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Innovating Innovation Policy: The emergence of 'Responsible Research and Innovation'

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Introduction

In writing their call for a 'new renaissance' for Europe, the European Research Area Board suggested a 'paradigm shift' in which completion of the ERA would be based upon a ‘new social contract’ creating a 'shared responsibility between science, policy and society', to ensure that science promoted ‘socially beneficial action as well as freedom of thought' (EC 2009c). This statement reflects a long shift from the 'republic of science' (Polanyi 1962) model in which science inhabits a neutral space which must not be tainted by political, social and ethical questions, to more recent constructivist models in which science and scientists are considered to be inextricably embedded in the social, economic and political world (Sturgis and Allum 2004), and science and society are simultaneously co-constructed (Jasanoff 2006). Along with this shift in thinking about the social aspects of science, there has also been a policy move away from 'deficit' models which claimed that public resistance is based on ignorance leading to irrational fear, and towards considering the public as having legitimate values-based questions to be asked about scientific research (Felt and Wynne 2007). This movement away from top-down 'govern*ment*' to more reciprocal structures of 'govern*ance*' is reflected across policy discourse in advanced capitalist societies from the late 1990s onward, spurred by both the increasingly technological complexity of contemporary social conflicts, and the need to promote legitimacy for political systems which, although democratic, are visibly asymmetrical in power (Schmitter 2006).

The Lisbon Treaty (2007), which came into force in 2009, brought a legal directive for all EU policy-makers and legislators to 'maintain an open, transparent, and regular dialogue with representative associations and civil society' (art. 8b.2), and tasked the European Commission specifically to 'carry out broad consultations with parties concerned' (art. 8b.3). In terms of science, technology and innovation (STI) policy, the Commission has been gradually increasing funding streams for research on the social impact of new technologies, and the discursive shift from deficit to engagement can also be seen in the renaming of programmes on Science *and* Society to Science *in* Society (Stirling 2006), and in the framing of questions about multi-level governance of emergent fields such as nanotechnology, and what might constitute socially responsible innovation in the face of unknown risk (see, for example, Hellström 2003, EC 2010a, Owen and Goldberg 2010, Grunwald 2012).

Although the details may differ (see Stahl 2012, Owen et al. 2013, von Schomberg 2013), there is a general agreement that *responsible* forms of innovation should be aligned to social needs, be responsive to changes in ethical, social and environmental impacts as a research programme develops, and include the public as well as traditionally defined stakeholders in two-way consultation. This has recently been codified by the European Commission's Directorate-General for Research and Innovation (DG Research) into a policy framework for 'Responsible Research and Innovation' (RRI), which promises to promote innovation in accordance with European social values by involving the public in all stages of the innovation process (EC 2012d).

RRI is now embedded in Horizon 2020, which replaced the Framework Programmes as the instrument for governing allocation of research funding under the Innovation Union flagship in January 2014. However, *responsible for what?* and *to*

whom? are questions which are difficult to operationalise at EU level, particularly in the face of ongoing financial and political instability, and it is possible that the more ambitious aspects of RRI will be diluted, rather than strengthened, by its embedding in the knowledge economy of the ERA. This paper will examine the emergence of RRI as a policy concept in the EU through a critical textual analysis of its formative documents, leading to a discussion of tensions revealed as RRI has made the journey from idea to policy.

Methodology

As RRI is a relatively recent policy object, a scoping study of documents issued by the various institutions of the EU, rather than a traditional literature review, was deemed more useful for revealing the 'extent, range and nature' (Arksey and O'Malley 2005, 21-22) of this newly-defined concept and the part it would play in the ERA. The research discussed below was undertaken between January and September 2013, as the initial phase of a project on 'Publics and the Emergence of Responsible (Research and) Innovation' which forms part of the Leverhulme Trust Research Programme *Making Science Public*. Documents were initially gathered through keyword searches for 'responsible+research+and+innovation' and 'european+research+area' using the EU Bookshop as an online search portal, adding supplementary documents from the Bookshop, the Europa portal, and EUR-Lex as relevant to the discussions contained within these two key areas.[1] A database of 123 mainly Commission-authored or funded documents, as well as legal regulations and

[1] <https://bookshop.europa.eu>. Where documents were retrieved through the Bookshop, catalogue numbers are included in the bibliographic reference to aid in location, as these may differ in layout from other versions available through the Europa and EUR-Lex portals.

Treaties, was created from this process.[2] Of these, 78 (covering the period 2000-2013) discussed the structure and development of the ERA and 13 (from 2011-2013) discussed RRI, although only five of these could be considered formative documents, in the sense of supplying working definitions or concrete recommendations.[3] The documents were then subjected to a textual analysis, with the five formative documents considered as artefacts deployed specifically to imbue the new term with organisational meaning (Yanow 1993). In the following sections, I will first discuss the formation of the ERA amid a changing discourse of innovation and growth, and then the process through which RRI was developed as a policy framework by the European Commission. I will then turn to an exploration of the tensions within RRI, between RRI and the ERA, and between RRI and policies emanating from other institutions within the EU before discussing some issues which could be further addressed.

Part I: Innovation in the context of the ERA

The connection between innovation and economic growth is not new in European policy discourse. The 1995 *Green Paper on Innovation* (COM(95) 688) refers to the pressures being placed on EU firms through competition with multi-national enterprises which could lower production costs through global outsourcing, and with countries which were investing much more heavily in research and development (R&D). In particular, the *Green Paper* focussed on strategies for alleviating the 'European paradox', defined as a weakness in translating the region's strength in published scientific research into 'innovations and competitive advantages'

[2] An update in April 2014 has added a further seven documents to the RRI category, which are not discussed here. The ERA category is no longer being tracked.
[3] This does not include documents expressly identified as the author's own views on RRI, which are considered instead as part of the additional literature.

(*ibid*: 5) which could make use of the single market. It called for policy intervention to 'stimulate the competitiveness and growth of European industry and…promote employment and the quality of life of Europe's citizens' (EC 1997, 4).

Although the refrain is now familiar, at this time the stress was on strengthening Europe's global position through cooperation and knowledge-sharing between member states (MS), rather than by increasing internal competition. This produced a focus on how to put 'research more clearly in the context of innovation' (EC 1999, 32-33) for Framework Programme 5 (FP5, covering the years 1999-2002) and was reflected in its thematic priorities, which included Competitive and Sustained Growth, and three horizontal programmes on using research and innovation to achieve this. Introducing its plans to consolidate the transition to a knowledge-based economy in its communication, *Towards a European Research Area* (COM (2000) 6 final), the Commission claimed that research accounted for '25 to 50% of economic growth' (*ibid*: 5), but noted that Europe was falling behind other parts of the world, particularly in high-tech areas, where there was a brain drain of younger researchers leaving Europe for places which spent more on R&D, such as the US. The creation of a well-funded common knowledge market and better integration of industry with academia, it was argued, would lead to more jobs, thus retaining European talent as well as attracting the best minds from abroad. At the same time multi-country research networks would stimulate the economic development of weaker regions, deemed crucial for deeper integration. To fund this, each MS was to gradually increase research intensity (the percentage of GDP directed towards R&D) to 3%, in addition to increasing EU funding for the Framework Programmes.

The Lisbon European Council (2000, sec. I.12-15, pps 4-5) agreed with the need for an ERA, urging that this be established in a 'flexible, decentralised and non-

bureacratic manner' through voluntary co-operation by MS. Although there is a strong emphasis on the need to stimulate employment, the tone of this document is essentially optimistic, beginning with the statement that the EU was 'experiencing its best macro-economic outlook for a generation' (*ibid:* 2), and was therefore well-placed to increase funding for research to levels which would allow it to compete with the US and Asia. The ERA was also envisioned as a key part of the preparations for the most significant enlargement of the EU, with the accession of eight former Soviet Bloc states and the islands of Cyprus and Malta in 2004. Described as a 'fifth freedom', the ERA would allow the circulation of knowledge in the same manner as goods, capital, services and workers within the single market. Subsequent documents have continued to argue for the ERA's potential for promoting deeper integration through standardisation of higher education courses and degrees; harmonising patent regimes; facilitating the movement of scientific experts and expertise through portability of grants and pensions; and the building of pan-European research infrastructures -- networks of facilities, equipment, services and interlinked projects -- which would be beyond the finances and resources of any individual MS (see COM(2000) 1 , EC 2003, COM(2007) 161 , EC 2008a, 2012c). Indicators were also developed to measure human resources, public and private investment in R&D, scientific and technological productivity (i.e. paper outputs generated), and the impact of R&D on the economy and on employment.[4] These showed that despite the relatively robust external conditions and the new markets provided by the expansion of the EU, the ERA was not delivering significant progress towards its goals. By its mid-term review, the Commission judged the Lisbon strategy to have failed (COM(2005) 24 final), and it was subsequently re-formulated away from long-term

[4] See the series of booklets on *Science, Technology and Innovation in Europe* issued yearly by Eurostat, beginning in 2008, and *She Figures*, which concentrates specifically on women in R&D.

strategies for deepening integration to focus on the 'immediate target' (*ibid*: 4) of jobs and economic growth. Although still proposing a target research intensity of 3%, this was now in the context of a much stronger emphasis on innovation as the 'beating heart' of a new knowledge economy (*ibid*: 4), to be produced through an intensification of internal competition for both research jobs and research funding in FP6. The objective was no longer to make Europe *a* dynamic knowledge economy, but '*the most* dynamic *and competitive* knowledge-based economy *in the world*' by 2010 (*ibid*: 3, emphasis mine). By the time the Lisbon Treaty came into effect in 2009, 'innovation' had become the driver for '*A New Renaissance'* (EC 2009c, : 24) in which the (still incomplete) ERA would become a 'beacon of excellence visible across the world'.

However, research intensity, recorded in the *Green Paper on Innovation* as 2% for the EU-15 in 1993, still stood at the same figure for the EU-28 in 2013. There is also significant variation in research intensity between MS, from over 3% in Finland, Sweden and Denmark, to less than 1% in ten countries, including most of the newest MS.[5] This lack of progress is reflected in *Rationales for the ERA* (EC 2008a, 4), which called for a 'clear purpose which is meaningful to Europe's citizens and political leaders' to create a 'compelling case for a real shift of resources' to complete the ERA. As part of the Ljubljiana Process (CEU 2008), this has included reshaping the priorities of the FP programmes into 'Grand Societal Challenges', so that former 'themes' such as climate change, energy, food, security, transport, health, and aging, have been re-framed as threats to the very survival of our species, which can only be addressed through an intensification of innovation (see, for example, EC 2008a, 2009b, c, 2010b).

[5] Eurostat, Total intramural R&D expenditure (GERD) by sectors of performance, 2004-2013 [rd_e_gerdtot], retrieved 7 April 2015. The exceptions are Slovenia, Czech Republic, Estonia and Hungary, all of which have significantly increased their research budgets since 2004.

This increasingly singular emphasis on 'innovation' as the solution to Europe's economic and social problems has now become an integral part of the Europe 2020 policy structure, in the form of the Innovation Union flagship (COM(2010) 546 final), under which Horizon 2020 became the main instrument for EU-funded research as of January 2014 (COM(2011) 809, 810, 811). The next section will look more closely at how 'Responsible Research and Innovation' (RRI) emerged as part of that process, and the function it is expected to play as a framework for STI policy in the EU.

PART II: Enter RRI

Since the inception of the 'Citizens and governance in a knowledge-based society' theme, which began with FP6 in 2002, there has been a gradual intensification of funding for research on informing, communicating with, and otherwise 'engaging' the public, in order to promote legitimacy for political decision-making about science. The Science and Society (SaS) programme was introduced under this theme, and became the Science *in* Society (SiS) programme in FP7, based upon the aforementioned shift in understanding of how the two are intertwined (see Stirling 2006, Owen, Macnaghten, and Stilgoe 2012 for detailed accounts of this transformation). However, these discussions were not confined to the Commission - a number of countries were similarly seeking ways to lead the field both scientifically, and in ways of gaining public approval before products entered the market. For example, the Royal Society in the UK commissioned a survey from which it concluded that the more aware of nanotechnology the respondent was, the more likely they were to agree it would be beneficial and should be developed (The Royal Society 2004). As argued during the SiS session at the 2007 *Future of Science and Technology in Europe* conference, this strand of research had made it clear that new structures of public engagement were needed in order to discuss crucial questions

about 'the outcomes to which all of this investment and activity is being directed' (EC 2008b). Because it was seen as an enabling technology and therefore crucial to Europe's economic future, research to bring nano-enabled products to market was made a thematic priority in FP6 and FP7, within both scientific and SaS/SiS programmes. This led to the development of a *Code of Conduct for Responsible Nanosciences and Nanotechnologies Research*, which the Commission could recommend as voluntary guidelines for all MS, as part of its Roadmap (EC 2010a) for creating a 'broad consensus' in support of nanotechnology among the public. Much of the discourse which has accompanied the emergence of RRI can be seen in the formative documents leading to the Roadmap, informed by the desire not to repeat the 'failure' of genetically modified organisms (GMOs) through public rejection of nanotechnology and other risky but potentially lucrative emerging fields (see, for example, von Schomberg 2007, Macnaghten, Davies, and Kearnes 2010). *Towards a European Strategy for Nanotechnology* defined this as 'responsible development', a deliberative process based upon the idea that the field could be guided by:

> ethical principles [which] must be respected and, where appropriate, enforced through regulation. These principles are embodied in the European Charter of Fundamental Rights and other European and international documents. (EC 2004, 18)

The term ‘Responsible Research and Innovation’, however, was initially used in a constructive technology assessment workshop on nanotechnology which took place in the Netherlands in 2007 (Robinson 2009). As a policy concept, it does not appear at the level of the Commission until a workshop for invited experts hosted by DG Research on 16-17 May 2011. Arranged in part by Rene von Schomberg, the workshop sought to bring a carefully selected group of research funders, consultants, and academics together with other members of the Commission in a creative attempt

to address the growing tension between 'innovation' as the driver of jobs and economic growth, and 'innovation' as finding socially and environmentally responsible ways to provide for Europe's basic needs. This took place just before the end of the consultation period for the *Green Paper on a Common Strategic Framework* (COM(2011) 811 final), which would eventually become Horizon 2020. It also took place against the backdrop of a severe (and at the time seemingly ever-deepening) crisis in the Eurozone, a rising discourse of austerity as a demonstration of economic responsibility, and the threat of dissolution and mainstreaming of the Science in Society Unit (see Dratwa and Laurent 2013 for a fuller discussion; also Owen, Macnaughten and Stilgoe 2012). The urgency felt by certain members of the Commission to counter this move was reflected in the opening speech to the RRI workshop given by Octavi Quintana, Director in charge of the ERA. Quintana argued that while it was true that Europe needed to overcome the economic crisis, it also needed to 'keep defending these values at the core of society and science' (EC 2011b, 2).

The two-day meeting made use of a number of different mechanisms for brainstorming, consultation, and priority-setting developed under previous participatory engagement projects (see EC 2009c, also Rask, Maciukaite-Zviniene, and Petrauskiene 2012 for some of these). These included Café Conversations, in which an idea is collectively disassembled to examine both overt and hidden assumptions, ritual dissent, council circles, mind-mapping and other visual representations. An informal *Newsletter* (EC 2011b) was subsequently issued, itself an innovative exercise in public engagement for the Commission. Using photographs and a very informal layout with minimal text to draw the reader into the process, the *Newsletter* attempts to make visible the inner workings of an invitation-only high-

level stakeholders meeting. Artefacts in this document, such as the mind-map created for the elements of an RRI framework which could help shape an ERA 'for society, with society, by society' (*ibid:* 22), clearly reflect the difficulties of this process, where concerns such as 'finding a balance between individual and collective needs', 'thinking for the whole of mankind 200 years ahead', 'stewardship' and 'interconnectedness' were outvoted by 'market-uptake and technological progress'. Of particular interest is the fact that 'embedding innovation in society', which appears as the most-voted category in the final list of components for 'A vision for Responsible Research and Innovation in Europe' (*ibid*: 21), does not appear in this form at all on the mind-map which produced the list. There, it is simply 'embedded' and appears to refer to the need to embed the framework of RRI into all aspects of the ERA.

Overall, however, the definitions derived by most of the working groups leaned towards defining 'responsible' as a moral imperative: environmentally protective, answering social needs, demonstrating 'shared European values', and beneficial to the widest range of actors. How these were to be operationalised was more heterogenous, with one working group suggesting a commitment to reflect the results of consultation in subsequent policy, a second suggesting stronger incentives for commercialisation of innovation, and a third considering RRI as a vision of the future, something which should be beyond the market.

The 2011 workshop was followed by a more comprehensive high-level conference, *Science in Dialogue - Towards a European Model for Responsible Research and Innovation*, which took place in Odense, Denmark in April 2012, during the Danish presidency of the EU. The conference suggested that there was also a wider vision for RRI, as a form of two-way science communication which could itself become enshrined as a new European value (scienceindialogue.dk 2012, : 27).

This idea was further developed in the chapter discussing RRI in *Ethical and Regulatory Challenges to Science and Research Policy at the Global Level* (EC 2012a) which suggested that as well as becoming a European value in and of itself, RRI could also produce European exchange value as a policy framework which could be exported globally in the form of an ISO standard, along with European experts in its application.

The results of these discussions were eventually announced to the public in a short informational leaflet, *Responsible Research and Innovation: Europe's ability to respond to societal challenges* (EC 2012d), that promised 'a smarter, greener economy, where our prosperity will come from research and innovation…[which] must respond to the needs and ambitions of society, reflect its values and be responsible.'[6] The leaflet lays out the six 'keys' of RRI: (1) inclusive engagement, (2) a commitment to gender equality, (3) more science education, (4) ethics, defined as shared values reflecting fundamental rights, (5) open access to data, and (6) developing new models of governance.[7] Apart from keys 3 and 5, these in general reflect the goals of the *White Paper on European Governance* (COM(2001) 428 final) which initiated the negotiations which resulted in the Lisbon Treaty, and stated that:

> Legitimacy [of the EU] today depends on involvement and participation. This means that the linear model of dispensing policies from above must be replaced by a virtuous circle, based on feedback, networks and involvement from policy creation to implementation at all levels (EC 2001: 8).

[6] This back-cover blurb was drawn from the speech given to open the Odense Conference, by Maire Geoghegan-Quinn, the Commissioner of DG Research.
[7] In the 2014 update of this leaflet, the 'keys' have become dimensions, and parts of the text have been substantially rewritten. This is particularly true of the key of Engagement, where the emphasis is no longer on European values, but specifically on who gets to engage.

As such, therefore, these 'keys' are not necessarily specific to RRI or even to R&D policy, but are broadly the result of legal changes to the governance of the EU, and to an evolution in the understanding of the rights of citizens to have a say in how they are governed (see also EC 2013a).

By November 2011 the idea of RRI as describing a form of participatory engagement had been incorporated into the key proposal establishing the legal framework for Horizon 2020:

> With the aim of deepening the relationship between science and society and reinforcing public confidence in science, Horizon 2020 should favour an informed engagement of citizens and civil society on research and innovation matters by promoting science education, by making scientific knowledge more accessible, by developing *responsible research and innovation agendas* that meet citizens' and civil society's concerns and expectations and by facilitating their participation in Horizon 2020 activities (COM(2011) 809 final, para 20, emphasis mine).

This statement also appears almost word-for-word in the new regulations proposed for the Euratom programme (COM(2011) 812 final, paras. 11.14, 15 and art. 13(1)), which is governed by its own treaty. However, of the five documents establishing the legal framework of Horizon 2020 it is mentioned only in these two, and only in this manner. Considering the proposals for Horizon 2020, the Competitiveness Council (CEU 2012) did use the term 'responsible research and innovation' several times, both capitalized and not, but again without an explicit definition of what it understood 'responsible' to mean in this context. The European Economic and Social Committee (EESC), which represents civil society organisations at EU level, did not use the term RRI in its opinion on Horizon 2020. However, it did note that while it fully supported the proposal for ongoing bottom-up consultation, the Commission's description of this was 'vague' and lacked 'detailed and precise

indications', particularly of how these would be funded (EESC 2012, pg 9, sec. 3.5.1). The *Science in Society Work Program for 2012* did contain an activity directed at developing a normative model for the governance of RRI, and resulted in the funding of four linked, large-scale, multi-sited projects.[8] Drawing from von Schomberg, this call defined RRI as:

> a transparent, interactive process in which societal actors and innovators become *mutually responsive* to each other with a view on the ethical acceptability, sustainability and societal *desirability* of the innovation process and its marketable products (C(2011) 5023, 7, emphasis mine).

However, The *Science in Society Work Program for 2013* redefined RRI as a process by which:

> societal actors (researchers, citizens, policy makers, businesses, civil society,…) work together during the whole research and innovation process in order to better align the process and the results with the expectations of society (C(2011) 5023, 5).[9]

This document also considers that these models should be aimed at creating 'a favourable environment for investment', and that 'RRI processes constitute by themselves a growing "niche market" that some companies have already started to exploit' (*ibid*: 6), ideas which did not appear in the previous call. In its most recent opinion of *Research and Innovation as Sources of Renewed Growth,* the EESC (2014, Sec 1.3) has, in fact, asked for priority to be placed on the removal of administrative, economic and social obstacles to innovation and has objected to a 'concept of responsible conduct exclusively and explicitly in relation to R&I', on the grounds that all social activities are expected to comply with ethical and legal expectations and

[8] These are GREAT (http://www.great-project.eu/), ResAgora (http://res-agora.eu), PROGRESS (http://www.progressproject.eu/), and Responsibility (http://responsibility-rri.eu/). Two projects funded more recently are RRI Tools (http://rri-tools.eu/) and Responsible Industry (http://www.responsible-industry.eu/), both of which are seeking to develop methods of practical implementation.
[9] This definition was still being used as of the recent consultation for the 2016-17 Work Programme.

therefore research and innovation activities should not be singled out. RRI was also not directly mentioned in the overview of ex ante impact assessments, *The Grand Challenge: The Design and Societal Impact of Horizon 2020*, which tended to interpret 'public engagement' to mean bringing research and innovation 'to the attention of the general public' as part of their 'right to know how their money is invested' (Rechel et al. 2013, 152), rather than as a citizen's right to influence policy and regulatory decisions on STI as members of the society which innovation will produce. This is to some extent also reflected in *Options for Strengthening Responsible Research and Innovation* (EC 2013c, Annex I), the Commission's final high-level document setting out the importance of RRI ahead of the European Parliament's vote on the budget for Horizon 2020. The options are based on a four-fold matrix detailing a disaster scenario, an unachievable utopia, and two plausible policy options, one of which – 'improved business as usual', with added funding for research into RRI itself as well as mainstreaming its implementation into existing programmes – appears to best describe the method chosen for Horizon 2020, in which the SiS programme has now become Science With and For Society (SWaFS).[10]

After a long and difficult negotiation within the European Council, and between the Council of the European Union (hereafter 'the EU Council')[11] and the European Parliament over the Multiannual Financial Framework (MFF) for 2014-2020 (see Huza 2014), the budget for Horizon 2020 was finally agreed in late November 2013 at €78.6b (in current prices),[12] approximately €9b less than requested but still substantially more than FP7, which itself more than doubled the budget from

[10] See <http://ec.europa.eu/research/swafs/index.cfm>.
[11] Not to be confused with the European Council, which is composed of the 28 Heads of State, and sets the political and economic guidelines within which the EU Council must negotiate.
[12] Current prices include 2% for yearly inflation, and are thus higher than constant prices, which are more often used for comparative purposes.

FP6.[13] While this can be seen as a victory by DG Research in using the nascent concept of RRI to convince the EU Council of the importance of adequate funding for research and innovation despite moves to cut the EU budget overall (Dratwa and Laurent 2013), at the same time RRI's deployment through the ERA, which is legally bound to the economic goals of the European Council, raises other problems which may prove more difficult to solve.

To briefly sum, therefore, while the impetus towards creating an RRI framework has its roots in a discussion of a moral responsibility to make the trajectory of R&D socially beneficial as well as environmentally sustainable, particularly with regard to technologies with as-yet-unknown, global risks (as in von Schomberg 2007), pressure from other EU institutions and directives, exacerbated during the Euro crisis, has channeled RRI away from its original goal of creating a mutually responsive society, and more towards the imperative of speeding up innovation to produce immediate economic growth. It is possible that this is largely a result of timing and embeddedness in pre-existing structures which will need to find ways to produce their own reflexive engagement, but it may also signal that there are irreconcilable objectives inherent in the application of 'responsibility' to innovation, which are further complicated by the difficulties of creating mechanisms for truly meaningful bottom-up engagement within a supranational, multi-institutional, multi-cultural structure such as the EU. These points will be further developed in the next section.

[13] FP6 (2003-2006) was budgeted at €19.3b current, while FP7 (2007-2013) received €55.8b (EC 2014). However, Horizon 2020 also incorporates funding from the Competitiveness and Innovation Framework Programme (CIP) and the European Institute of Innovation and Technology (EIT), which formerly had their own budgets.

Part III: Responsible to whom? For what?

The documents discussed above suggest that in general, RRI has been understood as both a process and an outcome (Sutcliffe 2011, 7). However, the aim of improving public involvement in shaping innovation towards technologies which will create social benefit, while simultaneously stimulating the pace of market-driven innovation as a means to restoring economic growth, may also explain some of the tensions presently inherent in RRI as a policy framework. Although Owen *et al*. (2012:752) have referred to an 'emerging zeitgeist' across the European political arena that a new kind of STI policy was needed to safeguard both the environment and the public interest against economic demands, *Options* still characterizes RRI as a process allowing 'stakeholders that are involved in the processes of research and innovation…to obtain relevant knowledge' (*ibid*: 3) so that public resistance can be avoided and market success ensured (see *ibid*: Annex II). In effect, the documents show alternately a research-oriented weighting towards ideas of democratic deliberative processes, ecological stewardship and specific problem-solving (although this has also been critiqued as a technological fix for the problems technology has created), and an innovation-oriented weighting towards 'challenges' as opportunities for creating, expanding and exploiting new markets.

Robinson's 2007 CTA workshop illustrates this tension well. Using future-based scenarios, Robinson found that his participants were reading the concept of RRI in two ways: one with an emphasis on innovation, which meant ensuring that new products made it successfully to the market as a measure of responsible use of public R&D funds; and another with the emphasis on social and environmental responsibility, up to and including halting certain lines of R&D which were deemed to be too risky, even if these might be highly profitable (Robinson 2009, 1231). This

fundamental tension is also demonstrated between RRI as the end-product of several decades of social science and humanities research in the broad areas of science communication, public engagement, technology assessment, and user-led design,[14] and RRI as formulated through the six 'Keys' of the Commission, which must align itself with the political and economic mandate of Lisbon and subsequent European Councils. Additionally, at the most basic level, it appears that 'science' is in general read by policymakers as natural science, technology, engineering and math (or STEM), and 'innovation' as entrepreneurial, which has sometimes made their use in STI policy more opaque, rather than more transparent, particularly for researchers in the humanities. Science Europe, a recently-formed association for organisations which fund and perform research, has recommended that the two activities should be seen as intertwined, but institutionally separate: researchers should not be forced to be entrepreneurs and business should not have access to academic research funds (Science Europe 2015). As the European Science Foundation (ESF) has recently argued, there is also a question of whether 'science' in these policies is understood as an institution or as a practice, along with a tendency to conflate 'society' with 'the public' (Felt et al. 2013). To this I would also add a tendency to conflate both with 'the market', and to assume that successful uptake of a product or service proves that it is socially beneficial.[15]

Second, RRI has mainly been discussed in the context of emergent or unproven technologies such as nanotechnology, synthetic biology and

[14] For good overviews see Stirling (2006), Felt and Wynne (2007) and te Kulve and Rip (2011) more generally, and Stahl (2012), Owen et al. (2013) and von Schomberg (2013) on RRI specifically in this context.

[15] Keurig one-cup coffeemakers are a good illustration of this problem. The product is considered environmentally beneficial because it uses coffee, which is water-intensive to produce, more economically. However, it is now growing controversial because its global popularity means the cups themselves are generating enormous amounts of non-recyclable, non-biodegradable waste (Carpenter 2010, Hamblin 2015).

geoengineering, as a way of understanding and anticipating risk and impact when these cannot yet be accurately predicted. It is unclear whether there is, or indeed even should be, an intent to apply RRI to existing technologies whose long-term risks are still unknown, but which already have a history of worldwide public resistance, such as GMOs. The case of ICT is instructive here; as a platform which enables a constant state of emergence and diffusion of innovation, it has been argued that better enforcement of the normative anchor points of existing EU policy, laws and directives as part of RRI -- for example the application of the fundamental right of privacy enshrined in the TEU to the collection and retention of data – can be used to ensure that as new technologies develop, they do not produce environmental or socially detrimental impact, without having to pass new laws (von Schomberg 2011). This strategy suggests that a normative RRI rooted in existing instruments as demonstrating 'European values' can potentially lend itself to retroactive application if there is the political will to act on society's concerns. While not legally binding, RRI follows the EU tradition of implementing ethical frameworks as soft law in order to allow innovation to proceed (Tallacchini 2015).

However, there is a danger that, as Wilsdon, Wynne, and Stilgoe (2005) have observed, an over-emphasis on public involvement may foster the idea that good upstream engagement can ensure that unwanted developments will simply not happen. There is also an understandable reluctance to interference with already-established technologies which represent significant investment in R&D (and have already developed strong industrial sectors), despite evidence that problems are arising downstream. However, without consideration also being given to the question of establishing when, and by what mechanisms, it might be determined that a line of research should be changed, or even stopped – a seventh key of 'responsive action'

(Owen, Macnaghten, and Stilgoe 2012) – there may be a further erosion of public trust in both science and in the political establishment to safeguard society's collective interests and to respond to legitimate concerns about the pace and trajectory of technological innovation.

On a more positive note, the separation of 'citizens' and 'civil society' in the documents establishing Horizon 2020 suggests that these are understood to represent two different aspects of 'the public'. This may help open up EU-level participatory structures, which are often limited to prominent non-governmental organisations (NGOs), and to the industry and labour-oriented civil society organisations (CSOs) which the EESC already helps represent. RRI must go further than simply allowing one-way input from a wider range of societal actors; as von Schomberg (2013) argues, engagement must be mutually responsive in order to be meaningful.[16] However, this may produce tensions with other directives towards accountability from the policymaker's side of the science-policy-public triangle. For example, an online consultation on the *Green Paper on the European Research Area* (COM(2007) 161) asked ‘stakeholders’ in the ERA (defined as representatives from NGOs, institutions involved in research and research funding, business, and government) how 'the public' (defined as CSOs) should be engaged with scientific research. These stakeholders showed a strong overall preference for sequestered forms of engagement, such as citizens panels or consultative channels designed by the project in question, over wide-scale surveys or direct involvement in decision-making processes (EC 2008b). This sentiment is also echoed in the published report of the *Goverscience Seminar* (EC 2009a), which brought together representatives from a number of EU-funded projects to consider ways of incorporating a wider definition of

[16] See also Kastrinos (2010) on co-ordination with local research policies in the social sciences and humanities, and Mejlgaard et al. (2012) on divergent national levels of experience with public participation.

'stakeholders' into processes of risk governance. The conclusion was that while risk consultation and management could undoubtedly benefit from greater inclusion of NGOs and CSOs, neither the public, nor scientists for that matter, should have direct involvement in the decision-making aspects of risk assessment. This suggests a third axis of tension between responsibility and innovation, one in which 'responsibility' is understood as liability, so that the majority of respondents agreed that the power to define and manage risk had to remain with those who could be held politically accountable for their decisions. By the same token, *Options* appears to uphold a normative assumption that the public need only *feel* included in the decision-making process through greater access to information; they do not actually need to *be* included through real sharing of directive power. There is also a question of whether even the best two-way public consultations can really produce useful knowledge for policymaking if only confined to discussions of technical risk. As Tyfield (2012, 157) argues, seeking to engage the public in consultative exercises where others retain control of the terms of the debate tends to exacerbate distrust and rejection. Citizens tend to be both more precautionary than policymakers (Dryzek et al. 2009) and simultaneously more weighted towards questions of personal, social and environmental impact (Sturgis and Allum 2004), issues which can remain problematic if even a technology could be proven to be completely without risk -- for example the ethics of marketing sterile GM plants in the developing world, where subsistence farmers must find cash to buy fresh seed each season instead of being able to conserve it from last year's crop. The Key of inclusive engagement, therefore, must apply not only to whom, but also to the topics, forms of evidence and expertise, and ways of warranting knowledge-claims which are accepted in such discussions, in order to avoid consultation becoming a matter of 'preparing the product for the market and the

market for the product' (Thorpe and Gregory 2010, 273). Since RRI has ultimately been framed as a solution to the original policy problem posed in the 1995 *Green Paper on Innovation*, namely difficulty in translating publicly-funded research into products and services which can contribute to European economic growth, it cannot fulfil either its protective or economic obligations if the public cannot somehow indicate the nature and levels of its non-technical concerns to scientists, potential investors and policymakers, and feel that these will be taken seriously enough to produce a change of course if needed.

Similarly, the shared norms of RRI are presumed to enshrine 'European values' (see EC 2011, among others) through the *Charter of Fundamental Rights* and the *Treaty on European Union* (2000, 2007 respectively). These documents do offer legal obligations towards the protection of the environment and of the social market economy, however, they are necessarily vague, and -- apart from prohibitions on eugenic selection, reproductive cloning of humans, and the sale of human organs (Charter, Art III) -- may offer no concrete definitions of 'European values' to be weighed against scientific research programmes. Data about what 'European values' might mean to ordinary Europeans are largely produced through broad commissioned surveys, such as the Eurobarometer, which allows citizens to voice an opinion, but is not a structure created for mutually responsive engagement. Another consultative mechanism, Your Voice in Europe, does allow members of the public to file a written response which must be considered by the Commission, but this must be confined to technical issues, and is thus difficult for ordinary people to use (see Badouard 2013). At present, structures such as the new European Citizens' Initiative, which allows anyone to create a petition which must be addressed by the Commission if it receives 1,000,000 signatures (EC 2012b), or changes to the European Parliament itself, may

provide some avenue for the public to make their concerns known, but these cannot support the collective re-imagining of science and social relations which RRI envisions. To do this, new consultative architectures will need to be developed, some of which may already be underway in projects recently funded. At the moment, however, there are serious and largely unaddressed questions about the knowledge politics embedded in deliberation and of deliberation as a methodology for producing the mutually responsive innovation society that RRI ideally envisions (van Oudheusden 2014), particularly when the real decision-making power lies with officials who must stand for re-election within different cultural and political systems.

The recent Eurobarometer on RRI showed that 35% of the European public feel that scientists definitely try to behave responsibly towards society with reference to STI, whereas only 10% thought that government definitely did, and 16% thought they definitely did not (EC 2013d). These figures suggest that if there is a crisis of legitimacy, it appears to be more political than scientific. They also suggest that if it is to truly incorporate social benefits, risks and impacts, RRI would have to be applied to the consultative processes of agencies that regulate the end-products of innovation, such as the European Food Standards Agency (EFSA), which at present require adherence to very strict standards, allowing only technical language discussing only technical risk (see, for example, Robinson et al. 2013, Hartley and Millar 2014).

In terms of other policies, the ethical engagement demanded by RRI may also find itself in direct conflict with the ERA and with Innovation Union (COM(2010) 546 final), as both advocate less regulation in order to allow greater risk-taking in research and to bring innovations more quickly to the market (EC 2011a, 2013b). This further complicates the tensions between 'responsible' as liable and accountable, 'responsible' as a form of moral action best deployed through processes of mutual

learning and deliberation, and 'responsible' as ensuring that public money allocated towards research does eventually create products and services which fill that society's needs, rather than merely creating new opportunities for purchase.

Innovation Union also underscores fundamental assumptions about not only the economic function of innovation, but about GDP as a meaningful indicator of 'European prosperity'. Despite statements supporting sustainability and the fulfilment of social needs, Europe 2020 as a whole is focussed on increasing GDP through competition, flexibility and economies of scale (COM(2010) 2020 final), but does not seriously address questions about the environmental and social impact of a 3% overall increase in production and consumption across the EU (van den Hove et al. 2012). This leaves 'Responsible Research and Innovation' in danger of repeating the experience of 'Sustainable Development', which rapidly transformed into a 'green' or 'eco-friendly' market sector, creating new products and some better corporate practices, but without substantially changing the patterns of over-consumption it was originally devised to counter (Hume 2010). Moreover, sixty years of perpetual growth in developed nations has not continued to increase overall happiness, health, or feelings of security; but rather has led to hyper-competition, casualisation of labour and rising levels of income inequality (Stiglitz, Sen, and Fitoussi 2009, Hatgioannides and Karanassou 2011). This may mean that there is, in fact, no correlation between growth as measured by GDP and fulfilling Europeans' social needs and goals. The question of what kind of technological society we wish to create is one that will also need a mutually responsive political economy in which RRI, as a critical as well as enabling process, is able to flourish.

Concluding thoughts

RRI was meant to be part of a New European Renaissance enacted through the ERA, a 'paradigm shift in how we think, live and interact together, as well as a paradigm shift in what the role and place of science should be' (EC 2009c). Despite the considerable success of DG Research in resisting the decimation of its budget and function through the promotion of RRI as an essential component of the ERA and of Innovation Union (including its enshrinement in what is now a programme of research on *Science with and for Society*[17]), the translation of RRI from academic theory to innovative European policy framework produces several tensions which will need to be addressed in order for RRI to become truly responsible to the needs, ambitions, and values of European society.

The first, and most obvious, tension has been a lack of official acknowledgement of the possibility that the ongoing, bottom-up engagement which is RRI's ideal may reveal that it is necessary to change or even halt a trajectory of research, or discuss how RRI might be applied to existing technologies which have already incited widespread public resistance, in order to determine whether they should continue to be developed with public funds. Moral, ethical and social questions are still often excluded from consultation structures, and deficit models which suggest that resistance to technology is merely based in a lack of 'correct' information have so far proven very difficult to dislodge. There are also presently no structures in place which allow meaningful exchange about STI policy between policymakers and citizens-at-large. Insofar as can be seen as of this writing, the moral underpinning of the RRI framework is likely to continue to struggle under the weight of political determination to return to pre-crisis levels of economic growth. The language of

[17] http://ec.europa.eu/programmes/horizon2020/en/h2020-section/science-and-society

Innovation Union shifts public trust from an aspect of creating scientific legitimacy to a pre-condition for attracting venture capital and ensuring smooth take-up of innovation, and casts scientific research as ultimately purposeful only if aimed towards bringing new products to the market. Rather than supporting RRI's capacity for innovating innovation policy, this may limit RRI's ability to fulfill its potential for reconfiguring 'responsible' as protective, ethical, and socially desirable, rather than merely liable. This will mean that instead of creating legitimacy for a European Union whose moves toward deeper integration are strengthened by greater citizen involvement in both political and scientific governance, there is a risk that RRI will remain a vague set of hopeful 'Keys' which must be incorporated into funding proposals, but do not significantly influence the norms, discourses and functions of other institutions in the EU, including those involved in regulating the end products of scientific research. Thus, although RRI has at times been presented as a way of protecting society and the environment from instrumental economic demands, without a concurrent paradigm shift in the way European politicians think about science and social relations, and about growth economics and the purpose of innovation, its deeper potential may become lost within policies which are designed to mould a knowledge-based economy in the image of a production-based single market..

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