

# **The role of Civil Society Organisations in European Responsible Research and Innovation**

Petra Ahrweiler<sup>a1</sup>, Nigel Gilbert<sup>b2</sup>, Benjamin Schrempf<sup>c3</sup>, Barbara Grimpe<sup>d4</sup> & Marina Jirotko<sup>e5</sup>

*<sup>a</sup>Johannes Gutenberg University Mainz, 55099 Mainz, Germany; <sup>b</sup>University of Surrey, Guildford GU2 7XH, UK; <sup>c</sup>EA European Academy of Technology and Innovation Assessment, Wilhelmstrasse 56, 53474 Bad Neuenahr-Ahrweiler, Germany; <sup>d</sup>Alpen-Adria-Universität Klagenfurt, 9020 Klagenfurt am Wörthersee, Austria; <sup>e</sup>University of Oxford, Oxford OX1 3QD, UK*

<sup>1</sup>petra.ahrweiler@uni-mainz.de, <sup>2</sup>n.gilbert@surrey.ac.uk, <sup>3</sup>benjamin.schrempf@ea-aw.de, <sup>4</sup>barbara.grimpe@aau.at, <sup>5</sup>Marina.Jirotko@cs.ox.ac.uk

# **The role of Civil Society Organisations in European Responsible Research and Innovation<sup>1</sup>**

## ***Abstract***

EC policy reveals a strong conviction that CSO's main function in EU-funded research and innovation projects is to take care of the "societal perspective", which would not be adequately represented otherwise. With this, CSOs are supposed to be the main advocates of RRI in project consortia and are supported by all kinds of EC policy measures to fulfil this role. This conviction is not only problematic due to definition problems concerning CSO as such. Empirical data about the role of CSOs in high-tech/high-innovation research projects and the distribution of RRI activities among consortia members reveal that the role of CSOs is much more multi-faceted (data providers, providers of access to the research field, providers of specific domain expertise etc.) than currently assumed. Furthermore, RRI policies of the EC have managed to sensitise all other actors in consortia to the societal perspective: universities and companies are likewise active to promote and realise RRI perspectives in project consortia with CSO not really standing out among them. These findings have at least two interesting implications: (1) CSOs have far more to offer than being just the "moral voice" of society in research and innovation; their contribution is multi-faceted and beneficial in many respects. (2) The RRI policy of the EC is even more successful than expected: it is not just one actor type that is supposed to introduce RRI keys and elements in consortia; we can observe something like RRI diffusion among different types of consortia members with all of them active in supporting RRI perspectives in their research work.

Keywords: Responsible Research and Innovation, European research policy, Civil Society Organisations, project consortia, RRI key actors, RRI key drivers

---

<sup>1</sup> Acknowledgement:

This work was funded by the European Union's Seventh Framework Programme under grant agreement n°321480 for the FP7 project 'Governance for responsible Innovation' (GREAT).

## 1. Introduction

Horizon 2020, the €70 billion research funding programme of the European Commission, intends to put Responsible Research and Innovation (RRI) centre stage. According to the Commission,

‘Responsible research and innovation is an approach that anticipates and assesses potential implications and societal expectations with regard to research and innovation, with the aim to foster the design of inclusive and sustainable research and innovation. Responsible Research and Innovation (RRI) implies that societal actors (researchers, citizens, policy makers, business, third sector organisations, etc.) work together during the whole research and innovation process in order to better align both the process and its outcomes with the values, needs and expectations of society.’

(<http://ec.europa.eu/programmes/horizon2020/en/h2020-section/responsible-research-innovation>; 22.06.2017).

According to Owen’s et al. influential paper ‘A Framework for Responsible Innovation’ (Owen et al. 2013) RRI is seen as having four aspects:

- anticipation and foresight (e.g. to prevent harmful consequences);
- reflection about responsibility in research and innovation;
- discursive, deliberative and participative opinion formation and decision making embedded in value discussions; and
- responsive behaviour by all participants

The involvement of civil society at the individual level as interested citizens, and at the organisational level as represented by Civil Society Organisations (CSOs) is expected to change the research and innovation system to favour RRI. As we shall see in section 2, the

Commission argues that CSOs are crucial to realising the 'societal perspective' in current research and innovation processes and hence, their policy programmes try to foster the inclusion and participation of CSOs in research consortia.

In the two-fold literature review of section 2, we shall demonstrate that the category 'Civil Society Organisation' is far from being well-defined, though it is central to the Commission's developing views on the importance of CSO involvement for embedding RRI in research and innovation. Given the ambitious role of CSOs in RRI envisaged by the EC on one hand and the definitional difficulties on the other, it is necessary to examine three issues: (1) the motivation for project consortia to include CSOs as partners; (2) the homogeneity of organisations classified as CSOs by project consortia, as well as their role within projects; (3) the actual occurrence of CSOs as main drivers of RRI in comparison to other actors. From these issues, a contribution to the question whether the assumptions underlying the EC policy are entirely accurate or whether certain adjustments to reality are expedient can be made.

The research questions derived from the two-fold review section will be addressed with the methods and data from the Competitiveness and Innovation Programme CIP introduced in section 3. Compared to the CONSIDER project (cf. Boeschen and Pfersdorf 2014), which also focused on the involvement of CSOs in FP7 research projects, there are important differences in intention, focus and outcome of our study. Firstly, while CONSIDER focused on all research areas of FP7 investigating the role of CSOs in research, our study will address the role of CSOs not only for research - but especially for the *targeted combination of research and innovation*, which had been the dedicated objective of the Competitiveness and

Innovation Programme CIP alongside FP7. Secondly, we are less interested in the general contribution of CSOs to projects, than in the role of CSOs for projects about innovation in *new and emergent technologies*, where CSOs are supposed to be of critical importance for providing ‘the societal perspective’ (technology assessment, early warners against technological hazard, user-driven innovation etc.). And thirdly, our main objective is to learn more about RRI as a concept, and about how CSOs specifically relate to it. Therefore, unlike CONSIDER, we analyse the project *contribution of all actor types to the four RRI elements ‘anticipate, reflect, deliberate and respond’* and check for the part the CSOs actually played in each of them.

The results, drawing on our survey and interviews with participants in one area of the Commission’s Framework 7 programme, will be presented in section 4. Finally, in section 5, we draw some conclusions and recommend how RRI might be better supported in the Commission’s research programmes.

## **2. The role of CSOs in the research system: a literature review**

This section contains a two-fold literature review on the role of CSOs leading to a set of research questions: the first part reviews academic RRI literature, the second part focuses on policy documents.

### **2.1 Definition problems**

Despite being central to the Commission’s RRI policy, the term Civil Society Organisation is not well defined. There are many terms such as ‘voluntary’, ‘third sector’, ‘charities’, ‘non-

governmental organisations', 'consumer and self-help groups', and even 'sports and leisure clubs', that in practice may have overlapping characteristics, and may be regarded as CSOs (Nugroho 2011, 762). However, following Hutter and O'Mahony (Hutter and O'Mahony 2004) who provide a comprehensive review of the literature on CSOs, we take the two defining features of CSOs to be that, 'in principle', they are independent from the state, and that they are 'primarily' not interested in profit-making (Hutter and O'Mahony 2004, 2). In addition to this cautious baseline definition, Nugroho's (Nugroho 2011) nuanced understanding of 'civil society' (in discourse and practices) provides further guidance:

'Scholars often perceive civil society as a cornerstone for a vibrant societal sphere, providing voices for the disenfranchised and creating centres of influence outside the state and the economy [...] As such, the spectrum of civil society activism is wide-ranging. At one end, there are CSOs who mainly work on promoting civic engagement, advocating civil and political rights through mobilisations, grassroots activities and lobbying, and are inevitably political. CSOs working in this area are commonly labelled as 'social movement organisations' or 'political' or 'advocacy' CSOs [...]. At the other end there are CSOs who work mostly on development programmes, commonly orientated towards poverty reduction and the protection of the environment. These organisations not only assist the poor, but also help in empowerment through education and training, resettlement, family health and other welfare matters. [...] These two camps should not be seen as mutually exclusive groups, but rather as poles of a continuum of CSO activism' (Nugroho 2011, 762).

Nugroho's view of CSO activities as a 'continuum' does justice to the empirical complexity of the many ways in which CSOs play a role in practice. CSOs are not clear-cut homogenous actors; they appear in all sorts of guises including organisations that do not consider themselves as CSOs, but nevertheless display CSO (or NGO) features. Also, an organization or group may be *perceived* to be a CSO by others, even though it does not identify itself as such. Furthermore, missing in Nugroho's definition is a historical perspective: many

organisations change over time, and these changes may include phases in which the organisation's identity becomes more or less CSO-like.

This echoes the points made by Evers (Evers 2013, 161) who pleads for a broad understanding of civil society beyond the confines of a supposed 'third sector'. Instead, civil society should be conceptualized as cross-cutting 'trans-sectoral actor-networks' and 'hybrid organisations' that 'support civility and civicness from different sides'. 'Hybrid' or 'social enterprise' would be appropriate terms for indicating the 'intertwining of economics and sociopolitical concerns'.

A number of authors have considered the actual or potential role of CSOs in the research system. On one hand, it is argued that CSOs have a positive role as independent and altruistic actors, and 'early warners'. Supposedly, CSOs mostly oppose scientific and technological innovations, acting as early warners against damage and harm (Mampuy and Brom 2015). Also, CSOs are motivated by 'altruistic motives' and 'social value creation', in contrast to profit-oriented organisations that are more 'self-interested' and more focused on 'economic value creation' (Blok 2014). CSOs that are NGOs and charities are expected to be trustworthy under conditions of asymmetric information, and have important risk management functions that differ from those of other actors (e.g. the state or firms) (Hopkins and Nightingale 2006). In addition, a number of authors assert that CSOs (and 'activists') exert socio-political or normative pressure on other actors in innovation systems, hence contributing, for instance, to the development of 'green' or environmental innovation (e.g. Penna and Geels 2015; Geels 2014; De Marchi 2012).

On the other hand, Krabbenborg and Mulder (Krabbenborg and Mulder 2015, 9) found that the role of CSOs as early warners of potential risks, and opponents of scientists and technology developers, may also entail problems such as their inability to engage in early-

stage debates in an open way, and to ‘shar[e] responsibility for the outcomes of negotiations’. Krabbenborg and Mulder argue that such active co-responsibility and flexible early engagement would be a departure from the ‘traditional mode of operation of CSOs’.

Another relevant strand of literature about the role of CSOs may be paraphrased as ‘system’ or ‘network’ approaches to innovation (e.g. Ekboir and Parellada 2001; Hermans, Klerkx and Roep 2015; Späth and Rohrer 2010; Vanloqueren and Baret 2009). What these approaches have in common is a shift of analytical focus from single actors, such as firms, as drivers of innovation to a broader array of interrelated actors that, in combination rather than one by one, shape innovation processes in significant ways. For instance, Parayil (Parayil 2003) perceives the need to include NGOs in innovation models, considering them another important actor in addition to industry and the state. Hodson and Marvin (Hodson and Marvin 2010) briefly discuss the concept of socio-technical regimes, according to which NGOs are but one among all those actors that, together, constitute an innovation system. Similarly, in a case study by Taminiau (Taminiau 2006), NGOs are considered as actors who, together with others such as the European Parliament, tried to exert pressure on technology producers and industry.

Some scholars explicitly question the importance of CSOs (and NGOs) in innovation systems. For example, according to Elzen et al. (Elzen et al. 2011), NGOs do not have much normative influence that they can exert on their own. Rather, they are influential when aligning with other actors, institutions or mechanisms such as policy-makers, markets, or regulation. De Saille (De Saille 2015) alludes to power imbalances among CSOs, making a particular point about EU policy. The latter should not only draw on the voices of prominent NGOs, but also be ‘opened up’ further.



This system and network literature also provide insights into the potential role of CSOs as regulators. Based on semi-structured interviews with stakeholders about the relationship between regulation and innovation, Paraskevopoulou (Paraskevopoulou 2012) found that regulation needs to be understood as a subtle process pervading many aspects of organizational work, and that regulatory activities are taken on by different actors in various ways. Also, regulation is understood as an institution that emerges from the interaction of various stakeholders, including CSOs.<sup>2</sup> Hutter and O'Mahony (Hutter and O'Mahony 2004, 8-9) argue that CSOs' regulatory activities may (perhaps unwillingly) turn them into the long arm of regulatory initiatives of states or the European Commission. CSOs empower citizens and may subsequently 'help to build political support and legitimacy for the resulting state regulation', although it would often remain unclear who the CSOs themselves would be governed by. Even though CSOs have 'multiple accountabilities to trustees, donors, staff and supporters', they would be 'generally less open to public scrutiny than government bodies'. Hutter and Mahony also argue that the need for funding appears to constrain CSOs significantly. For instance, attracting funding from the European Commission would often require adopting the Commission's policies, limiting a CSO's room for manoeuvre. This is also a possible reason why CSOs often appear to 'perform less effectively than their popular image'. The 'short term objectives of many official funding agencies' would restrict their abilities to pursue long-term issues such as successful 'local institutional development'.

## 2.2 Policy expectations

---

<sup>2</sup> According to Van Oudheusden et al. (Van Oudheusden et al. 2015, 1881), the EC has adopted such an interaction-oriented, systemic perspective on research and innovation processes.

The European Commission has adopted a position that maintains that CSOs are vital components for realising RRI (or a 'societal perspective') in current research and innovation processes, and that, therefore, the participation of CSOs in these processes needs to be fostered. This position has been refined over the course of at least a decade.

In the following, we trace the development of the current Commission's view on CSOs and RRI in a literature review of policy documents: The collection examined is listed in Appendix 1<sup>3</sup>. The story starts with a perspective on social science that stresses the importance of social arrangements in research and innovation and emphasises the role of (civil) society (EC 2007a, 7; cf. Gall, Millot and Neubauer 2009). The underlying concept is the 'knowledge society', where 'the expression 'knowledge society' alludes not only to the ever-increasing application of scientific knowledge, but also to the production and recombination of all kinds of knowledge in new settings of knowledge work' (Gross and Krohn 2005, 76; EC 2007a, 78; reasoning supported by EC 2007b, EC 2007c, EC 2008a, EC 2013c, EC 2014, and Sutcliffe 2011). This especially concerns the connection that is seen as precarious between science and society in relation to the 'grand challenges' in European research and innovation (EC 2007a, 17; reasoning supported by Beinare and McCarthy 2011, Benington 2010, EC 2007a, and EC 2008a). It is civil society, in the first instance, that is expected to be a 'game changer':

'Knowledge production encompasses new areas, for example: innovation and implementation; education, training and learning; knowledge management; research governance; science-society dialogue (as parts of the formation of the appliance of knowledge, and as the economic, cultural or social environment of research)... Of course all these concepts imply *new relationships and meanings of civil society in the knowledge production process*. They take into account mental and cultural frames of citizens

---

<sup>3</sup> For this section, we gratefully acknowledge the meticulous database work of our assistant Sarah Goetten.

engaged in science, consumers' innovative role, emerging civil intermediaries as mediators between different knowledge actors, etc. (EC 2007d, 2; reasoning supported by EC 2007c, and Seyfang et al. 2010).

The involvement of civil society in research and innovation is seen as a central part of a specifically European 'social model', whereas, for example, the US model is seen as having no other role for civil society than being the future costumers of new technologies (EC 2007a, 25; reasoning opposed by EC 2010a, and Seyfang et al. 2010). The envisaged role of civil society for research and innovation is highly diversified and ambitious, but clearly targeted towards RRI keys and elements (EC 2007d, 5-6; reasoning supported by Beinare and McCarthy 2011 and EC 2008b). Especially in controversial technology debates such as GM crops, BSE etc. civil society is expected to contribute corrective governance (EC 2007a, 43; reasoning supported by Benington 2010, EC 2007b, EC 2008a, EC 2009, EC 2011b , EC 2013c, EC 2014, Gall, Millot and Neubauer 2009, and Owen et al. 2013).

In this framework, CSOs are seen as the legitimate representatives of civil society, i.e. of 'general interest' and the 'societal perspective' as a whole:

'Civil society organisations are generally organisations whose members have objectives and responsibilities that are of general interest and who also act as mediators between the public authorities and citizens (cf. EU Commission, Science and Society Action Plan, 2001). Thus their function can be defined in correspondence to the main criteria for the assessment of public participation described below: Strengthening the accountability and transparency of decision-making; Improving the quality and legitimacy of decisions; Creating acceptance and a consensus concerning decisions; Building trust between administration and civil society; Stimulating individual and institutional networking; Raising public awareness and knowledge on scientific issues; Improving the active involvement of citizens in the democratic process; Being cost-efficient' (EC 2007d, 4); reasoning supported by EC 2007b, EC 2013c, EC 2014.

The concept of Responsible Research and Innovation itself then begins to be wedded to CSOs and their specific contribution (EC 2013a, 45; reasoning supported by Benington 2010 and Bösch and Pfersdorf 2014).

If there are any doubts about the role of CSOs for research and innovation, it is the apprehension that they might get contaminated by influence from other actors such as businesses (EC 2007d, 12). However, this is embedded in a general enthusiasm about the advantages of CSO involvement:

*‘Civil society organisations are becoming increasingly important actors in innovation by enhancing their use of new technologies to go beyond their existing roles as safety nets and as safety valves. In the long run, civil society organisations could function as social entrepreneurs that explore new organizational forms, and thus as sources of societal innovation. However, this transformation also means that civil society organisations are caught increasingly between the business value system (efficiency, market needs) and their social mission (adherence to principles, ideological agendas)’* (EC 2007d, 20; reasoning supported by EC 2011c, EC 2013c, Ferretti and Pavone 2009, and Sutcliffe 2011).

Success stories of CSO involvement in research are cited as ‘highlights’ (Fondation Sciences Citoyennes 2014, 12f; reasoning supported by EC 2008a, EC 2013a, Bösch and Pfersdorf 2014, and EC 2011d). From all this is derived a strong requirement to involve CSOs more actively in European research and innovation and to support their participation by funding them through CSO-related STI policies.

‘The new funding mechanisms in 7th Research Framework Programme (FP7) to facilitate the involvement of civil society organisations are a step in the right direction. But in order to explore the full potential of civil society organisation (CSO) involvement, new partnerships will be required. This requires support to the specific capacity of CSOs to engage, measures to ensure easier matching between possible partners, and incentives to

research institutes to take on the additional complexity of cooperation with diverse partners' (EC 2008b, 10; reasoning supported by Bösch and Pfersdorf 2014, EC 2011a, and EC 2011c).

'Research organisations (ROs) and civil society organisations (CSOs) can both benefit a great deal from working together. [...] The Science in Society (SIS) Work Programme under FP7 developed a number of schemes specifically designed to unite CSOs and ROs in joint projects across the various FP7 domains. [...] The publication also sets out the following recommendations that can encourage more and better RO-CSO partnerships at local, national and European levels: set up bridging facilities where CSOs, ROs and other groups can meet and share knowledge and experience; provide researchers with incentives to work with CSOs; ensure that the rules of research funding schemes take RO-CSO partnerships into account; open doors in research programmes (e.g. make more funding available to CSOs); make the most of CSO-RO project outcomes (e.g. broaden evaluation systems to encompass public participation and social innovation)' (EC 2010b, 73ff; reasoning supported by EC 2008a, EC 2011b, and EC 2013b).

There remains a concern that the new funding mechanisms do not suffice for the desired pattern to materialise as quickly as desired (Gall, Millot and Neubauer 2009, 39); reasoning supported by EC 2008b).

### 2.3 Research questions

In summary, the literature draws a heterogeneous and multi-faceted picture of the category 'Civil Society Organisation' in the research and innovation context, whereas the Commission treats it as unproblematic. It is far from well-defined which, in turn, generates difficulties to make the Commission's rhetoric concrete. This circumstance is discrepant to the far-reaching Commission policy regarding the envisaged role of CSOs in RRI aspects (see above).

Therefore, this review of policy papers and RRI literature leaves us with the following research questions:

- (1) What is the motivation for project consortia to include CSOs as partners? What do they expect to be their specific contribution?
- (2) How homogenous are organisations classified as CSOs? Do they obtain a unique and consistent role in project consortia?
- (3) Are CSOs indeed the main or only drivers of RRI within projects?

### **3. Methods and data**

In order to address these questions and shed more light on the promotion of RRI elements by CSOs, the role CSOs actually play and the importance and uniqueness of their contribution, a quantitative online survey was carried out, supplemented by semi-structured interviews.

Data were collected from projects funded within the 2007-2013 Competitiveness and Innovation Programme (CIP), in Information and Communication Technologies (ICT) under the Policy Support Programme (PSP) in the seventh Framework Programme of the European Commission.

This CIP-ICT/PSP programme was chosen because CIP projects are *per se* innovation-oriented. In ICT/PSP, the focus is on developing new information and communication technologies for supporting public sector and social innovation (in 44% of all projects, governmental institutions were beneficiaries) – an area of potentially high social impact, where many CSOs could be expected to be involved and indeed were.

The CIP-ICT/PSP consisted of 213 projects; the survey was conducted among all coordinators of these projects in May/June 2015. The first projects started in 2008, and the last ended in early 2016. Overall, the projects involved 2474 institutions, some of whom participated in more than one. Coordinators were contacted by email using email addresses provided by the European Commission, of which 26 were invalid. Thus 187 coordinators received an invitation for participation. Overall, 57 questionnaires were completed, which makes a response rate of 27% of all projects, or 31% counting only those with valid email addresses.

Table 1 shows the distribution of respondents according to the type of organisation in which they were employed. SMEs, governmental organisations and public/semi-public bodies coordinated 50% of all projects.

[Table 1 here]

Taking into account the general difficulty of defining CSOs and separating them from other actors, the following working definition was provided to respondents for guidance to enable them to identify CSOs among their consortium members: *Civil society organisations are defined as organisations that are non-governmental, not-for-profit, not representing commercial interests, and that pursue a common purpose for the public interest.*

The project coordinators were asked (Q.1.2 of the questionnaire, reproduced in Appendix 2) whether a CSO was included in the project consortium (see Table 2). CSOs were partners in 53% of all projects. In all the projects with CSO participation, at least two CSOs participated.

[Table 2 here]

Furthermore, coordinators were asked whether the CSOs were brought in to contribute to the project's RRI; whether this contribution was perceived by the coordinator as being unique and important; and which of all the partners in the consortium was the most active in each of the four aspects of RRI: anticipation, reflexivity, responsiveness and participation. Questions were structured according to the project life cycle: before the project began, during the project, and after the project had ended. A definition of RRI was provided to help coordinators understand and answer the questions.

In addition to the online survey, nine semi-structured interviews with ten interviewees (including seven coordinators) were carried out between December 2013 and August 2014. These were chosen from two thematic areas that the European Commission associated with 'pressing issues', namely, health and energy (EC 2007a, 17; see also section 2). For instance, the interviewees would participate in projects concerned with assistive technologies or energy efficiency. Depending on the interviewees' availability, the interviews lasted between 31 min. and 1 hour 52 min.; the average duration was 57 min.

The types of organisation that the interviewees represented varied, as shown in Table 3 (using the same classification as for the survey; see Table 1).

[Table 3 here]

#### **4. Results**

Before turning to explicitly addressing the posed research questions (see sections 4.1., 4.2.



and 4.3.), some important issues and basic results will be derived from our data.

The first issue that arose was the difficulty of deciding what counted as a CSO. While the EC discourse reviewed in section 2 speaks about CSOs as though this is an unproblematic and easily recognisable category, on the ground it quickly became apparent that the matter is not so straightforward. This was revealed through the qualitative interviewing approach which was partly narrative, and exploratory. The interviewees' detailed accounts of their everyday work and their organisations show various nuances in the profile and practices of these organisations. At first sight, organisations can be classified into different types such as CSOs, SMEs, large enterprises, universities, or governmental organisations. However, the interviewees made clear that their identity is much more multi-faceted when considering their (historical) profile and reported practices in greater detail.

The following three examples illustrate this shifting of identities. First, we classified one interviewee's organisation as CSO due to official information, i.e. the organisation's website, where it was described as a 'private, not-for-profit' research institute that receives both public and private funding. Legally, the organisation cannot pay dividends to its shareholders. The interview showed, however, that the organisation also has clear economic and commercial interests. This aspect makes it less CSO-like, as we discussed previously (Blok 2014). Second, we classified another interviewee's organisation as CSO because it has the formal mandate to represent the interests of a particular group of citizens, thus acting as a special interest, or 'advocacy' group (Nugroho 2011, 762). Legally, it is an organisation that is not supposed to maximize profit. It receives tax payers' money, but only from those who are members of the particular group of citizens just mentioned. At the same time, the interview revealed that the organisation pursues various activities that appear to be typical of project coordination in general. In this regard the organisation thus resembles other types of

organisations (SMEs, large enterprises, and others) coordinating CIP ICT PSP projects.

Thirdly, we conducted an interview with the representative of an organisation that could clearly be classified as government organisation, considering its legal status at the time of the interview. However, this government body has a history that makes it resemble a CSO, since it was, at some point, an association of individual enterprises acting as a special interest group, before being embedded in the government.

Against this background, considering the many different organisations making up the entire CIP ICT PSP pool we found them harder to categorise than we had expected at the outset of our research. The pertinent classification problem applied to all types of actor categories we considered in the early phase of our research (e.g. SMEs, large corporations, universities, governmental bodies). However, we found this classificatory ambiguity most interesting for CSOs, since they have been repeatedly associated with RRI-like features and activities in EC discourse, as discussed previously. Thus, in the remaining interviews, and for the survey, we decided to include questions for identifying CSO-like organisations and activities, and hence to unpack more systematically in which way, and to what extent a given organisation really ‘is’ a CSO; and in which way, and to what extent other organisations, that were not CSOs at first sight (by their official self-descriptions, or as perceived by others), would nevertheless display CSO-like features or activities. After integrating such questions in the survey – in particular, Q. 3.1, 3.4 and 4.3, which will be addressed in the results section 4 – we decided to settle on a specific classification of actors (see Table 1) as well as a specific definition of CSOs (see section 3). Through taking these measures we could proceed and conduct a broader quantitative analysis of project coordinators’ perceptions of RRI, and of how RRI had been realised with or without CSOs, in their projects.

Turning to the survey data, we wanted to find out whether the CIP-ICT/PSP projects did anything in terms of RRI at all, and – if yes – what measures and mechanisms had been implemented. This is why we checked for the four RRI elements anticipation, reflection, deliberation, and responsiveness.

In terms of anticipation, we asked: Before the project started, was there systematic anticipation of possible positive or negative societal or environmental outcomes? (Q2.1)

[Table 4 here]

Table 4 shows that the majority of projects had implemented some systematic anticipation mechanism to check for possible positive or negative societal or environmental outcomes: while 37% of all projects did not anticipate the project outcomes systematically, 63% did. Sophisticated, high threshold anticipation mechanisms (e.g. PIPA, SIAMPI) were rarely implemented in comparison to less standardised procedures.

In terms of reflection, we asked: *During the project - Were there boards, individual experts, work packages, external stakeholders, committees or dedicated groups in place helping you to reflect on ethical, political, societal or environmental issues?* (Q3.1)

[Table 5 here]

Table 5 shows that reflection mechanisms to consider RRI during the project were in place and used in two thirds of the project population. The most common issues considered during the project were societal ones (in 44% of all projects).

As can be seen from Table 6, issues arose mostly in the earlier phases of the projects, e.g. of the 14 projects reporting environmental issues, these issues arose in about 70% before

the project started. (Q.3.2: *During the project - Based on your previous response, when did the issue arise?*)

[Table 6 here]

In terms of participation and deliberation, Table 7 demonstrates that many projects had institutionalised RRI components, and had established boards or included experts where external advice was sought and deliberation took place. 58% (33 projects) did not have any boards, committees or dedicated groups in place in order to reflect upon ethical, political, societal or environmental issues. Project committees and dedicated work packages were most commonly found to be helpful for reflecting upon ethical, social environmental or political aspects of the project.

[Table 7 here]

Lastly, we asked for responsiveness: During the project - The following are some of the issues that might have arisen during the project. Which of these required you to make changes and of which dimension were these changes? (Q3.5)

[Table 8 here]

Table 8 shows that few of the projects indeed responded to change requests. Changes during the project were mainly made due to changes in the legal framework, whereas adaptations to ethical issues or social values were not necessary in most cases.

In summary, the projects indeed took RRI seriously and had implemented many of the relevant elements. With only a few exceptions, the common anticipation (Table 4) and early

reflection (Table 6) of issues relevant to RRI enabled the consortia to make timely changes if necessary (Table 8). The next sections will present results for the three research questions that arose from the literature review and expectations expressed in the policy documents (see section 2).

#### ***4.1 Motivations for including CSO as partners in research consortia***

Some questions from the survey were directed to address our first research question, namely to find the motivation for project consortia, as represented by their coordinator, to include CSOs as partners, and what the coordinators expected the CSOs' specific contribution to be.

Table 9 shows results for the question: What was the main motivation for you as a coordinator to include the following groups in your project? (Q4.3)

[Table 9 here]

End-users were mainly involved for data provision (56%) and for reflecting upon societal needs and ethical issues (38%). Including CSOs as partners in consortia was only partly motivated by the expectation that this would provide RRI competence, but much more by the expectation that they could contribute specific scientific capabilities and expertise including data not provided by other actor types. A capability to reflect upon societal needs and ethical issues was especially ascribed to governmental organisations (62%), meaning that the coordinators mostly assumed the RRI competence to be located outside the CSOs. These answers to our first research question regarding the anticipated role of CSOs in research consortia as seen by the coordinators are greatly differing from the role of civil society envisaged by the EC (see section 2). Tackling the second research question, the next section will present our results concerning the actual role the CSOs played in the projects under

examination.

#### ***4.2 The roles of CSOs in projects***

The survey data show that CSOs are mostly incorporated in projects as partners and/or beneficiaries in the same way as other non-university partners. They do not stand out as exclusively representing a specific formal role (Table 10).

[Table 10 here]

In the opinion of coordinators, the perceived relevance of CSOs among consortium members and their involvement in different phases of the projects does not make them less or more important and influential than other partners (Q4.5 and Q4.6). Table 11 indicates that other groups are seen as more or at least equally influential; Table 12 shows that the profile of involvement in different project phases does not vary significantly between actor groups; CSOs share this general involvement profile. This finding draws parallels to the ‘system’ or ‘network’ approaches to innovation which see CSOs as one actor within a broader array of interrelated actors (see section 2).

[Table 11 here]

[Table 12 here]

Table 13 demonstrates that 35% of all coordinators (with or without CSO participation in their projects) at least somewhat agree that CSOs had a big overall influence on their project, and 39% of all coordinators at least somewhat agree that CSOs contributed something unique to their project (Q.4.7).

[Table 13 here]

Summarising and providing an answer to the second research question, CSOs can have all the types of formal role available in consortia without specific preferences, and are generally seen as equally influential compared to other project partners. Therefore, the EC funding assumption (see section 2 above) that CSOs are integrated as RRI promoters in current research and innovation projects for strongly fostering the 'societal perspective' cannot be confirmed. Tackling the third research question, the next section will focus on the drivers of RRI within projects and will consider the contribution of CSOs to RRI aspects in particular.

### ***4.3 The drivers of RRI***

The interviews indicated that rather than CSOs being the main or only drivers of RRI within projects, other consortium partners often had an equal or greater role.

For instance, two interviewees from one of the government organisations explained in detail the 'living lab' approaches they apply in various projects, including EU projects. A 'living lab' is a space designed for open innovation, notably to allow prospective or potential users of envisaged services and products to partake in their development. This implies the collaboration of different stakeholders and hence may be considered an RRI approach (RRI Tools 2016). In a similar vein, the interviewee of the other government organisation was keen to stress that a good EU project should 'have a representation of the full value chain involved in a project', and should make sure that 'everyone puts the cards on the table', in order to explain his or her interests to the other participants. This view resonates with the RRI principle of inclusion and deliberation (cf. Stilgoe et al. 2015). Another interviewee, representing one of the two large enterprises in the sample, reported that they were involved in the development of a 'stakeholder plan' and an 'ethical committee package', that is, an

‘information pack’ that the other project partners needed to use in obtaining approval from existing ethical committees at local pilot sites. This may be considered a light but important form of RRI activity. While the other project partners had to obtain the required ethical approval, the interviewee said that they needed to ‘prepare’, ‘support’ and ‘coordinate’ the process. Not only were organisations that were formally CSOs carrying out functions beyond those expected, but organisations that were not CSOs were reported by the interviewees as showing RRI attitudes and carrying out RRI functions.

During the survey, coordinators were asked to rank the partners – by choosing their type<sup>4</sup> - that were most active with respect to each of the four aspects, anticipation, reflexivity, responsiveness and participation. For example, for the RRI element ‘reflexivity’, the survey question was: *During the project - Who were the three-most-active contractual partners when considering ethical, environmental, political or societal issues in the project?* (Q3.4)

Table 14 compiles results from Q2.3 (anticipation ranking); Q3.4 (reflexivity ranking), Q3.6 (responsiveness ranking) and Q4.9 (participation ranking) focusing on the most active partner. For Q2.3, coordinators, who had responded that anticipation was an issue at all for their project (52) were asked about the most active partner in this. In 25% of the projects, SMEs were most active; in 21% universities took this role. CSOs were hardly mentioned (6%). A similar profile can be identified for Q3.4 on reflexivity, which was an issue for 48 projects. Again, universities and SMEs were most active, this time seconded by governmental organisations; CSOs were just named for 4% of the projects. This low profile is maintained

---

<sup>4</sup> Respondents could choose a type from the following list: university, research organisation or network, large enterprise, small or medium enterprise, governmental organisation, public/semi-public corporate body, CSO, other.



for responsiveness and participation, too. In both categories, SMEs were seen as most active (33%) with CSOs far behind (4%).

With this, the importance of CSOs in representing the RRI functions is much less than expected. It is the SMEs as well as universities and governmental organisations that seem to play a central role in the promotion of RRI elements.

[Table 14 here]

Summarising, the survey provided three main insights concerning the research questions. Firstly, the motivation to include CSOs as partners in consortia are only partly driven by an expectation that they will provide RRI competence, and much more by the expectation that they can contribute specific scientific capabilities and expertise not provided by other types of actor. Secondly, organisations classified as CSOs are in fact highly diverse, their roles in the research consortia are multi-faceted, and extant definitions of CSO are difficult to apply consistently. Thirdly, rather than CSOs being the main or only drivers of RRI within projects, other consortium partners often have an equal or greater role.

## **5 Discussion**

Elements of our findings confirm the outcome of the CONSIDER project (cf. Boeschen and Pfersdorf 2014), which carried out a survey among all 14,000 FP7 project coordinators and reported the involvement of CSOs among 27% of the projects. The CSOs mainly participated in projects ‘to provide expert knowledge (69%), be a member of the research team (51%), contribute to the discussion and evaluation of results (46%) or contribute to publications

(47%)'. In a second round including only projects with CSO involvement (455 projects), the perceived role of the CSO was examined by asking both the project coordinator and the CSOs themselves. There was little dissent about the importance of CSOs concerning the dissemination of project results, and the contribution of expert knowledge was seen as one of the CSOs' main roles. Other important roles included agenda setting and project initiation. Overall, project coordinators seemed to assign to CSOs a somewhat more passive role in projects as compared to how CSOs saw themselves.

While the results of the CONSIDER project (cf. Boeschén and Pfersdorf 2014, see section 1) confirm the general patterns found, the results of this study offer meaningful additional findings.

The findings from the interviews support practice-oriented notions of RRI (and CSOs), including what has been coined *de facto* RRI (Randles et al. 2016). By extension, we found that there is much more '*de facto* CSO' than we had expected, among organisations that were (at first sight, and formally, officially) not CSOs.

Results of the survey showed that CSOs participate in more than 50% of the CIP-ICT/PSP projects due to their specific contents-related expertise and due to their good access to important data. They are found to be more influential, the less these contributions are provided by other consortium partners. Only 19% of all projects report that CSOs participate to contribute general societal perspectives or ethical aspects. Some project coordinators even claim that universities and Small and Medium Enterprises (SMEs) are the most active partners in promoting RRI functions within consortia. Summarising, the role of CSOs in realising and implementing RRI functions seems to be much less central than the Commission assumes.

There might be good explanations for why organisations other than CSOs are major drivers of RRI: EU funding programmes and calls (FP6, FP7 and Horizon 2020) have long required the integration of societal and ethical aspects in research and innovation. These programmes have also promoted the inclusion of heterogeneous actors in projects to ensure multiple perspectives. Only proposals and consortia that fulfil these requirements are awarded research contracts. This means that policy and incentive structures generally postulate and foster RRI among all research actors.

It can be assumed that all research actors—especially universities and research organisations, but also big and small firms—have adapted to this requirement with the result that RRI competence belongs to the standard profile of most of the organisations participating in EU research. Moreover, RRI competence ‘diffuses’ in projects among consortium partners. Partners without any track record in RRI learn about RRI while they collaborate in projects. RRI competence then diffuses through the research and innovation landscape. In that light, it can be speculated that it is often unnecessary for CSOs to establish a dominant role in realising and implementing RRI functions. However, this means that CSOs still have the potential to work as correctives in consortia, in case certain aspects of RRI have not been fulfilled by other actors or the consortium as a whole.

This is an important learning outcome for policy. Of course, CSOs should continue to be encouraged to be members of consortia; they provide important contributions to research and innovation. However, CSOs should not be assumed to be the only source of RRI in consortia; policies should recognise and respect that the advocates for, and implementors of RRI may be any beneficiary in a consortium.

A few further policy recommendations for promoting RRI within EU-funded project consortia in research and innovation can be derived from our results: Calls and proposal

requirements need to be carefully crafted: Given the actor's differing notions of the necessary and/or sufficient features determining an organisation as a CSO (by their self-descriptions or as perceived by others) on one hand and the frequently subsidiary role of CSOs in RRI aspects on the other, the term "CSO" should be defined more clearly. A loose definition enables CSOs without an inherent interest in RRI or a common purpose for the public interest to occupy seats in research consortia which, according to the intentions of the Commission, would normally be reserved to CSOs with desired RRI features.

Furthermore, policies and regulations should require that consortia consider social and environmental outcomes before proposal submission; our results showed that too many projects (37%) did not think about any of this. Proposals should clearly demonstrate how ethical/political/societal issues will be considered, and should be encouraged to set up specific boards or similar mechanisms to realise their plans – too many projects in our sample (58%) did not implement anything along these lines. Results show that RRI issues were found to arise in the early phases of the project for which the consortia need to be prepared.

Furthermore, the exchange of RRI ideas through a consortium is a very important way of disseminating RRI and should be encouraged and facilitated by appropriate policies. Last but not least, a feedback and learning cycle needs to be established: RRI good practice within consortia should be identified, and partners should be encouraged to carry that good practice into future bids for projects.

## References

Beinart, Dace; McCarthy, Mark. 2011. Civil Society Organisations, social innovation and health research in Europe. In: *European Journal of Public Health* 22/6: 889-893.  
DOI: 10.1093/eurpub/ckr152

- Benington, J. .2010. 'From Public Choice to Public Value'. In: Benington, J. & Moore, M. (eds.) *Public Value. Theory and Practice*, pp. 31-51. London: Palgrave.
- Blok, V. (2014) 'Look who's talking: responsible innovation, the paradox of dialogue and the voice of the other in communication and negotiation processes'. *Journal of Responsible Innovation*, 1/2: 171-190.
- Böschchen, Stefan & Pfersdorf, Simon. 2014. *Model of CSO Participation in research Governance*. CONSIDER Project, Deliverable D3.3. Available at <http://observatory-rri.info/sites/default/files/obs-governance-arrangement/D3.3%20Model%20of%20CSO%20Participation%20in%20Research.pdf>
- De Marchi, V. 2012. 'Environmental innovation and R&D cooperation: Empirical evidence from Spanish manufacturing firms'. *Research Policy*, 41/3: 614-623.
- De Saille, S. 2015. 'Innovating innovation policy: the emergence of Responsible Research and Innovation'. *Journal of Responsible Innovation*, 2/2: 152-168.
- Ekboir, J., & Parellada, G. .2001. 'Continuous innovation processes: public-private interactions and technology policy. *Agricultural research policy in an era of privatisation: experiences from the developing world* (Byerlee D and Echeverría RG, eds.). Wallingford, UK: CAB International, 120-154.
- Elzen, B., Geels, F. W., Leeuwis, C., & van Mierlo, B. 2011. Normative contestation in transitions 'in the making': Animal welfare concerns and system innovation in pig husbandry. *Research Policy*, 40/2: 263-275.
- EC (European Commission), Directorate-General for Research (ed.). 2007a. *Taking European Knowledge Society Seriously. Report of the Expert Group on Science and Governance to the Science, economy and Society Directorate*. Brussels: EUR 22700.
- EC (European Commission). Directorate-General for Research (ed.). 2007b. *Policy Review of Projects in the Area of Social, Economic and Governance aspects of Sustainable Development*. Carried out by Martin O'Connor. In: RTD info, Policy Review Series n°3. Brussels/Luxembourg.
- EC (European Commission). Directorate-General for Research (ed.). 2007c. *Report of the Expert Group on Humanities. Positioning Humanities Research in the 7th Framework Programme*. Brussels/Luxembourg.
- EC (European Commission). Directorate General for Research (ed.). 2007d. Banthien, H.; Bonaccorsi, A.; Clarysse, B.; Havas, A.; Leijten, J.; Menéndez, J.; Reger, G. &

- Romanainen, J. *The Future of Key Research Actors in the European Research Area*. Synthesis Paper. Brussels/Luxembourg.
- EC (European Commission). EC Joint Research Centre – Institute for the Protection and Security of the Citizen (ed.). 2008a. *e-Participation: Promoting dialogue and deliberation between institutions and civil society*. In: JRC Scientific and Technical Reports. Luxembourg.
- EC (European Commission). Directorate-General for Research (ed.). 2008b. *Public Engagement in Science. Report of the Science in Society Session*. Brussels/Luxembourg [Portuguese Presidency Conference, The FUTURE OF SCIENCE and TECHNOLOGY in EUROPE, Lisbon, 8-10 October 2007]
- EC (European Commission). Directorate General for Research (ed.). 2009. *A code of conduct for responsible nanosciences and nanotechnologies research [Commission recommendation] & Responsible nanosciences and nanotechnologies research [Council conclusions]*. Brussels/Luxembourg.
- EC (European Commission). 2010a. *Europe 2020 – public consultation. Overview of responses*. Commission Staff Working Document. Brussels.
- EC (European Commission). Directorate-General for Research and Innovation (ed.). 2010b. *Science, economy and society. Highlights 2009*. In: Socio-economic Sciences and Humanities. Science in Society. Brussels/Luxembourg.
- EC (European Commission). European Economic and Social Committee. The Europe 2020 Steering Committee (ed.). 2011a. *Europe 2020 Strategy. Civil Society Involvement in the National Reform Programmes. Summary report based on contributions from the national Economic and Social Councils and similar organisations in Member States*. Brussels.
- EC (European Commission). Directorate-General for Research and Innovation. 2011b.; von Schomberg, René (eds.). *Towards Responsible Research and Innovation in the Information and Communication Technologies and Security Technologies Fields*. In: Publication series of the Ethics and Gender Unit of DG Research and Innovation. Luxembourg.
- EC (European Commission). EC Joint Research Centre. Institute for Prospective Technological Studies; Centeno, Clara (eds.) Haché, Alexandra. 2011c. *Under the Radar: The Contribution of Civil Society and Third Sector Organisations to*

- elInclusion*. In: JRC Scientific and Technical Reports. Luxembourg. DOI: 10.2791/59558
- EC (European Commission). Directorate General for Research (ed.). 2011d. *Science, economy and society highlights 2010. Socio-economic Science and Humanities. Science in Society*. Brussels/Luxembourg.
- EC (European Commission). Directorate General for Research and Innovation (ed.). 2013a. *Options for Strengthening Responsible Research and Innovation*. Report of the Expert Group on the State of Art in Europe on Responsible Research and Innovation. Brussels/Luxembourg.
- EC (European Commission). Directorate-General for Research and Innovation (ed.). 2013b. *Scientific evidence for policy-making. Research insights from Socio-economic Sciences and Humanities*. Brussels/Luxembourg.
- EC (European Commission) (ed.). 2013c. *Optimising Civil Society Participation in Research*. European Policy Brief. n/a.
- EC (European Commission). Directorate-General for Research and Innovation (ed.). 2014. *The role of philanthropy in the promotion of Responsible Research and Innovation*. Report of the participatory workshop held on 21-22 October 2013. Brussels/Luxembourg.
- Evers, A. 2013. 'The concept of 'civil society': different understandings and their implications for third sector policies'. *Voluntary Sector Review*, 4/2: 149-164.
- Ferretti, Maria Paola; Pavone, Vincenzo. 2009. 'What do civil society organisations expect from participation in science? Lessons from Germany and Spain on the issue of GMOs.' In: *Science and Public Policy* 36/4: 287-299. DOI: 10.3152/030234209X436527
- Fondation Sciences Citoyennes (ed.). 2014. *Why and how to participate in the European Research and Innovation Framework Programme Horizon 2020?. Manual for civil society organizations*. Paris. Available at [https://ec.europa.eu/research/swafs/pdf/pub\\_public\\_engagement/manual\\_H2020\\_NG\\_Os\\_Sept\\_2014.pdf](https://ec.europa.eu/research/swafs/pdf/pub_public_engagement/manual_H2020_NG_Os_Sept_2014.pdf)
- Gall, Éric; Millot, Glen & Neubauer, Claudia. 2009. *Participation of Civil Society Organisations in Research*. STACS. Science, Technology and Civil Society. n/a. Available at <http://communityresearchcanada.ca/res/download.php?id=420.1>

- Geels, F. W. 2014. 'Regime resistance against low-carbon transitions: Introducing politics and power into the multi-level perspective'. *Theory, Culture & Society*, 31/5: 21-40.
- Gross, M., Krohn, W. 2005. 'Society as experiment: sociological foundations for a self-experimental society'. In: *History of the Human Sciences* 18/2: 63-86.
- Hermans, F., Klerkx, L., & Roep, D. 2015. 'Structural conditions for collaboration and learning in innovation networks: using an innovation system performance lens to analyse Agricultural Knowledge Systems'. *The Journal of Agricultural Education and Extension*, 21/1: 35-54.
- Hodson, M., & Marvin, S. 2010. *World cities and climate change: Producing urban ecological security*. McGraw-Hill Education (UK).
- Hopkins, M. M., & Nightingale, P. 2006. 'Strategic risk management using complementary assets: Organizational capabilities and the commercialization of human genetic testing in the UK'. *Research policy*, 35/3: 355-374.
- Hutter, B. M., & O'Mahony, J. 2004. *Business regulation: Reviewing the regulatory potential of civil society organisations* (Vol. 26). Centre for Analysis of Risk and Regulation, London School of Economics and Political Science.
- Krabbenborg, L., & Mulder, H. A. 2015. 'Upstream public engagement in nanotechnology: Constraints and opportunities'. *Science Communication*, 37/4: 452-484.
- Mampuy, R., & Brom, W.A. 2015. 'Governance strategies for responding to alarming studies on the safety of GM crops'. *Journal of Responsible Innovation*, 2,2: 201-219.
- Nugroho, Y. (2011) 'Opening the black box: The adoption of innovations in the voluntary sector—The case of Indonesian civil society organisations'. *Research Policy*, 40/5: 761-777.
- Owen, R., Stilgoe, J., Macnaghten, P., Gorman, M., Fisher, E. & Guston, D. 2013. 'A Framework for Responsible Innovation'. In: Owen, R., Bessant, J. & Heintz, M. (eds.) *Responsible Innovation: Managing the Responsible Emergence of Science and Innovation in Society*, pp. 27-50. John Wiley: Chichester, UK.
- Paraskevopoulou, E. 2012. 'Non-technological regulatory effects: Implications for innovation and innovation policy'. *Research Policy*, 41/6: 1058-1071.
- Parayil, G. 2003. 'Mapping technological trajectories of the Green Revolution and the Gene Revolution from modernization to globalization'. *Research policy*, 32/6: 971-990.



- Penna, C. C., & Geels, F. W. 2015. 'Climate change and the slow reorientation of the American car industry (1979–2012): An application and extension of the Dialectic Issue LifeCycle (DILC) model'. *Research Policy*, 44/5: 1029-1048.
- Randles, S., Laredo, P., Loconto, A., Walhout, B., Walhout, B., & Lindner, R. (2016). Framings and frameworks: six grand narratives of de facto rri. In R. Lindner, S. Kuhlmann, S. Randles, B. Bedsted, G. Gorgoni, E. Griessler, A. Loconto, ... N. Mejlgaard (Eds.), *Navigating Towards Shared Responsibility in Research and Innovation: Approach, Process and Results of the Res-AGorA Project* (pp. 31-36). Fraunhofer ISI.
- Seyfang, G.; Haxeltine, A.; Hargreaves, T. & Longhurst, N. 2010. Energy and communities in transition – Towards a new research agenda on agency and civil society in sustainability transitions. *CSERGE Working Paper EDM 10-13*. Available at <http://hdl.handle.net/10419/48803>
- Späth, P., & Rohrer, H. 2010. 'Energy regions: The transformative power of regional discourses on socio-technical futures'. *Research policy*, 39/4: 449-458.
- Sutcliffe, Hilary. 2011. *A Report on responsible Research and Innovation*. Prepared for the European Commission, DG RTD. MATTER, London. Available at [https://ec.europa.eu/research/science-society/document\\_library/pdf\\_06/rri-report-hilary-sutcliffe\\_en.pdf](https://ec.europa.eu/research/science-society/document_library/pdf_06/rri-report-hilary-sutcliffe_en.pdf)
- Taminiau, Y. 2006. 'Beyond known uncertainties: Interventions at the fuel–engine interface'. *Research Policy*, 35/2: 247-265.
- Vanloqueren, G., & Baret, P. V. 2009. 'How agricultural research systems shape a technological regime that develops genetic engineering but locks out agroecological innovations'. *Research policy*, 38/6: 971-983.
- Van Oudheusden, M., Charlier, N., Roskamp, B., & Delvenne, P. 2015. 'Broadening, deepening, and governing innovation: Flemish technology assessment in historical and socio-political perspective'. *Research Policy*, 44/10: 1877-1886.