the good practice standards and the showcases are meant to guide stakeholders in accomplishing good practice in RRI. The good practice standards, in turn, will contribute to an evaluation methodology of RRI and will be used to build tools for the RRI Toolkit.

Many steps have been taken in realising RRI, but more are necessary. RRI Tools is not the only project active in establishing RRI in Europe. For more in-depth information about the path towards RRI so far and a historical perspective on the development of the concept, we refer to the *About RRI* section on our [website](#); for further information on some of the European projects working on RRI, see Box 4.

Related EC projects

- **Engage2020**
The goal of [Engage2020](#) is to increase the use of engagement methods and policies by mapping what is practiced and spreading awareness of the opportunities amongst researchers, policymakers and other interested parties.
- **Great**
The [GREAT](#) project aims to develop an empirically based and theoretically sound model of the role of responsible research and innovation governance and investigate the characteristics of responsible practices.
- **Perares**
The [PERARES](#) project aims to strengthen public engagement in research (PER) by involving researchers and Civil Society Organisations (CSOs) in the formulation of research agendas and the research process.
- **Progress**
The [ProGReSS](#) project aims to advocate a European normative model for RRI globally, using constitutional values as a driver to inform societal desirability.
- **Resagora**
The [ResAGorA](#) project aims at doing extensive research about existing RRI governance across different scientific and technological areas, continuous monitoring of RRI trends and developments in selected countries, and constructive negotiations and deliberation between key stakeholders.
- **Responsibility**
The goal of the [Responsibility](#) project is to develop a virtual observatory for enhancing the interaction among research outcomes and policy making, making use of the full potential of scientific achievements to be incorporated in the policy development and implementation.