EUROPEAN SCIENCE FOUNDATION

50 **Science Policy Briefing** • June 2013

Science in Society: caring for our futures in turbulent times

Contents

Foreword

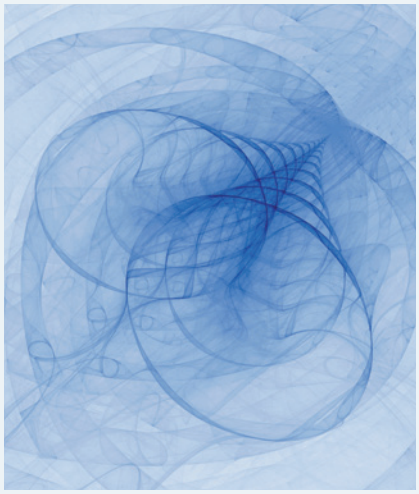
It is not easy today to capture the relationship between science and society. The days when modern science enjoyed a special status in Western societies are behind us. There was a time where a 'social contract' successfully ring-fenced the autonomy of the scientific enterprise against any social scrutiny, on the promise of scientific research being beneficial for the public good in the long run. Over the last decades this social contract has often been revisited, particularly as all public expenditure has been fiercely scrutinised.

Now is really the time to rethink the relationship between science and society in its multiple manifestations; from 'Science in Society' with capital letters – the common currency in science policy circles – to the more confined and mundane spaces where science and society become intertwined. The meaning of 'science' and 'society' can be perceived in different ways, and it is these differences that are important when discussing science and society issues.

This need was effectively articulated in the *EUROHORCs and ESF Vision on a Globally Competitive ERA and their Road Map for Actions* published in July 2009. The very first action puts the emphasis on the need to develop strategies to promote a closer relationship between science and the rest of society.

In order to implement this action, ESF established a Member Organisation Forum on 'Science in Society Relationships' in early 2010. This MO Forum, which published its conclusions in July 2012,[1] offered a useful platform for ESF Member Organisations to exchange information on practices and policy instruments under the 'Science in Society' rubric.

This Science Policy Briefing complements that exercise; it offers a tool by which to reflect on the multiple ways in which science interacts with society. These include traditional debates around the public and the natural sciences and applied technologies, but also other areas of debate. The publication is timely given the sense of crisis that is pervasive in Europe and the USA, and the consequences of this on science and technology governance. Science and society issues are relevant to the new management of our universities, to the creation of the European Research Area and to efforts to position Europe as an area for responsible research and innovation under the Horizon 2020 programme of the European Union. As this includes consideration of the humanities and the social sciences[2] – which go beyond the narrow definitions of 'science' – it has essential messages for all scientific domains as well as between domains.



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It was within this context of change that the Standing Committee for the Social Sciences (SCSS) decided to produce this Science Policy Briefing. We hope that the recommendations at the end of the report will trigger the thoughts and discussions we consider requisite to enable such a programme of change. It is now published by the successor body to the SCSS, the ESF Scientific Review Group for the Social Sciences, with endorsement from the Scientific Review Group for the Humanities and the Scientific Review Group for Life, Earth and Environmental Sciences.

Science Policy advice on matters such as these will now be undertaken by Science Europe (www.scienceeurope.org), where further discussion is anticipated under the Working Group 'Science in Society'.

Professor Sir Roderick Floud
Chair of the Scientific Review Group for the Social Sciences

Professor Milena Žic Fuchs
Chair of the Scientific Review Group for the Humanities

Professor Reinhart Ceulemans
Chair of the Scientific Review Group for Life, Earth and Environmental Sciences

Mr Martin Hynes
ESF Chief Executive

1. See http://www.esf.org/publications/member-organisation-fora.html

2. See SCSS Science Position Paper *Vital Questions* (2009) at http://www.esf.org/publications/social-sciences.html
See also the Science Europe Position Statement *Embedding Social Sciences and Humanities in the Horizon 2020 Societal Challenges* (2013) at http://www.scienceeurope.org/downloads

Executive Summary

Issues of 'science in society' are not in themselves new. However, this report is written at a time of **two novel, closely related, challenges**. First, science and technology are increasingly governed at multiple sites, by diverse actors and in disparate ways. Second, the sense of austerity and crisis across Europe has important consequences for the governance of science and technology. This all happens at a time when innovation is being promoted more vigorously than ever as a way out of crisis and as a foundation for future prosperity.

As this report argues, these two challenges raise significant implications for science-society relations. They create both threats and opportunities as important tensions in socio-scientific relations are thrown into sharp relief. And they necessitate novel ways of attending to science-society questions in order to allow for a properly balanced co-evolution between science and society.

This report starts by drawing some significant lessons from previous 'science and technology studies' (STS) scholarship. It also summarises the most important shifts in EU policy discourse related to science-society issues. From **several decades of STS research** we have (1) come to understand science and society as being in continuous co-evolution – a co-evolution which, however, demands constant attention in terms of governance and care. (2) A broad body of research addressing the challenges and limits related to the democratic governance of science and technology (or what is known as 'public engagement with science') has taught us that 'science' and 'society' are by no means clearly delimited or predefined entities. They are fluid and take shape in heterogeneous, context-specific forms. Engagement and governance therefore represent locations (or spaces) where values and norms and thus power relations are negotiated. But also (3) the innovation process itself, which is at the heart of re-imagining Europe, requires closer scrutiny and a broader understanding. Here, as already mentioned, there are clear indications that the governance of science and innovation is taking place at multiple and inter-related sites, involving a broad set of actors with different interests, values, expectations and cultural backgrounds. Yet the structures which have been established to support and guide innovations often rely on quite narrow sets of indicators which do not adequately reflect the complexities of innovation environments. This leads us to (4) address a central issue present across many sites: the discrepancy between broader value systems employed by societal actors to assess science as a public good and the often narrow evaluation criteria used in research, innovation and education policy. It is these narrow interests and visions – rather than the broader perspectives and values – that are currently most strongly shaping our future.

When it comes to **European policy on science-society issues**, this report points to a series of important discursive and programmatic shifts that have taken shape especially over the past two decades. Starting from a rather classical 'Public Understanding of Science' approach, we observe a shift in the notion of 'understanding' which was broadened out from concepts of 'perceptions and attitudes', to thinking in terms of 'dialogue, participation and governance', and finally to an even stronger emphasis on the integrative character of science and society, as expressed in the move from 'science *and* society' to 'science *in* society'. The most recent shift towards 'responsible research and innovation' further expands the realm of science-in-society concerns, yet so far has remained rather unspecified. We stress that these successive shifts cannot be understood as a linear process gradually moving towards greater societal integration. Much more – using the metaphor of a stratigraphy of science-society policies – we argue that it is a sedimentation process where new layers are added while older ones always remain present. But once the research and innovation system comes under pressure, frictions between the layers become more apparent and some of the previous layers may gain prominence once more. This point is especially relevant to the treatment of science-in-society issues amidst the current rhetoric of crisis and austerity.

Before considering the three major areas of tension identified in this report, we invite the reader to consider carefully **the very meaning of** the notions **'science' and 'society' as articulated in many programmes, activities and policy discourses**. Is science understood as 'an institution producing objective/truthful knowledge' or is science 'a social activity in context'? In the former sense, science itself is rarely questioned and the primary concern is making science better appreciated whilst supporting scientific knowledge generation and expertise. The latter sense addresses science as an activity, a practice of seeing and making the world, of conceptualising problems which in one way or another are shaped by or subsequently shaping society. The same reflexive questioning holds for society: Is society perceived as a 'coherent and stable entity' – often expressed when reference is made to 'the public'– or is society acknowledged as always being in continuous transformation manifesting itself in complex issue- and context-specific ways? These differences matter, we argue, as they frame how

science and society issues should and can be addressed within given framework conditions.

As the foundation to the changes described, we identify **three larger areas of tension** situated at different levels and gaining visibility in different settings.

We start (1) by drawing attention to a **major re-ordering in science-society relations**. To this end we point to the fact that the majority of policy measures tend to conceptualise research and innovation and their relation to society in terms of governance by management and control, while – from the perspective of this report – research and innovation are better understood as deeply intertwined with broader societal developments. This strong idea of management and control is expressed in the ways in which knowledge generation environments are organised along new public management logics. Here, futures become instrumentally imagined, society is often conceptualised in narrow terms of formal participation, and diverse values receive insufficient space.

Closely related to these broader governance issues we then (2) look more closely at some of the **changing conditions concerning research and innovation**, predominantly focusing on academic environments. We explicitly point out the tension between society valuing science as public good, and the quite narrow indicator-driven evaluations sometimes employed in research institutions. Likewise, we note the potential tension between accountability as a series of formalised procedures, and responsibility as a process of care for the development of science and society. We also note current moves to separate 'research excellence' from 'societal relevance', and also the challenges for individual researchers building their careers in circumstances which place little or no value on societal engagement.

Within our next area of tensions (3) we reflect on the **explicit practices of addressing science & society issues**. While policy makers frequently stress the need to undertake 'dialogue' to address societal concerns, we simultaneously observe efforts to keep control over the outcomes of such engagements between science and society: in particular, by insisting upon the speed with which innovation has to happen and by favouring specific forms of science-society interactions. Further, the lack of time which can be devoted to society-related activities within research is identified as problematic. And even if the number of explicit science-society activities has risen over the last years, we express our concern that these have become highly 'ritualised', i.e., performed 'by the book' and thus not sufficiently reflecting the differences across European contexts. This is linked to a quite narrow understanding of science as an 'institution producing objective/truthful knowledge' and society as a 'coherent and stable entity', at best differentiated along age or social groups.

Finally, a series of **recommendations** are presented which point to possibilities for **further research, invite re-consideration** of relationships between contemporary research and societal concerns, and suggest **possible policy measures**. These recommendations do not come in the familiar guise, stressing clear and specific actions. They much more take the form of issues and framings to be considered when policy is being developed and implemented in different local contexts, in different institutions, in different contexts and in addressing different issues. This report advocates a shift from a logic of choice, based on the assumption that there are rather clear-cut options to choose from, to an approach that acknowledges the **processual** and often messy ways in which contemporary science and society co-evolve. Accordingly, **we argue for a logic of care** which needs to **consider the contextuality, the complexity and the continuous development of science-society issues.**

Our recommendations touch upon five broad areas:

1. Linking excellence to relevance and responsibility

At a time when the policy discourse strongly embraces excellence as one, if not *the* guiding principle, careful consideration is needed as to how this commitment relates to questions of societal relevance and responsibility. While caring for quality in research is definitely a central issue, we simultaneously urge:

- opening up the notions of relevance beyond economic criteria and of excellence beyond classical research indicators, thus also creating the necessary conditions for responsible research;
- better research-based understanding of how excellence and societal relevance relate to each other;
- explicitly integrating science-society issues into the programmes and institutional settings dedicated to research excellence.

2. 'Science-society activities' – integration and separation from research

With regard to Horizon 2020 as well as national research programmes, the question of whether and how science-society activities/research pro-

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jects are integrated or separated from the research they are meant to accompany (or reflect upon) has been raised anew. In this context we suggest that institutions:

- do not pose this question in the form of an either/or, but search for a balance between these two approaches since they serve different purposes: including analysis of broader issues at stake beyond the borders of project(line)s, capacity-building in the community of researchers, and conducting concrete engagement activities;
- avoid what we call the 'ritualisation trap', i.e., delegating reflexivity solely to the social sciences and humanities, to perform it 'by the book' – following standardised models – or to limit it to specific moments, mostly towards the end of projects;
- reflect (and demand reflection upon) science-society issues explicitly in the set-up and pursuit of programmes and projects.

3. Plurality matters

It is widely acknowledged that contemporary societies have become more diverse and that transnational mobility will further increase this. Aiming to make this plurality matter in a positive way and turning it into a unique opportunity for Europe, our recommendations stress the need to:

- explicitly acknowledge European diversity in histories, values and traditions, as well as in different anticipation practices and ways of imagining sociotechnical futures. This demands both in-depth comparative research and closer consideration of diversity in policy making;
- address science-society issues in ways adapted to the concrete local settings; learning from each other not so much in terms of transferring 'best practices' as in carefully situating and re-locating experiences across cultural contexts;
- give space to a variety of understandings of progress and futures, thus opening up a variety of pathways;
- broaden the notion of innovation to the social sciences, humanities and arts and acknowledge a wider range of knowledge available in different sectors of society.

4. Expanding and creating new spaces for science-society interactions

While science-society issues have been under consideration for some time and a broad range of actions established, it seems important to generate new ideas in this area. This requires:

- critical reflection on the ways in which notions of 'science' and 'society' are implied or made explicit in diverse activities; it seems essential to move away from a narrow understanding of science and society issues to activities that portray more open and flexible understanding;
- more attention to the spaces organised bottom-up where science and society issues are negotiated in different ways and multiple alternative practices of engagement developed; this includes supporting and acknowledging the activities of researchers in engaging with these practices and creating such alternative spaces;
- the courage to abandon the idea of controlling science-society relations and embark instead on the venture of exploring and engaging with those relations in creative ways.

5. Making time-space for reflexive work

We end this report with a call for the active creation of more time and space for reflexive work within research. Accordingly, we stress the need to:

- develop visible incentive structures in order to make it possible for researchers to engage in these activities without damaging their career opportunities;
- re-connect broader societal values with approaches to evaluating research and innovation;
- do research to create a better understanding of the reflexive work happening in different fields, institutions, cultural contexts;
- transform science-society activities into an inspirational space which may help unleash previously neglected creative energies encapsulated in research and innovation – thus also contributing to a thriving culture of scientific research and knowledge-based innovation in a society appreciative of their beneficial outcomes.

1. Introduction – Unfolding the Issues

Discussions – and actions – concerning the need to better integrate science and society have been around for several decades. Ample evidence can be found in EU policy debates and in member states, in both governmental and industry circles, and certainly in academia. However, and while the issues themselves may be relatively consistent, there are considerable variations within and between countries due to contrasting histories and differing political cultures and cycles. We thus observe a remarkable national and international diversification and also proliferation of activities around science-society issues. New forms of governance of and through research have been put in place in many national and supra-national settings. With them, new demands have been formulated, on the one hand, towards knowledge producers and societal actors and, on the other, towards a stronger interaction between research and innovation. Forms and formats have multiplied in the effort to address and engage with diverse sectors of society. Research programmes dealing with ethical, legal and social aspects (ELSA) and 'responsible research and innovation' have been put in place in many European countries (EC 2012). Special efforts have been made to reflect on new research areas judged as having high potential to impact contemporary societies (e.g., life sciences, nanotechnology, synthetic biology, etc.). Finally, as a means of reflecting upon what has so far been realised and plotting a course for the challenges ahead, a number of working groups and advisory panels have been established at the European level and also within various nations (e.g., CEC 2006; Felt, Wynne et al. 2007; Marcus, Siune et al. 2009; METRIS 2009; ESF 2012).

Taking all this together, one might consider the addressing of science-society concerns to be a success story. Given the density of reforms and activities, it seems the issue has been sufficiently taken up by policy makers. The questions might then be reasonably asked: Why is it necessary to write yet another report tackling 'science in society' issues? What makes it so crucial to reassess the situation, pose critical questions and reconsider the challenges that lie ahead – both in research and policy making – concerning the integration of science and society? **This report argues that now is exactly the time to raise these issues both as the governance of science and technology becomes even more complex and as a sense of crisis lingers over many societies (certainly in Europe and the United States).** We do not claim to answer all the questions we raise. Instead our aim is to open up the discussion at a time when there are strong tendencies to close it down – as, for example, the drive towards knowledge-based innovation risks pushing aside larger discussions over the form and direction of sociotechnical change (e.g., Stirling 2010a).

1.1 Science-society relations: a concern under changing boundary conditions

Issues of 'science in society' are not then new – and we are certainly not the first to raise them. However, and as has just been noted, this report is written at a time of two closely-related challenges. First, science and technology are now governed at an increasing number of sites, involving ever more diverse sets of actors in more disparate ways. This leads to complex and new forms of distribution of power and constant struggle over the directions to take. These arrangements are neither stable nor is it always clear how the governance efforts relate to each other. Meanwhile, a second change is occurring. A strong sense of crisis and austerity has seized Europe – albeit to a varying degree and with varying responses – triggering quite important tensions with regard to the governance of science and technology. To offer but one example, this is spelled out quite explicitly in the executive summary of the *Europe 2020 Flagship Initiative*: "At a time of public budget constraints, major demographic changes and increasing global competition, Europe's competitiveness, our capacity to create millions of new jobs to replace those lost in the crisis and, overall, our future standard of living depends on our ability to drive innovation in products, services, business and social processes and models." (SEC 2010: 2)

Let us consider these two challenges in turn.

With the creation of the European Research Area – and even more so with recent efforts to position Europe as an innovation space and the accompanying changes in the governance bodies and funding structures (e.g., the creation of the European Research Council) – it seems essential to address the tensions arising between Europeanisation dynamics, on the one hand, and complex and highly differentiated national and regional developments, on the other. While nation states and their sub-entities have their own traditions and rationales in terms of governing science and technology, these require some coordination at the European level, which in turn has to find accommodation with global developments. Thus we need to better understand how regimes for establishing value or legitimacy work in different

societal contexts, how the design of such valuation systems matters and how the obvious plurality is dealt with in the context of science-society issues (e.g., Boltanski and Thévenot 2006; Jasanoff 2005). This is of particular importance as demographic changes and a growing mobility increase the fluidity of value structures in environments often assumed to be homogeneous and stable. Furthermore, we are living in a multi-polar world in which there is no longer one dominant leader, but rather multiple regions and correspondingly diverse visions in play. This is not only an issue of governance on different levels. In addition, the sites where science-society issues are negotiated have multiplied, new spaces of expression, participation and deliberation have emerged and new societal groups formed around technoscientific issues.

All this means that, when it comes to governing science and technology, the balance between different players, different sites and levels is under constant renegotiation. Thus, it is not only a question of defining local models of governance but also of reflecting upon how they relate to processes of choice and decision making at other levels. This implies, in other words, confronting the challenges of multi-level and multi-sited governance. Debates around issues like nuclear energy, carbon emissions, genetically manipulated organisms or stem cell research (to which some member states show more opposition than others) and on economic and social issues, such as financial regulation or higher education systems, are excellent examples of such multi-level and multi-sited governance challenges.

While these governance issues have been a constant concern over the past decades, the discourse of crisis and the accompanying measures, even though they come with rather differing degrees and on very different levels when we move across sites and countries, have both created new tensions and reinforced old ones. Very importantly, when using the term 'crisis,' we do not understand this as a monolithic, well de-limited entity; neither do we want to reduce it to the often-discussed financial crisis. Much rather we think that we are confronted with a patchwork, a mosaic of very different tensions and pressures – partly expressed in terms of crisis, partly not – particularly relevant for relations between science and society. This we will spell out in greater detail in the third section of this report.

Bringing these points together, the changes we have briefly described lead to early signs of a double move:

- The crisis discourse has been mobilised to push a strong innovation agenda. Innovation is thereby presented as the remedy for crisis (ERAB 2012). But the innovations in question are still conceived overwhelmingly in technological, rather than in organisational or social, terms – even though the notion of 'social innovation' has gained some prominence (Seyfang and Smith 2007; SEC 2010). And their fundamental orientations and directions are not opened for discussion, but remain self-evident and predetermined, with attention focused instead on the detailed modalities of implementation. As a consequence, exceptional expectations are raised concerning the possible roles for science and technology. A new agenda unfolds concerning 'how?' science and technology should be fostered – and 'how fast?'. But relatively little effort is expended on 'why?', 'in which ways?' and 'says who?' (Stirling 2010a). This discourse resonates strongly with the 'picking winners' rhetoric deployed in the 1980s, which was similarly associated with a strong selling of 'science as solution' (Nuffield 2012). The authors of this report are certainly not opposed to innovation, nor do they underestimate the importance of science and technology for contemporary societies. In advocating policy change, that would be an oxymoron. The questions we raise are instead about 'which innovation?' and 'for whom?' (e.g., Leach, Scoones and Stirling 2010; Felt 2013). In this, we wish to point to the danger of (explicitly or tacitly) closing down discussions which might put in question the indicated goals to be attained or suggest that innovation has a major social component.
- The austerity discourse and the pressures for rapid innovation also raise the potential for preoccupations with research and innovation activities to sideline closer attention to wider science-society considerations – even though social innovation is regularly highlighted as an important contributor to successful development (Gershuny 1983). This is often quite explicit in the form of concerns that too much societal reflection might slow down development and therefore prove more of a hindrance than a positive development. This move carries the danger of transforming science-society concerns into a luxury which can only be addressed once everything is back 'on track'. In moments of crisis, there is a tendency to move away from more experimental ways of thinking about science and society and towards more traditional, culturally entrenched and under-questioned forms, such as classical 'science communication' activities and opinion research.

Going further, we should be aware that both science itself and the contemporary societies in which it

is embedded have been experiencing a phase of unusually rapid change. This was already so, well before we entered what has now come to be labelled as 'the crisis'. In science, we have been witnessing (for example) the introduction of a 'new public management' logic hand in hand with a rising 'excellence' discourse combined with a rather unclear idea of the 'social impact' to be achieved through research. This changing context puts unparalleled pressures on the academic career structure with, for example, global competition and job mobility opening up national systems both to new opportunities but also increased uncertainties over the focus and purpose of the university. In this situation, calls for increased public dialogue around science and technology can easily come into sharp tension with the extending discourse of A-journals, citations and career-building (Molas-Gallart and Salter 2002). For society, issues of mobility of people or changing demographics have been around for a while as key challenges. They were important aspects when formulating demands towards science and technology, but also highlighted specific values to be taken into account when pushing innovation. These are but a few hints towards the changing landscape of science and society. They call – as we will argue – for continued thorough reflection and care, beyond this moment of crisis.

To continue outlining the complex and partly contradictory moves we consider in this report, we should point to the repeated emphasis by the European Commission on the importance of a stable and supportive relation between science and society, while at the same time the EC Directorate explicitly devoted to 'Science and Society' has first been relabelled 'Science, Economy, Society' and then dissolved. This raises the question of whether such moves do not create the danger of losing track of essential (research) questions and policy challenges in this area. While there is the claim that science-society issues will now be mainstreamed into all research sectors, there is reasonable concern that broader issues might get lost from sight (CEC 2006). This opens the important question as to whether or not science-society activities should be a separate field or integrated into research activities, a point we will address in more detail.

Activities concerned with science-society relations have had a remarkable history of expansion and have been accompanied by significant policy and academic reflection. Yet, this should not make us forget that they remain a fragile construct and are at the moment under threat of being sidelined or framed in a way giving little space to opening up issues and to broader societal participation in shaping the direction of innovation. The new situation and the expectations that come along with it (1) carry the danger of marginalising some of these acknowledged concerns and thus (2) demand our attention in continuing to develop existing interaction spaces and to create new ones in reaction to the changed situation. In that sense – to state the challenge briefly – reflections of the kind offered in this report are essential to the necessary re-thinking of what 'addressing science-society issues' might mean under changing conditions.

1.2 Broadening the meaning of science-society relations

This report argues strongly against presenting science-society activities as an add-on to the core activities of research and innovation. When looking at public discourses or policy documents, 'science in society' is still quite frequently understood in terms of communicating science and technology to wider society. In particular, when addressing the younger generation it is often about convincing them to engage in science- and technology-related careers. While this is essential, it does not suffice. Much rather, we argue that the rhetoric of crisis creates an environment in which science-society relations are challenged. Science communication should not mainly aim at persuading citizens and in particular young people to embrace science and technology in a rather unquestioned manner, but rather support them in becoming reflexive members of contemporary knowledge societies through caring for broader science-society issues. Thus, this is actually an opportunity to open new pathways of innovation which show a much deeper reflection and integration of societal needs and changes. In that sense also, we see the current sense of crisis as both a threat and an opportunity to address some fundamental issues.

We therefore wish deliberately to broaden the notion of 'science in society' and go beyond the kinds of understanding typically displayed in current policy discourses. Our aim is not limited to calling for intensified communication between science and society. And it is not so much about creating an innovation-friendly climate at any price. Nor are we attempting simply to add another 'tool' to the box for 'repairing' supposedly fragile relations between science and society.

Rather, we invite readers to think of science-society relations in more comprehensive ways: in terms of spaces and processes which need to be opened up and cared for; spaces and processes which allow 'responsible research and innovation' to become more than a programmatic

slogan; spaces and processes which allow for collective experimentation and careful reflection alongside and within research and innovation (Owen, Heintz and Bessant, 2013). The challenge here is about allowing greater and more explicit access by science-society concerns into the science and innovation systems: into research workplaces, knowledge and innovation creation practices, and career considerations. In this sense, our aim is to build greater acknowledgement of the multiplicity of simultaneous engagements between science and society on different levels, in different settings and involving different actors. Crucially, these engagements between science and society are neither exclusively invited from above, nor do they all follow one of the recognised forms and formats.

This also calls for embracing a broader understanding of science, including technological development as well as broader innovation activities. In today's research environments sharp distinctions between science, technology and innovation no longer adequately address the complexity of knowledge generating systems. These need to be seen rather as inseparably intertwined.

Our vision is one of a plurality of 'science in society' dynamics which together serve to foster greater care for the patchwork of activities and contexts which shape the directions for knowledge production and innovation alike. Our ambition in this report is both to encourage and contribute to this discussion and in that way to channel a range of issues which are already being raised across national and international systems for the governance of science and technology. The authors come from different nations and different backgrounds. Our aim is not to lecture but to draw greater attention to the challenges of caring for our future (or, as we prefer given the range of possibilities, our futures) in turbulent times.

The following report will proceed in three steps. It will start in section 2 by drawing some significant lessons from previous 'science and technology studies' (STS) work and offer a short analysis of major shifts in European policy discourse relating to science-society issues. Section 3 then explores a number of tendencies and tensions which together present possible re-orderings of both science and society. These include a series of factors which threaten to narrow our imagining of socio-technical futures, the changing conditions of research (including scientific career structures), and the possible role of social science and the humanities in addressing issues of science in society. Finally, in section 4 a series of recommendations are presented, which point to possibilities for further research, invite reconsiderations of relationships between contemporary research and societal concerns, and suggest possible policy measures.

2. The Context of this Report

2.1 Important lessons learned

What have we learned from several decades of research about 'science-society interactions'?

First, we want to underline that the contemporary intertwining of science and society is not fundamentally new. Research cultures and practices have always co-evolved with society. While this happens in many often barely visible ways, these intertwinings of science and society become visible at moments when recontextualisation happens, i.e. when the place and role of science and innovation in societal development are questioned, when different forms of knowledge and values are admitted to the knowledge production process, when technoscientific issues gain societal visibility or when more space is claimed by science and technology in making societal choices (e.g., Jasanoff 2004, Nowotny, Scott and Gibbons 2001). In such moments the importance of a continuous rethinking and care of the multiple relations between science and society becomes tangible as well as the need to cultivate, maintain and protect spaces where science and society can interact and engage with each other. A harmonious co-evolution of science and society thus demands continuous work in order to assure not only that some kind of integration of societal concerns and expectations into research happens, but to be able to decide how it is happening.

Second, STS has criticised and pointed to the power of the so-called 'deficit model' (Irwin and Wynne 1996; Wynne 1991). This refers to the tendency to attribute problems with technoscientific developments in contemporary societies to the lack of knowledge (i.e., to a knowledge deficit) of those who do not embrace the solutions offered by science. This STS critique has helped make a clear discursive shift away from rather simplistic models of public understanding of science, towards more integrated models of public engagement or participatory governance which pay closer attention to the actual significance of science and technology to a broad range of actors (e.g., Bucchi 2008; Stilgoe, Wilsdon and Wynne 2005). Simultaneously, it was pointed out that engagement with science and technology needs to happen much earlier in the innovation process ('upstream engagement'), i.e., at a point in time when directions of

technoscientific development are still relatively open (e.g., Wilsdon and Willis 2004). However, when the research system finds itself under pressure, versions of the deficit model still tend to emerge – all the more problematically for being concealed in the euphemistic language of 'two-way' communication. The resulting 'dialogues' are actually often highly asymmetric.[1]

The attractiveness of such relatively simple models concerned with 'diffusion' of knowledge from where it is 'produced' to where it is 'lacking' lies in the fact that they imply clear causalities and over-promise control. Such models do not question generic terms such as 'science' or 'the public' and take for granted rather narrow instrumental understandings of 'society'. Such understandings afford little space – and fail themselves to create potential – for legitimate disagreement. Yet, studies embracing a more complex understanding of interaction processes between science and society have taught us that there are no such pre-existing entities (e.g., Felt and Fochler 2010). Instead, far more heterogeneous and context-specific forms of publics, understandings of science and models for society are all co-produced in and around science-society exercises. Furthermore, public knowledge cultures by no means follow a naïve science/anti-science logic, as often claimed in policy debates, but rather manage to develop more context-sensitive, refined positions towards science (Irwin and Michael 2003). These more complex (and realistic) understandings thus force us to ask questions about who gets space to express their position and who does not? Which values matter and which do not? Crucial issues are thereby raised about accountability and responsibility (Irwin 2006).

Third, numerous studies have also pointed to the persistent syndrome of conceptualising innovation in a linear way, starting from basic research, moving to applied research and then to product development (e.g., Balconi, Brusoni and Orsenigo 2010; Edgerton 2004). In such a model, lack of flow of innovations was often simply attributed to an insufficiency in basic research investments, or the absence of an innovation-friendly societal climate. In a similar vein, the idea of using market forces to decide whether an innovation is worthwhile investing in – and is to be regarded as a success – seems highly problematic. This obscures the visibility of the crucial social dimensions of innovation – both as a process and as an outcome. It does not sufficiently consider the need to embed processes of innovation into broader societal expectations and concerns in order to allow innovations to address many of the grand societal challenges identified. It would need much more to embrace more diverse and distributed forms of innovation, which acknowledge the knowledge-abilities available in the rich variety of social actors concerned (Felt, Wynne et al. 2007).

Moves towards studying the ethical, legal and social issues of emerging fields and applications of science and technology marked a remarkable step (at first in the context of the human genome project) towards integrating reflexivity and anticipation into the very research processes. Experiments with different forms of technology assessment, such as 'Constructive Technology Assessment' and 'Real-Time Technology Assessment' (Schot and Rip 1997; Guston and Sarewitz 2002), went further in their attempt to create innovative settings that may help advance knowledge integration and public engagement among diverse academic fields and social actors, thus constituting research ensembles that would enable new approaches to reflexive and anticipatory governance of science and technology in society (Barben et al. 2008). Overall, research has frequently pointed to an obvious yet unacknowledged contradiction: while there are clear indications (as already mentioned above) that governance of science and innovation is complex and multi-sited, involving a broad set of actors with different values, expectations and cultural backgrounds, the structures which are meant to support and guide innovations often tend to rely on quite narrow sets of indicators and actors which by no means adequately reflect the complexities of innovation environments.

Finally, there has been considerable analysis and debate drawing attention to the issue of values and evaluations, both with regard to science and science-society issues. In this context it seems essential to point to the difference between valuing and evaluating. While there has been considerable research on science as a public good and on complex processes through which people value scientific knowledge and technological realisation, when it comes to the procedures which have been put in place within research systems and funding schemes, these are predominantly turning towards quite narrow indicators when evaluating people and knowledge or when making choices. This is a profound reduction of complexity, which might lead us to overlook other kinds of forces/actors playing an essential role in fostering innovation and thus in creating different kinds of futures.

1. For a critique of the traditions of research and policy advice based on approaches to risk perception, risk communication and public understanding of science and technology, together with an alternative analytic framework, see, e.g., Felt, Wynne et al. 2007; Barben 2010. A specific example where exactly these tendencies led to the disbanding of a European Commission 'science in society' advisory committee is documented in EGSIS, 2008.

What has so far been largely missing from this picture are the social sciences and humanities (SSH) – which have only rarely been the subject of explicit and broader (self) reflection. Within STS research, SSH communication and interaction practices with wider societal constituencies have more recently received some attention, and so have the processes of creating innovations which shape society. However, no participatory exercises have been organised which would allow societal actors to question the knowledge thereby created (e.g., economic or social models). Nor have questions been clearly placed on the agenda as to whose values get represented in social sciences' and humanities' knowledge production. To take one apparent counter-example, there has been some professional discussion (especially since 2008) concerning the possibility that business school-based teaching and research has 'lost its way' (Bennis and O'Toole 2005; Rafols et al. 2012). Yet, this has not been a focus for extended public debate nor have wider engagement activities taken place on this theme (Morsing and Rovira 2011).

2.2. Shifting policy discourse on science-society issues

Over the past two decades or more, the topic of science-technology-society relations has also moved onto the policy agenda, both at the European and national level. While it would go beyond the scope of the report to analyse the rather different ways in which nation states in Europe and beyond have tailored such science-society programmes, it seems of interest to take a brief look at the way these issues have been addressed at the European level.

Varying in formats, intensity and timing, many of the programmes and actions launched at the European level have been driven by two sets of related beliefs: (1) that the future of Europe and its member states could be actively shaped and would largely depend on Europe's capacity to produce technoscientific knowledge and a continuous flow of innovations; and (2) that the achievement of this goal requires both a 'European public' supportive of technoscientific innovation as well as a young generation of Europeans choosing R&D for their careers.

These beliefs have been gradually consolidated in European policy, which has meanwhile gone through a number of discursive and programmatic shifts with regard to the framing of science-society issues (see Figure 1).

The policy of the first layer, dating back to the late 1980s, framed science-society issues largely as a problem to be solved by intensifying classical communication efforts and monitoring citizens' knowledge and attitudes through large-scale surveys (e.g., Eurobarometer surveys). These efforts were inscribed in the early so-called 'Public Understanding of Science' paradigm (Royal Society 1985), with its clearly linear communication model, which aimed at filling the knowledge gap which in turn would make citizens 'naturally supportive' of scientific and technological progress.

Reformulation efforts at the European Commission started within the action- and coordination-oriented 'Raising Awareness Programme' (FP5) in the late 1990s.

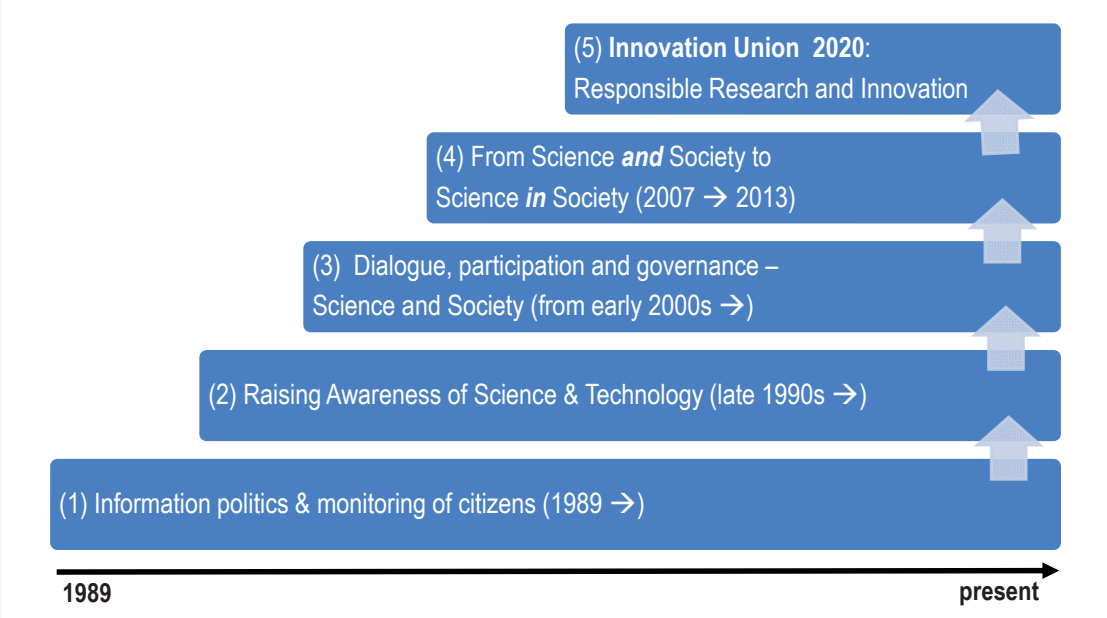

Figure 1. Layers in the EU policy discourse on 'science-society' issues (Felt 2010)

Little to no room for research was foreseen in this programme. While it called for the integration of more critical aspects of science and technology into public communication, at the same time it underlined the need to attract young people (and in particular women) into science. Furthermore, it stressed that researchers should increase their involvement in these activities.

The third layer started to form at the turn of the millennium with the introduction of the key notions 'dialogue' and 'participation', which were linked to a call for new forms of the governance of science and technology. Beyond science policy papers, these changes became manifest in the funding line 'Citizen and Governance in a Knowledge-Based Society' and the 'Science and Society' focus of FP6. This allowed a research foundation to be created concerning these issues at the European level, as well as some space for experimenting with participatory mechanisms in the governance of science and technology. Moreover, in this step the broader science policy imaginary has also shifted to thinking more strongly in terms of new governance modes and the ways in which science, technology and innovation are intertwined.

With the formulation of FP7, the programme line 'Science *and* Society' was transformed to 'Science *in* Society', emphasising the integration of societal and technoscientific developments and the importance of not seeing science and society as separate entities. It particularly also meant the integration of civil society actors into parts of the research activities and thus experimenting with alternative forms of knowledge generation (see CEC 2006). Yet this period also saw major tensions. Science-society questions were addressed from a quite instrumental angle. Traces of this were expressed in the change of name of the responsible EC directorate from 'Science and Society' to 'Science, Economy and Society', but also in the quasi-dissolution of the Expert Advisory Group on Science in Society (EGSIS 2008).

Finally, at the time of writing this report, a new layer is developing in the framework of discourses around the recent 'Innovation Union 2020' communication from the European Union, in which innovation is depicted as being key to Europe's future. Only through a specific kind of innovation policy now, the narrative runs, is there any hope of establishing a strong and sustainable model of growth by 2020. In this context the label of 'responsible research and innovation' (RRI) is introduced, often quite broadly defined as 'societal actors work[ing] 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 European society' (EC 2012). So far the notion has thus remained rather vaguely described – we might speculate due to a lack of imagination as to how to engage with this morally quite laden notion – while we can at the same time observe here and there examples of people trying to work with the notion and fill it with meaning (e.g., von Schomberg 2011). On the face of it, the notion of responsibility respects insights acquired in earlier moves – prompting attention as much to the responsibility of innovation processes as to the presumed status of their outcomes.

To sum up, what we can observe over time (despite the eddy currents) is a gradual opening up towards high profile recognition of the need to involve a broader variety of societal actors in the European research and innovation process. There is a shift from preoccupations merely with 'communication' to more substantive and ambitious aims concerning governance. And, as the focus moves towards the innovation process itself, so is there greater space for more experimental and participatory ideas. Yet we also see that while the first layer has already put in place and continued to develop a set of standard practices, the more we advance in the layering the less we can identify clear sets of practices.

The value of this short description does not lie in the image of a linear succession of ways in which European policy makers address science-society issues. Instead, the geological metaphor of a stratigraphy of science-society policies seems more helpful. It at once draws our attention to how over time different layers of policy thinking were developed, deposited and sedimented; to the different compositions of contrasting layers, involving different kinds of sources, actors and imaginaries of the science-society relations. It also highlights the fact that the advent of any new layer never simply replaces pre-existing ones, but adds to them. Layers always co-exist and interrelate. Thus previous approaches remain somehow present while new perspectives and ways of seeing the problem are added and partly discursively 'overwrite' previous conceptualisations. This is as it is. But once the research and innovation system comes – or is perceived to be – under pressure, frictions between the layers become more apparent and some of the previous layers can gain prominence again. The quote "The deficit model is dead – long live the deficit model!" by Wynne (2008) captures such moments when ideas declared as left behind get reinvented under a different guise. In our observation one such friction is now becoming especially visible. This concerns the general positioning of science-in-society issues amidst current feelings of crisis and accompanying moods of austerity.

2.3 Connected policy reports

Issues of 'science in society' have been addressed by a number of expert groups in the past couple of years, nationally as well as at the European level. Looking at the most recent European initiatives these reports start from quite similar concerns expressed in terms of the democratic governance of contemporary science and technology development, highlight the complexity of the issues at stake, yet then focus on different aspects. Three of them should be mentioned in order to outline the field of discussion with a few brief brush strokes.

- In 2007 an expert group of the European Commission on 'Science and Governance' addressed the current challenges of science and society. Published under the title of *Taking Knowledge Society Seriously* (Felt, Wynne et al. 2007) the report called for an important rethinking exercise: rethinking innovation, risk and ethics; reflecting how to integrate society more actively into research; and moving away from narrow considerations of innovations to broader understanding of the sociotechnical imaginaries which frame contemporary societal development. One central message was to move away from risk governance to innovation governance and in doing so to embrace a much broader vision of innovation as a social and a technical process. This seems to resonate with the most recent policy shift towards 'responsible research and innovation' (Horizon 2020). Yet it has so far remained open how the terms 'responsible' and 'research and innovation' underlying this policy will be understood once this guiding principle is put into practice.
- Two years later another expert group at the European Commission on 'Monitoring Activities of Science in Society in Europe' was meant to examine the role of science in society, to analyse emerging trends and challenges, with specific attention to areas identified in the action lines of 'Science in Society' of FP7. Under the heading *Challenging Futures of Science in Society - Emerging trends and cutting-edge issues* (Marcus, Siune et al. 2009), the report takes a slightly different turn, integrating much more strongly than the previous report aspects of a changing research system such as the move towards excellence, the importance of human potential development, but also of the right of civil society to access and participate in the research system itself. At the same time, during the process of writing this report, it was neither clear how the new framework programme Horizon 2020 would position itself towards issues of science in society, neither was the crisis discourse in all its different facets as clearly palpable as it is now.
- Finally, we should also mention that the European Science Foundation Member Organisation (MO) Forum on Science and Society Relationships began working on 'science in society' issues in 2010. As with other MO Fora, it provides a platform for ESF Member Organisations to exchange information on practices, experiences and policies, and should lead to cooperative activities as well as potential joint actions. The MO Forum mainly aimed to review the methods and tools employed by ESF Member Organisations in the development and management of the science-society relationship and to establish and share best practice. These observations are gathered in a recently published report (ESF 2012).

In the pages that follow, we will not merely repeat the important points made in these earlier reports. Instead, we offer a perspective on key issues that is not new in itself but which has emerged under a different guise and become more urgent in the present situation. Part of this perspective is our concern with how things are taken for granted, which then hides the complexities that should be debated. This 'blackboxing' is linked to a sense of urgency about the European Project, about Europe as a global player, and now about crisis and austerity. While these are important challenges, we feel the need to emphasise opening up the black boxes, to address the challenges better.

3. Science-Society Relations under Changing Boundary Conditions: tendencies and tensions

In this section, we address a range of tendencies and tensions gaining importance under changing boundary conditions for science and society – often linked to discourses of crisis or austerity – and thus demanding careful scrutiny. It is essential to recall here the notion of a patchwork that we used to describe the multiplicity of tensions which arise but also the fact that they do not necessarily fall into a clear picture once we have identified them. These tensions interact but do not necessarily add up. We are then not only interested in identifying them, but will also have to ponder over the complex ways in which they interrelate.

Before discussing the tendencies and tensions in the science-society relations, it seems important to reflect on the way the very notions 'science' and 'society' are conceptualised in contemporary practice related to addressing science-society issues. As society has taken on a different, partly new configuration, so has science also. Capturing the multiple ways of understanding science and society, we offer the following visualisation of the 'science-society landscape'.

Approaches to science-society issues can actually be understood as located in a space spanned by two axes. One axis describes the continuum of understanding of science ranging from 'an institution producing objective/truthful knowledge' to science as a 'social activity in context'. In the former sense, science itself is rarely questioned, but the focus is much more on making society understand and support scientific knowledge generation and expertise. We suggest using '**S**cience' with a capital S for this type of conceptualisation. The latter sense, with a small s, addresses '**s**cience' as an activity, a practice of seeing and making the world, of conceptualising problems, as framing society while being framed by it.[2] A similar framing applies to society on the other axis of Figure 2. If we use the capital S – '**S**ociety' – then we address conceptualisations of society as a supposedly coherent and stable entity. This is closely related to the idea of 'the public', i.e., a rather undifferentiated mass of people needing to be convinced, educated, etc. in order to support the innovations defined as necessary by policy makers. Using a lower case s for '**s**ociety' then addresses the fact that society is better understood as situated, local, fragmented, multiple and always contextual. In consequence, publics are rather created, shaped and, perhaps again, dissolved. This landscape will allow us to better understand the tendencies and tensions we will identify.

In what follows we will briefly elaborate a number of changes and the tensions they bring about. While we do not necessarily find them in any causal relation with 'the crisis', and their development started well before the crisis discourse gained strength, they often emerge in a new light through the changed (and still changing) contexts. They take place on different levels and appear in different settings. We will start by drawing attention to how science, technology and innovation are understood as deeply intertwined with broader societal developments. We will reflect on the dominant visions of how science and technology should be governed, on the ways in which this relates to society in terms of progress and specific kinds of futures to be attained as well as on the societal actors and their values gaining voice in these processes. In a second part – closely related to the governance issues – we will look more closely at some of the changing conditions concerning research and innovation, predominantly focusing on academic environments. We will more explicitly reflect on the changing conditions and consequences of academic careers and scientific excellence, on the emerging tensions between scientific and societal values and new management approaches to evaluating academic performance, as well as on the

2. E.g. Martina Merz (2012 WS2) pointed very clearly to the disunity in scientific cultures in contemporary research systems. Note: References to the presentations at the workshops contain the name followed by the abbreviation WS and the number of the workshop (see Annex 2).

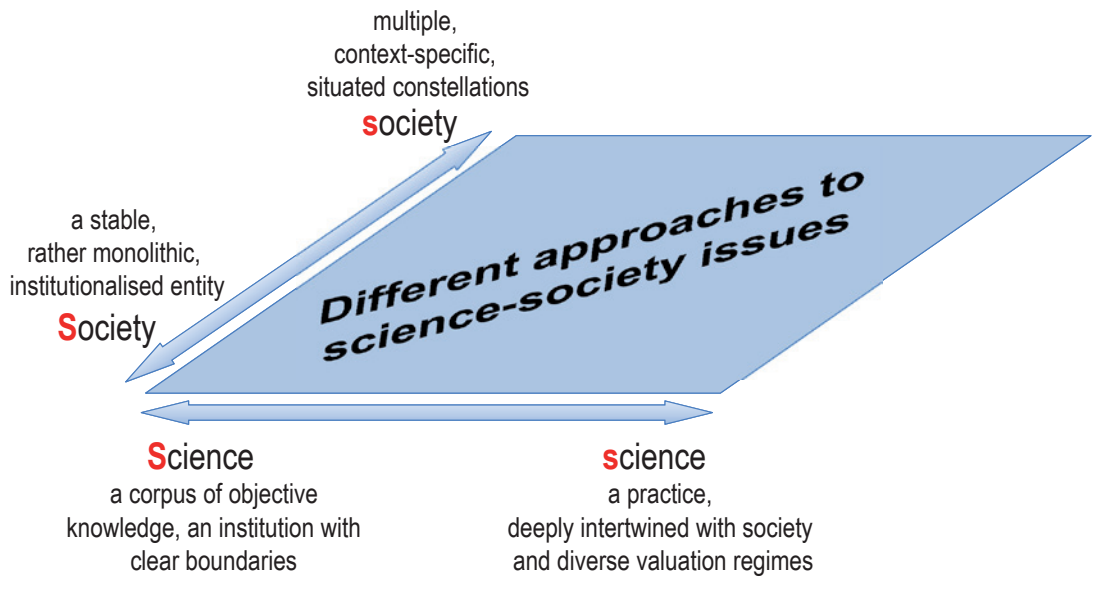

Figure 2.
The 'science-society landscape'

dynamics around accountability. In the third and last part we will then reflect on the practices of addressing science and society issues, how they have developed alongside the above-mentioned shifts and major challenges identified.

3.1 Re-ordering science-society relations

Over the past decades a number of analysts have pointed to major re-orderings in the ways research and innovation relate to developments of contemporary societies. These are in part triggered by moves in policy makers' framing of research, innovation and their institutional conditions, by the role knowledge and innovation plays in the shaping of societal futures and by the way societal actors and their values have been given or have claimed a voice in making technoscientific choices.

New governance and recontextualisation

When investigating changing science-society relations, two simultaneous and partly contradictory moves are essential. One is a major shift in the governance of research, which often comes under the label of 'New Public Management' (NPM) (Pollitt, Van Thiel and Homburg 2007). Linked to an ideal of increasing accountability and efficiency of funds allocation according to performance, cost reduction and better capacity to respond to 'societal needs', this 'administrative technology' has been introduced in many sectors of contemporary societies, such as health care, higher education and research. Even if we can speak of a global trend towards introducing such governance logic, it is also essential to acknowledge the varying degrees and forms in which such a trend is realised due to different sectorial conditions and political traditions.[3] We can therefore state that while we witness similar trends in different institutional and regional contexts, both timing and outcomes do not necessarily produce the same results (see Gläser 2012 WS2).

NPM in research comes with a rather strong idea of management by objectives, a quite far-reaching definition of quality of research by a set of rather fixed quantitative indicators and a new discourse on excellence. On all levels we witness a strong emphasis on a set of goals to be attained often defined in quite narrow terms and a growing "trust in numbers" (Porter 1995), for example expressed by a rising number of rankings evaluating organisational or individual performance in science, technology and innovation. Among other dimensions, it is this logic which allows a fierce competitive race to be staged. But introducing such audit structures also leads researchers to start self-auditing along such formalised criteria, which potentially leads to the narrowing down of their capacities of imagination (Power 1997).

The second shift can be labelled, according to Nowotny and co-authors, "recontextualisation of science in society" (Nowotny et al. 2011; see also Marcus, Siune et al. 2001). It points to the growing demand on science to open up towards society. This includes addressing potential contexts of application at an ever-earlier moment in the innovation process, which may fit well with the goal orientation expressed in the NPM logic but would also be appropriate under a different regime logic. But recontextualisation also stands for a call to actively engage with a broad range of extra-scientific actors, such as non-governmental and civil society organisations, patient groups or other relevant constituencies of contemporary societies, when it comes to making technoscientific choices or shaping research agenda. This means creating environments in which such collective work on innovation can happen, where **care can be given to integrate societal values along the innovation processes**. And in this form it can create tension with the NPM logic.

Tensions between these two shifts might then gain in importance for s/Science-s/Society concerns as scientific and technological choice is increasingly framed as a central means to overcome the current crisis. This creates the risk of narrowing down the set of values allowed into the process of making scientific choices. For example, pushing towards research governance by indicators (which seems a preferred choice in many contexts) might narrow the provision of space and time within research processes for addressing science-society concerns; or management by objectives might restrict participation by societal actors, if these are defined along quite narrow criteria. Yet, we argue in line with Callon and co-authors: "If the end justifies the means, only debate can justify the end." (Callon, Lascoumbes and Barthe 2009: 109).

All this points to an important role that institutions of research and funding will play in the creation of an environment in which extended recontextualisation can take place and where innovative processes of interlinking s/Science and s/Society can unfold. This becomes particularly important when we think about the (still) rather vague notion of responsible research and inno-

3. E.g., Linková and Stöckelová (2012) trace the peculiar trajectory of research evaluation and NPM in the post-communist Czech Republic and its effects on science-society relations.

vation (RRI) and the strong management rationale expressed by NPM. RRI has so far not been filled with meaning and related practices. Yet it has the potential to become a key force not only in realising technological and scientific innovations, but also in turning them into social innovations. It will thus be essential to remain attentive to the particular agenda pursued by certain actors, together with the criticisms and conflicts those agenda have engendered.

Making technoscientific futures

In the context of both moves, i.e., NPM and recontextualisation, we witness growing concerns about how to shape and control the future through fostering specific kinds of technoscientific developments. This use of a future to be realised through specific sociotechnical choices has gained particular importance in the debates surrounding the 'Innovation Union 2020' vision of the European Union. Numerous analysts (e.g., Adam and Groves 2007) have indicated the increasing attention given to anticipating, transforming and/or controlling societal futures through science and technology – in short we witness a "colonisation of the future", to use Giddens' (1991) term. This has become visible through massive investments in the development of anticipatory methods such as technology assessments and foresight exercises (including the formulation of complex science and society scenarios). Such wide-ranging practices of anticipation are related to the strong idea that we have to shape our future through steering science and technology in a way that improves a society's performance in the competitive race. This creates the feeling from the side of research institutions, but also researchers, of being in a constant 'positioning game' and thus under pressure to make the right strategic choice. Social sciences have been and are still playing a key role in these developments and in pondering over the processes through which such futures could be brought about as well as who should be involved in making them.[4]

Yet while societal futures seem to be predominantly imagined to happen through technoscientific innovations, most recent policy debates have also started to call for social innovations as "an important new field which should be nurtured" (SEC 2010: 21). While technoscientific innovations are envisioned to be taken care of by industry, government and universities, social innovations are much rather seen as being taken care of by "charities, associations and social entrepreneurs to find new ways of meeting social needs which are not adequately met by the market or the public sector" (SEC 2010: 21). Thus instead of integrating technoscientific and social innovations, we witness here a divide both between social and technoscientific innovation and between who should invest and take responsibility for producing these.

But as we argue (see Figure 2), science and society (with lower s) are never separated. Neither are social and technological dimensions of innovation. As technoscientific choices are thought of in terms of futures they might bring about, it is also crucial to consider the processes and settings in which such visions of a future to be attained are shaped. This points to the danger that the broader "sociotechnical imaginaries" (Jasanoff and Kim 2009) of a society, i.e., "the collectively imagined forms of social life and social order reflected in the design and fulfilment of nation-specific scientific and/or technological projects", might become predominantly shaped by science and technology only. If collective societal values are not sufficiently reflected in such imaginaries and if different national technopolitical cultures (Hecht 1998; Felt, Fochler and Winkler 2010), their interests, values and histories are not acknowledged in more global decision making, then tensions in the realisation of technoscientific projects will be unavoidable. Considering the differences in technopolitical cultures will help us better understand why specific innovations such as GMOs, nuclear power plants or certain vaccines are embraced in certain (national) contexts while they are perceived more critically or even rejected in others.[5] This is a particular challenge for Europe as we have to accommodate important differences across nations, due to their histories and specific technopolitical cultures among other things. Yet, technological and scientific choices are always made against the backdrop of an already technoscientific past and with the prospect of a technoscientific future. In that sense public choices are never simply for or against technology or science more generally, but have to be understood as for or against particularly imagined forms of life and futures that are realised through them. Such sociotechnical imaginaries should, however, not be understood as given. They are constructed through processes of collective debate and engagement leading to futures that seem to a nation's citizens worth developing (see Felt 2013).

This means that we have to consider the processes by which future directions are decided. Caring for research

4. For a broader reflection on the emerging trends in the socio-economic sciences and humanities, see the METRIS Report (2009).

5. In her study comparing the governance of life sciences in Germany, the UK and the US Jasanoff (2005) convincingly shows how different societies employ different modes of public reasoning when making decisions involving science and technology.

and innovation does not simply require that they be managed, but also taken care of to improve how they are embedded into society, among other things. This implies that those responsible for making decisions on science, innovation and society can help provide opportunities for others to voice their values and concerns.

The concern is that the attempts at controlling the future, the rhetoric of crisis, and the related idea that we have to act fast, might lead to a considerable narrowing of possible futures perceived. It carries the danger of excluding a broader set of actors from participation in the processes of developing alternative sociotechnical futures, with a result of *a priori* side-lining and squeezing out some of them. This might put in danger any more complex participatory processes, or turn them into limited rituals (Irwin, Jensen and Jones 2013), and thus give little to no space to more collective forms of imagining sociotechnical futures.

Diversifying actors and values

The call for recontextualisation and more collective forms of imagining technoscientific futures opens up two further issues: who are the actors to be involved and what interests and values will be admitted to the negotiation processes?

Analysts of science-society interactions have strongly pointed to the fact that European publics are not simply 'out there', but are actively created, framed and given a voice in processes of technoscientific choice. (e.g. Felt, Wynne et al. 2007) Therefore policy rituals matter, as they make publics appear in the form of consumers, (affected) citizens, users, etc., but also as different forms of statistical aggregations[6] (e.g., in opinion polls) or as more organised forms such as NGOs. Yet from recent debates around technoscientific issues, we know that also 'uninvited publics' (Wynne 2007) form in a bottom-up manner and claim a voice. Across Europe the ways in which issues are framed, publics admitted and political choices made are mutually constitutive, evolving together over time and producing effects on the way science, technology, innovation and society are intertwined. It is important to note here that while in most cases voices are expressed about the direction in which innovation should or should not go, it is important to consider also cases of participatory research (Callon et al. 2009), such as the NGO 'Fondation Sciences Citoyennes'[7] which gets project-related funding from the French government (Neubauer 2012, WS1). Here farmers and academic researchers collaborate on the issue of plant selection, with the aim of integrating different forms of knowledge, interests, values and experiences into the process of generating innovations (see Box 1 for more details).

Including or excluding certain publics is also about giving space for expressing certain values and interests as factors in technoscientific choices. The idea of Europe being a community of values and harmonisation something to go for is an important frame for debates around science, technology and society. At the same time, little effort has been devoted to carefully reflecting upon what notions like 'harmonisation' or 'value community' might mean when put into practice. Both notions actually play a key role when thinking about who can participate in specific science-society activities, but also in innovation processes: who gets a voice in making our futures and whose values are represented in potential choices or in developing solutions? These values, so the critique goes, have for a long period been framed too narrowly in terms of commercial values and have thus limited potential options. Many of the more integrative science-society activities, but also more open innovation experiments have been aimed at introducing different valuing practices into processes of technoscientific choice, yet have encountered numerous challenges in doing so (see also Box 4). Diversity has thus remained an under-appreciated aspect in science-society relations, demanding new frameworks addressing disparities and thus making innovation potentially more responsive to a broader range of values and expectations (Stirling 2007; STEPS 2010; see Box 2).

Conceptualised in terms of actors and values on a broader level, it is essential to think carefully about the many social and cultural constituencies, but also important demarcations (e.g., the role of national and regional differences, the role of religion or immigrant groups moving across different cultural and national boundaries) and the quite powerful implicit 'maps of Europe': drawing boundaries between 'old' and 'new' Europe, between those to be regarded as centres and those who are at the periphery, between those who give direction and those who should follow. Thinking in terms of crisis and the way this might affect our thinking of diversity as a value in Europe, we want to express concern about how an unreflexive convergence dynamic will exclude diverse models and voices and thus lead to a lowest common denominator type of governance. It might narrow down options and not take stock in the strength of diversity, which might be seen in terms of increased resilience in times of crisis.

6. For a critique of how publics are framed by survey methods, see Law (2009).
7. http://sciencescitoyennes.org/

Box 1: Engaging with societal actors in knowledge generation

Over the past years there has been a growing body of literature pointing out the important role civil society organisations can play in producing knowledge adapted to societal needs and concerns. A recent study has drawn together the multiple involvement of civil society organisations (CSO) in research in the French context (Millot, Neubauer and Storup 2012). On the basis of a number of recent experiences it argues that the expertise and competences embodied in CSOs could support research in opening up and going beyond classical "thematic framings, paradigms and methodologies dominating public and private research institutions" and thus should be recognised more fully as complementing research performed in both public and private settings.

A prominent example of societal involvement relates to patient organisations and their role in shaping knowledge production concerning 'their' medical condition. The AIDS movement and its participation in shaping clinical trials (Epstein 1995) or the muscular dystrophy patients and their engagement in research (Callon and Rabeharisoa 2008) are but two well-known examples. Another case is the French network of peasants and researchers *'Semences Paysannes'* (Peasants' seeds, transl. by authors) engaged in developing a distinctive vision of agricultural science. The aim of such a research engagement is to formulate needs which are much more adapted to a specific region and terroir (e.g., in the choice of seeds); to involve a broad variety of sciences in the development of models of agriculture from population genetics through functional ecology to social sciences (so as to foster interdisci-plinary collaboration); to make space for different forms of knowledge; and to carry out investigations in participatory projects which aim to contribute not only to methodological and scientific but also to political and social outcomes. In that sense research is understood as much as a project of society as it is of science (http://www.semencespaysannes.org/; Neubauer 2012, WS1). These cases point to the importance of acknowledging other forms of knowledge and experience in producing innovations. How this form of knowledge generation fits with current norms and standards of measuring quality in research, however, remains a major challenge (see also Irwin 1995).

Box 2: Pluralisation and the energy sector

An example of some practical technoscientific implications of pluralisation may be found in the energy sector. Here, it is a striking feature of current high-level policy debates that even the imperatives of much-discussed transitions to new low carbon infrastructures leave in play a formidable diversity of potentially economically feasible and socially viable alternative innovation pathways (Stirling 2010b). The scope for choice spans a variety of centralised or distributed renewable technologies and infrastructures as well as transformative service and demand-side innovations and – in some views – nuclear and carbon capture technologies. These in turn invoke a diversity of starkly contending sociopolitical values and interests. Yet European societies as a whole also remain quite radically uncertain about the wider social and environmental consequences of all these strategies. So, in this context as in others, the prospect both of inclusive plural engagement and deliberate technoscientific diversity represents a very concrete pragmatic response (Stirling 2008).

By avoiding the kind of early lock-in typically pressed by those in office, society as a whole may at the same time learn about the implications of disparate future pathways and accommodate divergent cultural forces in ways that are otherwise irreconcilable (Page 2007). And this kind of deliberate technoscientific diversification also helps energy strategies to address more sensitively the variety of settings across Europe, as well offering a basis for fostering greater resilience in the face of shock and more socially responsive and robust onward innovation (Arthur 1994; Landau, Taylor and Wright 1996). Of course, such diversity is not a panacea. And the prospect of multiple alternative contrasting – and equally diverse – energy portfolios means that diversity also does not avoid the necessity for clear, caring political engagement and accountability of the kind addressed more widely in this report. But the energy sector does present one example of a field in which the implications of this analysis can be quite clearly appreciated (Stirling 2010c).

To summarise we have identified the following tensions:

a. between the strong emergence of a new public management ideal, which comes with **a logic of clear-cut choices** (to be taken at a given moment in time and based on a limited set of criteria) and the need to allow more open-ended processes accompanying the generation and application of knowledge and innovations, which follow what we call a **logic of care**;[8]
b. between the ideal of focused and **controlled futures** and the fact that we need to understand the **future as more open for exploration** involving a variety of sociotechnical imaginaries;
c. between the focus on invited participation which comes with the idea of publics to be be enrolled into a quite **ready-made technoscientific future** and the reality of **context-dependent, ever-changing future-in-the-making**;
d. between the strong imaginary of a community of **homogeneous values** and a reality of a growing **diversity of values**, each asking for a voice;
e. between normatively **pre-established assessment structures** and more **open valuing processes** (including science as a public good).

3.2 Changing conditions for research and innovation

Building on the broader frame set through the previous reflections, we will now look more closely at the ways contemporary research systems are managed and ponder how these impact on the manner in which science and society issues can be addressed. While there are numerous possible approaches to tackle this problem, we have decided to focus on three perspectives: careers, evaluation and accountability structures.

Careers and 'science in society' concerns

Debates around what it means to be a researcher in contemporary (academic) science systems have been gravitating around a number of important changes. They have pointed to (1) a shift from a 'calling' to 'a job', often under rather precarious working conditions (at least in the early stages of a career); (2) changing and more diverse roles of scientists (e.g., entrepreneur, industrial researcher or policy advisor) and accompanying shifts in social standing; (3) new employment policies formally demanding mobility across institutions and regions and offering less stable work conditions; (4) the growing importance of rather narrowly defined career models. These are but a few examples of the changes we want to point out.

While some of the moves harbour considerable potential for positively developing the research system (e.g., different experiences through mobility), they also create constraints when it comes to the engagement with 'science in society' issues. For example, spatially fragmented careers, a rapid move across institutions, regions and countries might pose significant obstacles to serious long-term engagement with societal issues. Similar observations could be made with regard to the narrow definition of a scientific career, where the rather strict focus on criteria of excellence in research (often following strict indicators such as impact factors or A-journal publishing) might hinder engagement with science and society issues since it is seen as in the worst case lowering the standing of the scientist and in the best case not being considered in career criteria (Stöckelová 2012). We thus see a juxtaposition of 'career work' and 'engagement work', which might become an important selection criterion for being able to and wanting to stay in the system. Here also gender comes in, as studies hint at the potentiality that this kind of care for the articulation between science and society has the tendency to be gendered and taken up by women more often than by men (Linková 2012 WS2).

While this is a problem even without the growing pressure that comes along with the crisis discourse, the latter surely works as a catalyst to reinforce such tendencies. It thus carries the danger that the growing pressure, formalisation and fragmentation of career development work against the expressed wish by policy makers to have a more varied and democratic opening-up towards society and more engagement.

Evaluations and funding channels shape science-society relations

When looking at science-society issues it also seems essential to question the value dynamics at work, first within each of these entities but also in their intertwinements. This opens an important contradiction between what we want to call 'valuing', i.e., the varied ways in which we attribute values within science and society, and 'evaluating', i.e., the formal ways in which we assess the value of scientific knowledge and innovations within their context of production but also within society (see Box 3).

8. The use of the notion 'logic of care' has been inspired by Mol's (2008) distinction between logic of care and logic of choice in health care.

In the scientific community, there has been a quite emotional debate about the impact narrow evaluation processes in science, along with strict output criteria such as SCI publications and their respective impact factors, or the amount of third-party funding a person is capable of attracting, have on the choice of research topics to follow, but also on the directions to take once a choice has been made. From the science-society perspective, there is an apparent tension between what is valued as a public good and how research is evaluated.

In a world organised along the principles of new public management and the accompanying audit structures it seems essential to think about how and where broader societal values might come in, where societal actors are given a voice and where they are silenced. Above all, it is essential to understand how we gradually move from broader valuing of research to the quite narrow evaluating of output. To understand these narrowing processes, where and how they happen, seems particularly important at a time when pressure on the system tends to support more conservative and secure approaches.

Box 3: Questioning indicator-driven understandings of quality

While this is already quite a long-standing debate, it is worth looking at the recent questioning of journal impact factors as a measure for quality of research in general and the career performance of individual researchers in particular – as represented, for example, by a gathering of concerned scientists at the December 2012 meeting of the American Society for Cell Biology. The outcome was the *San Francisco Declaration on Research Assessment* (DORA)[9] which was strongly supported in a recent Editorial of *Science* on 17 May 2013 [10]. The declaration cautions against a too narrow managerial view on research and stresses that "the outputs from scientific research are many and varied, including: research articles, reporting new knowledge, data, reagents, and software; intellectual property; and highly trained young scientists." From the perspective of the current report, while such a vision of scientific work can be seen as a step towards re-installing a broader meaning of 'doing research', unfortunately there is no mention of the value of engagement of scientists with society.

Furthermore such statements, although expressing unease with the current governance modes, do not hinder institutions from continuing to perform assessments deeply rooted in this logic and according to a trust in numbers (Porter 1995) as an 'objective measure' for quality.[11]

9. http://am.ascb.org/dora/files/SFDeclarationFINAL.pdf
10. http://www.sciencemag.org/content/340/6134/787.full
11. See for example a scientist's blog debating these issues http://occamstypewriter.org/scurry/2013/05/16/impact-factors-declared-unfit-for-duty/

Accountability requirements towards research

The third observation concerning the changes within the research system touches upon the growing demands for accountability which can be observed at different levels of the system. While accountability in itself could be regarded as a means for opening up towards society and thus for triggering new forms of engagement, the way it is put in place, in particular under a growing pressure to contribute to the innovation flow, is probably counterproductive to this goal. Accountability, we thus would argue, has become a strictly formalised way to respond to demands. In the case of ethics, accountability might simply mean filling out the ethical clearance forms or respecting the strict minimal legal requirements for research to be carried out.

Here it would be relevant to introduce a distinction between responsibility and accountability. While the latter can be understood as following the formally binding and structurally entrenched set of procedures that assure that research is seen as according to accepted practice, responsibility would be a more personal engagement with values and practices and how this relates to societal preferences and expectations.

This means engaging with institutional change under the auspices of crisis and austerity and asking how this might reduce the responsibility conditions in contemporary research.

To summarise we have identified the following tensions:

a. between broader and often quite complex **societal valuation processes** when it comes to assessing technoscientific developments and a quite narrow indicator-driven evaluation of research and innovation; this sets incentives to mainstream research along a **fixed set of indicators** and might hinder engaging with wider societal value regimes;
b. between **excellence** which is often represented as remote from societal concerns and **societal rele-**

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vance, i.e., engaging with societal needs; focusing too strongly on the former might lead to a disentanglement of research with societal concerns;

c. between **accountability** as a formalised procedure and **responsibility** as a form of engagement with the issues at stake; putting too much emphasis on the former might lead to narrowing down the perspectives taken care of in research;

d. between **career work** which is guided by a set of formal criteria and **engagement work**, which is not recognised sufficiently by existing academic reward systems; this is also seen as involving important gender issues.

3.3 Explicit science-society activities

While we have addressed in the first two parts of this section the way science and society have recently been re-ordering as well as how research systems have changed, we now look in a more focused way at the more troubled sides of current science-society work.

Making time and creating spaces for 'science in society' issues

The increasing organisation of research work along 'project' lines, with new public management systems as well as specific kinds of career imaginaries (mobility and temporal contracts in the early part of academic lives) have triggered a major re-ordering in the research system. We call this **re-timing**. This means that actions within institutions are increasingly set within tight timeframes, work packages are related to time-units and the output is always set in relation to the time spent to produce it (Garforth and Červinková 2009). Thus time has become an essential commodity in the research system. Treating it as a physical resource then creates the idea that an ever-increasing number of activities can be squeezed into one time-unit and this is looked on favourably as a sign of efficiency (Castells 1996). This also explains how the speed of the innovation flow has become a major concern, with less attention to the direction in which the innovation is going. This in turn is linked to an obsession with controlling the future. This re-timing means that young researchers in particular have to invest considerable time and energy to build an academic life out of the fragmented elements, epistemic and social ones (Fochler 2012 WS2).

Thus we observe that 'science in society' activities run the risk of either getting 'squeezed in' between many other activities with low attention attributed or even getting 'squeezed out' of the system (CEC 2006). This happens in a number of ways. First, reflections related to 'science in society' quite frequently run the risk of being 'outsourced' to social scientists, philosophers or science communicators, thus minimising the reflection time of researchers. Social science researchers are incorporated into interdisciplinary teams, but do not manage to become partners in the process. They are expected to deal with the ELSA aspects but not the core complexities and uncertainties of the research and the desirability of the very goals of the research programmes (see Box 4). The same is still true for critical NGOs raising their concerns (Marris 2012 WS1; Marris and Rose 2012). Second, society- and value-related questions to be dealt with are often phrased in such ways as not to hinder the speed of the development, as this is seen as crucial for the development of contemporary societies. Third, the readiness to engage on the part of researchers can tend to decrease as they find themselves in a situation where too much reflection might hinder them from producing straightforward output. Therefore we find quite often more readiness to engage in 'fun' exercises of communication rather than in serious questioning of a researcher's own individual research against the backdrop of societal concerns, since this is felt more threatening.

Overall, this shows that time has to be made by institutional actors and research programmes within the routines of research. But also, researchers have to be convinced that this kind of engagement (i.e., taking time for it) is valued by the system and does not hinder the potential for innovations to emerge, instead presenting the potential that these innovations might be different. As much as we need to take account of the timing of science-society concerns, the question of spaces in which engagement processes can happen are also essential. Within contemporary research practices spaces very rarely exist for this type of work. And it needs a lot of personal engagement on the part of researchers in order to create and cultivate them.

Rituality of 'science in society' activities

While the introduction of science-society concerns into research policy and the creation of corresponding support structures (e.g., project or action funding) was essential for opening spaces of communication, reflection and participation, it has also gradually led to what we want to call '**ritualisation of science-society activities**'. In a highly normatively oriented policy world, very

Box 4: Limits and possibilities of engagement

In 2006, the US National Science Foundation, when granting more than 23 million dollars to a research consortium for work on Synthetic Biology, charged social scientists (Rabinow and Bennett) to engage in this consortium in order to address societal, ethical but also biosafety related issues emerging in this field. Similar approaches of integrating social scientists into the newly developing synthetic biology research environments were put in place in the UK and other European countries.

Classical ELSA projects were seen as operating too often independently and downstream of the actual scientific research. Thus they insufficiently considered the context in which research happens, i.e., institutional and funding arrangements, the embedded value structures and everyday practices of researchers. Societal and ethical issues would instead be addressed all along the process of building the field of inquiry and of producing knowledge. Can we draw some lessons from these exercises?

While Rabinow's and Bennett's (2012) project ended in a quite widely debated 'divorce' and their encounters with researchers were described as a mixture of disinterest, dismissal and, at times, hostility [12], other researchers' accounts tell of more engagement of the researchers with societal concerns. UK social scientists engaged in ELSA work on synthetic biology highlight that while much of the internal debates they had with researchers "acknowledge[d] the complexities and uncertainties involved in their research, [these] sadly [...] often disappear when synthetic biologists present their work in official public dialogues – or to journalists." (Marris and Rose 2012). This state creates space for polarisation of societal debate and hinders a more nuanced discussion of the issues at stake. Marris and Rose thus conclude that only such an opening-up of researchers towards "addressing inherent complexities and uncertainties, and about desirable futures [...] to a whole range of social groups, not least those who have anxieties and criticisms might take us beyond the limits of most previous public-engagement exercises." This could not only "ensure a more democratic process in which different visions of what is desirable are debated", but could do so "before particular ones become entrenched and hard to modify" (Marris and Rose 2012).[13]

12. See also: http://www.biopoliticaltimes.org/article.php?id=6311

13. For a fuller discussion of the obstacles and opportunities, epistemological and otherwise, facing collaboration between researchers in the life sciences and the social sciences 'The Good, the Bad and the Ugly': Understanding Collaboration between the Social Sciences and the Life Sciences (2013), available at: http://www.esf.org/publications/social-sciences.html

quickly we observe the creation of sets of 'best practices' as well as benchmarking (e.g., activities around the Science and Society Action Plan). While best practice approaches and benchmarking aim to create quality standards, at the same time they yield a number of consequences which are detrimental to a more open and context-sensitive approach to these issues. And this for at least two reasons:

1. Defining a set of accepted practices from which 'users can choose', for which funding is more straightforward and which are less questioned, leads to a mainstreaming of activities, but also to engagement and participation 'by the book'. It also leads to the fact that science-society activities seem to be omnipresent – they have somehow been mainstreamed – yet at the price of quite frequently being wrapped into a standardised discourse without paying tribute to the specific aims and features of a concrete undertaking. In particular, the use of more interactive formats like consensus conferences have turned out to be far from unproblematic procedures that can easily be transposed and replicated in different political cultures (e.g., Joly and Kaufmann 2008 for France). In this context it is important to stress that social science research somehow contributes to this ritualisation, as on the one hand it is easier and less risky to tap into a pre-existing repertoire of accepted forms and on the other these approaches have more legitimacy towards policy makers and involved scientists.
2. Linked to this we, second, see the emergence of a 'tacit geography' (Felt and Stöckelová 2009), which means that certain countries become the dominant models for how an engagement with science-society issues should look, while others are set up or set themselves up as the followers/as in need of catching up. In that sense we have also created a centre-periphery model when it comes to science-society activities and reflections, imposing a dominant reading of what is the 'gold standard'

to do these reflections. Taking such an approach wipes out the geopolitical asymmetries that are embedded in many of these reflections. A closer look at the academic writing about science-society issues reveals for the European context a very high prevalence of the UK as a frame of reference or, when it comes to specific methods, e.g., the citizen conferences, it is a single country (Denmark in the case of citizen conferences). This neglects important cultural differences and different value regimes we have pointed out earlier. It closes down the richness and different histories of how science is/can be embedded in society.

While it is important to take cases as learning experiences and to profit from the know-how accumulated elsewhere, it is nevertheless quite risky to naively assume that such concepts can simply travel across cultural contexts and technopolitical cultures (Felt and Fochler 2010; Horst and Irwin 2010). Such an approach somehow tacitly embraces universalistic assumptions about science-society interactions, about science and its interlocutors from the public space. Yet we have seen that place and local cultures matter a lot and so approaches should be much more open and context sensitive avoiding the 'cut and paste' idea, which we also find in the field of evaluation models and other 'transfer activities' (Gläser 2012 WS2). As such translation activities always happen, it seems promising to engage with them in a creative manner and see them as a source of innovation which can develop its full capacity when careful recontextualisation happens. This broadens the meaning of translation as a complex process in which both processes and meanings are renegotiated.

Rendering engagement policy relevant

Finally, we would like to come back to the distinction between s/Science and s/Society with capital S and lower s. We argued that the distinction first points to the nuances we have to consider when looking at, supporting, developing or implementing science-society activities or putting in place governance structures, but also allows us to capture the structure of the landscape. When assessing current policy supported actions, we could say that the field is much more densely populated at the 'Society/Science' end than is the case for 'science/society'.

This points to the fact that much of the opening-up discourse has been narrowed down in its transformation into actions. But it is also a result of limited policy (and social science) recognition and appreciation of what has been happening, regarding science and society, at multiple uncontrolled spaces. Over the past decade or more, we have witnessed the creation of a whole spectrum of new spaces where science-society issues are addressed. In particular, the emergence of the World Wide Web not only offered the possibility for creating, distributing and collecting information, but also allowed for numerous alternative ways of negotiating and expressing a position and thus developing alternative visions of sci-

Box 5: Informational and material engagement and participation

Public engagement with science and technology has all too frequently been framed in terms of understanding information related to science and technology, which in turn should become the basis for making choices. In policy contexts, complaints have routinely been expressed that citizens show disinterest in certain issues related to science and technology and are largely ignorant about scientific facts. Countering this argument, research has pointed out that ignorance was often linked to the fact that scientific or technological issues had no clear relevance to people's everyday lives.

Yet, using solely information-oriented approaches to understand citizens' (non)engagement with science and technology related issues seems limited. When it comes to complex issues such as climate change, it would be relevant to grasp how people manifest their engagement not only on a more abstract informational level but in everyday practices, such as commuting, cooking, heating or gardening. For example, in her recent book Noortje Marres (2012) offers insights into how people engage with climate change through everyday technologies of carbon accounting put forward in the UK and in other countries. She points out the complexities of such engagements and how they are in important ways framed by social, technical or economic relations that constitute people's everyday life.

Such studies might also help us to grasp the discrepancies between citizens' information centred engagement, i.e., expressing their choices discursively pondering over information, scenarios or past experiences (as in the case of consensus conference, focus groups...) and citizens' material engagement, i.e., their manifest choices made in everyday contexts such as energy consumption, consumer choices, and many more.

ence in society. Be it bloggers, groups exchanging and collecting information, self-help or activist groups, they have all created thought collectives allowing reflection on their respective expectations of scientific knowledge and innovation. It seems essential that public participation research and practice should take into account these different formats of participation. Using the example of climate change, we have seen that different forms and formats of engagement have proliferated in recent years through new technologies such as twitter, online blogs, as well as exhibitions such as 'Making things public' (Latour and Weibel 2005), demonstrations of sustainable housing and many others. But societal participation is also expressed in everyday material practices – that can make possible or hinder change (Marres and Lezaun 2011; see Box 5). The issue then is not so much regarding science and society as separate entities which need to be linked, but bringing public participation, which is already happening, to social science and policy (Marres 2012 WS1).

To summarise we have identified the following tensions:

a. between a declared aim of **fostering engagement** of research and innovation with societal actors and the strong countervailing pressure to **keep control** and limit any such investment to avoid the compromising of conventional innovation agenda;
b. between a strong discourse of the need **to open up** towards a broader set of societal values and a **narrowing down** of concrete possibilities in terms of temporal regimes and spaces where this can happen;
c. between the wish to implement a culture of mutual learning through **narrowly framed 'best practice'** approaches and the need for **careful adaptation to local contexts**;
d. between a **multiplication** of investments in explicit science-society activities and a simultaneous **ritualisation** leading to a reduction of real engagement;
e. between a clear tendency to multiply **S**cience-**S**ociety activities rather than process-oriented engagement with **s**cience and **s**ociety.

4. Recommendations

The analysis presented in this report addresses deep-seated and pervasive dynamics at the highest and most extensive levels of governance of science in society. It does so at a time when general crisis discourse is burgeoning across Europe, with broad acceptance of the necessity for rather widespread – and potentially transformative – institutional consequences. It is in the nature of these circumstances, therefore, that the implications of this analysis will be quite profound and far-reaching. Such conditions do not lend themselves well to single detailed concrete instruments or highly specific practical operational adjustments, of the kind normally implied when thinking about 'policy recommendations'.

The implications that flow from this analysis, then, are at this stage not so much about formulaic 'actions', as about ways of thinking, speaking and intervening at quite a high level of generalisation. Yet, we are nonetheless unapologetic about referring to the following implications of our analysis as 'recommendations'. Without appreciation of this fundamental rationale and programme for change, it would be easy to misunderstand or underestimate the challenge. And each of the recommendations that follow presents very tangible knock-on consequences, that affect structures and practices at a variety of strategic and organisational levels and in many diverse socio-political settings. So, having conveyed the overall shape and thrust of our analysis in this way, the authors of this report remain committed to working with colleagues throughout European science governance arenas, in order to help design and implement the more specific consequences in different contexts.

In this way, what is presented here is nothing less than a basis for developing a new constitutional framework for research and innovation in Europe. As such, this programme for change itself represents a potential innovation of precisely the more transformative, open-ended and socially-responsive kind. It is our main purpose to help enable such a prospect.

In describing many of the trends and tensions, we have pointed out the predominance of a certain kind of managerial logic. It is in these instrumental terms that science-society issues at the moment tend to be 'dealt with'. We have argued that following this logic too exclusively will often lead to quite narrowly defined goals, and to a limiting of the potential ways in which to engage with the complexity, plurality and ever-changing faces of science-society dynamics.

While we are aware of the global context in which Europe has to position itself, pointing continuously at the supposedly imminent threat of 'losing' the innovation 'race' carries the danger of quite quickly narrowing down opportunities for societal engagement. This, in turn, means failing to integrate different sets of values when making societal choices. Just as technoscientific innovation is seen as key in developing our future societies, so it is correspondingly crucial to develop more accommodating approaches – allowing the creation of richer sociotechnical imaginaries inspired by broader ideals than simply managerial objectives. In that sense, we have argued repeatedly for an embracing of process-oriented approaches to the integration of science and society following more a **logic of care instead of a managerial logic of choice and control**. Embracing a logic of care means nurturing and protecting spaces, allowing for more open and diverse forms of innovation to happen, but also more long-term engagements between scientific and societal actors. Thinking in terms of care further draws our attention to the fact that we have to consider the cultural, institutional and discursive contexts that accompany and embed processes of technoscientific innovation. These must be thought of as flexible and open environments rather than as rigid moments of choice performed 'by the book'.

The following groups of recommendations flow from these current tendencies and tensions. But they also arise from broader reflections over the ways in which the field of science in society has developed over the past decades – and what we have experienced and learned from this. Within each recommendation we identify a number of different actions to be taken. Collectively, these are thus aimed at advancing several goals at the same time. First, they point to the research that is needed in order to accompany and understand specific developments in this area. Second, they invite reconsideration of the ways in which contemporary research structures and practices can accommodate broader societal aspirations, diverse valuation regimes and different concerns. Third, they point to specific policy measures which could support the former two moves.

4.1 Linking excellence to relevance and responsibility

The past decade has seen a growing 'excellence discourse', with accompanying institutional arrangements such as the European Research Council and many national initiatives. With this, important questions have arisen over how ideas of societal relevance and their underlying interests and values can become articulated with notions of excellence. Quite frequently, relevance and excellence are staged as if somehow separate ideals. 'Excellent research' tends to be understood as 'purely curiosity driven', while 'relevant research' means involving those 'outside' actors who are seen to be related to the societal problems being addressed. And the advent of 'responsibility' discourse sometimes seems to compound this dichotomy, by adding further weight to it. As we have argued in the previous section, this distinction matters a lot for the science-society endeavour. This is because the tacit assumption is conventionally adopted that excellent research does not interfere with – or is influenced by – societal issues and so does not necessarily need to engage. Instead, it is constructed as being remote from society, triggered and shaped only by inner scientific concerns.

We want to put forward a different argument. Taking seriously the future of 'science in society' makes it essential to better and more explicitly link excellence and societal relevance in a careful manner – recognising and making more visible their deep and pervasive intertwining. Conceived in this way, strengthening the notions of 'responsibility' in research and innovation processes can reinforce appreciations of this link. We even go so far as to say, then, that the question of 'responsible' societal values bearing on the making of technoscientific choices needs to be posed in particularly explicit ways in the context of 'excellence programmes'. After all, whether deliberate or blind, these also implicate choices. Yet, excellence is becoming increasingly strongly defined by solely science-internal criteria. Such narrowly defined indicators (like impact ranking of publications and platforms) create rigid categorisations of excellence, privileging particular groups and institutions in quite unrefined ways. It becomes progressively more difficult to allow recognition for the important roles that might be played for more diverse and subtle evaluative criteria and categories of excellence.

In order to be able to ensure that science-society issues can be addressed adequately in the context of this tension between excellence and societal relevance, three broader issues need to be addressed:

1. In order to assure a fruitful integration of excellence and relevance, steps need to be taken to prevent: the narrowing down of relevance criteria simply to economic relevance; and (equally) of excellence criteria to simple output indicators. What is required instead is a thorough discussion of how broader notions of societal relevance can be embedded in evolving discourses of excellence.

2. Research is needed in order to better understand how excellence and societal relevance are (or are not) related to each other in different institutional and national contexts – equally at the levels of programmes, institutions and individual researchers. This knowledge promises potentially huge impact on the ways in which science-society activities can (and need to) be integrated into these contexts.
3. Funding institutions and programmes are particularly called upon to ensure that 'science in society' issues become an integral part of excellence initiatives. Both programmes and institutions need to create: (a) spaces for reflexivity over science-society issues within research processes; and (b) possibilities for doing 'science in society' research both as accompanying reflexive element to research and innovation processes and as independent research endeavours.

4.2 'Science-society activities' – integration and separation from research

Since the very beginning of explicit science-society activities there has been an ongoing debate over whether or not this research needs dedicated spaces in its own right, or whether it should be integrated and 'mainstreamed' into the research programmes and projects. This issue has remained highly relevant. It needs particular reconsideration given the major re-orderings discussed here affecting contemporary science and society alike.

From previous experiences, but also given the tendencies and tensions we have indicated, it seems essential to escape from dichotomised either/or understandings of this question. Rather, it is essential to look for a balance between these two approaches. It is of course important to launch more integrated programmes, where research and the posing of questions relevant to societal concerns go hand in hand and where capacity building within research happens. Yet, it also remains of crucial importance to keep alive a reflection which moves beyond single projects, captures wider connections and crosses spaces in order to understand broader developments. In times when scientific and technological development is given such an important and powerful role in shaping contemporary societies and when citizens are asked to support this move, it is crucial to accompany the research process with processes of reflection of both kinds – oriented towards giving voice to contrasting needs and demands as expressed by diverse constituencies in society.

Furthermore, it is important to avoid what one could call the 'ritualisation trap' we pointed out earlier. It is not enough merely to add a social science or humanities researcher to each project and so delegate the reflexive work to an 'outsider within the project'. Likewise, it is inadequate simply to bolt on some outreach activity at the end of a project. Undertaken appropriately, these might offer initial steps or catalysts. But they are not enough to address the wider societal challenges discussed here. What is needed is the development of clear yet qualitative frameworks for engaging with science-society issues in different contexts – integrating such elements in diverse and interlinked ways within both research programmes and projects. Rather than coming in only at the end of a research initiative, well delimited from the rest of the 'real research', communication or discussion activities should be undertaken from the outset and threaded throughout. And the ways in which this is done should be explicitly addressed when initiatives are designed and assessed.

4.3 Plurality matters

Throughout this report, we have frequently pointed to the fact that diversity and plurality in science-society issues need particular care. By stressing that it is not only the speed of innovation that matters, but also its direction, we highlight the importance of respecting different value systems and interests when making technoscientific choices. It is in this way that we may more explicitly recognise that technoscientific innovations also at the same time entail social innovations.

From these observations, we would identify four imperatives needing closer attention. Without seriously addressing these, both in terms of research and policy actions, attention to diversity and plurality will amount to little more than lip service.

Plural sociotechnical histories and futures

Europe is a plural environment, comprising different value systems, histories and technopolitical cultures. In such a context, it is essential for any robust governance of science and technology that these differences be addressed sensitively, directly and accountably (see, for example, different energy choices, Box 2). One key element in this task is through comparative research – focusing both on contemporary and more historical perspectives. Yet, despite honourable exceptions in particular European projects, such research has (partly due to financial and time constraints) remained rather

limited. Given that so much policy attention is otherwise attributed to shaping and controlling the future, this seems an unjustified gap. It is crucial to understand the anticipation practices of different actors in different contexts – in research and beyond. Although of general significance, plurality makes this especially important in the European context, since countries embody such different histories. The contrasting ways in which science and technology have been integrated in society yield different bases for their entanglement in future development. This raises challenges and opportunities – familiar in other sectors, but less well recognised in science and technology – of multi-level and multi-sited governance. Only by recognising these realities may otherwise potentially daunting tensions be resolved – both across national settings, but also between local, regional and national arenas and the overarching European level of governance related to science in society.

Diversity as resource and challenge – moving beyond a buzzword

In contemplating the future development of science in society, we want to stress the importance of diversity both as a resource and as a challenge. Of course, particular aspects of diversity have been addressed in research over the years. Considerable work has been undertaken concerning the role of gender, for instance. But this is only one dimension among many others that need to be addressed. Diversity comes in very different guises: different interests, life situations, experiences, cultural backgrounds and valuation practices. These and many other aspects can matter profoundly in appreciating the social implications of science, technology and wider innovation. It is crucial not to see value systems as fixed and uniform, mapping in some simple fashion to specific categorised groups in society. Instead, the challenge is one of complex, shifting constellations, in which values and interests are expressed in highly situated ways. This also means that the disparate historical roots of different constituencies across Europe really matter in contemporary relations between science, innovation and society. As a consequence, Europe will not be able to develop a 'one size fits all' solution to addressing science-society issues. Instead, there is a need to pay specific attention to the development of diverse policy processes assuring responsive accommodation of this plurality. Newly emerging multidimensional concepts and frameworks for appreciating diversity can help in this regard – not as mechanical metrics, but as heuristic provocations and practical means of rendering visible and mapping crucial disparities in any context.

Plurality of progress and futures

Much contemporary policy discourse concerning future technoscientific developments rests on rather particular notions of innovation and progress. Here, an especially prominent narrative is one of progress as a competitive 'race'. Without diminishing the importance of commercial and political-economic competition, it is crucial to understand that progress does not take place along a single predestined pathway for change. It is as much about efficacy in exploring other potential orientations for progress, as about the pace of advance in any particular direction. This underscores the importance of enabling diverse actors and values to express authentic voices in innovation processes. This means thinking not only in terms of citizens and representation, but also of the production and transfer of knowledge as a social relational issue. By opening up research and innovation systems – including universities, agencies and companies – to diverse constituencies and stakeholders, European plurality presents opportunities for more fruitful diversity in innovation and research. This in turn highlights the importance of reinforcing currently-neglected capabilities around agenda setting, funding, capacity building, organising, monitoring, evaluation and accountability (see Box 1 for some cases where such capabilities of societal actors were integrated).

Plurality of knowledge

Diverse forms of knowledge need to get access to innovation processes. And it is essential that this greater expression of plurality is not only acknowledged, but also acted upon. While we have pointed to societal actors being important knowledge agents, we also want to stress that explicit 'science in society' research and policy interventions have so far mainly focused on a quite narrow segment of innovation: medicine, life sciences and, more recently, nanosciences/-technology. Other areas, but above all also the social sciences and humanities (SSH) as producers of societally relevant knowledge and models of the world, are rarely, if at all, at the core of engagement exercises. This leads to three kinds of recommendations.

First, innovation processes need to be developed in a way giving sufficient and clearly acknowledged space to societal actors as knowledge agents (see also section 4.4.). This will demand seriously reconsidering institutional structures (from funding to careers) and the corresponding (e)valuation processes. Second, it is essential to engage social sciences, humanities and the creative arts as important actors in the processes of producing innovations. While social innovations have

become more central in recent policy discourse, there is so far little imagination as to what such innovations could be and how they relate to technoscientific innovations. How might SSH's innovations be supported and fostered with similar energy and investment to that which is routine in some technoscientific areas? What roles might/should SSH play in (co)shaping the nature and orientation of technoscientific innovations themselves?

If we embrace such questions – and moves – we, third, need to extend the focus of attention and analysis to SSH in order to grasp how they contribute to understanding and shaping the world. This includes thinking about developing more effective means to facilitate and catalyse broader societal participation in and reflection on the ways how fields like economics, sociology and history shape contemporary societies.

4.4 Extending and creating new spaces for science-society interactions

This report has observed the chronic lack of time and space in (academic) research for reflection and engagement with science-society issues. We have noted that the ways in which science and society activities have been ritualised compounds other drastic constraining effects on the values and interests that help shape research and innovation. This underscores a need for more serious scrutiny of prevailing understandings of 'science' and 'society'. We therefore suggest a number of steps towards creating new, broader and more diverse spaces and for extending and varying the already existing ones in order to address science in society issues. Our suggestions contain three elements.

Fostering reflexivity about science-society issues

Returning to distinctions introduced between 'capital S' and 'small s' concerning science and society, this allows us to obtain a better understanding of the landscape of science-society activities extant in any given context. With this distinction we thus offer a heuristic tool to aid further reflection concerning the nature, implications and relationships between different kinds of practice. This heuristic framework is applicable equally to research organisations and funding bodies, as well as fields of research and innovation, agencies of a nation state or supra-national institutions like the European Commission as a whole. Even a single research community (or individual researchers) may find this helpful in contemplating the kinds of interaction they are engaged in, or might want to undertake in order to address the science in society implications of their activities.

As underlined earlier, the large majority of activities tend to work with quite limited and stable understandings of 'Science' and 'Society' – both written with a capital S and situated in the lower left of the landscape. While this is important, the aim of further measures should be to support a shift in attention towards activities which are situated more towards the upper right corner of this field, addressing 'science' and 'society' (with lower case s) as they are practised in the realities of particular contexts. In this way, we might hope to build a governance environment that allows for deeper and broader integration of societal concerns in all their actual diversity. Only in these richer and more authentic ways may we truly sustain science as a public good.

This shift from 'S-S' to 's-s' activities also means abandoning the idea of an easy top-down control of the interfaces between science and society. It means allowing innovations to unfold in a much more open environment. An emphasis on S-S creates an illusion that (high-level) policy making can control the outcomes of science, technology and innovation through the definition of rules which structure these spaces for engagement. By excluding certain critical voices – thus allowing participation upon explicit invitation only – it is sometimes hoped to create support for favoured orientations for innovation. In fact, it is more likely that the tight framing of such activities undermines the creativity and value of such settings and it does carry the risk that other spaces where opposition to innovation gets voice will be created in a bottom-up manner (see Box 4).

Making this move also demands protection for spaces where open negotiation is possible. This can be a challenge in the often highly pressured environments of innovation systems. And protecting such spaces requires measures and incentives that allow researchers to engage with societal issues without fearing that this will prove counterproductive in their careers. This highlights a strong need to experiment with new forms of valuing and rewarding societal engagement by scientists, alongside more narrowly conceived scientific outputs (see Box 3).

Finally, while pointing out some serious limitations of 'S-S' activities that are too narrowly defined, fostering 's-s' activities need not mean abandoning or diminishing the value of such initiatives. Instead, a complementary emphasis on 's-s' may enable the reimagining and refocusing of 'S-S' through integrating elements learned from 's-s' exercises. In order to achieve this, there is also a need for feedback mechanisms between 's-s' and 'S-S'

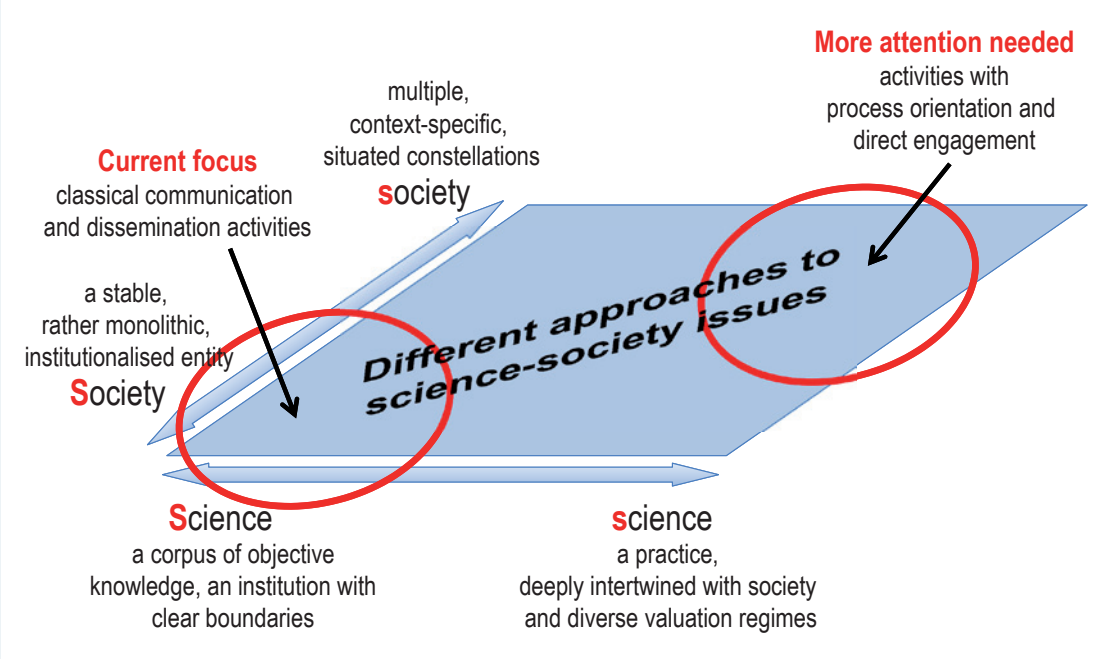

Figure 3.
Shifting our attention in approaches to science-society issues

in order to enable more reflexive and creative configurations of the two.

The need for different forms and formats

Taking seriously the notion of change and the potential inherent in the idea of crisis also challenges the existing repertoires for dealing with science-society issues. It invites us to move away from doing 'science in society' activities by the book and observe more attentively the multiple ways in which spaces of exchange and debate about science in society are created bottom-up. Much rather than seeing these as 'not invited' from the top (and thus potentially disturbing), they might be understood instead as creative and experimental ways of addressing these complex issues. Taking these diverse forms and formats seriously and investigating their functioning mechanisms will help avoid reliance on the currently growing standardised repertoire of possible engagement settings. Instead, it will allow greater understanding of what it is that people see in such spaces as effective ways to raise their voice, how it is they wish to engage, and why and in which ways disparate values and interests may be expressed in relation to contending innovation pathways. This means that we need more careful study and understanding of such tacit (less visible) forms of articulation between science and society – and how they can create micro-innovations in their own right.

One obvious corollary of this is the importance of extending attention to encounters and engagements with technoscience in the many new virtual spaces opening up in the internet, web and social media. There we find multiple – and often not very visible – arrangements, representing partly radically disparate conceptions and implementations of 'participation' and 'engagement'. These too may offer important sites for better integration of science in society.

This recognition of virtual spaces as sites for integration goes beyond their role as arenas where the institutional positioning game can be played (i.e., using them as promotional platforms). There already exists wide appreciation for their functioning as platforms for attracting public attention to science and technology, for competition between institutions about the public face of science, or for new forms of selling – both of institutions as well as the innovations and knowledge they create. Instead, efforts more actively to attend to the roles of these virtual spaces should engage:

1. in better understanding the multiplicity of micro forms, formats and forums which are already emerging beyond the domains of reputation management and marketing – and understanding them not just in individual terms, but collectively as a broad range of recontextualisations for science in society of a kind that matter deeply to the future of both;
2. in approaching such experiments as kinds of lab-floor, exploratory and creative spaces within and between which it is possible to learn more widely about diverse ways of engaging the many-stranded entanglements of science in society.

4.5 Making time-spaces for reflexivity – institutional/structural rearrangements needed

Finally, there are important ways in which the present analysis and recommendations place direct demands on institutional leaders and policy makers. Responsibilities arise to support both the creation of space and time for reflexive work and for creating the conditions under which truly responsible research and innovation can unfold. This can be done through a variety of different actions.

1. It is essential to acknowledge these kinds of activity and develop ways of **incentivising** associated work and making it visible. Specific efforts in this regard are already underway in individual institutions in particular countries, to experiment with such opening up of science and society activities and making them count in policy making. It is important to follow and build on these cases – taking them as learning environments in order to re-imagine wider contexts for research and innovation itself.
2. It is also an essential step to reconnect the process of **valuing and evaluating**. If research and researchers remain evaluated under a narrow set of activities and outputs, it will not be possible to integrate science in society activities into research in the necessary deep or wide-reaching ways. This broadening of research evaluation requires the development of new context-specific models for institutional valuing of this kind of work. This need not be in the form of scalar quantitative indicators. It also requires learning to value research in terms of contending narrative arguments over quality and necessity, rather than just counting and accounting exercises. The aim in the long run is to shift the self-understanding of scientists, re-invigorating roles for public intellectuals who contribute to knowledge society by formulating, translating and moving ideas through thinking and acting in broader terms – beyond the confined space of routine tick-boxes and indicator charts.
3. Building on experiences gained in the past decade, it is especially important to make serious efforts to further science in society activities in the realms of research and innovation themselves. While there have been quite important attempts made through the introduction of ELSA programmes or diverse technology assessment approaches, what is needed is a more extensive and diverse array of insights across different fields of science and technology, institutional domains and sociocultural traditions. Located both in private as well as public settings, it is a key requirement that these spaces for reflexive anticipatory governance of science and technology in society become more developed and enhanced. Large interdisciplinary research projects, including clusters of excellence, might provide appropriate settings for such undertakings, as might other venues for the societal embedding and pursuit of research and innovation.
4. In the most general terms, policy making must rethink science-society processes, not (as at present) just as 'annex' activities, which can be pushed aside when pressures get high – but as essential **inspirational spaces** that can help drive the creative energy behind research and innovation. Engagement activities provide spaces to step outside institutional pressures and re-connect with the broader aims and purposes of research (careers). Allowed to flourish in more spontaneous and diverse ways, these are dynamic places where both research and society get actively re-imagined and where social and technoscientific innovations can be co-produced simultaneously.

Annexes

Annex 1. The process of producing the Science Policy Briefing

ESF Standing Committees and Expert Boards have been key players in the promotion of science policy strategies within their scientific domains and research areas. In fulfilling this role, the Standing Committees and Expert Boards of ESF have produced Position Papers and Science Policy Briefings, thereby leveraging the voice of European science in national and European science policy arenas.[14]

In this context, this ESF Science Policy Briefing is the outcome of a strategic action under the title of 'The Future of Science in Society' launched by the ESF Standing Committee for Social Sciences (SCSS) in the autumn of 2011.The activity emerged from a proposal by Ulrike Felt (University of Vienna) following a scoping workshop that she chaired in Strasbourg in January 2011. This event, which gathered leading experts in Science and Technology Studies, representatives of ESF Standing Committees, members of the MO Forum on Science and Society Relationships and a member of the COST Domain Committee for Individuals, Society, Culture and Health (DC ISCH), was an opportunity to collectively identify major arenas and perspectives where the dominant framing behind 'Science in Society' needed rethinking. On the basis of these discussions, the proposal for this activity highlighted a number of topical issues for further reflection.

To conduct the work, the SCSS appointed a Scientific Committee of social scientists with expertise in studies of Science, Technology and Society. Chaired by Ulrike Felt, the membership of the Scientific Committee included Daniel Barben (RWTH Aachen University), Alan Irwin (Copenhagen Business School), Pierre-Benoît Joly (INRA-IFRIS), Arie Rip (University of Twente), Andy Stirling (University of Sussex) and Tereza Stöckelová (Academy of Sciences of the Czech Republic).

The Scientific Committee organised a series of thematic workshops (see Table 1) in the first half of 2012 to discuss in depth the topical issues and background considerations identified in the proposal. For each thematic workshop a background paper [15] was circulated in advance and selected discussants invited to the workshop to 'open things up' – see below for list of presentations in the thematic workshops. Looking for early and direct interaction with the intended audiences of this Science Policy Briefing, workshops were also attended by representatives of ESF Standing Committees, members of the MO Forum on Science and Society Relationships and a member of the COST DC ISCH – see below for list of participants in the thematic workshops.

As with any exercise of this kind, discussions in thematic workshops offered a complex array of branching avenues of deliberation, some remaining ambiguous or unresolved and others displaying divergent shades of interpretation. In order to structure and refine the most important observations, challenges and open ends to go in the final report, the Scientific Committee came together in a 'synthesis' workshop in Vienna on 26-27 July 2012. In line with the basic assumption that science-society issues always need careful contextualisation, the members of the Scientific Committee agreed to avoid producing a list of absolute considerations (or research to

14. A role that is progressively being taken over by Science Europe (http://www.scienceeurope.org/)

15. Background papers and list of participants are available online at www.esf.org/science-in-society

Table 1: Thematic workshops and crosscutting issues

the role of diversity	historical perspectives	technological/material framing	issues of norms and values underlying research and innovation	systematic reflection of all fields of science, including the social sciences and the humanities	
					Thematic Workshop 1 (20-21 February 2012, Vienna, Austria) Chairs: Ulrike Felt/Tereza Stöckelová On the diversity of European publics and political cultures
					Thematic Workshop 2 (3-4 May 2012, Vienna, Austria) Chairs: Arie Rip/ Pierre-Benoît Joly Changes in and around science: their dynamics and their evaluation
					Thematic Workshop 3 (18-19 June 2012, Vienna, Austria) Chairs: Daniel Barben/Alain Irwin "Science in Society" issues and the scientific community

be performed in the future) and focused instead on identifying spaces to which wider attention and care should also be directed.

The drafting process of this report has seen substantial reviewing by the Scientific Committee through three rounds of written comments and a teleconference on 8 January 2013. The Scientific Committee has also asked some of the participants in the thematic workshops, including the representatives of ESF Standing Committees from all domains, for written feedback. This activity has been formally approved by the successor body to the SCSS, the ESF Scientific Review Group for the Social Sciences, on 16 April 2013.

Annex 2. List of presentations in the thematic workshops

Workshop 1 – On the Diversity of European Publics and Political Cultures

20-21 February 2012, Vienna, Austria

Background paper – *Rethinking publics, issues and governance processes*
Ulrike Felt (University of Vienna) and Tereza Stöckelová (Academy of Sciences of the Czech Republic)

Discussants:

- *The ghost of science's publics is out of the bottle? New heuristics for mapping issues*
  Noortje Marres (Goldsmiths, University of London)
- *A few thoughts on the Diversity of European Publics and Political Cultures*
  Heritiana Ranaivoson (Vrije Universiteit Brussel)
- *A few thoughts from a NGO perspective*
  Claudia Neubauer (Fondation Sciences Citoyennes)
- *Science in society: the impact of established STS knowledge and the role of social science researchers as actors?*
  Claire Marris (King's College London)
- *Science and Media*
  Massimiano Bucchi (University of Trento)

Workshop 2 – Changes in and around science: their dynamics and their evaluation

3-4 May 2012, Vienna, Austria

Background paper – *Tensions between the new governance of science and the ongoing recontextualisation of science*
Arie Rip (University of Twente) and Pierre-Benoît Joly (National Institute for Agronomic Research)

Discussants:

- *Sites of recontextualisation and the dynamics of opening up and closing down*
  Andy Stirling (University of Sussex)
- *Experiences on the workfloor*
  Olivier LeGall (National Institute for Agronomic Research)
- *Studies of new governance of science*
  Jochen Gläser (Technical University of Berlin)
- *Experiments in recontextualisation, a personal journey*
  Jack Stilgoe (University of Exeter)
- *Anticipation and imaginaries*
  Ulrike Felt (University of Vienna)
- *Overall diagnosis, own experiences in committees in Europe and in Italy*
  Andrea Bonaccorsi (University of Pisa)

Workshop 3 – "Science in Society" issues and the scientific community

18-19 June 2012, Vienna, Austria

Background paper – *Science Culture: "science in society" issues and the scientific community*
Daniel Barben (RWTH Aachen University) and Alan Irwin (Copenhagen Business School)

Discussants:

- *Disunities and tensions: scientific cultures today*
  Martina Merz (University of Lucerne)
- *Excellence and its Others: practices and policies of research evaluation and gender equality*
  Marcela Linková (Academy of Sciences of the Czech Republic)
- *The impact of society on science*
  Martin Hendry (University of Glasgow/ Science and Technology Facilities Council)
- *Risky (dis)entanglements: tracing the intertwinements of science and society in living and working in research*
  Maximilian Fochler (University of Vienna)
- *Complex societies, complex systems and the future of research organization and life*
  Clark Miller (Arizona State University)
- *From "Science in Society" to "Responsible Research and Innovation"*
  Philippe Galiay (DG Research and Innovation, European Commission)

More information about the thematic workshops and dissemination activities can be followed at: www.esf.org/science-in-society

Annex 3. List of participants in the thematic workshops

The following people contributed to the discussions leading to this Science Policy Briefing:

- **Jean-Pierre Alix,** *National Centre for Scientific Research (CNRS), France*
  ESF Member Organisation Forum on Science and Society Relationships
- **Adrian Alsop,** *Economic and Social Research Council (ESRC), UK*
  ESF Standing Committee for the Social Sciences (SCSS)
- **Daniel Barben,** *RWTH Aachen University, Germany*
  Scientific Committee Member
- **Stefan Bernhardt,** *Austrian Science Fund (FWF), Austria*
  ESF Member Organisation Forum on Science and Society Relationships
- **Stéphane Blanc,** *Hubert Curien Pluridisciplinary Institute (IPHC-CNRS), France*
  ESF Standing Committee for the Life, Earth and Environmental Sciences (LESC)
- **Andrea Bonaccorsi,** *University of Pisa, Italy*
  Discussant WS2
- **Massimiano Bucchi,** *University of Trento, Italy*
  Discussant WS1
- **Adam Bžoch,** *Slovak Academy of Sciences, Slovak Republic*
  ESF Standing Committee for the Humanities (SCH)
- **Diego de la Hoz del Hoyo,** *European Science Foundation, France*
  Science Officer, Humanities and Social Sciences Unit
- **Ulrike Felt,** *University of Vienna, Austria*
  Scientific Committee Chair
- **Maximilian Fochler,** *University of Vienna, Austria*
  Discussant WS3
- **Jana Gašparíková,** *School for Economic Management and Public Administration, Bratislava, Slovak Republic*
  COST Domain Committee for Individuals, Society, Culture and Health (DC ISCH)
- **Jochen Gläser,** *Technical University of Berlin, Germany*
  Discussant WS2
- **Philippe Galiay,** *DG Research and Innovation, European Commission, Belgium*
  European Commission
- **Elisabeth Gulbrandsen,** *The Research Council of Norway, Norway*
  ESF Member Organisation Forum on Science and Society Relationships
- **Martin Hendry,** *University of Glasgow / Science and Technology Facilities Council (STFC), UK*
  ESF Standing Committee for the Physical and Engineering Sciences (PESC)
- **Alan Irwin,** *Copenhagen Business School, Denmark*
  Scientific Committee Member
- **Pierre-Benoît Joly,** *National Institute for Agronomic Research (INRA-IFRIS), France*
  Scientific Committee Member
- **Dionysia Lagiou,** *DG Research and Innovation, European Commission, Belgium*
  European Commission
- **Olivier LeGall,** *National Institute for Agronomic Research (INRA), France*
  Discussant WS2
- **Marcela Linková,** *Academy of Sciences of the Czech Republic, Czech Republic*
  Discussant WS3
- **Noortje Marres,** *Goldsmiths, University of London, UK*
  Discussant WS1
- **Claire Marris,** *King's College London, UK*
  Discussant WS1
- **Martina Merz,** *University of Lucerne, Switzerland*
  Discussant WS2
- **Clark Miller,** *Arizona State University, USA*
  Discussant WS3
- **Claudia Neubauer,** *Fondation Sciences Citoyennes, France*
  Discussant WS1
- **Giovanni Pacini,** *National Research Council (CNR), Italy*
  ESF Standing Committee for the Medical Sciences (EMRC)
- **Heritiana Ranaivoson,** *Vrije Universiteit Brussel, Belgium*
  Discussant WS1
- **Arie Rip,** *University of Twente, The Netherlands*
  Scientific Committee Member
- **Matti Sintonen,** *University of Helsinki, Finland*
  ESF Standing Committee for the Humanities (SCH)
- **Jack Stilgoe,** *University of Exeter, UK*
  Discussant WS2
- **Andy Stirling,** *University of Sussex, UK*
  Scientific Committee Member
- **Tereza Stöckelová,** *Academy of Sciences of the Czech Republic, Czech Republic*
  Scientific Committee Member
- **Isabel Varela-Nieto,** *Autonomous University of Madrid, Spain*
  ESF Standing Committee for the Medical Sciences (EMRC)
- **Alison Woodward,** *Vrije Universiteit Brussel, Belgium*
  ESF Standing Committee for the Social Sciences (SCSS)

Bibliography

Adam, B. and Groves, C. (2007) *Future Matters: Action, Knowledge, Ethics*. Leiden: Brill.

Arthur, W. (1994) *Increasing Returns and Path Dependence in the Economy*. Ann Arbor: University of Michigan Press.

Balconi, M., Brusoni, S. and Orsenigo, L. (2010). In defence of the linear model: An essay. *Research Policy*, 39(1), 1–13.

Barben, D. (2010) Analyzing acceptance politics: Towards an epistemological shift in the public understanding of science and technology. *Public Understanding of Science* 19, 274-292.

Barben, D., Fisher, E., Selin, C. and Guston, D. (2008) Anticipatory Governance of Nanotechnology. In: Hackett E., Amsterdamska O., Lynch M., Wajcman J. (eds.), *Handbook of Science and Technology Studies – Third Edition*. Cambridge, MA: MIT Press, 449-473.

Bennis, W.E. and O'Toole, J. (2005) How business schools lost their way, *Harvard Business Review* 83/4, 96-104.

Boltanski, L. and Thévenot, L. (2006) *On justification. The economies of worth*. Princeton, NJ: Princeton University Press.

Bucchi, M. (2008) Of Deficits, Deviations and Dialogues: Theories of Public Communication of Science. In: Bucchi, M. and Trench, B. (eds.) *Handbook of Science Communication*. London/New York: Routledge, 57-76.

Callon, M. and Rabeharisoa, V. (2008) The growing engagement of emergent concerned groups in political and economic life. Lessons from the French Association of neuromuscular disease patients. *Science, Technology & Human Values*, 33, (2): 230-261.

Callon, M., Lascoumes, P. and Barthe, Y. (2009) *Acting in an Uncertain World: An Essay on Technical Democracy*. Cambridge, MA: MIT Press.

Castells, M. (1996) *The Rise of the Network Society*. Oxford: Blackwell.

Commission of the European Communities (CEC 2006) From science and society to science in society. Towards a framework for 'co-operative' research. Report from the 'Gover'Science' Seminar, rapporteur A. Stirling. Directorate General for Research and Technology Development Available at: http://ec.europa.eu/research/science-society/pdf/goverscience_final_report_en.pdf

EC (2012) *Responsible research and innovation – Europe's ability to respond to societal challenges.* European Union; available at http://bookshop.europa.eu/en/responsible-research-and-innovation-pbKI3112921/?CatalogCategoryID=IG.ep2IxTjoAAAEucsAIYMRa

Edgerton, D. (2004) 'The linear model' did not exist: Reflections on the history and historiography of science and research in industry in the twentieth century. In: Grandin, K. and Wormbs, N. (eds) *The Science–Industry Nexus: History, Policy, Implications*. New York: Watson.

Epstein, S. (1995) The Construction of Lay Expertise: AIDS Activism and the Forging of Credibility in the Reform of Clinical Trials. *Science, Technology & Human Values*, 20(4): 408-437.

ERAB (2012) *The new Renaissance: will it happen? Innovating Europe out of the crisis*. Third and final report of the European Research Area Board. European Union.

ESF (2012) *Science in Society: a Challenging Frontier for Science Policy*. Report from the ESF Member Organisation Forum on Science and Society Relationships. Strasbourg: European Science Foundation. (to be retrieved at http://www.esf.org/publications/member-organisation-fora.html)

Expert Advisory Group on Science in Society (EGSIS 2008) Final Report of the Expert Advisory Group on Science in Society, EC Framework Programme 7, rapporteur A. Stirling. European Commission Directorate General for Research, Brussels, July 2008. Available at: http://ec.europa.eu/research/fp7/pdf/old-advisory-groups/sis-thirdreport_en.pdf#pagemode=none

Felt, U., Wynne, B. et al. (2007) *Taking European Knowledge Society Seriously*. Report of the Expert Group on Science and Governance to the Science, Economy and Society Directorate, Directorate-General for Research, European Commission, Luxembourg.

Felt, U. and Stöckelová, T. (2009) Modes of Ordering and Boundaries That Matter in Academic Knowledge Production. In: Felt, U. (ed.) *Knowing and Living in Academic Research. Convergence and Heterogeneity in Research Cultures in the European Context* (Prague: Institute of Sociology of the Academy of Sciences of the Czech Republic): 41-124.

Felt, U. (2010) Vers la construction d'un public européen? Continuités et ruptures dans le discours politique sur les cultures scientifiques et techniques. *Questions de Communication* 17, 33-58.

Felt, U. and Fochler, M. (2010) Machineries for Making Publics: Inscribing and Describing Publics in Public Engagement. *Minerva* 48, 219-238.

Felt, U., Fochler, M. and Winkler, P. (2010) Coming to Terms with Biomedical Technologies in Different Technopolitical Cultures. A Comparative Analysis of Focus Groups on Organ Transplantation and Genetic Testing in Austria, France, and the Netherlands. *Science, Technology, & Human Values* 35, 525-553.

Felt, U. (2013) Keeping Technologies Out: The formation of Austria's technopolitical identity. In: Jasanoff, S. and Kim, S.-H (eds.), *Dreamscapes of Modernity: Sociotechnical Imaginaries and the Fabrication of Power*. Preprint available at http://sciencestudies.univie.ac.at/publikationen

Garforth, L. and Červinková, A. (2009) Times and Trajectories in Academic Knowledge Production. In: Felt, U. (ed.) *Knowing and Living in Academic Research. Convergence and Heterogeneity in Research Cultures in the European Context*. Prague: Institute of Sociology of the Academy of Sciences of the Czech Republic, 169-226.

Gershuny, J. (1983) *Social innovation and the division of labour*, Oxford University Press

Giddens, A. (1991) *Modernity and Self-Identity: Self and Society in the Late Modern Age*. Stanford CA: Stanford University Press.

Guston, D.H. and Sarewitz, D. (2002) Real-Time Technology Assessment. *Technology in Society* 24, 93–109.

Hecht, G. (1998) *The Radiance of France. Nuclear Power and National Identity after World War 2*. Cambridge/Massachusetts: MIT Press.

Horst, M. and Irwin, A. (2010) Nations at ease with radical knowledge: on consensus, consensusing and false consensusness, *Social Studies of Science* 40/1, 105-126.

Irwin, A. (1995) *Citizen Science. A study of people, expertise and sustainable development.* London: Routledge.

Irwin, A. (2006) The politics of talk: coming to terms with the 'new' scientific governance, *Social Studies of Science* 36/2, 299-320.

Irwin, A., Jensen, T.E. and Jones, K.E. (2013) The good, the bad and the perfect: criticising engagement practice. *Social Studies of Science* 43/1, 119-136.

Irwin, A. and Michael, M. (2003) *Science, Social Theory and Public Knowledge*. Maidenhead/ Philadelphia: Open University Press.

Irwin, A. and Wynne, B. (1996) (eds) *Misunderstanding Science? The public reconstruction of science and technology*. Cambridge: Cambridge University Press.

Jasanoff, S. (ed.) (2004) *States of Knowledge. The Co-Production of Science and the Social Order*. London: Routledge.

Jasanoff, S. (2005) *Designs on Nature: Science and Democracy in Europe and the United States*. Princeton NJ: Princeton University Press.

Jasanoff, S. and Kim, S.-H. (2009) Containing the Atom: Sociotechnical Imaginaries and Nuclear Power in the United States and South Korea, *Minerva* 47, 119-146.
Joly, P.-B. and Kaufmann, A. (2008) Lost in Translation? The Need for 'Upstream Engagement' with Nanotechnology on Trial. *Science as Culture*, 17 (3): 1–23.
Landau, R., Taylor, T., and Wright, G. (1996) *The Mosaic of Economic Growth*. Stanford University Press, Stanford.
Latour, B. and Weibel, P. (2005) *Making things public*. Cambridge MA: MIT Press.
Law, J. (2009) Seeing Like a Survey, *Cultural Sociology* 3: 239-256
Leach, M., Scoones, I. and Stirling, A. (2010) *Dynamic Sustainabilities: Technology, Environment, Social Justice*, Earthscan, London.
Linková, M. and Stöckelová, T. (2012) Public accountability and the politicization of science: The peculiar journey of Czech research assessment. *Science & Public Policy* 39 (5), 618-629.
Marcus, E., Siune, K. et al. (2009) *Challenging Futures of science in society: emerging trends and cutting-edge issues.* Report of the MASIS Expert Group. Brussels: European Commission DG Research.
Marres, N. and Lezaun, J. (2011) Materials and devices of the public: an introduction, *Economy & Society* 40, 489-509.
Marres, N. (2012) *Material Participation: Technology, the Environment and Everyday Publics*. Houndmills: Palgrave Macmillan.
Marris, C. and Rose, N. (2012) Let's get real on synthetic biology. *New Scientist*, 2868; available at: http://www.newscientist.com/article/mg21428684. 800-lets-get-real-on-synthetic-biology.html
METRIS Report (2009) *Emerging Trends in Socio-economic Sciences and Humanities in Europe – The METRIS report*. A report by an Expert Group set up by the European Commission. Luxembourg: Office for Official Publications of the European Communities, EUR 23741.
Millot, G., Neubauer, C. and Storup, B. (2012) La recherche participative comme mode de production de savoirs. Un état des lieux des pratiques en France. Available at: http://sciencescitoyennes.org/wp-content/uploads/2013/05/FSC-recherche_participative-FdF.pdf
Mol, A. (2008) *Logic of care: Health and the problem of patient choice*. London/New York: Routledge.
Molas-Gallart, J. and Salter, A. (2002) Diversity and excellence: considerations on research policy. *IPTS Report* 66 (5), 5-13.
Morsing, M. and Rovira, A.S. (eds.) (2011) *Business Schools and their Contribution to Society*. London, Thousand Oaks, New Delhi, Singapore: Sage.
Nowotny, H., Scott, P. and Gibbons, M. (2001) *Re-thinking Science. Knowledge and the Public in an Age of Uncertainty*. Cambridge: Polity Press.
Nuffield Council on Bioethics (2012) *Emerging biotechnologies: technology, choice and the public good*, Nuffield Council on Bioethics, December 2012.
Owen, R., Heintz, M. and Bessant, J. (eds.) (2013) *Responsible Innovation. Concepts and Practice.* London: John Wiley.
Page, S.E. (2007) *The Difference: how the power of diversity creates better groups, firms, schools and societies,* Princeton: Princeton University Press.
Pollitt, C., Van Thiel, S. and Homburg, V. (eds.) (2007) *New Public Management in Europe: adaptation and alternatives*. Basingstoke: Palgrave Macmillan.
Porter, T. (1995) *Trust in Numbers. The Pursuit of Objectivity in Science and Public Life.* Princeton: Princeton University Press.
Power, M. (1997) *The Audit Society: Rituals of Verification*. Oxford: Oxford University Press.
Rabinow, P. and Bennett, G. (2012) *Designing Human Practices. An Experiment with Synthetic Biology*. University of Chicago Press.
Rafols, I., Leydesdorff, L., O'Hare, A., Nightingale, P. and Stirling, A. (2012) How journal rankings can suppress interdisciplinary research: A comparison between Innovation Studies and Business & Management. *Research Policy*, 41(7), 1262–1282.
Royal Society (1985) The Public Understanding of Science. Report of a Royal Society ad hoc Group endorsed by the Council of the Royal Society. Available at: http://royalsociety.org/uploadedFiles/Royal_Society_Content/policy/publications/1985/10700.pdf
Schot, J. and Rip, A. (1997) The Past and Future of Constructive Technology Assessment. *Technological Forecasting and Social Change* 54, 251–268.
SEC (2010) Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. Europe 2020 Flagship Initiative Innovation Union. SEC(2010) 1161. Brussels, 6.10.2010, COM(2010) 546 final. http://ec.europa.eu/research/innovation-union/pdf/innovation-union-communication_en.pdf
Seyfang, G. and Smith, A. (2007) Grassroots innovations for sustainable development: Towards a new research and policy agenda. *Environmental Politics*, 16(4), 584-603.
STEPS (2010) A *New Manifesto for Innovation, Sustainability and Development*, STEPS Centre, University of Sussex. Available at: http://anewmanifesto.org/wp-content/uploads/steps-manifesto_small-file.pdf
Stilgoe, J., Wilsdon, J. and Wynne, B. (2005) *The Public Value of Science – Or how to ensure that science really matters*. London: Demos.
Stirling, A. (2007) A General Framework for Analysing Diversity in Science, Technology and Society, *Journal of the Royal Society Interface*, 4(15), 707-719.
Stirling, A. (2008) Opening Up and Closing Down: power, participation and pluralism in the social appraisal of technology, *Science Technology and Human Values* 33(2), 262-294.
Stirling, A. (2010a) From Enlightenment to Enablement: opening up choices for innovation, In: A. Lopez-Claros, The Innovation for Development Report: 2009-10, Basingstoke: Palgrave Macmillan, 199-210.
Stirling, A. (2010b) Multicriteria Diversity Analysis: a novel heuristic framework for appraising energy portfolios, *Energy Policy* 38, 1622–1634.
Stirling, A. (2010c) Keep it Complex, *Nature* 468, 1029-1031.0
Stöckelová, T. (2012) Immutable mobiles derailed: STS and the epistemic geopolitics of research assessment. *Science, Technology & Human Values* 37, 286-311.
Von Schomberg, R. (2011) *Towards Responsible Research and Innovation in the Information and Communication Technologies and Security Technologies Fields*. Luxembourg: Publications Office of the European Union.
Wilsdon, J. and Willis, R. (2004) *See-through science: Why public engagement needs to move upstream*. London: Demos.
Wynne, B. (1991) Knowledges in Context, Science, *Technology and Human Values* 16, 1-19.
Wynne, B. (2007) Public Participation in Science and Technology: Performing and Obscuring a Political-Conceptual Category Mistake. *East Asian Science, Technology and Society*, 1 (1): 99-110.
Wynne, B. (2008) Elephants in the rooms where publics encounter "science"?: A response to Darrin Durant, "Accounting for expertise: Wynne and the autonomy of the lay public", *Public Understanding of Science* 17, 21–33.

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Authors

- **Professor Ulrike Felt (Chair)**
  University of Vienna, Austria
  Scientific Committee Chair
- **Professor Daniel Barben**
  RWTH Aachen University, Germany
  Scientific Committee Member
- **Professor Alan Irwin**
  Copenhagen Business School, Denmark
  Scientific Committee Member
- **Dr Pierre-Benoît Joly**
  National Institute for Agronomic Research (INRA-IFRIS), France
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- **Professor Andy Stirling**
  University of Sussex, UK
  Scientific Committee Member
- **Dr Tereza Stöckelová**
  Academy of Sciences of the Czech Republic, Czech Republic
  Scientific Committee Member

Editor:
Mr Diego De La Hoz Del Hoyo

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European Science Foundation
1 quai Lezay-Marnésia • BP 90015
67080 Strasbourg cedex • France
Tel: +33 (0)3 88 76 71 00
Fax: +33 (0)3 88 37 05 32
www.esf.org

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