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STAGE (HPSE-CT2001-50003) Final Report – February 2005

Science, Technology and Governance in Europe: Challenges of Public Engagement

Volume 1

Report

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Annex 1:

The STAGE Team
STAGE Conferences and Workshops

Annex 2: Key Discussion Papers:

DP1 – Elam and Bertilsson
DP2 – Hagendijk and Kallerud

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Abstract

STAGE was an eight country thematic network whose aims were to develop and refine a heuristic model of science and technology governance in Europe. Its approach has been one of iteration between, on the one hand, conceptual overview and synthesis, taking account of work under FP4, wherever possible parallel work under FP5 and the wider literature, and, on the other, 29 analytic case studies, based on existing research, of how policy cultures confront the governance of particular technologies, particularly in relation to wider public engagement.

Through this process, and the refining of our conceptual framework, we aimed to:

- understand more about the structure, process and boundary characteristics of national policy cultures in confronting common issues of science and technology governance, including those that arise from, or contribute to, the implementation of European regulation;
- analyse the particular science and technology issues, actors and processes which each policy culture highlights in relation to three technology domains – ITC, genetic modification in relation to food and medicines, and environmental management – examining particular mediating/brokering institutions and processes which construct issues, rhetorics and repertoires of response;
- and offer in consequence a more secure knowledge base to frame policy and practice concerning wider social participation in the governance of science and technology.

During the thirty-nine months of the network's life we have:

- organised six workshops in Portugal (October 2001) Norway (June 2002), Sweden (October 2002) , Greece (May 2003), Finland (November 2003) and the Netherlands (June 2004) to develop our thinking and plan further work;
- during each workshop, engaged with local analysts, policymakers and practitioners about distinctive features of their national culture of scientific governance
- Held conferences in Denmark (January 2002) and London (December 2004) to put STAGE into a wider context of related work
- produced two framing discussion papers, by Elam and Bertilsson and Hagendijk and Kallerud which have reviewed the literature, clarified key dimensions of governance, and framed the choice and writing of our case and country studies (discussion papers on these two papers are annexed to volume 1 of this report).
- produced 29 case studies of public engagement in science and technology governance covering a range of technology issues (annexed to this report in volumes 2, 3 and 4)
- made widespread collective and individual dissemination efforts including a Brussels presentation of the key results for policy and practice, over 60 STAGE related academic publications, and some 80 presentations at conferences, workshops etc

This report presents our typology of scientific governance, our main findings from our case and country studies, our conclusions for the understanding of scientific governance in general and for the development of public engagement in particular, ten lessons for policy and practice, and some thoughts on the future agenda for research.

1. Executive Summary

The context for our work: challenges to European scientific governance

This STAGE proposal was prepared in 2000, at a time when the public evaluation of, and response to, scientific and technological innovation were becoming seen as central to both economic and social policy. The spread in preceding months of bovine spongiform encephalopathy (BSE) and the consequent concerns about variant CJD had sensitized Europeans to a wide range of issues – such as the costs of GM food and medicines, the distributive effects of information and communication technologies and issues of environmental protection – which challenged scientific governance to take account of an expanding range of stakeholders and public assessments (including consumer choices and more diffuse expressions of anxiety). Thus scientific governance had become central to the relationship between public accountability and effective strategy and between social confidence and robust decision-making structures; and had achieved wide significance for the whole future of governance in Europe and the place of science and technology within European culture. At the broadest level, then, we could not understand the future of the European project itself without a better understanding of these 'new politics of science'.

We were encouraged in this focus by the the debate which the Commission had stimulated on developing a *European Research Area*[5], stimulated by concerns about Europe's declining research competitiveness, poses relations between science, society and citizens as one of its central concerns. The Commission *White Paper on European Governance* included reference to

> 'making scientific expertise more democratic in particular in the sensitive issues of health and safety'[6]

and the November 2000 Commission working document *Science, society and the citizen in Europe*[7] had the aim of provoking debate and stimulating proposals as to new thinking and action. Its prescription includes 'stepping up the science/society dialogue', 'using scientific and technological progress responsibly' and 'involving users in definition and implementation of research programmes'.

The STAGE work programme

STAGE took its cue from these developments. With other work supported at national and European level, it saw a need to find new mechanisms which could reconcile the needs for the continued development of science-based innovation, on which European economic competitiveness depends, with the demands for public participation and accountability. Within the confines of resources and approach of a thematic network, our aim was to make an input to understanding which could contribute to the broad shape of these new arrangements.

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[5] ***Towards a European research area****: communication from the Commission to the European Parliament, the Council, the Economic and Social Committee and the Committee of the Regions.* Document reference: COM(00) 6 Date: 18 January 2000
[6] October 2000 – Document reference: SEC (2000) 1547/7 final – page 7
[7] 14 November 2000 – Document reference: SEC (2000) 1973

In research terms the goal of the STAGE thematic network was to develop a heuristic comparative typology of forms of public participation in decision-making about technology, innovation and science-bound issues. In particular we sought to:

- understand more about the structure, process and boundary characteristics of national policy cultures in confronting common issues of science and technology governance;
- analyse the particular science and technology issues, actors and processes which each policy culture highlights in relation to three technology domains – ITC, genetic modification in relation to food and medicines, and environmental management
- offer in consequence a more secure knowledge base to frame policy and practice concerning wider social participation in the governance of science and technology and disseminate the results to a range of potential users

STAGE was contracted to work for 36 months from mid-September 2001 to mid-September 2004. In the event, because we took longer to assimilate a set of case studies that was much more extensive than originally planned, and because of delays in our final dissemination events, our contract was extended to 39 months until mid-December 2004.

Although we followed our overall objectives quite closely, we modified our means of achieving them during the first year. This stemmed from the development of a much more sophisticated understanding of the dimensions of the governance of science and technology, which culminated in the production of our first discussion paper, *Consuming, Engaging and Confronting Science: the Emerging Dimensions of Scientific Citizenship* (Elam and Bertilsson, March 2002).

In parallel, progress made at our early conferences and workshops led to a much clearer view of how case studies could contribute to our work. This work in developing a perspective on our case studies was led initially by João Nunes and Marisa Matias. Nunes and Matias argued that case studies should be chosen for their 'anchoring' capacity: for their facility in providing entry points into other case studies which may serve as 'qualifiers' to the main case. Dialogue between the anchoring studies and these wider dimensions is intended to be a continuing feature of this approach and a continuing resource of the STAGE network. Working with this approach would achieve a better understanding of the way in which the local policy systems in our eight countries respond to common European and local issues of science and technology policy and management, compared to continuing with separate studies to illuminate the 'top-down' and 'bottom-up' aspects, as originally proposed. We believe that these methodological changes, in line with the 'analytical and empirical flexibility' in the interests of the wider project to which we initially committed ourselves have enhanced the explanatory power of the network.

A bridge between this methodological approach and the conceptual analysis shown in the first working paper was provided by the original leaders of work packages 2 and 3, Egil Kallerud and Rob Hagendijk. After extensive discussions with the team they produced in September 2002 a *Framework for STAGE Case Studies*. This was further

developed into Discussion Paper 2 – *Changing Conceptions of Governance in Science and Technology in Europe: a Framework for Analysis* - by March 2003. These papers set out a typology of scientific governance, with six principal forms presented as ideal types[8], and some detailed guidelines for developing the case studies around key stages in the process of public engagement:

- setting the agenda;
- framing issues;
- framing expertise and publics;
- the forms and formats of participation used;
- outcomes – decisions and their effects;
- how this fitted into the overall sequential structure of the policy process.

Because of the significance of these two discussion papers for our work we have included them in volume 1 of this report.

As a result of applying this more developed methodology we produced a more extensive set of case studies – 29 papers as compared with the planned 8 – which are individually richer and which were the background for a fuller and more nuanced analysis of how national, European and global systems interact with different forms of governance in determining issues, actors and outcomes. Our detailed analysis can be found in the substance of this report and the case studies are appended in full; we hope that others will find the case studies useful for secondary analysis and thus add to the value of STAGE's work. In this executive summary we first summarise some of the main patterns of scientific governance across Europe, then give a synthesis of our conclusions about current science and technology governance in Europe, look more closely at f the deliberative mode, and offer some reflections on the potential of this body of knowledge to be used, through careful analysis and selective learning, to generate some competitive advantage for Europe. Finally, in summarising our conclusions, we present our ten lessons for deliberative practice and scientific governance.

Main features and issues in current science and technology governance in Europe

(a) Technology as a driver of the governance agenda

In attempting to learn lessons for the future of S&T governance we need first to try to understand how far the particular features of particular technologies have influence on the particular forms of governance response. Can it be argued that the same cases and technological developments evoke essentially similar patterns of governance and public response across Europe?

In our judgement, the development of public controversy is unlikely to be a matter of *either* technology *or* context but instead a combination of the two. Thus, in European nations where certain religious views hold strong, issues of the sanctity of human life

[8] These are set out more fully in section 3.3 of this report. These framing discussion papers, 1 and 2, can be found in full in annex 2 to this Report, published in Volume 1. The case studies appear as annex 3, ion Volumes 2,3,and 4.

may resonate especially (eg with regard to stem cell research), whilst in others questions of globalisation are seen as more significant (for example, in relation to GM foods). There is a particular danger of over-generalising across technologies and contexts in this regard. We recommend that further research be conducted into these questions of 'technology specificity' – especially with regard to new and emerging technologies. Technological characteristics alone cannot explain patterns of social response and we resist the idea that certain technologies *cause* public controversy. Instead, our case studies suggest much more complex patterns of social construction and response. Further reflection on our case study material could be a useful starting point for the early identification of future controversies.

(b) Multi-actor governance

Governance implies processes of policy setting, implementation and assessment which are not confined to government itself but which extend through a network of organisations and agencies and collective actors. In this narrow, literal sense, all contemporary scientific governance is multi-actor: the participation of government - be it European, member state or local – is necessary, but insufficient.

In looking at the broader role of multi-actor governance in this study we have been interested in the scope of these government centred networks and the dynamics by which they are constructed and maintained. Who is involved, what are their constituencies, and how do these relate to wider publics? Our cases also show the functioning of multi-actor governance in a narrower sense – in terms of the interplay of the executive, the judiciary and the legislature, and the way in which those processes interact with wider public and stakeholder engagement.

Multi-actor governance of science often echoes wider governance arrangements in other policy domains. In Norway, it exhibits aspects of 'inclusive corporatism' seen by some observers to be an entrenched part of Norwegian political culture. It includes among its members a number of representatives from major stakeholders, including 'critical' NGOs and experts. To balance between these various groups and functions has been a delicate task but it also contributes to the exclusion from debate of the general public. The technology board is a 'proxy' public debate on biotechnology, providing a sufficiently broad framework and credible standards for debating biotechnology issues to secure a key role for its input to public debate and to the political process. Corporatist structures and processes also lead to the exclusion of citizens from debate in Finland, where the partners are firms, research institutions, state agencies and ministries. A form of deliberation takes place between these, but a tradition of acceptance of new technology and the authority of the state means that unlike Norway, contacts with NGOs are generally weak. However, in the case of forest biotechnology, Finnish scientific corporatism is modified, and reflects the diverse set of interest groups and stakeholders connected to the forest sector, although NGOs complain about the limited impact of their opinions. Some of the inclusivity reflected in the governance of this sector may reflect ownership patterns – approximately every fifth Finnish family owns some forest, and private ownership accounts for over 75% of the wood used by the industry.

If the UK GM crops debate turned into a tentative if vulnerable experiment of a multi-level corporatist-deliberative-discretionary hybrid in science policy, the more or less

contemporaneous GM food debate in the Netherlands can be seen as something of an anti corporatist experiment, having its roots in the public engagement turn allied to scepticism about industry and NGOs having dominated a nuclear energy debate in the 1980s. The nuclear energy debate itself, having roots in popular protest against nuclear power plants, had been an attempt to broaden the range of participants, but had produced a decisive 'no' response which the government went on to ignore. Whilst responding to the momentum participatory approaches had established, a principal aim of the exercise was to ensure that the GM crops debate did not get highjacked by participants and the broadest scope for decision-taking was retained by government.

The Danish Board of Technology may be seen as having established one of the distinctive roles in multi-actor governance. Although its work is seen to be grounded in public participation, the public cannot be seen as its clients. Rather the Board can be seen as working for industry and for central and local government in testing the real social space available for new technologies: anticipating where opposition may surface in the real world, and helping sensitise participants in the exercise to the complexities of managing change – potentially shaping as well as reflecting new technology (an approach exemplified in the electronic patients' records case).

(c) *Dynamics of engagement*

Engagement can display a wide range of aims, processes, frameworks and dynamics, locating itself upstream or downstream, and demonstrating anticipatory (pre-innovation), participatory (usually at the point of innovation) or even post-participatory features (as when engagement exercises encourage further debate about the exercises themselves).

Although the wider public debates and protests that have surrounded participatory exercises in the Netherlands have developed a wide agenda of issues, formal public participations have always had a downstream focus, being narrowly politically and technically framed: thus the nuclear power debate was framed as being about the siting of reactors rather than broader issues of energy and environmental policy, and GM food about the conditions in which GM products and processes would be acceptable rather than the desirability of GM itself or its place in wider food policy. The Netherlands exception was the broader anticipatory approach in the IT debate of the early 1980s, with a focus on technology policy and preparing the public for technical change, and on establishing an ongoing capacity for technology assessment. However, even this debate was downstream in the sense that IT was assumed to be a technological imperative.

Until the early 1980s biotechnology was not seen as an independent field for regulation in Denmark and as a result the early approach to genetics issues was anticipatory. In 1980, with genetics being introduced to pharmaceutical products as well as to human reproduction, concerns were demarcated between risk, framed as a technical issue, and ethics which was perceived as an issue of general public concern. The establishment of the Board of Technology in 1986 led to the adoption of a wide range of techniques for assessment and citizen involvement applied to an equally wide range of issues, selected from an annual bids process.

In countries with strong corporatist traditions, like Greece, the public is less likely to get involved into the debating of new science and technology issues. This has been a recurring theme in the Greek case studies, especially in the ENGOs case, where, in

order to depoliticise the debate, the State attempted the corporatist inclusion of the leading groups.

The UK has witnessed or contemplated most forms of public participation in the last somewhat fevered decade. Agonistic action in particular on GM crops has been influential in prompting media coverage, which in some quarters of the press turned into media campaigns which supported consumer boycotts. The food producer industry was trying to appeal to the government for rationality in the face of prejudice just as consumer forces were rushing to align themselves to a new reality of the marketplace. Supermarkets were aided in anti-GM food policies by similar action by food-processing companies who supplied them.

Arguably the most sustained public deliberation during the period in the UK has been on the idea of deliberation itself. Academics and NGOs were very influential in this and in particular in the framing of the Jenkin Report, *Science and Society*. Since *GM Nation?* there is some evidence of the coalition of interests between academics and NGOs trying to consolidate deliberative processes, push them upstream, and extend their scope to cover decision-making within, for example, the research councils.

Although countries have introduced procedures for incorporating scientific advice into government decision-making, there appear to be no regular patterns across Europe in post-participatory processes.

(d) Transnational dimensions

The UK Jenkin Report, *Science and Society*, pointed up a paradox in that just as science and technology dramatically increased its offer of products and processes, the possibility arose that this might be prejudiced by public distrust. At that time the UK was playing science governance catch up in relation to many established countries of northern Europe, but nevertheless the full-hearted way that Jenkin embraced a more dialogic approach to public engagement temporarily catapulted the UK into a 'leadership' role on issues of scientific advice and on participation. The more ambitious claims for participation - as a new social technology which would extend democratic approaches into science and provide new trajectories of socio-technical change enjoying wider public consent - foundered in part on a new paradox: that EU policies and processes, but also those of global trade and economic regimes, can be seen to be the wider framing processes at work. Neo-liberal approaches to competition and trade, in which the need to develop a competitive knowledge economy dominated, strongly determined an agenda of issues, and set restricted frames for public engagement on them.

This new paradox recurs in our case studies. We see the problem of the articulation of public concerns being out of step with increasingly transnationally defined technology policies in the Netherlands, whilst Finland becomes a model of the knowledge economy, as one where participative mechanisms largely do not need to be invoked. Swedish trust in their own scientists leads to an expanded 'republic of science' where the wider social choices surrounding new technologies are left for the scientists themselves to judge and manage. Even in Denmark, the reference point on European pluralism and public participation on S&T, the Danish Board of Technology underwent a period of political threat. European restrictions on opt-out were seen to provide constrained room for manoeuvre of the UK government in relation to GM crops.

Of course, in other cases transnational borrowings and reference points helped to challenge existing positions and open up space for debate. In 1993, as the suspicion arose of the existence of BSE cases in the country, Portuguese authorities invoked scientific uncertainty on how to diagnose the disease as an argument to declare its non-existence. In 1996, however, as a consequence of the Europeanization of the BSE controversy, the Portuguese political authorities were forced to accept the existence of the BSE risk and of cases in the country.

Further, Europe itself has become a space for study, analysis and social learning. Here the EU itself and in particular the Citizens and Governance in Knowledge-Based Society and the Science and Society streams of FP6, have been important contexts of learning. Portuguese social movements took advantage of their short and recent history to draw in a selective way on other European experiences, appropriating and adapting some of the most innovative initiatives and avoiding responses that had failed in other contexts. The overwhelming majority of borrowings of institutions and processes appear to be from within Europe and this may contribute evidence to the existence of a distinctive European model. However, the foreign tag on counter-expertise has not always played well in domestic politics, and this is particularly true in Greece where national solutions have particular political salience. In addition, it appears that the Greek environmental NGOs, in attempting to read a European programme into their domestic politics, may have neglected opportunities to learn about Greek popular priorities in the environmental field.

(e) *Convergence and divergence*

In their most open form, deliberative approaches to scientific governance might be expected to open up a variety of issues and values, reflecting the diversity we have found in national systems across Europe. They would be bottom-up agents of divergence. But our case studies have made us aware of the importance of the framing of deliberative exercises. Framing can be inclusive or restrictive with regard to the choice of issues, the selection of participants, the construction of evidence and the significance of results in determining policy outcomes. Such framing can reflect and enhance the significance of local concerns, or it can reflect European or global agendas.

As we already noted, global neo-liberal pressure towards economic competition within and between the triads of Europe, Japan and the U.S. and in relation to developing East Asian economic power, is one of the strongest drivers towards contemporary convergence of national and world regional systems. The analyses that support these developments are variants on the old linear model of innovation, tying economic success closely to achievements in science and technology.

Following convergence down this route we might expect deliberative mechanisms to develop in future into a restricted role in providing information on the socio-technical space open for market motivated and market or discretionary delivered solutions. However, there are other possibilities open. Looking behind the surface, the limits of consensus may be in the course of being reached. The case of biotechnology controversies in Denmark reflects fundamental political disagreements about what constitutes the good society, as do the conflicts between GM and organic production in the UK. Such developments present a challenge to governance – that of coexistence

rather than consensus. They may leave behind politically fragile settlements whose legitimacy can be called into question**.**

Our reading of the Portuguese cases seems to apply across most of the countries we have studied. On the one hand, it is an environment that promotes market modes of governance - many countries that were used to dealing with scientific governance issues primarily in other terms, like the Netherlands and Denmark, are forced to acknowledge and adapt to this change. On the other hand, it is one in which agonistic modes of governance will be increasingly significant. So the wider economic policy environment may look for consensus within societies and convergence between them, but may promote dissensus and divergence.

Some states are not yet fully subject to the deliberative turn, and although presenting different features, they suggest that convergence is a slow process. Norway, self-consciously identified as a laggard, conservative state, demonstrates a view of technology strongly anchored in regulatory law and practice. The ethics, social utility, sustainability, and the precautionary principle that defines the restrictive and 'conservative' regulatory policy adopted by Norway, may also at the same time be seen as a 'provident' policy, as these concerns have increasingly become parts of European regulatory policy. More deliberative modes of governance in S&T policy have emerged in Norway during the last decade with the establishment of an institutional structure of S&T policy by which some completely new institutions have been charged with a specific responsibility to stimulate public debate and facilitate broader public participation in processes of science and technology policy. As these develop they may take a different course from the market led – and market-constrained - initiatives of other countries.

In terms of the pressures for convergence, the implications of international economic competition for scientific governance is not a new issue. Discussion amongst European governments of the extent to which public scepticism towards science and technology is an obstacle to the creation of an 'innovative knowledge society' dates back over 20 years.[9] However, there is little doubt that global regulatory regimes and pressures within Europe from the Lisbon agenda have given market governance additional impetus. In consequence it has been argued that the deliberative agenda and the Danish model of participatory science and technology governance are being subsumed into the discourse of economic growth - changing the deliberative mode towards more discretionary and educational modes, co-existing with the market mode as for instance in the GM labelling case. Thus Danish consensus conferences mix ideals of deliberation between citizens and consumer contributions to policy.

Portugal is in a unique position, having deliberately 'de-selected' popular participation as a contribution to democracy in the period of 'normalisation' which followed a plethora of popular and citizen initiatives in 1974-75. Portugal today represents discretionary scientific governance with a strong educational component, and no institutions for experimenting with participatory procedures. Unlike Greece, agonistic struggle is seen on particular issues and in the co-incineration case enjoyed a kind of victory after a general election changed policy. This capacity for mobilisation, and its local roots, are one potential for new approaches to scientific governance; another is the contradiction between the attention to the promotion of scientific education and culture,

[9] To the Versailles Economic Summit of the EU in June 1982, which had on the agenda public resistance to technical change.

and the absence of the Ministry from most public controversies on S&T; and a third is the discrepancy between the positions on controversial issues such as environmental problems taken in European forums and those for internal consumption.

Of the countries we have studied Norway and Portugal may be those most likely to produce new trends in scientific governance.

Some conclusions on the current governance of science and technology across Europe

The results of our work show that these are indeed fascinating times for the political treatment of science and governance across Europe. Our cases suggest a diversity of European governance practice – but also certain thematic links and common debates.

Of particular relevance to this report, social initiatives in democratic engagement, once limited to a small number of European nations, have now become more widespread. The Danish model of 'consensus conferences' has been widely borrowed and, even more widely, discussed. Dutch approaches to national debate and consensus formation (for example, around energy policy) no longer appear quite so unique in the European context as they did in the 1980s. The UK has moved from its previous reliance on expert committees to some experimentation with public debate and engagement (notably, in the context of genetically modified foods but likely also in the area of nanotechnology). The European Commission itself has adopted a 'Science and Society action plan' in which issues of public support and engagement are given prominence.

On the one hand, matters of science and technology policy (especially genetic modification, stem cells and nanotechnology) have become central to political and institutional action within Europe. On the other, there would appear to be a growing acceptance (fuelled partly by experience of previous controversies) that such matters cannot be tackled without public engagement and support (or at least legitimation). In this situation, it is perhaps tempting to talk of a new European paradigm for scientific governance in which science and society work together and innovative forms of social partnership are being created. In this report we examine the evidence for a new European governance style – but also consider a series of critical issues concerning the future of science, technology and governance in Europe.

Certainly, there is a significant disparity between this (admittedly partial) turn towards engagement in the countries of Europe and the wider experience of global scientific governance. European discussions of the need for public consultation appear very different in focus and tone from the treatment of science and innovation in North or South America, Africa or Australia. Of course, there have been (and indeed still are) initiatives of this type in the USA, Canada and Australia (to offer three obvious examples) but such initiatives have not generally been supported at the national institutional level nor are they 'mainstream' in the manner talk of public consultation and engagement has become in Europe.

In drawing attention to this apparent trend, it is also important to maintain a critical perspective on the kinds of change that have taken place. As a number of colleagues

within the STAGE network have observed, there is a danger that this shift is taking place largely at the level of rhetoric – of 'talk about talk' (Bertilson and Elam, Hagendijk, Horst, Irwin). Equally, in an entity of the scale, complexity and diversity of the European Union, it is unlikely that any trend will be uniform or one-directional. As previous research in the EU has suggested (Irwin, Rothstein, Yearley and Mc Carthy) standardisation and diversity often accompany one another so that attempts to impose a common European pattern can actually accentuate questions of local identity and difference. Immediately, therefore, we encounter the necessity for analytical scepticism about claims to a commonly applied European paradigm or a sweeping shift in international institutional practice. There is also a methodological requirement to move beyond broad statements about paradigm shift and towards a more careful empirical and comparative treatment of national practices.

One major aim of this report will be to examine the balance between national/ and supranational statements of policy intent and the actual 'on the ground' (or lived) experience of policy formation and enactment. Included in this will be a discussion of the often-implicit aims of the new governance style: does public engagement necessarily lead to policy consensus? Will such deliberation facilitate or impede the innovation process? At the heart of the discussion here will be an attempt to evaluate recent governance initiatives across Europe and to consider their implications for the political direction of science and technology.

Our argument is **not** that a new paradigm of engagement has swept across Europe, pushing aside the old emphasis on innovation and economic competition. Although interesting social experiments in engagement have taken place, it is not plausible to suggest that these have replaced more familiar modes of governance and institutional action. In any case, significant debate still surrounds the form and effectiveness of such experiments.

What we **do** argue instead is that Western Europe represents a particularly important site for the study and development of scientific governance. As our typology of governance will convey, it is over-simplistic to portray European scientific governance as caught in a battle between two models of governance (the neo-classical vs the deliberative). Instead, we present a situation where a number of governance modes are in loose (often implicit and unacknowledged) co-existence and (sometimes) competition. We do not view any single 'paradigm' as being entirely dominant (although the 'market' mode appears to be growing in influence across Europe right now). But we do portray a European scientific culture into which there has been an infusion of deliberative ideals and a consequent questioning of the best route to social and technological innovation. We also argue that concrete examples of deliberative governance are shaped by the simultaneous existence of several other modes of governance: deliberation cannot simply be viewed as an ideal but must also take tangible shape in settings where there are other influences on the form and direction of scientific governance.

What makes Europe distinctive is not the replacement of one governance mode by another. Instead, there is a distinctively European culture of scientific governance in which new questions are being asked and issues of 'science, society and innovation' have become more mainstream than in the past. Our report represents one attempt to

explore this contemporary scientific and governance culture in Europe and to assess the lessons for analysis and action. Going further, however, our report also raises more critical questions for the European governance of science. As we will suggest, the notion that scientific governance can operate exclusively at national level is very much open to question. It is also necessary to consider the wider challenges to governance under three broad headings: the *global* context, the context of *innovation*, the *social, economic and cultural* context of science.

A typology of governance

Our argument then is that it is necessary to move beyond a simple bi-modal presentation of governance styles. Too much discussion has taken the form of either/or presentation: typically, *either* an emphasis on innovation and competition *or* a concern with democracy and engagement. As a means of moving beyond this, we next present a basic taxonomy through which different forms of governance may be characterized and related to one another.

One important aspect of this taxonomy (or typology) is to compare the roles assigned to 'public' groups within each mode. Is 'the public' being constructed as active or passive; as consumers or as citizens; as homogeneous and stable or as fractured and dynamic? Each mode 'performs' the relationship between scientific/technological innovation and wider society in a distinctive manner. In what follows, some very broad generalisations are offered: no country fits straightforwardly into any single classification and all combine a mix of these elements. Equally, the categories are not intended to be watertight. Considerable overlaps can be identified, for example, between the corporatist and deliberative (or educational and market) approaches.

The typology proposed here comprises the following six types:

Discretionary: In discretionary governance, policy making takes place with virtually no explicit interaction with 'the public'. Decisions are taken with very little input to the policy process by any group outside the institutions directly responsible for science and technology policy (essentially, government departments and closely related industrial and scientific bodies). On a general level, science governance in Portugal and Greece can be seen to exemplify this discretionary mode in the sense that governance is presented primarily as a matter for government. Government is portrayed as serving universal goals of progress, welfare and growth. Equally, the public interest is easy to define and enact. Within this mode, there is no sustained effort to incorporate the views of various publics in policy processes, let alone to develop a culture of scientific citizenship;

Corporatist: Within corporatist governance, differences of interest between stakeholders are recognized as inputs to processes of negotiation in which workable compromises are sought. The processes of negotiation take place within a closed or highly regulated space, so the decisive feature is the question of admission and recognition of legitimate stakeholders. In Finland and Sweden the creation of a knowledge society as a necessary prerequisite for the establishment of a well-functioning national innovation system has been seen as a commonly shared goal. Hence, all relevant stakeholders have been expected to contribute to the fulfilment of this vision, leaving very little room for

opposing voices to be heard. Norway and Denmark, on the other hand, can be seen to have shaped an inclusive corporatist mode of governance where various oppositional voices are sought to be included as stakeholders in the processes of negotiation. Perhaps the basic assumption within corporatist governance is that real differences of interest exist but that these can be defined and then resolved through closed processes of deliberation and negotiation;

Educational: Educational modes of governance assume that conflicts or tensions regarding science and technology policy are founded on a lack of knowledge on the part of the public. Hence it is necessary to educate the public through dissemination of scientific (expert) knowledge in order to create an informed public of scientific citizens that understand the experts' assessment of the problems and possibilities of science. Educational modes seem to be part of the style of governance in many European countries, particularly in connection to the high-profile controversies surrounding biotechnology, where initiatives aiming at disseminating knowledge (exhibitions, special teaching material for schools, information campaigns) have been part of the governance portfolio. A notable example of this educational mode has been the effort to create a pervasive and widely spread scientific culture in Portugal through a national agency - *Ciencia Viva* – in charge of programmes for the promotion of scientific education and culture. But the efforts in Finland and Sweden to increase the public understanding of science as a necessary component of building a knowledge society can also be seen as exemplifying this educational mode of governance;

Market: Market governance is based on the notion that science and technology can be governed through the economic mechanisms of demand and supply. The value of science comes from the surplus value created through its commercialisation and the general contribution to the generation of wealth in society. Scientific governance should be supportive of this potential. In this mode, the public participates as customers and consumers in a market when they make decisions about purchasing a product. Compared to countries outside the EU (notably the US) European traditions of governance may be less explicitly market oriented (although science and technology policy discussion in the UK about the need for 'confident consumers' fits this model well). However, there are signs that economic liberalisation and deregulation are increasingly leading to a market mode of governance (as for example in Finland). This is exemplified also by the persistent European suggestion that GMO labelling is the best means of letting consumers choose for themselves rather than relying on complex regulatory structures;

Agonistic: Agonistic governance takes place under conditions of confrontation and adversity, when decisions have to be made in a political context where positions are strongly opposed. In general the political democracies of Europe are not primarily characterised by agonistic forms of governance. It seems, however, that certain policy processes regarding science and technology evolve in ways which can lead to a form of agonistic stalemate. Governance of nuclear waste in the UK, for instance, is an example where policy decisions have been made in the face of heated public opposition. Agonistic processes suggest a loss of control by the state (either deliberate or, more generally, not) as a variety of stakeholders struggle for authority and influence;

Deliberative: Deliberative governance rests on the ideal that governance of science can be based on strong public support deriving from a continuous public debate of, and engagement with, science. Consensual agreements developed within the framework of the public sphere serve as foundations for legitimate policy decisions. In this mode, members of the public do not partake as consumers of science, but as scientific citizens who take on the perspective of the common good. This concept of public deliberation cannot be seen as a complete description of policy formation in any of the European countries. Nevertheless, it seems to be an ideal, which – as we have already noted - is rather important in the constitution of science governance, and various participatory exercises have been moulded around this aspiration. In particular, the consensus conferences arranged by the Danish Board of Technology have been influential in this context, but also the GM Nation public debate in the UK must be seen as a significant attempt to realise the ideal of deliberation. The assumption within deliberative governance is that lay participation will improve the quality of decision-making, stimulate rational debate and provide a new route to social consensus.

As this brief discussion of our typology has demonstrated, European scientific governance cannot be interpreted as a simple pattern of convergence or a linear, uni-directional development. Our European case-studies demonstrate that none of the examined European countries can be characterised by only one of these modes of governance. Rather, each country can best be described as a unique mix of several of these modes.

For example, the UK manifests just about every mode – although corporatism has largely been out of fashion there since the 1970s. Meanwhile, Denmark also contains a modal mix but has historically placed less political emphasis on market governance. Furthermore, it seems that the different national styles of governance are not stable, but rather in periodic transition (Sweden may increasingly be operating within an educational/discretionary mode whilst Norway shows signs of moving in a very different direction). Although there seem to be patterns of mutual influence, it is also clear that different countries follow different trajectories, individually shaped by local, national cultures. In this context, it is also interesting to consider how directly 'European' institutions (especially the European Commission) fit with our typology. Our suggestion again is that these typically combine several modes (sometimes within one policy statement) with the market, educational and deliberative approaches often being expressed.

Our argument is that it is specifically this co-existence of modes that represents the European framework (or style) of scientific governance. As this report will go on to discuss in considerable detail, the juxtaposition and 'churning' of modes offers a unique opportunity to consider the future possibilities for scientific governance. In that sense, Europe represents a distinctive social and institutional laboratory – although, given the close link between scientific governance and wider political and institutional cultures, it cannot be assumed that what works in one setting will necessarily work elsewhere.

We are not offering a unitary paradigm of scientific governance in Europe but instead a more complex – but distinctive in international terms – pattern of diversity, co-existence and contradiction/complementarity. It follows that merely criticising individual nations for being 'insufficiently' committed to one mode or another (for example, for failing to

live up to deliberative ideals) may be of limited intellectual and practical benefit. Instead, we should recognise that nations will almost inevitably combine modes. However, this inevitable combination in turn suggests the need for greater analytical clarity – and policy reflection. The current political tendency is to make different 'modal appeals' simultaneously: as when institutional rhetoric (for example, in government reports and major political speeches) shifts - at times, very abruptly - between public engagement and greater international competitiveness without pausing to consider their possible connection or tension. Our recommendation is that, rather than presenting each of the modes as separate and hermetically sealed, serious reflection should now be given to their mutual accommodation in policy practice. We see little evidence that this process of critical reflection has so far begun.

The typology of modes of science governance should therefore not be seen as a meta-framework for judging (or comparing) national styles of science governance, in order to assess whether they comply with a single European paradigm of science governance. Instead, the typology is employed as a heuristic model, which makes it possible to expand the understanding of the various patterns of convergence and divergence across Europe. It is also important to stress that the allocation of each governance case-study to a particular mode is likely to be contested (one commentator's 'deliberative' mode may appear 'educational' to another). As is common to heuristic models the 'modes' distinguished are intended as 'sensitizing devices' (Blumer, 1969).[10] There are no rigid criteria to distinguish between modes in an indisputable manner. Different modes may also be rather less distinctive in practice than they appear to be in principle. Thus, the deliberative case for 'broadening the stakeholders' can develop in practice into an extension of older corporatist principles. These are fluid judgements, open to contestation. This suggestion is strongly supported by our empirical findings.

It seems to be an overall lesson from our case-studies that claims about procedural (un)fairness, accusations of manipulation/bias as well as the questioning of motives represent an important and integral part of debates over science governance. In the UK, for instance, parts of industry denounced the outcome of the *GM Nation?* public debate by stressing that the organisation of the exercise had allowed too much space for viewpoints from radical participants rather than maintaining a more controlled deliberative process (Healey)[11]. Passing judgements on forms of participation and governance are therefore significant and often constitutive elements in public debates with substantive consequences. They form a rhetorical reservoir of arguments that can be used by different stakeholders in order to sustain substantive positions, questions and outcomes and they should be analysed as such.

What we have dubbed 'deliberative governance' played a special role in our analysis as ideas about deliberative democracy have played such an important role inspiring governments and citizens to develop and engage new forms of public engagement with science. Evidently, the existence of a European deliberative rhetoric about 'science and society engagement' is an important phenomenon which has an effect in itself. What lessons can be drawn from our case studies for the conduct of future engagement

[10] Blumer, H. (1969). Symbolic interactionism; perspective and method. Englewood Cliffs, N.J.,, Prentice-Hall.
[11] STAGE Discussion Paper 28, this report, volume 4

initiatives? In the remainder of this executive summary, we will focus especially on processes of deliberation and engagement within Europe

The deliberative mode in European practice

As has already been suggested, in all the countries studied within our project scientific governance has been on the agenda as an increasingly important aspect of policy making. Furthermore, ideals about public participation have surfaced in all countries, although there are significant differences in the extent to which such ideals have actually been implemented. Thus, countries such as The Netherlands, Denmark and the UK have been relatively energetic in this regard whilst deliberation has been less influential as a governance mode in Portugal, Greece and Finland. In this context, it should also be acknowledged that the need for public engagement has in some cases originated within the policy establishment – as, for instance, has largely been the case with GM debate in UK and the Netherlands - or from civil society - as was demonstrated in the case studies from Greece and Portugal.

In general, it is difficult to identify a clear pattern of convergence with regard to the relation between policy formulation and outcome of actual participatory exercises designed to make an input to policy. The case-studies do not suggest a straightforward connection between the conclusions of specific participatory exercises and changes in policy. However, the identification of a causal relationship between deliberative 'output' and policy change is less straightforward than is often presented: we are typically dealing with complex multi-variable situations where it is often hard to identify a single 'cause' of policy change. Rather we should see the relation as one of mutual shaping or, more accurately, as a *co-evolution* of public debate and policy processes. It is however also clear that there is a widespread demand for greater clarity about the status of participatory exercises ahead of their commencement. In particular, there is very commonly public scepticism about whether government will change its views as a consequence of deliberative recommendations.

While it is understandable that governments will wish to keep their options open in terms of awaiting the actual outputs of a deliberative exercise before committing to take the findings seriously, such a non-committal stance encourages a climate of suspicion and distrust ('they'll only accept the result if it tells them what they want to hear'). Once a government states that the goal of a participatory exercise is to have policy impacts, then government should be committed to incorporate (or at least pay close and explicit attention to) the outcome – otherwise the exercises might very well produce adverse effects in terms of lack of trust and engagement. One theme across our cases was a persistent scepticism about the extent to which engagement exercises were 'real' or 'legitimatory'.

It is important to emphasise the concrete situations in which public engagement in scientific governance is introduced. The case studies present a continuum stretching from a situation in which they are employed as way of trying to soften or avoid *agonistic* stalemate (as the debates about GM in Netherlands and UK demonstrate) or as a way of dealing with *anticipated conflicts* (as in the country cases from Sweden and Finland) in situations where the relation to the publics so far has been primarily corporativist or even discretionary.

The case studies also demonstrate a rather diverging picture when we ask whether the public engagement is supposed to be an *end in itself or a means to a particular outcome*. As an *end in itself* public engagement is introduced primarily as a way of empowering participants and creating a culture of scientific citizenship. As *a means* deliberative initiatives can be employed both to extend corporativist efficiency (by resolving potential conflicts through negotiation) and to learn about consumer/citizen preferences in order to make socially robust public policy. In this context a number of points seem relevant:

- It is important to establish whether public engagement with science is seen as a means to *support and sustain* a high rate of technical innovation (as in the educational modes in Sweden and Finland) or *oppose* it (as in Norway, where values and public scepticism are incorporated as a kind of legitimate stakeholder in corporativist negotiations);

- It is important to be aware of how notions of common ground, common good, rational arguments and responsibility for the whole enter the policy discussion about participatory exercises. In some cases these ideals seem to be expected as a form of outcome – for instance in the Danish model of consensus conference. But sometimes they also seem to be a necessary input – as in the Dutch case, when participants in the GM debate should be 'innocent' citizens with no prior strong opinions on the issue;

- There is a need to consider further the relationship between participatory mechanisms and marketization – it seems that, in some cases, participatory methods become a way of exercising consumer choice. In this context, it is interesting to discuss the difference between consumers exercising their rights to choose based on individual preferences, and the ideal of deliberation by citizens committed to being convinced by the better argument. This is not to say that the latter is better than the former, but in actual exercises confusion between the two might cause distress and distrust. Furthermore, it is possible that there are a number of issues which can probably not be dealt with adequately in a market mode (for example, broad issues of research ethics or regulatory frameworks);

- In close connection to the latter points, our cases raise questions concerning the best relationship between participatory initiatives and conventional policy institutions: should such initiatives be kept at arm's length from government or more fully integrated? The arm's length conduct of participatory initiatives is relatively common – with a semi-independent agency (eg the Danish Board of Technology or the UK Agriculture and Environment Biotechnology Commission) charged with conducting initiatives at a distance from government. From a governmental perspective, such a structure allows a very visible independence and autonomy for deliberative initiatives. However, this relationship can leave the agencies in question struggling very publicly for resources and vulnerable to political change – and can create a situation where they are seen as optional extras to the policy process rather than a central feature.

The cases also raise important issues about the relationship between wider public participation and scientific review of the same issues. One common way of dealing with this is for government to separate the 'public' and 'scientific' discussions of an issue (for example, the UK decision about whether to proceed with the commercialisation of GM crops). The alternative is to bring scientific experts and members of the public more directly together in order to allow an exchange of views and assessments (this is partially attempted within consensus conferences).

From the STAGE perspective, one vital aspect of any participatory process is the actual 'framing' of the debate ie deciding which questions to ask, what sources of evidence are necessary, how the key issues are to be defined. This is especially important when the issues dealt with across the network can be encapsulated in a variety of ways: is the nuclear power debate in Sweden about the science and technology of radioactive waste disposal or the maintenance and encouragement of the larger nuclear fuel cycle (including military uses)? Very often, ethical, political, scientific and legal issues are not easily separated so that implicit decisions are made to prioritise certain questions over others and to define the issues in particular ways. Our suggestion is that this phase of problem definition and framing is integral to the policy process. If deliberative initiatives are to be worthwhile then we recommend that public groups should participate in the initial stage of problem definition (ie in deciding what needs to be discussed and how) rather than being forced into a sometimes-problematic framework. 'Upstream' participation in defining and framing of debates does not preclude that major struggles about the 'proper' framing of questions, issues and procedures will continue to play a role. The Dutch debate about GM food in 2001 illustrates that.

It is also important for those sponsoring deliberative initiatives to take a broader look at the kinds of evidence that will be considered relevant and important. There is still a tendency to see public groups as contributing only to ethical and political discussions rather than having legitimate evidence and forms of knowledge to offer. Strict separations of 'public' and 'scientific' review can also mean that legitimate questions (eg about the need for particular innovations) do not get fully addressed.

Looking across our cases where there have been attempts to put the ideals of public deliberation into practice, a number of further observations can be offered:

- In antagonistic circumstances, stakeholders experiencing lack of support for their views have a tendency to use accusations of a hijacked debate as a means of rejecting the exercise. In this way, deliberative exercises run the risk of making antagonisms even more pronounced. In additional deliberative efforts might actually make latent conflicts more explicit – as suggested in one of the Swedish case studies;

- The restriction or extension of legitimate actors is a crucial issue, and 'exclusion by composition' is a common theme within the case studies, although it takes different forms. In the Portuguese case studies it was obvious that several relevant stakeholders from the public were excluded from the process. But it may be the case that the explicit wish to engage with 'neutral' citizens (as in the Dutch or British GMO cases) is also a question of exclusion by composition,

since stakeholders (with strong viewpoints) are seen to be 'polluting' the process of public deliberation;

- There is a tension between efficiency and legitimacy in participatory methods. Deliberative exercises need to be steered, but this steering can be overdone with a consequential loss of credibility. In many of our cases, considerable effort was needed to keep the initiative on-track and alive. As with the Dutch GM discussion, debates are not always successful and it would be useful to conduct further research into the circumstances surrounding success and failure;

- In many of our cases, there was a governmental desire to achieve social consensus through deliberation and so regain public trust. The view that greater engagement is a route to rebuilding public trust appears to be widespread across Europe – despite the evidence that deliberative exercises can exacerbate as well as resolve policy differences. Equally, consensus may not be an achievable – or necessarily desirable – policy objective. The view that the deliberative mode can in itself (ie without wider institutional change) settle public concerns about the direction and form of socio-technical change is not supported by our cases. Instead, it could be suggested that rhetorical statements about the need for deliberation which do not also consider the full institutional implications of this mode are likely to lead to alienation and increased scepticism.

One might be tempted to conclude from the above that the ideal of deliberation is too contested, contextually-sensitive and flexible to be of any intellectual or policy value. To do so at this stage would be wrong in our view. The situation is much more complicated and our assessment of the deliberative mode of governance should at least take the following features of deliberative practices into account:

- A **partiality** within the conduct of deliberation across Europe: only particular (generally high-profile) issues have been selected for deliberative discussion. Initiatives tend to be rather small-scale and marginal;

- A **conflictuality** within the cases: despite the enthusiasm among government bodies for deliberation as a means of consensus generation, we find considerable areas of dissent and disagreement;

- A **fragility** to these initiatives: deliberative processes have not become embedded in government but often appear to be at the point of termination. For example, both the Danish Board of Technology and the UK Agriculture and Environment Biotechnology Commission have been under threat at different points during our work.

Our argument is that partly it is the antagonistic elements, the confusion between the different modes and the constant threat of collapse that keep participatory exercises alive. Perhaps it is precisely these challenges that give participatory exercises their capacity to invoke (and provoke) change – although the promises of deliberation might never be fulfilled as such. However, these partial, conflictual and fragile tendencies need to be balanced with a policy framework which is open to the issues raised, flexible in the face of competing assessments, and committed to taking the outcomes of

deliberative exercises seriously. We do think that the questions suggested by the STAGE network need to be reflected on more fully by policy institutions which still have a tendency to make statements about the need for greater deliberation without thinking through the consequences of such a significant shift in political and institutional culture or its relationship to other modes of scientific governance.

Contrary to widespread belief - it may often be the antagonistic elements, the confusion between the different modes and the constant threat of collapse that keep participatory exercises alive. Perhaps it is precisely these challenges that give participatory exercises their capacity to enrol people and to invoke (and provoke) change. Rather than trying to do away with partiality, conflictuality and fragility altogether, we need a policy framework which is open to the issues raised, flexible in the face of competing assessments, and committed to taking the outcomes of deliberative exercises seriously in formally democratic decision procedures. That might be just enough. To ask for more might not only be unattainable, but might actually become counterproductive as it sacrifices the fruits of continuing but constructive disagreement about fundamental values at the altar of premature consensus on issues of subsidiary importance.

Scientific governance in critical perspective

So far in this summary, we have raised some basic questions about the practice of scientific governance across Europe. In this section, we raise more fundamental matters which take us beyond the specifics of institutional practice in the different nations. What underlying issues of science and social change are being raised? And what are the consequences of these for the way we conceptualise scientific governance in the future?

There are many starting points for a critical perspective on contemporary scientific governance. As we will see in many of the case-studies, there is a lingering scepticism about whether engagement exercises are merely tokenistic – or whether they fail to address the 'real issues'. It is also possible to criticise the very language of 'governance' for its imprecision. Certainly, the term is open to variable definition and, in particular, it is not always clear which groups are included/excluded (where are the parameters of governance actually drawn?). Here we will draw attention to three particular areas of challenge which take us outside the internal operation of scientific governance and raise wider issues.

For the purposes of this executive summary, these challenges can be presented as follows:

- the challenges of the *global context*: the fact that our cases are all essentially *national* in focus (albeit with strong international connections) is very revealing of the tendency for deliberative governance (and indeed the other modes) to be framed in 'single nation' terms. We would argue that there is something decidedly anachronistic in the idea that individual nations can adopt an independent approach to the fundamentally-global technologies and socio-technical processes considered in this report. Of course, this principle of international collaboration is fundamental to activities within the European Union.

However, there is still a tendency for individual governments to present these issues as a matter for *national* debate (as in the UK's *GM Nation?*) rather than taking seriously the global networks involved. This in turn raises wider issues concerning the operation of democratic principles within globalised techno-industrial systems. Generally, the determinedly national focus of most attempts at deliberative governance in particular fails to address such issues;

- the challenges of the *innovation context*: as we note in the main report, this point can be raised through the issue of consultation timing. Based on our cases, it can certainly be argued that serious public discussion generally only occurs after the basic processes of scientific research and industrial development have taken place. By the point of 'GM debates' taking place in countries such as The Netherlands and UK, substantial investment had already taken place and the product development was already at a very advanced stage. In this situation, the possibilities for deliberative governance are very constrained and it is certainly difficult to raise more basic questions of the need for and direction of change. In this situation, 'upstream' engagement has been presented as a way forward – but, as we note, there is no inherent reason why this will be less constrained than current approaches (although it may also have advantages);

- the challenges of the *social, economic and cultural context*: the current tendency is for deliberative governance to add a layer of 'public debate' to existing institutional processes without acknowledging possible tensions between, for example, economic competitiveness and democratic engagement. Governance is presented as a way of facilitating change but more fundamental questions of the relationship between science, democracy and the marketplace are not considered. This tension becomes particularly apparent when different forms of 'evidence' (whether based on scientific review, economic evaluation or public assessments) are brought together within processes designed to achieve speedy social consensus. In this situation, there is a tendency for 'public' views to be downgraded. Presented differently, the social context of innovation could be seen as fundamental to any form of successful technical change. The current tendency is instead to see societal evaluation as a hurdle to be cleared rather than the *sine qua non* of the innovation process.

These challenges all highlight the problematic character of scientific governance in contemporary Europe and it is tempting to reach negative conclusions about the future of such inherently flawed processes. Taken positively, however, they could also suggest a distinct *European advantage* for future innovation. Given our suggestion that Europe has built up a unique body of practice and experience in this area, European nations are also in a very strong position to develop new ways forward which do not simply recreate the governance problems of the past. Rather than presenting public ambivalences around science and technology as a weakness – as a handicap when

dealing with competitor nations - it is possible to present the experience represented in our case studies as a rich source of learning and practical insight. To offer one example, the case studies discussed here in the area of gene technology should be of substantial assistance when dealing with the new issues of nanotechnology. This beneficial effect, however, will require open and reflective institutional processes that are receptive to the lessons of past experience. Certainly, it is safe to conclude that ignoring our own past and denying these experiences cannot provide a route to future success.

Ten Lessons for Deliberative Practice and Scientific Governance

We have so far presented a series of findings and observations based on the cases studied within the STAGE network. We understand that the points raised are, on the one hand, condensed and sketchy (since we are generalising from a very rich body of empirical material) and, on the other, diverse and discursive (since these are subtle issues of overlapping modes and partial experimentation). At the risk of over-simplifying a large body of evidence, it is worthwhile to summarise some of our findings in the form of relatively specific policy recommendations. The number of these is somewhat arbitrary and the relationship to STAGE-based evidence is admittedly variable. However, we offer the following as a contribution to policy discussion around these issues.

1. ***Don't promise what you can't (or won't) deliver. Do be clear in advance about the institutional response to and uptake of any exercise.*** Policy institutions embarking on a deliberative exercise should be as explicit as possible in advance about the status of the exercise and its recommendations. Failure to do this can lead to public disillusionment and scepticism (one of the most common questions asked by members of the public when participating in such exercises is 'will this make any difference?'). This also suggests that institutions should think carefully before embarking on any exercise about what they are trying to achieve (clarifying issues or achieving political closure?);

2. ***Don't assume that consensus is a practical (or desirable) policy objective***. There would appear to be a common rhetorical move across Europe from 'engagement' to 'consensus formation' (and the concept of 'consensus conference' has been very influential here). We see no reason for consensus being more appropriate to policy than the identification of significant areas of disagreement and dissent. It may also be that the search for consensus within contested public issues is doomed to failure (and risks being seen as artificial);

3. ***Don't treat deliberation as a one-off hurdle***. There is a tendency for governments in particular to view 'public participation' as an obstacle to be negotiated and then left behind as 'normal' bureaucratic processes resume. It would be better to view 'engagement' as a regular interaction designed to ensure that policy objectives and public assessments do not deviate over time. In this way also, the wider culture of governance cannot operate in isolation from (or ignorance of) public concerns;

4. ***Don't confuse a small number of high-profile engagement initiatives with the wider culture of European scientific governance. Institutions should consider the relationship between different governance modes.*** As our presentation of the governance typology above underlines, contemporary scientific governance in Europe can best be characterised as multi-modal with the deliberative mode simply one among many (and certainly not the dominant mode). This also suggests that any particular governance mode must co-exist with (often several) others – the 'market' mode is especially significant. Inevitably, this means that compromises and balances must be made. Currently, these seem to be implicit and indeed unconscious rather than explicit and reasoned;

5. ***The form – and framing – of engagement initiatives is crucial to the outcome***. As a number of our cases demonstrate, the question is not simply *whether* public discussion occurs but crucially also *in what form* that takes place. The current tendency is for government to impose a framework on deliberation which suits its own short term policy needs rather than engaging with public problem definitions and concerns (as when 'technical' issues are artificially separated from 'ethical' problems or questions of 'need' or policy alternative are defined out of discussion). Our recommendation is that considerably greater attention should be given to the 'pre-stage' of any deliberation – with public inputs especially valuable at that point;

6. ***There is still a tendency to polarise 'science' and 'the public'***. Despite substantial criticism of the 'deficit' model of science-public relations, there remains a strong tendency for official bodies to present the public as both homogeneous and remote from scientific matters. Over-generalised talk of 'science and society' tends to reinforce this unhelpful schism. There is an urgent need to embrace more pluralistic and overlapping models of science-public relations by, for example, acknowledging the diversity of European publics and the considerable differences in scientific evidence across multiple contexts of policy formation;

7. Linked to the previous point, ***there remain substantial and unresolved tensions around the relationship between 'public engagement' and 'sound science'.*** As we have stressed at a number of points in our report, further policy attention needs to be given to the inter-relationship between contrasting governance modes and also to the wider relationship between public policy making and scientific advice. There is considerable lack of clarity right now about how scientific advice should feed into deliberative debates. The tendency is to keep science remote from engagement but this in turn places substantial constraints upon public discussions and arguably diminishes the effectiveness of science and technology policy making;

8. ***Transparency and engagement are not enough***. Whilst for many policy makers deliberation is seen as an end in itself, for many members of the public it is primarily a means to wider institutional and policy change. So far the implications of deliberative governance for the operation of scientific institutions have been barely considered. The assumption that deliberation is

simply an add-on to current policy processes may come under increasing challenge in the future;

9. ***It is important to consider what lies behind public concerns over these issues***. In particular, there is a political tendency to reduce diverse public concerns over the form and direction of proposed innovations to a 'risk' framework. It is then relatively straightforward to present such concerns as uninformed and mistaken by comparison with a technical risk assessment. Such an approach is ultimately provocative rather than helpful and will cause further problems of public alienation from policy processes. Once again, the importance of planning the 'pre-debate' stage is emphasised. Equally, policy institutions will need to be more consistently attentive to public questions and issues as they arise;

10. ***Institutional learning is generally neglected.*** There is a tendency for initiatives to be completed and then immediately consigned to history as policy actors move on to the next challenge (or return to business as usual). It is essential that the experience of deliberative initiatives is brought together on a regular basis in order that lessons can be learnt from common experience. Given the richness of European experience in this area, there is considerable potential here for further reflection and policy development.

2. Background and objectives

This STAGE proposal was prepared in 2000, at a time when the public evaluation of, and response to, scientific and technological innovation were becoming seen as central to both economic and social policy. As issues across Europe - including the costs of GM food and medicines, the distributive effects of information and communication technologies and issues of environmental protection - suggested, the governance of science and technology was required to deal with an expanding range of stakeholders and public assessments (including consumer choices and more diffuse expressions of anxiety). Consciousness of these issues had been propelled to the fore in the immediately preceding months by the spread of bovine spongiform encephalopathy (BSE) and the consequent concerns about variant CJD. In this situation, governments at local, national and European level were confronting within the domain of science and technology key issues of the relationship between public accountability and effective strategy and between social confidence and robust decision-making structures, which had wide significance for the whole future of governance in Europe and the place of science and technology within European culture. At the broadest level, we could not understand the future of the European project itself without a better understanding of these 'new politics of science'.

These issues were well recognised in the institutions of the European Union. The debate which the Commission has stimulated on developing a *European Research Area*[12], stimulated by concerns about Europe's declining research competitiveness, poses relations between science, society and citizens as one of its central concerns. The Commission *White Paper on European Governance* included reference to

> 'making scientific expertise more democratic in particular in the sensitive issues of health and safety'[13]

and the November 2000 Commission working document *Science, society and the citizen in Europe*[14] had the aim of provoking debate and stimulating proposals as to new thinking and action. Its diagnosis rested on the accelerating process of scientific change, with new social needs contrasting with the increasing financial and commercial interests in the generation of new knowledge, and an increased capacity for the well informed to critique new developments reinforcing a wider erosion in confidence in political authority. Its prescription includes 'stepping up the science/society dialogue', 'using scientific and technological progress responsibly' and 'involving users in definition and implementation of research programmes' – a process which it saw as comparatively well advanced with EU funded research. It noted that this whole agenda implies an increased role for the economic, social and human sciences, and calls for comparative studies of lessons to be learned from user involvement.

STAGE took its cue from these developments. With other work supported at national and European level, it saw a need to find new mechanisms which could reconcile the needs for the continued development of science-based innovation, on which European

[12] ***Towards a European research area****: communication from the Commission to the European Parliament, the Council, the Economic and Social Committee and the Committee of the Regions.* Document reference: COM(00) 6 Date: 18 January 2000
[13] October 2000 – Document reference: SEC (2000) 1547/7 final – page 7
[14] 14 November 2000 – Document reference: SEC (2000) 1973

economic competitiveness depends, with the demands for public participation and accountability. Within the confines of resources and approach of a thematic network, our aim was to make an input to understanding which could contribute to the broad shape of these new arrangements.

Specifically, the STAGE thematic network's overall objectives, as recorded in the technical annex to the original proposal, were to:

- develop work under FP4 through the PESTO (TSER) and BASES (BIOMED) projects and add value to and synthesise research and analysis with which European scholars are involved nationally
- locate it within a heuristic model;
- refine this model through complementary analytic studies of the workings of eight European policy cultures in relation to their response to:
    i. common Europe-wide issues. Such issues may include those where perceived risks and benefits of science and technology are elements of Europe's negotiating position vis-à-vis other states through mechanisms such as the WTO;
    ii. particular issues and processes that characterize the individual national system.
- bring the results to stakeholders in the process including policymakers and research managers in industry, government and academia across Europe, as well as NGOs and grassroots movements operating at a national or European level

Through this process, the technical annex continued, we aimed to:

- understand more about the structure, process and boundary characteristics of national policy cultures in confronting common issues of science and technology governance, including those that arise from the implementation of European regulation;
- analyse the particular science and technology issues, actors and processes which each policy culture highlights in relation to three technology domains – ITC, genetic modification in relation to food and medicines, and environmental management – examining particular mediating/brokering institutions and processes which construct issues, rhetorics and repertoires of response;
- offer in consequence a more secure knowledge base to frame policy and practice concerning wider social participation in the governance of science and technology and disseminate the results to a range of potential users

STAGE was contracted to work for 36 months from mid-September 2001 to mid-September 2004. In the event, because we took longer to assimilate a set of case studies that was much more extensive than originally planned, and because of delays in our final dissemination events, our contract was extended to 39 months until mid-December 2004. Although we followed our overall objectives quite closely, we modified our

means of achieving them during the first year. This stemmed from the development of a much more sophisticated understanding of the dimensions of the governance of science and technology, which culminated in the production of our first discussion paper, *Consuming, Engaging and Confronting Science: the Emerging Dimensions of Scientific Citizenship* (Elam and Bertilsson, March 2002). In parallel, progress made at our Coimbra workshop and Copenhagen conference led to a much clearer view of how case studies could contribute to our work. This work in developing a perspective on our case studies was led initially by João Nunes and Marisa Matias. Nunes and Matias argued that case studies should be chosen for their 'anchoring' capacity: for their facility in providing entry points into other case studies which may serve as 'qualifiers' to the main case. Dialogue between the anchoring studies and these wider dimensions is intended to be a continuing feature of this approach and a continuing resource of the STAGE network. Working with this approach would achieve a better understanding of the way in which the local policy systems in our eight countries respond to common European and local issues of science and technology policy and management, compared to continuing with separate studies to illuminate the 'top-down' and 'bottom-up' aspects, as originally proposed for WP2 and WP3 respectively. Instead, the analysis of the anchoring and qualifying cases set out by Nunes and Matias took place progressively across the whole period of work packages 2 and 3, until month 27. This is in line with the 'analytical and empirical flexibility' in the interests of the wider project to which we initially committed ourselves (STAGE Technical Annex, para 3.4, p. 14). We believe that it has enhanced the explanatory power of the network.

Following this approach, we achieved a better understanding of the way in which the local policy systems in our eight countries respond to common European and local issues of science and technology policy and management, but no longer planned separate studies to illuminate the 'top-down' and 'bottom-up' aspects, as originally proposed for WP2 and WP3 respectively. Instead, the analysis of the anchoring and qualifying cases for all the dimensions set out by Nunes and Matias took place progressively across the whole period of work packages 2 and 3, until month 27. This is in line with the 'analytical and empirical flexibility' in the interests of the wider project to which we initially committed ourselves (STAGE Technical Annex, para 3.4, p. 14).

In order to provide a bridge between this methodological approach and the conceptual analysis shown in the first working paper, the original leaders of work packages 2 and 3, Egil Kallerud and Rob Hagendijk, worked together during this period to provide more specific guidance in the selection and analysis of the case studies. They organised discussion on this as the main business of the Oslo workshop, and after iteration with team members produced in September 2002 a *Framework for STAGE Case Studies*. This was further developed into Discussion Paper 2 – *Changing Conceptions of Governance in Science and Technology in Europe: a Framework for Analysis* - by March 2003. These papers set out a typology of scientific governance, with six principal forms presented as ideal types[15], and some detailed guidelines for developing the case studies around key stages in the process of public engagement:

[15] These are set out more fully in section 3.3 of this report. These framing discussion papers, 1 and 2, can be found in full in annex 2 to this Report, published in Volume 1. The case studies appear as annex 3, ion Volumes 2,3,and 4.

- setting the agenda;
- framing issues;
- framing expertise and publics;
- the forms and formats of participation used;
- outcomes – decisions and their effects;
- how this fitted into the overall sequential structure of the policy process.

As a result of applying this more developed methodology we have produced a more extensive set of case studies – 29 papers as compared with the planned 8 – which are individually richer and which create the opportunity for a fuller and more nuanced analysis of how national, European and global systems interact with different forms of governance in determining issues, actors and outcomes. Our analysis can be found in the substance of this report; we hope that others will find the case studies useful for secondary analysis and thus add to the value of STAGE's work.

3 Scientific Description

3.1. Theoretical background

Around 2001, talk about engaging the public in scientific and technological change has become fashionable among policy makers, especially in Europe. There are at least three important sources for this enthusiastic endorsement of public participation in innovation policies. First, there has been considerable public concern in the 1980s and 1990s about technological change in relation to food, public health, animal safety, environment, innovation and employment. Public unrest not only shows the disquieting mistrust of government agencies among the public, it also signalled that innovation policies that are underway as a part of the emerging knowledge economy may run into fierce opposition unless something is done to rebuild public trust. Secondly, after decades of arguments about public ignorance social research convincingly demonstrates lay people's abilities to engage in discussions about science and technology and changes that might affect their everyday lives. The deficit model, arguing that most people miss the knowledge and ability to engage in rational discourse about the implications of science and technology for society is increasingly questioned and new, more optimistic views finally get a hearing among policy makers. Thirdly, the ambition of European leaders to make Europe the most competitive knowledge economy in the world requires both the mobilization of public support for technological innovation as well as appeasement of the public with respect to regulatory reforms and adjustments in social security systems and employment. Government initiated public deliberations about the necessity to realize the new knowledge economy may contribute to achieving both goals provided debates do not get out of hand with respect to basic premises.

The increased support among policy makers for public participation can be understood against the background of the factors just mentioned. And this resulted in new and pressing questions. How can policy making benefit from public consultation? How to organize large scale public deliberations that would allow the general public to become involved and to educate itself at the same time? What are best practices? How do various EU members countries deal with public unrest and public participation? What are the key parameters that may explain the diversity of current countries across the EU? Is there convergence? Is a specific European form of scientific governance emerging and if so, what does it entail?

This report draws on recent research work especially brought together in order to develop a heuristic framework to analyze and compare practices across various European countries. We did altogether 29 case studies in more than eight European countries. Alongside the work on case-studies we have held workshops in each of the countries involved in the project both to explore the national policy cultures from nearby and to discuss theoretical problems and perspective from which we might profit in developing the comparative heuristic framework. In what follows we report on how our more general theoretical considerations have inspired the construction of the typology.

3.1.1 Lay citizens' abilities and political realities

The attempt to develop a typology to compare and analyse the ways in which citizens and governments engage with one another in public consultation exercises takes us beyond the old debate between elitist deficit views on the public understanding of science and ethnographically inspired critiques of these.

To see this there is no need to recount in detail how food scandals like BSE, Food and mouth disease and concern about genetic modification contributed to a major crisis of public confidence in the 1980s and 1990s. Until quite recently, governments and their spokespersons often responded quite negatively to public unrest. It was taken as a signal that the public needed to be better educated with respect to science. Studies which showed how little citizens knew and understood about areas like cloning, and biotechnology, framing etcetera were drawn upon to illustrate how deficient citizens' knowledge of current scientific matters actually was. The idea that citizens were not sufficiently versed with respect to science became known as the deficit model. Public opposition to technological innovations could be delegitimated and dismissed with reference to this thesis. Opposition was a sign of ignorance and preferably ignored or dismissed as such.

This approach increasingly became problematic as ethnographic studies documented the ability of lay people to understand as well as deconstruct science–based arguments and data once these became directly relevant to their everyday concerns. In addition various sources and surveys in the mid and late 1990s added to the idea that 'ignorance' was not a very likely factor in helping to explain cross-national differences in the acceptability of GM food.

Yet, to show the ability of lay people to understand complicated arguments and to engage in rational debate does not solve the problem as to how to actually organize new and more inclusive forms of public participation. How does the idea that one should take the lay citizen's views seriously match up to the existing political system and its dynamics? How to conceive of the relation between experts and lay people and their differential input into the policy process once you seek to make the latter more inclusive? How important is it whether attempts of governments to engage the public are merely rhetorical ploys or based on genuine endorsement of the new ideology? (An impossible question, but nevertheless an important practical issue for which solutions are created on an everyday basis across Europe and beyond.) From an ethnographic perspective such questions should of course be addressed through empirical analysis rather than through abstract and normatively charged theorizing. And as (perceptions of) contexts are of vital importance for how such processes turn out in practice, the typology should flesh out such contexts and how they matter.

3.1.2 Deliberative or agonistic democracy

The current trend towards more inclusive models of public engagement should not be seen in isolation from what happens in other domains of government and the development of the European political agenda. Nor can the intellectual context from which changing practices are analysed be artificially restricted to the domain of science

and technology studies, ignoring shifting conceptions of governance and democracy in the broader intellectual and political debate. The review of this wider intellectual environment in discussion paper number 2 was of considerable importance to the development of the typology. And the same can be said about our debates about the context of governance and politics as it exists and develops in the EU.

Although ethnographic studies have brought us a powerful critique of the deficit model and convincing analyses of lay people's ability to participate, they have not matched this with equally worked-out ideas as to what lessons they provide on engaging lay citizens in matters of technological innovation. And where implications seem to be obvious, they seem rather naïve and unreflexive vis-à-vis the hard-nosed realities of the well-entrenched political system and its dynamics. Irwin 's (2001)[16] observations about the biosciences consultations in the UK illustrate this point. Suggestions to policy makers to be open minded and to allow citizens just to say what have on their minds were at best only partially successful in this exercise. The necessity to relate to the current political agenda as defined by the policy makers and its 'clock' led to procedures and outcomes that diverted from the ideas suggested in the ethnographic literature. Exercises to elicit public views on technological issues would have to work with a different time schedule or 'beat' than the one that rules the lives of professional politicians. Such politicians are said to be more impressed by survey outcomes than by the results of non-directive discussion or focus groups.

From the perspective of the everyday reality of the politicians as well as from the perspective of 'realist' political thinkers, pleas for more lay-oriented participation strategies quickly sound rather idealistic and naïve. History (and lack of knowledge thereof) is often invoked to show the impossibility or unfeasibility of more radical forms of democracy. A similar observation can be made with respect to some notions and theories that belong to the recently emerged and much debated theories of deliberative democracy.

The recent popularity of public consultation about technological innovation among policy makers is not an isolated phenomenon. It is associated with a wider trend towards deliberative democracy and multi-actor governance in Europe and globally that has emerged since the early 1980s. In public policy analysis 'governance' as a term has largely replaced the language for what has traditionally been called 'government'. Public policy making is increasingly conceptualized as something that emerges in interactions between a plurality of stakeholders and interested parties. Multi actor governance has replaced the conception of policy making as a top-down chain in which governments decide about the policy to be implemented . (See f.e. Hanf and Scharpf, 1978).[17] Public policy making should be inclusive in its attempts to integrate all relevant stakeholder groups and their views, arguments and opinions in negotiations about the proper definitions of the situation, the problems to be solved and the best means to do that.

[16] Alan Irwin, 'Constructing the Scientific Citizen: Science and Democracy in the Biosciences', *Public Understanding of Science*, 10 (1), (2001), 1–18.

[17] Kenneth Hanf and Fritz W. Scharpf. Interorganizational Policy Making; Limits to Coordination and Central Control. London: Sage, 1978.

Deliberative democratic theory focuses on citizens instead of groups and associations that make up civic society. The deliberative conception of citizenship is also an active one. Deliberative democracy is ambitious: it wants to expand the number of citizens engaged in public debate. The recent popularity of deliberative democracy has partly to do with the growing recognition that aggregative and representative approaches to democracy may work well in situations in which interests and dependencies are clearly and unambiguously defined and open to a negotiated compromise. But, as Guttman and Thompson (1996)[18] have pointed out, many of the questions and issues with which the modern polity has to deal have a different nature.

New developments in science and technology, like for example genomics and biotechnology, are known to throw up such questions and issues that can hardly be dealt with through the traditional forms of doing politics. They throw up normative issues in situations in which the precise features of the new technologies and possible applications are not yet known, let alone their implications for interested groups and stakeholders. In such situations interest aggregation and representation through formal democratic decision making does not make sense. Rather than waiting till the situation has been clarified it seems advisable to clarify technological opportunities and normative and social implications through deliberation at an early stage.

According to the major theoretical proponents of deliberative democracy the guiding principles of deliberative democracy are reciprocity, liberty and opportunity. The reciprocity principle refers to the capacity to seek fair terms of cooperation through a process of political reasoning in which participants are required to mutually justify their positions using arguments that the other participants should be able to accept in principle. The reciprocity rule applies to both moral and empirical arguments. The principle of liberty specifies that all participants should be free to express their positions and arguments without restraint. All citizens should have the opportunity to engage in such deliberations.

When deliberative democracy is defined in terms of such general and abstract normative rules it seems rather far away from the more mundane practices and dynamics of contemporary politics and also blind to the historical and structural conditions that seem at odds with deliberative principles. As Dryzek (2004)[19] – himself a supporter of deliberation – observes, a major problem with almost all strands of deliberative theory is that they have little to say about external factors that may conflict with the rosy picture of free deliberation on a level playing field on which we are truly equal and respected. Critics like to point to the dominant position of big business, radical economic inequality and the effects of cultural domination and. Postmodernist critics, feminists and left wing theorists have also criticized deliberative democracy for its homogenizing tendencies and assumptions and its bias towards a particular view of rational argument associated with a political culture and conceptions of science and rationality dominated by particular groups, i.e. members of the white male liberal upper

[18] Amy Guttman and Dennis Thompson. Democracy and Disagreement. Cambridge: Harvard U.P. 1996.
[19] John S. Dryzek. 'Democratic Political Theory.' In: Geralf F.Gaus and Chandran Kukathas (eds) Handbook of Political Theory. London:Sage. 2004, pp. 143-55.

class elite. On closer view seemingly neutral procedural principles are less innocent than they claim.

A more fundamental critique that is of direct relevance to the development of our typology and this report has been mounted by Chantal Mouffe. As she points out western style liberal democracy is a historical compromise between distinct political principles that became popular in the late 18th and 19th century. Around 1800 principles of civil and political rights and economic liberalism were articulated alongside and independent from one another. The liberal democratic state is an uneasy and historically specific compromise and merger between these principles. Its subsequent development continues to be informed by the contradictions and tensions built into its foundations. These are contradictions and tensions that can not be resolved on a logical basis once and for all. Proposals that seek to define the essence of democratic deliberation in a limited set of key regulatory principles tend to ignore this context and the boundaries of public democracy, individual rights and the economy. But these contradictions are continually reappearing and are continually addressed on a case by case basis. Instead of defining politics in terms of the regulatory principles of consensus seeking deliberative democracy, Mouffe, drawing on Carl Schmitt, defines political democracy as inherently antagonistic and agonistic. The vitality of democracy is defined by its conflict-ridden nature. In Mouffe's conceptions democracy is struggle and agony if not antagonism. In a political democracy 'closure' of debates will and should always be temporary. For Mouffe lack of closure is not a bad thing but a good, productive, thing. New debates may flare up again at any time when new opportunities to reopen the debate appear. In such a context scientific and technological advances form an important source for the renewal of agonistic debates. Science and technology challenge and redefine identities and the emotions and rights associated with them. As a result of their dynamic nature closure of controversies can only be temporary. The same applies to another major source of continual conflict, concerning the boundary between civic society and political democracy on the one hand and the economic domain on the other.

The significance of Mouffe's views in the current context and with respect to the typology is twofold. It is not about whether one agrees in every respect with what she argues and what that implies in normative or political terms. The first point of relevance for our project is that one may distinguish between participatory practices in terms of the extent to which they allow, encourage or restrict the space for controversies. We are familiar with the idea that issues may be 'depoliticized' by redefining them in purely technical or scientific terms. One may do the opposite by pointing to the political dimensions of definitions and actions that are seemingly neutral, scientific or objective. But a similar thing may be done with respect to the boundaries between the economy and the domain of the state. A plea to forbid GM food altogether as there are better and less risky ways to solve our needs touches on the boundary between the economy and the state. A campaign to label GM food in order to inform customers and to leave it to consumers whether they want to eat such product or not also does so through respecting economic liberalism in its currently powerful definition. One could call agonistic all forms of public engagement with science that explore the boundaries of the liberal democratic system by seeking to challenge these boundaries and principles and to politicize what others would prefer to keep away from the political arena.

The short journey into political theory presented above may seem far removed from the sort of issues that are usually discussed in debates about technological change. In public debates about new technologies most attention goes to technical features and the associated opportunities and risks for health and the environment. Issues of privacy, consumer freedom and the position of small companies may also be debated. Seldom will the debate shift entirely to the boundary between democracy and economic liberalism. Yet, this should not lead us to believe that the tension between economic liberalism and the state is entirely absent in such debates. It does make its appearance every now and then and when it does not one may still assume that it operates in the form of assumptions that structure and demarcate what topics surface for explicit consideration. Struggles about specific issues can easily be shown to reflect different ideas about the limits that should be observed with respect to governmental responsibilities and rights to intervene.

A heuristic framework for empirical analysis aiming to compare initiatives for public engagement in innovation policies should therefore be sensitive to the way in which such policies are defined in substantive terms as well as in procedural terms. To what extent do such initiatives reflect deliberative or agonistic views or are they more corporatist in design? How are the problems defined that are at the core of the consultation? Do they genuinely reflect an interest in the concerns of citizens or civic groups or are they primarily framed in relation to the government agendas for innovation policy? What room is there to challenge the dominant view of innovation priorities and the goals they are supposed to serve?

3.1.3 The Lisbon strategy

The connection between the so-called Lisbon strategy or Lisbon agenda and ideas about enhancing public engagement with respect to science nicely illustrates some of the ideas that underpin our work as outlined above and the resulting typology of scientific governance.

The current interest among policy makers in public participation cannot be adequately understood without paying attention to the innovation agendas governments have developed in response to globalization, radical technological change and international trade and competition. In fields like IT and genomics national governments closely watch one another as they seek to improve the incentives to attract high tech industries and to capitalise on investments in scientific and technological research. In the face of rapid advances in the US innovation agenda, European leaders agreed on the Lisbon strategy in 2001. According to this strategy Europe should become the most competitive knowledge economy in the world by 2010. The Lisbon strategy encompasses major reforms of various sectors including the establishment of the so-called European research area and the standardization of educational systems across Europe. Educating the public about ICT and key technologies is an integral part along with creating new jobs and fostering investment in new high tech companies. To realize the ambitious goals also requires a critical review of regulatory practices including the removal of regulatory obstacles to innovation.

It is perhaps no accident that the push for public participation was endorsed by European leaders at about the same time as they accepted the 2001 version of the

Lisbon agenda. To succeed with the ambitious Lisbon strategy it was considered essential that the public understands the urgency of the reforms and developments that are envisaged. Yet, the turmoil about genetic modification at the end of the 1990s, the food scandals and public distrust of policy makers and government agencies made it abundantly clear to political leaders that public support might be difficult to mobilise and that there would be ample opportunity for groups opposing innovation policies to delay change. Public confidence with respect to governments' ability to manage opportunities and risks involved in technological change was low even though surveys indicated that the European public was supportive and optimistic about scientific and technological change in general. In response to this situation more and more policy makers became convinced that radical openness in public consultation and engagement with the public was needed to restore confidence and to get the public support needed. This eventually resulted in the endorsement of large-scale public engagement about technological opportunities as a constitutive principle of innovation policy.

Notwithstanding the above, one should not overstate the enthusiasm of policymakers for public engagement with science at that time. Many policy documents remained ambiguous with respect to the extent to which ideas were taken up, suggesting a radical turn in the concerns of lay publics with respect to innovation. Documents suggesting the need for change are in fact often intriguing mixtures of the old and now officially rejected deficit view of the public's ability to take part and the new optimistic view according to which lay people can discuss and reflect upon the implications new technologies have for their everyday lives. This ambiguity in policy documents suggests that the endorsement of the new perspective has been less than complete and that policies may once again shift to less deliberative forms of decision making at some point.

Recently and especially in 2004 the EU leaders have become much more concerned about the realisation of the Lisbon agenda. The US lead in the field of technological innovation seems to grow, new economic giants like China and India are emerging as global players in the field of technological innovation and the Lisbon agenda is not progressing according to schedule.[20] The documents preparing the installation of a new EU commission stress the importance of stepping up technological innovation and regulatory harmonization. The Kok committee is very critical of the delays and stresses the need to convince everybody of the need for radical change. Passages about this need to convince and enrol the public stress the need to engage with the public. There is mention of public debates that should take place, but it is hard to believe that these debates are supposed to leave much room for voices that are critical or sceptical with respect to the goals set by the European governments. In the most recent presentation of its agenda the Barroso Commission has made it clear that 'science for growth', 'competiveness' and 'employment' are the dominant elements. This fits very well with the shift towards stressing science-industry partnerships rather than radical forms of public engagement.

Obviously the relation between politico-economic agendas and the agenda for public engagement varies over time and across locations. The first may be articulated in

[20] **Facing the challenge. The Lisbon strategy for growth and Employment. Report from the High Level Group chaired by Wim Kok. Brussels, November 2004 (**http://europa.eu.int/comm/lisbon_strategy/index_en.html)

response to changes in the external international situation, while the second reflects concerns over internal opposition to policies and lack of legitimacy. In combination, however, they illustrate once again the claim that democracy is not just about principles that should govern public discourse but also about the limits and boundaries of what can and what cannot be legitimately put up for debate. The currently emerging shifts in EU policy may easily feed into public scepticism whether the interest in the citizens' views and concern is not opportunistic and the expression of the new forms of political marketing.

3.1.4 Tokenism, authenticity and empirical research

However, questions concerning the intentions of policy makers who call for broad public consultations are hard to answer in an unambiguous and unbiased way. Many involved in such initiatives are evidently inspired by ideals of deliberative democracy in some way. In consequence the agenda for public consultation draws heavily on notions of deliberative democracy and this is the case even when such notions are not articulated in the abstract by those directly involved.

To adhere to principles of deliberation does not exclude the possibility that such endeavours do not work out as envisaged or that they can not be manipulated or that the actual effects will be different from what was intended. In systems of multi-actor governance the intentions of the initiator of a debate are often less relevant for the outcomes than the subsequent framing and conduct of the debate that follows from the interactions between a chaotic variety of people and organizations, including mass media, public commentators and spin doctors.

Rather than taking a position on whether specific initiatives are tokenistic or sincere we argue that one should take the debate about such questions as well as debates about correct deliberative procedures as symptomatic of the current situation in Europe with respect to scientific and technological change. Instead of passing judgement our first goal should be to investigate the substance as well as the procedures in such forms of public engagement and how these are defined and changed simultaneously as well as independently from one another in the course of events. As Irwin has argued: 'The task (…) is then to explore the nature of these shifting representations of scientific governance and the assumptions about expertise and citizenship that are at their core".

What is needed is critical comparative analysis of examples of public engagement with science and technology. We need to explore not only how issues are framed and contested, but also the way in which debates and encounters are organized drawing upon or opposing institutional and cultural contexts. In doing so we should be careful to attend to what is focal in public discourse as what remains hidden, kept from explicit deliberation to operate as background assumptions that structure what can and what cannot be made topical in the debate.

3.2 Methodology

Thematic networks draw on existing research. They aim to bring researchers from various European countries together to draw out the wider implications of their research work. Such networks do not allow for the start of new research projects. The design of systemic comparative empirical research is therefore not possible. One has to combine work with research projects that are already underway and that were started for different reasons with the secondary analysis of others' studies. As a result approaches and methodologies will differ and there will be limitations to the conclusions one may draw.

In the STAGE project we used case studies as the basis for drawing up a heuristic framework about various forms of public engagement in various countries with respect to key technologies like ICT and biotechnology and issues and controversies including environmental protection and public health. A first goal was to explore the theoretical considerations that should go into the construction of the heuristic framework to be developed. This resulted in the first discussion paper written by Elam and Bertillson (2002). On the basis of that and initial reviews of the case studies a second discussion paper (Hagendijk & Kallerud, 2003) was written in which the heuristic typology was presented. This typology was to be observed and tried by the authors of case studies in their descriptive analyses.

In deciding on case studies we followed a strategy to first chose for each country an anchoring case study that would be treated as typically reflecting problems and issues with respect to public participation in that country. Already at the start of the network a crucial observation was that it would not be possible nor analytically productive to distinguish between grass root initiatives and top down initiatives with respect to public engagement. Local initiatives and activities from NGO constantly mix with actions and initiatives from government agencies. Local initiatives may be a response to government initiatives at local, national or transnational levels. Government initiatives are often at least in part attempts to deal with or pre-empt the emergence of public unrest i.e. to integrate public involvement in such a way that serious public concerns can be addressed and incorporated into the policy process at an early stage. Instead of trying to draw and maintain such an artificial distinction it was decided to follow closely how issues emerged and how various parties sought to define their form, development and conclusions. By comparing the results of the anchoring case studies with further case studies for each country it was attempted to put the results of the anchoring case study in perspective and to allow comparisons across domains or diachronically. In the end twenty nine case studies became part of the empirical yield of the STAGE network. As we were dependent on work that was already available or information that could be assembled through desk research the set of case studies may look heterogeneous. Yet, one might say that the set is no less heterogeneous than the variety of practices and formats of public engagement we have come across for the various countries and domains.

3.3 The STAGE typology of public engagement and governance

A key argument in drafting the typology was our conviction that we need to move beyond a simple bi-modal presentation of governance styles. Too much discussion has taken the form of either/or presentation: typically, *either* an emphasis on innovation and competition *or* a concern with democracy and engagement. As a means of moving beyond this, we next present a basic taxonomy through which different forms of governance may be characterized and related to one another.

Another important aspect of our taxonomy (or typology) is our ambition to compare the roles assigned to 'public' groups within each mode. Is 'the public' being constructed as active or passive; as consumers or as citizens; as homogeneous and stable or as fractured and dynamic? Each mode distinguished in the typology 'performs' the relationship between scientific/technological innovation and wider society in a fairly distinctive manner.

In drawing up and working with our typology we have treated claims about procedural (un)fairness, accusations of manipulation/bias as well as the questioning of motives as important and integral parts of the debates over science governance. In the UK, for instance, parts of industry denounced the outcome of the GM Nation? public debate by stressing that the organisation of the exercise had allowed too much space for agonistic viewpoints from radical participants rather than maintaining a more controlled deliberative process (Healey 2004). Passing judgements on forms of participation and governance is therefore a significant part of the controversies. It is a rhetorical reservoir of arguments that can be used by different stakeholders in order to sustain particular interests and viewpoints in the policy processes. How and when participants shift from substantial arguments to procedural ones and vice versa (and with what effects) is at the heart of the dynamics of public consultation practices.

The typology proposed comprises six basic types of governance.

Discretionary: In discretionary governance, policy making takes place with virtually no explicit interaction with 'the public'. Decisions are taken with very little input to the policy process by any group outside the institutions directly responsible for science and technology policy (essentially, government departments and closely related industrial and scientific bodies). On a general level, science governance in Portugal and Greece can be seen to exemplify this discretionary mode in the sense that governance is presented primarily as a matter for government. Government is portrayed as serving universal goals of progress, welfare and growth. Equally, the public interest is easy to define and enact. Within this mode, there is no sustained effort to incorporate the views of various publics in policy processes, let alone to develop a culture of scientific citizenship;

Corporatist: Within corporatist governance, differences of interest between stakeholders are recognized as inputs to processes of negotiation in which workable compromises are sought. The processes of negotiation take place within a closed or highly regulated space, so the decisive feature is the question of admission and recognition of legitimate stakeholders. Generally, the Scandinavian countries can all be taken as examples of this mode of governance. In Finland and Sweden the creation of a knowledge society as a

necessary prerequisite for the establishment of a well-functioning national innovation system has been seen as a commonly shared goal. Hence, all relevant stakeholders have been expected to contribute to the fulfilment of this vision, leaving very little room for opposing voices to be heard. Norway and Denmark, on the other hand, can be seen to have shaped an inclusive corporatist mode of governance where various oppositional voices are sought to be included as stakeholders in the processes of negotiation. Perhaps the basic assumption within corporatist governance is that real differences of interest exist but that these can be defined and then resolved through closed processes of deliberation and negotiation;

Educational: Educational modes of governance assume that conflicts or tensions regarding science and technology policy are founded on a lack of knowledge on the part of the public. Hence it is necessary to educate the public through dissemination of scientific (expert) knowledge in order to create an informed public of scientific citizens that understand the experts' assessment of the problems and possibilities of science. Educational modes seem to be part of the style of governance in many European countries, particularly in connection to the high-profile controversies surrounding biotechnology, where initiatives aiming at disseminating knowledge (exhibitions, special teaching material for schools, information campaigns) have been part of the governance portfolio. A notable example of this educational mode has been the effort to create a pervasive and widely spread scientific culture in Portugal through a national agency - Ciencia Viva – in charge of programmes for the promotion of scientific education and culture. But the efforts in Finland and Sweden to increase the public understanding of science as a necessary component of building a knowledge society can also be seen as exemplifying this educational mode of governance;

Market: Market governance is based on the notion that science and technology can be governed through the economic mechanisms of demand and supply. The value of science comes from the surplus value created through its commercialisation and the general contribution to the generation of wealth in society. Scientific governance should be supportive of this potential. In this mode, the public participates as customers and consumers in a market when they make decisions about purchasing a product. Compared to countries outside the EU (notably the US) European traditions of governance may be less explicitly market oriented (although science and technology policy discussion in the UK about the need for 'confident consumers' fits this model well). However, there are signs that economic liberalisation and deregulation are increasingly leading to a market mode of governance (as for example in Finland). This is exemplified also by the persistent European suggestion that GMO labelling is the best means of letting consumers choose for themselves rather than relying on complex regulatory structures;

Agonistic: Agonistic governance takes place under conditions of confrontation and adversity, when decisions have to be made in a political context where positions are strongly opposed. In general the political democracies of Europe are not primarily characterised by agonistic forms of governance. It seems, however, that certain policy processes regarding science and technology evolve in ways which can lead to a form of agonistic stalemate. Governance of nuclear waste in the UK, for instance, is an example where policy decisions have been made in the face of heated public opposition.

Agonistic processes suggest a loss of control by the state (either deliberate or, more generally, not) as a variety of stakeholders struggle for authority and influence;

Deliberative: Deliberative governance rests on the ideal that governance of science can be based on strong public support deriving from a continuous public debate of, and engagement with, science. Consensual agreements developed within the framework of the public sphere serve as foundations for legitimate policy decisions. In this mode, members of the public do not partake as consumers of science, but as scientific citizens who take on the perspective of the common good. This concept of public deliberation cannot be seen as a complete description of policy formation in any of the European countries. Nevertheless, it seems to be an ideal, which – as we have already noted - is rather important in the constitution of science governance, and various participatory exercises have been moulded around this aspiration. In particular, the consensus conferences arranged by the Danish Board of Technology have been influential in this context, but also the GM Nation public debate in the UK must be seen as a significant attempt to realise the ideal of deliberation. The assumption within deliberative governance is that lay participation will improve the quality of decision-making, stimulate rational debate and provide a new route to social consensus.

As this brief presentation of our typology and some of the results from our analysis demonstrates, European scientific governance cannot be interpreted as a simple pattern of convergence or a linear, uni-directional development. The typology is a heuristic device that is sensitive to detail and situation specific variation. Our case-studies demonstrate that none of the examined European countries can be characterised by only one of these modes of governance. Rather, each country can best be described as a mix of several of these modes. For example, the UK manifests just about every mode – although corporatism has been out of fashion there since the 1970s. Meanwhile, Denmark also contains a modal mix but has historically placed less political emphasis on market governance. Furthermore, it seems that the different national styles of governance are not stable, but rather in periodic transition (Sweden may be moving towards an educational mode having been previously associated with a more deliberative approach). Although there seem to be patterns of mutual influence, it is also clear that different countries follow different trajectories, individually shaped by local, national cultures.

Our goal was to trace this co-existence of modes as representative for the European framework (or style) of scientific governance. As this report will go on to discuss, the juxtaposition and ‘churning’ of modes offers a unique opportunity to consider the future possibilities for scientific governance. In that sense, Europe indeed represents a distinctive social and institutional laboratory – although, given the close link between scientific governance and wider political and institutional cultures, it cannot be assumed that what works in one setting will necessarily work elsewhere.

We do not assume a unitary paradigm of scientific governance in Europe but expect a more complex – but distinctive in international terms – pattern of diversity, co-existence and contradiction/complementarity. It would follow that merely criticising individual nations for being ‘insufficiently’ committed to one mode or another (for example, for failing to live up to deliberative ideals) may be of limited intellectual and practical benefit. Instead, we should recognise that nations will almost inevitably combine

modes. However, this inevitable combination in turn suggests the need for greater analytical clarity – and policy reflection. The current political tendency is to make different 'modal appeals' simultaneously: as when institutional rhetoric (for example, in government reports and major political speeches) shifts - at times, very abruptly - between public engagement and greater international competitiveness without pausing to consider their possible connection or tension. Our recommendation is that, rather than presenting each of the modes as separate and hermetically sealed, serious reflection should now be given to their mutual accommodation in policy practices.

To caution: The typology of modes of science governance should not be seen as a meta-framework for judging (or comparing) national styles of science governance, in order to assess whether they comply with a single European paradigm of science governance. Instead, the typology is intended as a heuristic model, which makes it possible to expand the understanding of the various patterns of convergence and divergence across Europe. It is also important to stress that the allocation of each governance case-study to a particular mode is likely to be contested (one commentator's 'deliberative' mode may appear 'educational' to another). These are fluid judgements, open to contestation. This suggestion is strongly supported by our empirical findings.

3.4 Case Study Discussion

3.4.1 National Systems and Styles

If one looks across the various countries and fields one sees not only differences but also a clear awareness of what others are doing. One recognizes differences and similarities but also mutual learning, mimicking and profiling. For example, the way in which the British government dealt with the BSE crises as well as later attempts to implement new deliberative forms of engaging ordinary citizens in discussions about GM food, were closely studied around Europe and beyond. In adjusting their policy framework in response to the question how to engage with the general public the British studied the Danish experience with consensus conferences. In designing the GM nation debate they looked at what other countries had already done in that area. From the outside it may seem that all Scandinavian countries are the same, yet there are profound differences. Sweden and Finland differ from Denmark but also from one another. A similar point applies to Norway and The Netherlands. Yet, over the last decades there is a tendency in all countries towards more civic engagement with respect to science and technology. Evidently, Greece and Portugal have been relatively late in developing institutional frameworks for science and technology policy, but there to one sees the emergence of new forms of public engagement with respect to key technological domains and environmental issues.

Undoubtedly, European coordination and stimulation has played an important role in stimulating these new forms of engagement. Around 2000 one can observe significant changes in the policy documents with respect to science, society and innovation emitted from Brussels. The problems at stake were redefined following the BSE crises as critical analyses on public understanding were taken on board that stressed the ability of citizens to discuss and assess the consequences of science and technology for everyday

life in rational and open ways, even when they were not particularly well-versed in the technical specifics of new technology. European ambitions to develop the EU into most competitive knowledge- economy of the world were also important for this as there was a widespread awareness that to accomplish that, massive mobilization and support from the population would be needed. Eurobarometer surveys showed that such support was not to be expected unless widespread public distrust of new technologies as well as the ways in governments operated would be addressed.

So the drive towards public engagement did not stand on its own. It was mixed with a politico-economic agenda that became known as the Lisbon strategy. Technological innovation, social reform, expansion and market liberalization are key words associated with this agenda. In all countries the drive towards new forms of public engagement which had started in the UK mingled after 2000 with the study of the conditions for successful technological innovation. Especially Finland became a source of inspiration for technological change and innovation after the success of its IT strategy. An integrated approach to market new products coming out of information technology in which government, industry and representatives of labour unions and mainstream civic groups cooperate seemed to recommend itself. In Finland there was little enthusiasm to copy the sort of broad public engagement campaigns organized in the UK and other north-west European countries.

For various reasons a simple mimicking of the Finnish IT model in these countries is not to be expected. The Finns themselves are also themselves increasingly aware that the success in IT may not be easy to copy in other sectors, i.e. biotechnology.

To develop better modes of public engagement and to improve our understanding the differences across countries and domains a more fine-grained heuristic model may be necessary. In what follows we will look at the countries involved in this study and try to indicate how the case studies illustrate particular aspects or dimensions of similarity and difference and how these relate to the heuristic typology described above.

Denmark

As in The Netherlands, Danish governmental policies with respect to science and technology became more open in the the 60ies and 70ies. Prominent examples are the debate about the environmental act in 1974. The abandonment of nuclear energy in 1982, following ten years of public debate, provides another example of early public engagement and changing government response. The Danish anchoring case about the changing modes of biotechnology governance in Denmark demonstrates how these efforts were followed by substantial calls for the governance of science and technology to endorse deliberative approaches with respect to genetic technology.

It took a long time before biotechnology was discovered as a technological field that needed particular stimulation and regulation. Until the early 1980s biotechnology was not considered to be an independent regulatory field. Because of this the policy approach with respect to genetic technology can best be described as expectant. This changed in the 1980ies when genetic technology was introduced in pharmaceutical industry as well as medical fertility treatment. The challenges resulting from this have been framed in terms of risk (in relation to industrial production) as well as in terms of

the ethics of human reproduction. In contrast to the issue of risk, which was predominantly framed as a technical issue, the issue of ethics was perceived as an issue of general public concern and it was argued that legitimate decisions should be based on public consensus established through wide public debate and engagement. These calls for deliberation was sustained by a particular Danish ideal of the necessity to base legitimate policy making on public debate stemming from a particular Danish tradition of 'dialogical enlightenment' dating back to the middle of the nineteenth century.

On the basis of these calls of deliberation, the Ethical Council was established in 1987 with the task to monitor the bio-medical development in order to be able to advise public authorities on the basis of deliberation undertaken within the council as well as in the public. Almost simultaneously and inspired by the American Office of Technology Assessment and the Dutch Rathenau Institute, the Board of Technology was created in 1986 as a central body for technology assessment on a more general level. It is, however, characteristic that both of these institutions were commissioned to undertake advisory functions based on experiments with deliberation in various publics in order to create some form for consensus upon which legitimate regulation of sensitive issues could then be based. Consequently, these institutions have been undertaking various experiments with public deliberation, consensus conferences and stimulation of public debate since they were established.

The efforts to reach consensual regulation on biotechnology, however, were increasingly questioned throughout the 1990ies and this was made particularly clear in connection to the introduction of GM soya beans in 1996 and the announcement of the birth of Dolly in 1997, which created large public scepticism and resistance. In the following years the controversy about GM foods gradually became framed as an issue of consumer choice and strict regulation about labelling transformed the regulation of agricultural biotechnology towards a market mode of governance. So far, however, consumers have been sceptical towards GM organisms keeping them largely outside Danish food production and consumption.

The controversy about Dolly was followed by a lengthy public discussion about the outcomes of medical genetic technology and the second Danish case-study reveals human cloning to be a particular sensitive issue in the mediated public debate. The case study demonstrates how the media play an important part in the shaping of public discourse about these new technologies. On the one hand, mass media is a central source of information and debate in contemporary societies and therefore should be perceived as a major arena for public debate about political issues such as biotechnology and science governance. On the other hand, mass media cannot simply be viewed as a neutral mediator of various constructions of meaning concerning biotechnology. Mass media representations of biotechnology are made by journalists and their sources in particular organizational and institutional settings, which influence the news creation in many ways. The mass mediated representations of biotechnology can therefore just as well be seen as the creation of biotechnological controversies (and their solutions) as they can be seen as a mirror of these controversies. On this basis the case study demonstrates how the mass media representation of human cloning can be understood as an exploration of the socially viable interpretations of central issues in the political controversies about the governance of science and technology. It shows how the biotechnological controversies should not be perceived as simple deficits in the

understanding of and communication about science, but rather as fundamental political disagreements about the role of science in the shaping of 'the good society'. In this way, the controversies demonstrate science and technology to be a truly political field of contestation and antagonism and it questions the probable success of the Danish model of consensus building through public debate.

The failure of public debate in general to lead to a broadly shared social consensus about the governance of biotechnology can also be seen to be acknowledged by the Ethical Council. In 1994 the council changed its official policy from trying to seek consensus on the debated issue to a more general effort to deliberate and explore various 'ethical positions' on the issues at hand. At the same time other new trends appeared as the public deliberation concerning science and technology became latched unto the 'innovation agenda' as government increasingly began to see public scepticism towards science and technology as an obstacle to the creation of an 'innovative knowledge society'. This have lead many observers to argue that the deliberative agenda and the Danish model of participatory science and technology governance is being subsumed into the discourse of economic growth changing the deliberative mode towards more discretionary and educational modes co-existing with the market mode as for instance in the case of GM labelling.

After the conservative and liberal parties won the elections in 2001 and formed a coalition government the Board of Technology was threatened by closure. The new government sought to reduce the influence of various experts and advisory bodies on policy making. The board survived, however, although its resources were cut. The case study on the Board documents how the role of the board has changed from being primarily a political advisory body to be a mediating institution. Its role is to facilitate and assess how new technologies may translate in specific contexts of human practice and decision-making. In this way the Board still fulfils an important technical-practical role as a `switchboard´ used both by national/local government and industry in `testing´ controversial technological innovations. An example of this role is how the Board did a project about electronic patient records that encouraged actors and stakeholder groups to articulate and discuss their concerns and preferences. In this way the board now appears as a very practical administrator of modern risks and insecurity. The staging of `democratic experiments´ can therefore be viewed both as an exploration of opposition that might surface in the real world, and as an instrument to help participants becoming sensitive to the complexities of technological change and decision-making. In so far as the results will be taken into account, one might say the Board helps to shape technology as much as it promotes its discussion.

The history of public participation in Denmark exemplifies how a political culture that combined corporatist forms of representation and an inclusionary political ideology was transformed to adopt more pro-active deliberative ideals by creating two separate bodies to stimulate public debate about controversial issues concerning science and technology. The story also documents how this deliberative form of governance was subsequently increasingly accommodated to a market mode of governance.

The latter development was made possible because the Danish consensus conferences mix ideals of citizens engaging in deliberative dialogue with a vision of consumers that voice their preferences on policy making. It remains to be seen how the deliberative

dialogue can be maintained vis-à-vis the consumerist perspective, once the pressure from the innovation agenda becomes stronger in Denmark.

Finland

Finland is known worldwide for the way it developed its IT sector in the 1990s. In recent years attempts have been made to mimic these successes in IT sector for biotechnology but this has proven more difficult.

In terms of our typology, Finland is best characterized as following a commercially oriented market model and a strong state-centered corporatist approach to issues of policy making and public consultation. In a way however there is an underlying tendency towards discretionary governance. Educational formats play a role to prepare the population for the changes to come and how that will affect what they will have to do and comply with. The Finnish public is known to have rather positive views of technological innovation compared to other European countries. There is a quite large implicit public trust towards science and technology policy and ICT. Agonistic forms hardly surface, radical NGOs opposing biotechnology are ignored. Emphasis on the role of consumers and users' needs as well as a distancing from the welfare state ideology fits rather well with market governance in the development of the information society.

The anchoring case study and the studies of ICT, forestry and biotechnology document the Finnish approach to involving the public in technological innovation. The prevalence of cooperative committees and a networked culture of action between the public and private sectors has been a peculiar feature in ICT policy in Finland. In this model, the role of the trade union has been particularly important together with representatives of the state administration and the industry. Such corporatist arrangements have been characteristic in Finnish politics since the 1960s when the dominant politico-administrative ideology emphasized the creation of a uniform network of welfare services and the formation of an integrated negotiation and contract mechanism concerning central decisions in economic and labour market policy. Since the end of 1960s the consensual dimensions of the system have intensified as the state has granted interest organisations permanent positions in the planning and decision-making system in certain policy domains. The core of the Finnish corporatism has been the general incomes policy settlement where since the 1970s the state, employees and employers have made a centralized agreement on the wage level and working conditions. The significant role of the trade unions has been related to the high degree of unionization, which has been nearly 80 per cent. In this respect the ICT sector has been exceptional since the employees in the ICT sector have not generally been active to unionize. During the ICT boom the sector was unorganised and it was only when the ICT recession came in the early 2000 that the employees started to join unions.

The case study about the IT sector problematizes some interpretations of the Finnish success in IT. It argues that the conception of citizenship informing Finnish innovation policies is limited. It concentrates on people as consumers and as employees that should prepare themselves for tomorrow's knowledge economy. Furthermore, ICT development has led to unbalanced growth between the south of the country and more

peripheral regions. Spreading the success of the few growth poles to larger parts of the country has indeed become an important challenge for policy makers.

The EU's broad turn to more open forms of public engagements has also affected the Finnish approach. Parliament and government have recently started to consider how direct citizen participation can be increased and how representative and participatory democracy can complement each other. Despite these signs of opening towards more inclusive models, the general model is still rather exclusive and shows only restricted deliberative potential. The collective nature of the corporatist structure excludes individual citizens from the processes. Firms, research institutions, state agencies and ministries are the principal parties in the deliberative models inside the corporatist system while contacts to NGOs are generally weak. The role of the NGOs is generally limited to commenting on certain proposals for new legislation and national strategies.

The case study of biotechnology deals with the emergence of biotechnology as a second sector of corporatist state-orchestrated technological innovation in Finland alongside ICT. With the declining validity of the new economy thesis, more and more weight has been given to the market expectations of biotechnology. The National Technology Agency (Tekes) identifies the field as one of the key technologies (Tekes 2001). There are also hopes that a new biotech Nokia can be established. Still the idea of the generic nature of biotechnology is unclear.

As the case study of biotechnology demonstrates, the strong market orientation has prevented a principled discussion of the rights and responsibilities of the state, industry and academic researchers in issues of biotechnology. Even though the Finnish policy makers are certainly aware of ethical, environmental and health issues and seek to address these, they seem primarily keen to know how national competitiveness can be maintained by investing in biotechnology production.

There have been few attempts to integrate the various policies, although there have been discussions of the need to have horizontal means for information and interest mediation. Inflexible forms of communication have also prevented the development of horizontal structures to include public concern and participation. Representatives of academic science have accused the government of a systematic favouring of technology projects and industries and seeking to promote the quality and intensity of fundamental research in biotechnology.

The biggest effort to incorporate public views into decision-making has been made by the Advisory Committee on Biotechnology. The Committee became statutory through the introduction of the Statute on Gene Technology (821/1995). Its mission is to promote co-operation between officials, researchers and others working in the field, to follow discussion on biotechnology and to develop education and distribution of information in biotechnology. Attempts both from the side of NGOs and the state to create forums for discussion about gene technology have not generally been very successful.

The case study of forestry demonstrates that there are policy areas in which there is active discussion about civil society and citizen participation in Finland when it comes to environmental issues. Finland has many NGOs and citizens groups involved in

environmental issues and animal rights. Apparently, biotechnology has not become a big issue among the general public. The case study about forestry and biotechnology also demonstrates, however, that the inclusionary and integrative forms of collaboration between green movements, the state and the forestry industry still fit in the overall picture of the market-oriented and corporatist form of governance.

Greece

The three Greek case studies undertaken within the framework the STAGE thematic network deal with Environmental Non-Governmental Organisations (ENGOs), Biotechnology and ICTs, the second among them being the Greek anchoring case.

They had developed over the last thirty years, the life-span of the Third Hellenic Republic (1974 to the present), yet, all these issues had not appeared at the same time: the seventies mark the emergence of the environmental debate, the eighties the biotechnologies' one, while in late nineties greeted the ICTs' issue.

The analysis of three Greek case studies seems to suggest that a discretionary model of scientific governance has prevailed to date in Greece. Issues of science and technology have, by large, been framed as 'experts' issues – to be tackled and discussed mainly by scientists and bureaucrats. A 'design and command' ethos stirs the various committees, in a never ending struggle to meet deadlines, absorb EU funding or incorporate into national law long overdue EU Directives. A late rejoinder on issues that have tantalised Western Europe for quite a few decades, the archaic Greek bureaucracy have dealt with these new issues in the good-old legalistic, selective and/or corporatist method.

However, such an attitude was challenged at various times, especially by concerned non-governmental organisations, which, being de facto excluded from the officially-sanctioned debate, took the matter to the people. And the people occasionally did react, albeit with varying determination and commitment.

These challenges to the existing mode of governance did not go unnoticed, yet the overall response was quite different from what one might have expected: thus, in the environmental debate, the Greek ENGOs, enjoying a low public support, by late nineties came to over-depend on state-regulated subsidies, casting serious doubts on their ability (or, one should say willingness?) to challenge the State authorities. On the biotechnologies' front, a tactical retreat by the government in the mid-nineties, at the high point of the Greek 'anti-GM' feeling, was followed up by the continuation of the same old discretionary model of government, spiced with a certain educational flavour. This has also been the favoured approached in the latest of the Greek case-studies, that on ICTs.

In other words, despite at times seriously challenged, the discretionary model of governance did not yield, nor had the Greek administration to overhaul its preferential strategy. The typical 'top-down' political inclusion of social interests and demands that has characterised the modern Greek state seems to had repeated itself even in these new policy domains.

What, then, do the Greek case studies can contribute to the wider debate of Science, Technology and Governance in (Western) Europe? Without wishing to sound too cynical, Greece should better be viewed as an outlier case. Certainly, other countries, such as Portugal, Finland and Denmark, also have, for 'better' or for 'worse', their very own characteristics. Yet, what makes Greece an interesting case is, on the one hand, the novelty of the issues at stake –and consequently of the primordial character of the debate- and, on the other hand, the corporatist character of the State –which has hitherto undermined any attempts of public participation. In other words, we could argue that Greece is in a transient form the 'business-as-usual' mode of governance to a more participatory one. And it is precisely this transitory trajectory that renders Greece comparable to other countries, albeit not those of the original STAGE research group. Since the major stimulus for the developments at home has been the European Union, the insights gained from the Greek cases could, in some ways, foretell the developments in other countries, outside the European core, such as the new member-states.

So, what are the characteristics of this transition in S&T governance? To start with, past knowledge matters. The framing of new issues depends more on past, national experience (which should be viewed as governance 'experiments') than on an osmosis-effect from developments in other countries or at the EU-level. This claim is substantiated when comparing the Greek ENGOs and Biotechnologies case-studies. Second, the national way of 'doing politics' is important. New issues do not include in their back-kit new models of governance. Accordingly, the predominant (or historical) ethos of policy making and public involvement in it plays a crucial role. In countries with strong corporatist traditions, like Greece, the public is less likely to get involved into the debating of new science and technology issues. This has been a recurring theme in the Greek case studies, especially in the ENGOs case, where, in order to depoliticise the debate, the State attempted the corporatist inclusion of the leading groups.

This latter point is quite important, especially for moderating the (unfortunately, popular) reading of 'more deliberation' as a sign (or, as a way towards) better, more inclusive, more open and/or more democratic governance. In a succinct description of the Greek State's interaction with social movements, a Greek author once used the term 'ventriloquist power': the State 'appears' to debate and enter into discussions with the challengers, yet this is but an apparition. In reality, those in places of authority choose, condone and legitimise those societal interlocutors that they wish –thus, in effect the State is conversing with itself. If the Greek case-studies have but one lesson to offer us, this has to be that appearances (even in the case of governance) can well be deceiving. While the 'scientists' – 'lay citizens' dichotomy is a useful starting point in assessing the S&T governance's inclusiveness, the nature (and role) of the latter beast has to be carefully assess and should never be accepted at face value.

Are we, then, suggesting an 'end-of-history' appraisal for the Greek Science & Technology Governance – and, mutatis mutandis, for all later (country) rejoinders? Certainly not: ever since the turn of the century, the social challenges to state hegemony have been increasing, in both qualitative and quantitative terms, while the State is loosing its traditional grip on the national economy. The last three years have witnessed massive demonstrations – although on trade union and anti-war/anti-globalisation issues - suggesting an awakening or a reassertion of the Greek civil society. The environmental degradation, the genetic engineering and the ICTs technologies are here to stay – thus

they will continue to exercise considerable influence on people's perceptions and everyday lives. Taking an optimistic, yet not unfounded, guess, we argue that in the mid-term it will become increasingly difficult for the Greek State not to open up the policy arena to more participatory forms of public engagement.

The Netherlands

The three case studies for The Netherlands deal with different periods as well as different technologies. They reflect major episodes in the development of public participation in Dutch science and technology policy.

The anchoring case study is a detailed analysis of the 2001 debate about genetically modified food. It reflects the attempt of the Dutch government to comply with the new trend towards more public engagement but at the same time it documents the growing irritation among policy makers, scientists and intellectuals with what they saw as manipulation of public debate by radical NGOs in the name of democracy. Such irritations go a long way back and have taken long to find expression. The case study about the Broad Social Debate about nuclear energy can be seen as one of the roots for the scepticism viz-a-viz debates in which NGOs and industrial groups dominate.

The third case study focussing on the debate about information technology from the 1980s is important as it directly led to the establishment of the Rathenau Institute, an independent institute for technology assessment comparable to the Danish Board of Technology, charged with organizing public engagement with scientific and technological change.

The debate about nuclear energy was inspired by ideas about public participation that came from the same group of people involved in attempts to make governmental science policy more accessible to the public and especially to stakeholder groups. Looking back to the 1950s and 1960s one may say the formation of policies with respect to science were dominated by the scientists and by institutional policies with respect to higher education. In terms of the typology one may say these policies were discretionary. Technology policies were corporatist in the sense that deliberations were rather exclusionary and a matter of collaboration between industry, governmental agencies with participation from representatives of organized labour. Science and technology policy were hardly institutionalized as separate policy domains in those years. Research policies resided under the Ministry for Education, Arts and Sciences, technology policies were concerns for the Ministry for Economic Affairs and specialized ministries like agriculture, defence issues.

Science policy became institutionalized as a separate domain in The Netherlands towards the end of the 1960s. There was a need to integrate the policy initiatives and routines in various domains and to decouple science policy from policies with respect to higher education and its budgeting. To achieve these goals the Advisory Council for Science Policy (RAWB) was established, the department dealing with science policy within the Ministry for Education, Arts and Sciences expanded and a start was made with the publication of an annual review of all government spending and policy making with respect to science and technology. Yet, science policy remained closely associated

with higher education and policies with respect to universities and academy till the 1980s. The move to institutionalize scientific research and technology policy as a special policy domain coincided with the campaigns of the late sixties by students and younger academic staff to make universities more democratic, to enhance the public accountability of science and to mobilize science in support of social and environmental goals. Eventually this led to a major attempt to open up the government policies with respect to science and technology to public debate and to steering by committees in which science, NGOs and industry were all represented on a tripartite basis. Sector Councils were created that were supposed to review and give advice on the research activities and spending of the government in key sectors (health, environment and physical planning, energy, development aid etc.) In these sector councils representatives of science, government and society (industry and NGOs) were equally represented in tripartite forms. These new policies of public consultation were an attempt to open up earlier discretionary forms of policy making and to be more inclusive with respect to public concerns. Representatives of public concerns, like NGOs, were supposed to have a say at an early stage and the system should also be more open towards the scientists.

This drive towards more democracy and open forms of consultation was not restricted to the universities, but a much more widespread phenomenon at the end of the sixties. In 1966 a new liberal democratic party was founded that aimed at constitutional reform and the introduction of public referenda. It soon entered the government coalition and would deliver the first minister for science policy, Mr. F. Trip who would be in charge of the formation of the sector councils.

The attempts to become more inclusive is also understandable from the perspective of the growing importance of science and technology in society, the perceived negative consequences and the implications to be considered among them. It probably started with the consequences in the area of physical planning. The expansion of the population, industrialization, urbanization and the development of roads, railroads and aviation required a very dynamic planning process. Until the seventies at least this was a very discretionary process involving planner, local governance representatives and industries involved in carrying out the projects. In the 1960s the lack of public involvement was criticized more and more and new procedures were introduced in which citizens' abilities to object to plans were extended. This coincided with a growing awareness of the environmental consequences of these physical changes and increased expressions of public concern.

The controversy about the expansion of the Rotterdam harbour, about the siting of the chemical plant Progil near Amsterdam, about the chemical pollution of polders and the controversy about the mega-structural project to close off all mains estuaries in the South West of the country against the sea, were examples of this. And so was the debate about nuclear energy a sign of the transformation of a mainly discretionary cum corporatist polity towards a more deliberative and inclusive model.

The public controversy about nuclear energy started around the initiative by the ministry of economic affairs to build nuclear energy reactors and introduce an extra tax related to the energy bill to collect the financial resources needed. In part the controversy was about the location of the new reactors. Citizens groups emerged

opposing this and soon a coalition was in place fuelled by researchers who were also critical about the plans. They argued that a broader social debate was needed about the desirability of nuclear energy and its risks as well as alternative options and the need for sustainable growth.

When attempts to ignore the public opposition failed the government followed the advice of a coalition of municipal governments, churches and labour unions to organize a broad public debate about all aspects of energy policies ranging from technical and health risks to the desirability of market capitalism. The case study discusses the way this debate was conducted, how it was organized, how issues were defined and dealt with, how certain issues disappeared in the course of events and some parties got frustrated and others refused to participate. At the end the result was an overwhelming NO with respect to building nuclear reactors. The government refused to accept the result and from the political right and the industry it was argued that the debate had been hijacked by the left wing activist and critical scientists. The decision to build the reactors despite the public debate was shelved, however, immediately after the Chernobyl crisis.

A second public debate of interest concerns IT in the 1980s. The emergence of new information technology raised questions about the social and economic consequences, how to prepare the Dutch nation for the information age, how could Dutch industry and Dutch science take part in the new generic technologies? The second case study focuses on the public debate about this issue. It was much more loosely structured, there was little explicit attempt to mobilize the public other than to educate itself with respect to the new technologies. A committee led by professor G. W. Rathenau, a former director of Phillips' physics laboratory, was in charge. It was dominated by experts. Industry was keenly interested. In hindsight this debate would be characterized as hijacked by industry and science.

In the 1980s and 1990s technology policy became more dominant and the centre of gravity moved towards technology policy and innovation. As with IT other domains of new technological development started to take shape and debates started concerning what to think about them. The final report of the Rathenau committee had already mentioned the desirability to establish an institute for technology assessment to give advice to the government and to stimulate and organize civic debate about the societal implications of technological change. In 1986 this institute was established as NOTA (Netherlands Organization for Technology Assessment). In 1994 it was renamed Rathenau Institute, after the chairperson of the committee that had come up with the plan to establish such an institute. In the course of its existence the institute has organized all sorts of conferences to explore and discuss technological change and its consequences, but without assuming that such meetings should necessarily lead to consensus.

The establishment of the Rathenau Institute and the idea that the public should be educated and involved in debates about technological change was not the only expression of the growing awareness of the economic importance of science-based technology. The Advisory Council for Science Policy (RAWB) was reformed and put under the Ministry of Economic Affairs. Its name was changed into Advisory Council for Science and Technology Policy (AWT).

The third and anchoring case study deals with the debate about GM food. As the detailed analysis shows, the debate reflects the critique of the so-called deficit model of public understanding. Yet it also was an attempt to organize public deliberation without the possibility for stakeholder groups, be they industry or NGOs to hijack the debate. It is an interesting attempt to engage with lay people defined as people who do not regularly participate in NGO activities or have specific interests in the matter. It also provides a good example of attempts to frame the issues to be debated in such a way as to be in line with the stage of policy development and against those who question the value and legitimacy of the technological developments in the food and agricultural sectors as such. In this respect it repeated the attempt to frame the debate about nuclear energy as a debate about siting reactors instead of a debate about the energy needs and the sort of world citizens prefer to live in. Likewise, the GM food debate was explicitly framed in such a way that the debate should not be about the general question whether GM food was needed or desirable in principle general. Instead the debate should explore the conditions under which particular uses of biotechnology in food would be acceptable for the public.

In this respect the case study can be seen as an attempt to develop and extend forms of deliberative democracy. It also shows the limits of such models and what may go wrong if ideals of deliberative democracy are applied half-heartedly and when the articulation of public concern is out of step with the development of increasingly transnationally defined technology policies.

Norway

Norway has pursued a regulatory policy concerning biotechnology in particular which has been among the most restrictive and cautious in Europe This is in apparent conformity with the highly sceptical national public opinion on biotechnology issues in Norway. In both international comparative perspective as well as in national R&D policy debate Norway has been defined as a 'laggard' nation, lacking in determination and capability to exploit the scientific and economic opportunities of biotechnology. It is, however, also noted – at least in the national debate – that the strong emphasis in regulatory law and practice on ethics, social utility, sustainability, and the precautionary principle that defines the restrictive and 'conservative' regulatory policy adopted by Norway, may also at the same be seen as a 'provident' policy, as these concerns have been increasingly become parts of European regulatory policy.

More deliberative modes of governance in S&T policy have emerged in Norway during the last decade with the establishment of an institutional structure of S&T policy by which some completely new institutions have been charged with a specific responsibility to stimulate public debate and facilitate broader public participation in processes of science and technology policy.

The anchoring case about biotechnology governance in Norway demonstrates how biotechnology became a public issue in Norway through a parliamentary initiative from the Christian Democrat Party, rather than as a response to explicit public concern and debate. The strong emphasis this party puts on ethical considerations with respect to

abortion, IVF, eugenics and also issues pertaining to biotechnology, has been important in raising the political stakes concerning biotechnology. A strong concern with ethical issues has become a salient feature of the Norwegian governance of science and technology in the area of biotechnology.

A key institution in the governance of biotechnology is the Norwegian Biotechnology Advisory Board, which was established in 1991. In parallel with the Danish Ethical Council, the Norwegian Board provides policy advice but grafted onto this role are broad educational as well as diffusely deliberative missions to inform the public as well as to stimulate 'informed' public debate. As in many other forms of 'participatory governance' in Norway, it exhibits aspects of 'inclusive corporatism' seen by some observers to be an entrenched part of Norwegian political culture. It includes among its members a number of representatives from major stakeholders, including 'critical' NGOs and experts. To balance between these various groups and functions has been a delicate task and contributes to closure with respect to involvement of the general public. The board is a 'proxy' public debate on biotechnology, providing a sufficiently broad framework and credible standards for debating biotechnology issues to secure a key role for its input to public debate and to the political process.

A key event in the emergence of participatory governance in Norway was the establishment in 1999 of a Technology Assessment Board. The initiative imitated the Danish model and was specifically charged with a mission to promote public debate on technology issues. The second case study is about the controversy over the institutional design of this agency, and is hence an analysis of how the evolvement of conflictual framings of what deliberative practices in S&T policy are, and to what general developments of S&T they should contribute. As its mission and approach overlap with those of the Biotechnology Advisory Board, its own projects have largely been on issues of ICT. Projects outside biotechnology have, however, attracted limited publicity, and concerns are expressed as to its role and whether it really adds value to the decision-making process.

Bringing together the analyses of the emergence of these two institutions provides us with a window on the emergence and institutionalisation of new forms of governance of science and technology. These are agencies with a responsibility to employ both educational, deliberative and corporatist modes of governance to contribute to the production of robust policies. The low visibility of the Technology Assessment Board, however, also questions whether it is possible to extend the deliberative experiments outside the realms of the highly political and ethically controversial realm of biotechnology.

There are signs that issues concerning science and technology move towards centre stage in Norwegian politics. This became apparent, inter alia, in the controversy over the incorporation of the European directive on biopatents in Norwegian law (Norwegian anchoring case study) in 1999-2003. A politicization of S&T issues has emerged in which agonistic framings and processes have become visible. The sources of such forms of agonism are, however, in this case predominantly to be found within the political process itself, rather than in the dynamics of the biotechnology domain on itself.

Similar agonistic tendencies show themselves with respect to the emerging innovation agenda in Norway (second case study – Discussion Paper 16). The affluent Norwegian oil economy has exempted Norway from the crises that many other countries experienced within the last decade, including some of its Scandinavian sister countries, Finland and Sweden in particular. But this is seen by many as part of the problem, having made Norwegian society less inclined to initiate the changes necessary to adapt to the emerging new, knowledge-intensive and more competitive global economy. Controversies are being fought over what policies to adopt for the transition from a resource-based to a more technology-intensive economy, and a highly restrictive public opinion and an equally corresponding restrictive policy pursued within the bio-technology domain in particular are seen as barriers to effective exploitation of its industrial potential.

Portugal

1986 – the year Portugal formally became a member-state of the European Communities - may be regarded as a turning point in the relationship between science, technology and Government in the country. There had been, to be sure, previous links between science and policy-making. But joining the EC meant for Portugal starting to move away – even within limits, as we shall see – from living for almost half a century (1926-1974) under a dictatorship hostile to science, towards a generalization of access to education and the promotion of critical thinking.

From this moment on, in parallel with the reorganization of the National Board for Scientific and Technological Research (JNICT), it became possible to strengthen the support for research activities in Portugal. In particular, with the start of programmes supported by the European structural funds (the first programme, CIENCIA, started in 1990), available funding opportunities increased and became more frequent. Initially great emphasis was placed on scientific infrastructures, together with the training of young scientists and the funding of research projects in all scientific areas – including the natural and social sciences and the humanities - which continued to be of central importance since.

The importance given to policies for science was reinforced, after November 1995, when a socialist government came to power and the Ministry of Science and Technology was created, under the leadership of José Mariano Gago, a physicist who then became the first Minister of Science and Technology. The period 1995-2002, when Mariano Gago was in power, was framed by the dominance of policy for science, its main priority being the creation and consolidation of a national system of scientific and technological research, supported by public funding – a considerable part of it originating in European funds. This science-oriented or science-led science policy, defining a limited set of stakeholders, had as its underside the underdevelopment of science for policy, particularly in areas associated with (or likely to generate) public controversy.

Standard accounts of State/society relationships in Portugal have stressed the tendency to an authoritarian mode of exercising power, with little interaction with civil society or participation by, and a weak input from scientific and technical advice. Joining the EC should have led to a change in this picture, in particular through the need to transpose legal devices and a range of frameworks for public debate and participation, as well as a

push towards a more integrated management of issues related to science and technology at the European level. There was indeed a broad redefinition of legal frameworks or their creation almost from scratch (especially in areas like environment or consumer protection), as well as the re-emergence of public participation as a concern. In addition this process opened up the possibility for citizens to invoke European directives or legislation to oppose government or the state whenever citizens felt that their rights were being violated or threatened. The time-honoured gap, well-documented by Portuguese sociologists, between legal frameworks and social, political and administrative practices remained, however, a pervasive feature of state-society relations since 1976. After joining the EC, additional aspects of this feature became visible:

a) The use of opposite discourses in international fora and for domestic consumption by the Portuguese government (e.g. on environmental issues);

b) The lack of incorporation of European directives into domestic law or their delay;

c) The lack of enforcement of directives incorporated into domestic law.

The Portuguese case-studies bring to the fore the main features that have been associated with the latest phase of Portuguese history, the phase we describe as "europeanization". They provide "thick" illustrations of two different sides of the science-technology-governance nexus, policy-for-science and science-for-policy.

The anchoring case study is focused on the conflicts over the siting of facilities for the co-incineration of hazardous waste in cement kilns. Waste management has been a central issue in Portugal over recent years. The case around the installation of a co-incinerator in Souselas, a village near the city of Coimbra, was a process that emerged in 1998 and become a central controversy in Portugal until 2002.

The controversy over the decision to turn co-incineration into the main mode of hazardous waste disposal brought the debates on environmental strategies, citizen participation, scientific expertise, democracy and science and state-society relations to the public scene. With broad media coverage, the controversies around this issue fuelled public debate involving local populations, environmentalist associations, scientists, experts, local governments, national parties represented in parliament and the national government. Two scientific reports were issued (one focusing on the process and the other one on the impacts on public health). Both were strongly criticized and opened up a broader space of debate among all the actors involved. During the sixty days the medical report was open to public discussion, 11,650 written comments were sent to the Ministry of Environment contesting the results, but not a single one was considered relevant to the final decision on whether or not the process should be carried out. Another example of how the public was treated in this process was the silence over a period of almost eighteen months on the largest local petition ever delivered to Parliament. This petition, promoted by the Environmental Association of Souselas, asked for the suspension of the process until more detailed studies were available, and was signed by more than 50,000 persons.

But both scientific debates (and, in particular, the positions of those scientists who opposed the decisions of the government) and citizen actions as legitimate contributions to a public controversy were ignored by government. This may be regarded as a symptom both of the lack of experience of the Portuguese state in dealing with controversial situations (dealing with them as if they were routine processes of risk

management), subjecting it to conventional, discretionary political action, and of the suspicion towards and disqualification of any form of citizen participation, to the point of transforming public consultations into mere formalities.

This case is also exemplary from the point of view of the behaviour of the Portuguese state within the European Community, namely the dual discourse produced for international and domestic purposes concerning environmental regulation, on the one hand, and, on the other, the emergence of a new space and new instances of legitimacy which became available to action by environmental and citizen associations.

The second case, on the regulation of the field of reprogenetics, displays another example of a controversial issue at the intersection of policy for science and science for policy. In spite of early efforts at creating a regulatory framework for medically assisted reproduction (MAR) and, more generally, developments in the life and biomedical sciences and interventions based on them (such as genetic information and its diagnostic uses, stem-cell research and research with human embryos), a regulatory void has persisted since 1990, when the National Council for Ethics in the Life Sciences (CNECV) was established. Attempts at drafting and passing laws on MAR were compromised by the dominance of a restrictive orientation expressed in the Council's reports and advice, and met with the opposition of experts and practitioners in the field. In spite of some public resonance, mainly through media coverage, debates in this field tend to be confined to experts in the relevant fields of biomedicine, biology, law and bioethics, with a limited involvement of social scientists, and deliberation is restricted to the CNECV and Parliament, during the debates on this issue. MAR is currently offered by a number of public institutions and private clinics, but it exists within the aforementioned regulatory void. This is a clear case of an intersection of corporatist/professional and market regulation.

The third case study, on responses to the BSE crisis, is a good example of the ways in which the "Europeanization" of risk assessment and management shapes science for policy in Portugal. In 1993, scientific advice was dismissed by a parliamentary committee on the basis of the alleged state of uncertainty concerning the means of diagnosing cases of the disease and of disagreements among experts. In 1996, however, as the BSE controversy had become "Europeanized", the Portuguese Parliament and political authorities were forced to change course and recognize the existence of the problem based on cases in the country. From 1998 onwards, the European Commission had a key role in confining and controlling BSE in Portugal. At the same time, initiatives were taken to create a national agency for food quality and safety which would amount to an institutionalization of scientific advice and intervention in the field. The agency, however, has not materialized in a form that allows it to fulfil these roles. It is interesting to underline that during the first two phases, the Portuguese political authorities displayed a discretionary mode of intervening in the process. After 1998, this discretionary form of action was taken over by the European Commission. Although these three phases coincide with a parallel deliberative dimension, through the appearance of hearings carried out by parliamentary committees, these cases provide a clear example of the predominance of discretionary action in the national system, as the results of the parliamentary hearings were dominated by the governmental positions. The prevalence of the discretionary dimension led to the failure to articulate the work of the committees with the regulatory process.

In short, we may describe the current trends in the governance of science and technology in Portugal as based on a strong discretionary orientation, with minor

contributions from educational and corporatist approaches and occasional deliberative episodes. It is likely that, in the wake of the strong commitment to the privatisation of both public companies and services and of the management and provision of public services, market and agonistic modes of governance will be increasingly significant. Agonistic governance, however, depends on the capacity of citizens and civil society organizations and movements to mobilize and intervene to respond to the effects and consequences of the dynamics of privatisation and marketization.

The current trend towards neoliberalism and market orientation, and the weakness of national social movements and NGOs with a capacity to promote public mobilization and public debate over controversial issues suggest that a turn towards more deliberative forms of governance (beyond Parliament and some specialized advisory boards or councils) is unlikely to happen.

Sweden

Not so terribly long ago, Sweden earned a reputation as a pioneer of a socially responsible science policy. Supplementing comprehensive corporatist labour market agreements, there arose a wealth of educational and participatory practices assuring workers and a wider set of stakeholders a say on the technoscientific transformation of Swedish society. The very first computer legislation addressing issues of private integrity and electronic surveillance was launched, as well as pro-active initiatives concerned with medical risks linked to displays or 'the domestic digital divide' threatening to leave certain computer illiterate strata lagging behind.

An account of the current state of things, however, provides a sharp contrast to this retrospect, since it demonstrates how a resurgence of commitment to scientific autonomy has led to the national decline of a politics of socially responsible science. Sweden appears no longer home to industrial democracy, but rather a re-purified techno-scientific authority in government.

At first sight, questioning this pattern of development, are the commitments to public participation in the area of nuclear waste management in Sweden. Through fostering educational and deliberative procedures, the involved institutions have succeeded in breaking a former stalemate caused by public protest and rejection of waste disposal plans. The anchoring case on the public participation in Swedish Nuclear Waste Management, however, demonstrate that even in this field only certain aspects of the process have been open for public participation, in order to win support for a ready-made technical concept; deliberation is piecemeal and constrained at most, still under the reign of corporatist or technocratic modes of governance. Public deliberation is only feasible in the two local authority areas where nuclear waste is already stored and largely accepted as local destiny. Local deliberations in nuclear communities are directly related to a broader strategy of public exclusion from the siting process with reference to the vast majority of the Swedish population.

The second anchoring case of Sweden examines the creation of a knowledge society as the 'republic of science enlarged'. Gaining momentum in the late 1960s, the idea of something resembling a 'new mode of knowledge production' was penetrating Swedish research policy. Officially, such an idea was to remain valid and cherished until fairly

recently, although, already at the beginning of the 1980s it was encountering criticism. By the beginning of the 1990s the fate of the piecemeal social engineering associated with so-called sector research policy was sealed through the creation of a 'knowledge society' in which the traditional autonomy of both science and scientists in society was to be reimagined. Institutionalizing this, several new research foundations came into operation in 1994. Instead of a society being science-led from the outside, a new breed of strategic scientists interacting closely with others and with industrialists in particular was to build the world-class research environments delivering the knowledge society.

However, hardly had the establishment of the foundations put a stop to one controversy, before they gave birth to another one. If not before, the years now following, very clearly demonstrated that the interests having so fiercely taken sides against the former sector research policy, in fact were very different sorts. Being brewed was now another outbreak of conflict, developing into "Sweden's own internal Science War". To be struggling were two versions of how to defend the autonomy and exclusivity of science under growing global competition. On the one side there was a politics rooted in a reassertion of orthodox patterns of scientific authority, arguing for a reaffirmation of the indispensable authority of basic research. On the other side was the policy now materialising in the wake of the science foundations with a strong focus on strategic research. Although sharing the same concern for 'the knowledge nation', these two 'layers' of Swedish science policy clashed and after various battles the Swedish Research Council came into existence on the 1st of January 2001. Although not exactly embracing the notion of two purified worlds of science-controlled research and non-science controlled research, with no hybrids in-between, the forms of practices having evolved around the new Council, do not support a neo-liberal research policy so much as a neo-classic liberal research policy; mirroring the mission to relaunch collective scientific opinion as a concentrated source of social power. If neo-liberal research policy at the beginning of the 1990s sought to lever Swedish science out into society; neo-classic liberal research policy after 1998, then, has aimed to place the socialization of science in knowledge society under a firm scientific control.

Following this there has been a strong scepticism towards EU science and technology policy in recent years in Sweden and it has been emphasized that the country is more similar to the US in its established commitment to excellent basic research which remains the long-term foundation of international competitive advantage. Swedish actors like the new director of the European Science Foundation have been at the forefront of efforts to establish a new European Research Council pushing European science policy in a more American direction.

The same trend towards re-purification is observed in the third Swedish case study about the use of film as medium to educate the public about biotechnology. Sweden has always privileged the 'educational mode' through its historical commitment to 'folkbildning'. At the beginning of the 20th century 'folkbildning' emphasising the natural sciences was seen explicitly as a useful 'political education' to be given to the working classes in advance of them being granted political citizenship. A 'scientific world view' would enable the working classes to make rational choices at election time. This style of thinking persits today where new educational initiatives in relation to the 'new biology' clearly privilege the voice of bioscientists as the case study demonstrates. Explicitly referring to the public instrument of 'folkbildning', a specific budget was

allocated to the Research Council for co-ordinating a broad programme to strengthen public knowledge and stimulate debate on 'the New Biology'. Judging by both how this programme so far has been framed and manned, and of which particular parts of the 'folkbildning' tradition one has chosen to revive, it falls vulnerable to an ill-concealed scientific distrust in the ability of the public to think through biotechnology for themselves. Thus, rather than mainly expanding public knowledge about contemporary science, this New Biology education seems to be concerned with correcting public knowledge in order to win public greater acceptance of scientific achievements.

This is only one of many examples of how the current political invention and intervention in the governance of science is being pursued to the advantage of those scientists and research organizations most closely involved in the field. To a higher degree than elsewhere, Swedish scientists are being entrusted with the task of standing guard over the ethical, political and commercial dimensions of their own research practices. In a wider perspective, this fits into a pattern of re-envisaging Sweden as the seat of boundless scientific initiative, rather than of progressive industrial democracy. Building upon but at the same time also going beyond neo-liberalism's vision of Swedish knowledge society as the republic of science enlarged, neo-classic liberal research policy has aimed, and has largely succeeded, at placing this republic in firm control of its own enlargement.

The United Kingdom

Up to the closing years of the twentieth century British science and technology policy has oscillated between two principal yet opposing ideas. The first, which dates back to the founding of the Royal Observatory in 1675 to support both astronomy and navigation for trade, is an integrated approach to science and technology as interacting resources for exploitation in defence of perceived national strategic and economic interests. When the first world war exposed the UK's dependence on the products of German industry, the British government in 1916 set up the Department of Scientific and Industrial Research (DSIR) with the aim of mobilising capacities for the war effort. At a later period, in the 1960s, the Ministry of Technology, which briefly took over responsibility for UK science budgets, did so again on the basis of the issue of industrial competitiveness, although this time a key issue was seen to be the need to counter the pre-emption of technological resources by defence.

The second big idea has been for a separation of lines of responsibility for different kinds of research. What became known as the Haldane Principle (1918) suggested a clear distinction between research relevant to the main departments of state and financed by them and curiosity-driven research which was to be protected from short-term departmental interests by being organised through buffer organisations. This principle was the basis for the first research council, the MRC (1920) and for the big period of governance innovation when more or less the current institutional landscape of Research Councils was created late in the 1960s.

This was the setting for the crisis of BSE in the late 1980s. It came from, and confronted, a UK system of scientific governance which was discretionary/educational in style. Government departments were still the more or less uniquely legitimate

vectors of the democratic process in defining sectoral S&T policy, and operated largely through a self-selecting set of expert advisory committees. The UK had long operated as a centralised unitary state with an electoral system which produced strong governments, but the 1980s represented some kind of peak of this tendency: during it the Thatcher government swept away most of the corporatist institutions which had previously provided a brake on discretion by requiring some bargaining between competing interests.

The 1980s system of scientific governance also gave little political space to citizens or consumers. From 1985 on, the deficit model was officially incorporated into public thinking through the influence of the work of the Royal Society Committee on the Public Understanding of Science under Sir Walter Bodmer, but the model was of course a paradigm of educational governance and there was no hint of the need for dialogue.

Although the BSE crisis was not the only one shaping the development of the public science and technology system at the cusp of the twentieth and twenty-first centuries, it was by far the most significant for what happened subsequently in the UK, and as we see from other cases, widely influential in Europe. In the UK BSE created three kinds of challenge to the science governance system and its operating conditions. First, it opened up fundamental process questions about the operation of the scientific advice system. Second,. it pointed up central issues for scientific governance itself, in particular structural weaknesses within government with the then Ministry of Farming, Fisheries and Food (MAFF) being responsible for the conflicting demands of promoting the agricultural industry and protecting public health. Lastly it raised issues of wider political accountability which focused on the degree and nature of public trust in the processes and policies of government and scientific institutions.

The three UK case studies take up these different challenges and the response of the UK system to them during the late nineties and early noughties. One - Challenges to UK Scientific Governance - exhaustively pursues follows a wide-ranging set of developments through a breakneck period of institutional innovation and reform. The Agriculture and Environment Biotechnology Commission (AEBC), the Food Standards Agency (FSA) and indeed the Department of the Environment, Food and Rural Affairs (DEFRA) itself were created as part of the response to BSE. The intensity of scrutiny and change at the peak of that period is indicated by the fact that between November 1999 and September 2001, a period of just 23 months, the government either received, published or responded to 12 major official reports or pieces of legislation concerned with the governance of science and technology. Through this study we see the origin and diffusion of three sets of key ideas, of the means to more robust scientific advice, of a machinery of government able to recognise and openly confront and deal with conflicts of interest, and of approaches and mechanisms related to issues of legitimacy wider public trust. In particular we see the influence of three key documents, the Chief Scientific Adviser's Guidelines on Scientific Advice in Policymaking (first published 1997), the House of Lords Select Committee Report on Science and Society, under Lord (Patrick) Jenkin (2000), and finally the exhaustive report on the public inquiry into BSE – The Phillips Report (also 2000). In these three reports the UK was both distilling experience of governance elsewhere in Europe but also contributing to thought and practice in the Commission, the European Parliament and in Member States.

A second case study looks in detail at The Guidelines on Scientific Advice in Policymaking, key to shaping the governance changes, and arguably destined to be the longest-lasting of the changes noted here. There does seem to be some commitment to changing the processes by which scientific advice is produced and assessed. Ostensibly the aims of the exercise have been well thought through in their own terms, applied progressively throughout government, and to some extent evaluated. However, its aims can be seen as tangential to the participatory turn as such: they are to buttress the reliability of expert scientific advice within government by acknowledging uncertainty and ignorance and ensuring that the process is more intellectually competitive. The application of these principles to the composition of scientific committees does lead to more pluralism in membership, but of course there is no guarantee of a corresponding competition between values and approaches in the internal workings of these committees except in those cases – still a minority – which involve open and transparent meetings.

However it is the wider context of change which gives the GM Crops Debate its significance and resonance as the third anchoring case study of contemporary UK scientific governance. The wider set of changes in UK scientific governance and the subsequent willingness to experiment are probably the central reason why this debate takes place; the restricted grounds on which the UK can except itself from a general EU presupposition in favour of GM crops frames the specific issue, whilst the process and evidence base of the debate - as an example of innovative practice - takes place on a quasi-corporatist basis within a new government body, the Agriculture and Environment Biotechnology Commission (AEBC). This debate on GM Crops, taking place in the summer of 2003, was the first attempt of the government in the UK to take public soundings to establish an evidence base to be interrogated in a government decision on scientific policy.

The period of this brief review of the background to the GM debate is, in the context of the evolution of governance, extremely short – about two years. It was, however, one of unparalleled intensity as government started to come to terms with the impact on the governance of science and technology of the - by now – socially shared conception of BSE as disaster and the unresolved conflicts over the distribution of potential costs and benefits of GM. We have looked at the participation in the governance debate of a limited range of actors, in government, in parliament, and in agencies and inquiries that the government has set up. Nevertheless, the debate - and especially the Jenkin report - has been very permeable to NGO, industry and academic influence and opinions, and these have been cited in support of conclusions and recommendations reached. Academically this was, arguably, the greatest period of social science influence over science and technology policy and one of the biggest impacts in any policy domain within the UK. There has been a social multiplier of this impact as scientific and governmental institutions have sought to apply the Science and Society analysis and approaches to the legitimation of their work, and sometimes also to its aims, structures and processes.

In one sense this period can be seen as an extended period of crisis management, during a period when the increasing salience of science and technology to the economy has raised the stakes for stakeholders. Indeed, the period has something of the passionate intensity of a revolution, with a key political discourse emerging – that of public

engagement and dialogue – and a rapid re-alignment of the discourse of government and major S&T institutions (but not industry) in line with the new rhetoric.

However, one can ask where scientific governance in the UK stands at the end of this period and how fundamental the changes discussed here have been. It is probably a mistake to look for too much coherence in such periods from actors who are to some extent using the crisis and the new repertoires of analysis and action accompanying it in jockeying for power and advantage. The GM crops issue may now be closed but the approaches to framing and resolving social issues involving S&T are far from settled issues. In particular government has been seen to be in support of a variety of forms of governance, perhaps shifting slightly more decisively to embracing educational/deliberative process as the period ends, but not buying into process in a manner which cedes discretion over outcomes.

Indeed, the UK government can only have been said to have made a half-turn towards a deliberative component in UK scientific governance. The case for the GM Crops debate – a publication called Crops on Trial - was the product of its vehicle for experimental change in the GM debate, the AEBC, and agonistic methods – supermarket boycotts by consumers, activists trashing filed trials of GM – had helped put the issue onto the agenda. During the exercise the AEBC Steering Board had to fight its parent government department for the necessary resources to conduct the debate, and then for a commitment from government to refer to the debate results in giving to the reasons for its decisions. This commitment was given and honoured but may prove to have been a one-off.

The GM crops debate - *GM Nation?* - caused considerable controversy in terms of the framing of the issues and the processes employed. Early in the exercise an ad-hoc group of social scientists attacked the methodology and the formal post-hoc independent evaluation by a consortium led by the University of East Anglia was very critical, and indeed challenged the finding directly with the results from its own surveys. Although concern had been expressed as to whether NGOs would remain committed members of the steering board, it was the industry representative who resigned when the results of the debate were seen to be critical of GM, seeing the exercise as one of NGO mobilisation of an unrepresentative audience. Although the government had organised the debate so that there were separate exercises to assess the economic benefits and scientific issues surrounding GM, both these more technically framed studies were also cautionary in tone.

GM Nation embodied one interesting organisational feature. The steering board did not have the resources to conduct the whole debate. It concentrated on organising a small number of 'first tier' debates and then left it to others to multiply the process. Local authorities, who had already been used to public consultation in the planning process, were major facilitators of this process. It may be that public consultation is an embedded technology at local government level in the UK. If so this may contribute to a long-term political dynamic.

The legacy of the GM debate is ambiguous. The whole organisation of the debate into three strands may have been thought of as an exercise to maximise discretion. The position was further muddied when the food standards agency – controversial for the

extent to which it followed a food industry agenda – organised a citizens' jury for the young which supported GM. It was also significant that the steering board did not in the end have a chance to tap into public opinion again after the science and economic strands or after the results of farm scale evaluations to test the effects of the farming practices which included GM on biodiversity – the issue that was crucial to any UK opt-out from EU regulatory decisions. When the government decided in principle to approve one GM product and reject another it followed the recommendation of its advisory body which in turn followed directly the results of these trials.

There is some mystery as to why the AEBC allowed itself to be led onto the narrow technical ground of 'yes or no to GM crops' when it was clear that the purposes of GM crops, the farming practices which surrounded them and in particular the pesticide application regimes, and the values which informed these choices, were the real social choices needing to be made. Current discussion in academia and NGOs – but not significantly with government and industry – is about 'moving public engagement upstream' so that any 'Nano Nation?' debate[21] reflects these wider issues.

In the further evolution of UK scientific governance a number of hybrids are possible: deliberative processes which, being conducted by bodies which are ostensibly representative of major stakeholders, inform negotiated outcomes of a corporatist character; deliberative processes which have a clear linkage to government decisions. Just conceivably, developing pluralism within the scientific advisory system, coupled with the extension of participatory approaches from their current base in local government practice, could seem the 'AEBC model' evolving in this direction. However, the most likely future is a continuation of limited, ad hoc deliberative processes which simply inform discretionary governance, most often prompted by market considerations, and stressing consumer sovereignty on issues like labelling. In this situation, the only decisive prompt for deliberative processes may be the perceived political and economic costs of agonistic forms.

3.4.2 – discussion: technology as a driver of the governance agenda

We do not suggest that our cases were chosen on the basis of a comprehensive selection process. In that sense, we make no claim to their 'representativeness' nor do we argue that they are 'typical' of scientific governance across contemporary Europe. There is indeed no obvious criterion by which such 'representativeness' could be established. Instead, our approach was intentionally based upon the selection of important and revealing cases which would be especially suggestive of the underlying issues and challenges. On that basis, we claim that, whilst our cases may not be representative in any statistical sense, they are certainly symptomatic of the treatment of scientific governance in Europe. Indeed, the anchoring case methodology was specifically designed to allow the selection and development of cases which are particularly revealing of the settings and contexts at issue. In that way, the patterning of our cases and their discussion do illustrate and exemplify the contours of scientific governance across Europe.

[21] Such a debate, learning from the lessons of *GM Nation?* is proposed in James Wilsdon and Rebecca Willis, *See-through Science: why public engagement needs to move upstream*, London, Demos, 2004

In this section, we will consider the relationship between the technologies under discussion (specifically, their socio-technical characteristics) and responses in the form of scientific governance. The previous section dealt with national characteristics. Here, we take as our starting point socio-technical characteristics and explore the extent to which the particular features of these technologies have influence on the particular forms of governance response. Can it be argued that the same cases and technological developments evoke essentially similar patterns of governance and public response across Europe?

Looking at the clustering of our cases, it is obvious that in many of the countries studied (for example, Norway) scientific governance in general and the governance of biotechnology are so intimately intertwined that the two histories are very difficult to separate (at least in the context of the 'new wave' of governance discussions since the late 1990s). Across most of our countries (with the possible exception of Finland and Greece) biotechnology is playing a central role in the development of scientific governance – and in the development of public engagement in particular. However, it is also obvious as we look across the case studies that the 'biotechnology' issue has been characterised separately in different contexts so that we find rather different national discussions taking place under the biotechnology heading: human genetics and cloning, forestry, GM foods, aquaculture. Biotechnology has generally been an issue across our European countries but the specific technologies and social consequences under discussion vary significantly: in the UK, the GM case has been more prominent in terms of public debate than stem cell research whilst the opposite appears to be true in Norway and Portugal.

Compared to what might have been anticipated had one been conducting the STAGE project in the 1980s, the ICTs feature less prominently in our cases. There is little evidence of broad public engagement in the implementation of such technologies so that, for example, the widespread European adoption of mobile telephones has not led to new forms of governance and public intervention. Instead, the tendency has been for discretionary governance to dominate (for example, commissions of inquiry and expert committees) punctuated only by the occasional outbreak of local controversy with regard to the siting of mobile phone masts (in the UK, for instance). It would appear across the countries studied that ICT has not ignited new governance initiatives. Of course, this is not the same as stating that public concerns over these technologies are less important or less strong – but that such concerns as do exist (for example, regarding the usage of mobile phones by children) have not led to new governance initiatives.

At this point, we are led to speculate about the kinds of issues which lead to public debate – and those which do not. To take another example, environmental issues are not driving public engagement/deliberation in the manner that would previously have been anticipated. Of course, it could be suggested that contemporary governance initiatives bear the imprint of earlier controversies over environmental matters – and notably debates in the 1980s over nuclear energy (as discussed in one of our Dutch cases). In the coming years, environmental issues may become more contentious with regard to nuclear waste disposal and global warming. Equally, environmental concerns enter other cases – for example, with regard to the potential environmental impact of GM organisms. However, during the period of the STAGE project at least environmental

concerns have not led to major challenges to the processes of governance in many countries – although Portugal is a notable exception to this pattern.

Why then the different governmental and public responses to these issues? In November 2000, a report from Lancaster University compared the 'social constitutions' of GM and IT [22]. From a public point of view, information technology can be seen as user-friendly, under the control of the individual, visible and external to the body, susceptible to effective regulation, offering clear personal benefits. GM meanwhile is often presented by members of the public as invisible, internal to the body, not susceptible to individual control, raising new issues and potential problems, offering benefits to industry but not necessarily to the consumer. Themes of ignorance and uncertainty figure very large in public discussions of genetically modified food. Statements that there are no known risks lead the wider publics to ask about the unknown risks - about the limits to current knowledge and understanding. Equally, trust plays an important role in public assessments. Routine scepticism is expressed about the motivations and interests of government, scientific and industrial bodies – and also those who claim to speak for 'the public'.

It is certainly important to reflect upon such issues – not least in order to anticipate future public concerns (around, for example, nanotechnology). To take the case of biotechnology, the issues do appear to be quite differentiated and this leads to different forms of governance. Thus, it is noteworthy in the UK that the body responsible for agricultural biotechnology (the AEBC) has often been controversial and may indeed be disbanded while its equivalent for human genetics (the HGC) has been viewed in a generally positive light. At this point also, the familiar distinction between 'red' (medical) and 'green' (agricultural) biotechnologies comes to the fore – alongside an overlapping separation of the debates into public/private discourse/individual choices; social distribution of risk/opportunity.

In our judgement, the development of public controversy is unlikely to be a matter of *either* technology *or* context but instead a combination of the two. Thus, in European nations where certain religious views hold strong, issues of the sanctity of human life may resonate especially (eg with regard to stem cell research), whilst in others questions of globalisation are seen as more significant (for example, in relation to GM foods). There is a particular danger of over-generalising across technologies and contexts in this regard. We recommend that further research be conducted into these questions of 'technology specificity' – especially with regard to new and emerging technologies. Technological characteristics alone cannot explain patterns of social response and we resist the idea that certain technologies *cause* public controversy. Instead, our case studies suggest much more complex patterns of social construction and response. Further reflection on our case study material could be a useful starting point for the early identification of future controversies.

[22] Grove-White, Robin, Phil Macnaghten and Brian Wynne (2000), Wising Up: The public and new technologies, Lancaster: IEPPP, Lancaster University

3.5 What patterns do we find across Europe?

3.5.1 Multi-actor governance

Governance implies processes of policy setting, implementation and assessment which are not confined to government itself but which extend through a network of organisations and agencies and collective actors. In this narrow, literal sense, all contemporary scientific governance is multi-actor: the participation of government - be it European, member state or local – is necessary, but insufficient.

In looking at the broader role of multi-actor governance in this study we have been interested in the scope of these government centred networks and the dynamics by which they are constructed and maintained. Who is involved, what are their constituencies, and how do these relate to wider publics? How does what is considered legitimate for debate relate to who is considered legitimate to discuss it? How broad are the conceptions of expertise being defined and in whose interest? Do coalitions emerge and if so what are their scope – procedural or substantive - and their permanence? Do they draw on, or help to establish, longer-term corporatist arrangements or more loose forms of coordination? How influential are participatory outcomes and how do they map back onto decision-making in government or established deliberative forums like parliaments? Our cases also show the functioning of multi-actor governance in a narrower sense – in terms of the interplay of the executive, the judiciary and the legislature, and the way in which those processes interact with wider public and stakeholder engagement.

In most cases of scientific governance, different actors take a different view of the range of actors and issues which are legitimately included. This can be seen most clearly in agonistic struggles – such as the Portuguese co-incineration case - in which there are no independent rules, processes or reference points on which all participants can agree. The Portuguese case is described in Latourian terms, as an opposition between 'programme' and 'anti-programme'. All the issues are problematised, and all perspectives different. From the point of view of the government - 'the programme' - the whole matter is discretionary and there is only one legitimate process: that is confined to a set of scientific and technical issues, the experts who will interpret evidence on them and advise, and the politicians who decide. From the point of view of those opposing - 'the anti-programme' - the legitimate space included the spokespersons for different positions within the scientific community – counter expertise - and coming from a range of disciplines broader than the one represented in the government committee involved, as well as the citizens affected by the policies being discussed, their movements, associations and spokespersons. For the 'anti-programme' the underlying central issue was the legitimacy of citizen involvement and the inseparability of technical and political issues. For the 'programme' – framed by the government - not only was the legitimacy of citizen involvement not recognised, with the largest local petition ever delivered to the Portuguese Parliament ignored for eighteen months, but even the public contributions on the technical issues were effectively de-legitimised, since the government ignored the comments received during the sixty days a medical report on the effects of co-incineration was open to public discussion. Public consultation had been rendered into a mere formality.

The Portuguese environmental case also showed a very restricted role for expertise. The committee which the government established was short-term and ad hoc, it took a narrow view of its role as a routine matter of risk-assessment, and experts operating outside these constraints were ignored. Elsewhere, notably in the reforms in the construction and use of scientific advice being carried out in the UK, securing more varied sources of expertise and subjecting them to more intellectual challenge are seen as processes which help to test the strength of positions and specify uncertainties and unknowns.

Multi-actor governance of science often echoes wider governance arrangements in other policy domains. In Norway, it exhibits aspects of 'inclusive corporatism' seen by some observers to be an entrenched part of Norwegian political culture. It includes among its members a number of representatives from major stakeholders, including 'critical' NGOs and experts. To balance between these various groups and functions has been a delicate task but it also contributes to the exclusion from debate of the general public. The technology board is a 'proxy' public debate on biotechnology, providing a sufficiently broad framework and credible standards for debating biotechnology issues to secure a key role for its input to public debate and to the political process. Corporatist structures and processes also lead to the exclusion of citizens from debate in Finland, where the partners are firms, research institutions, state agencies and ministries. A form of deliberation takes place between these, but a tradition of acceptance of new technology and the authority of the state means that unlike Norway, contacts with NGOs are generally weak. However, in the case of forest biotechnology, Finnish scientific corporatism is modified, and reflects the diverse set of interest groups and stakeholders connected to the forest sector, although NGOs complain about the limited impact of their opinions. Some of the inclusivity reflected in the governance of this sector may reflect ownership patterns – approximately every fifth Finnish family owns some forest, and private ownership accounts for over 75% of the wood used by the industry.

The UK and the Netherlands are examples of multi-actor governance in evolution – in the Netherlands over a long period, in the UK with much newer and shallower roots. Corporatist approaches in the Netherlands have their origins in the 1960s, and by the 1980s were represented by sector councils with a tripartite structure of participation, comprising science, government and society (industry and NGOs). At that time a national debate on ICTs reflected a concern of the times, debated at the Versailles Economic Summit of 1982, that public opposition might slow the rate of introduction of new technologies. In the UK, which was based on strong discretionary styles of government that had not been seen in the Netherlands since the 1950s and 1960s, this led to the Royal Society Report on the Public Understanding of Science and the perceived need to counter a proposed deficit in public understanding. By contrast, in the Netherlands, the embedded idea of governance involving negotiation between different interests led to the deficit seen to be not in the public but in governance processes. A report on information technology led to the establishment of the Rathenau Institute with continuing responsibilities for technology assessment and public engagement.[23] Although education were part of the 1980s offer in both countries, the

[23] The Rathenau Institute is often compared with the Danish Board of Technology, but it is noticeable how in their Dutch form, there is no requirement that consensus conferences lead to consensus.

different governance traditions of the Netherlands led to a view that the citizen should also be involved in debates about technological change.

The conflicts of interest within government, and the difficulties in framing and using scientific expertise in public policy, lead to a number of new government agencies in the UK in the late 1990s, dealing with Food Standards and safety, Human Genetics ('red' biotechnology –the HGC) and Agricultural and Environmental ('green') Biotechnology (the AEBC). All of these new agencies had slightly different roles, and all represented (though not self-consciously) experiments in multi-actor governance. The AEBC's role was strategic advice to government , and its composition broadly corporatist, and representative of different interests and sources of expertise. A different set of expectations now surrounded science policy, the 'participative turn' had happened – in the UK at least in rhetorical terms - and instead of a new corporatist body being a substitute for wider public debate (which the government might have expected), on GM crops the AEBC argued for and then helped organise wider public engagement (which the government clearly didn't welcome), helped by local government where public engagement, particularly over city and country planning issues, was more socially embedded.[24] The AEBC had potentially opened up a new form of multi-actor space – one in which stakeholders frame the issues and processes for wider public consultation and recommend to government in the light of its findings. However, the process was shallow-rooted and stakeholder commitments were confined to what they could get out of the exercise in the short-term; there was no commitment to the process as such from either the NGOs or the industry side, who watched each other warily throughout.

If the UK GM crops debate turned into a tentative move towards a corporatist-deliberative-discretionary hybrid in science policy, the more or less contemporaneous GM food debate in the Netherlands can be seen as something of an anti corporatist experiment, having its roots in the public engagement turn allied to scepticism about industry and NGOs having dominated a nuclear energy debate in the 1980s. The nuclear energy debate itself, having roots in popular protest against nuclear power plants, had been an attempt to broaden the range of participants, but had produced a decisive 'no' response which the government went on to ignore. Whilst responding to the momentum participatory approaches had established, a principal aim of the exercise was to ensure that the GM crops debate did not get highjacked by participants and the broadest scope for decision-taking was retained by government.

The Danish Board of Technology may be seen as having established one of the distinctive roles in multi-actor governance. Although its work is seen to be grounded in public participation, the public cannot be seen as its clients. Rather the Board can be

[24] There are no UK mechanisms for defining a regional dimension of science policy although some local authorities have developed public participation, and one strong case (Hampshire) in developing environmental waste strategy (prompted by agonistic action). There was similar institutional and local government protest to the decision of the UK government to locate a new synchrotron radiation source in a Oxfordshire laboratory, rather than in the home of its predecessor source in Cheshire, in the north-west, and this led to a more balanced pattern of scientific investment between the two regions. There are thus hints of a new spatial dynamic in UK scientific governance, but one which is currently limited and ad hoc.

seen as working for industry and for central and local government in testing the real social space available for new technologies: anticipating where opposition may surface in the real world, and helping sensitise participants in the exercise to the complexities of managing change – potentially shaping as well as reflecting new technology (an approach exemplified in the electronic patients' records case).

The case study of forestry demonstrates that there are policy areas in which there is active discussion about civil society and citizen participation in Finland when it comes to environmental issues. Finland has many NGOs and citizens groups involved in environmental issues and animal rights. Apparently, biotechnology has not become a big issue among the general public. The case study about forestry and biotechnology also demonstrates, however, that the inclusive and integrative forms of collaboration between green movements, the state and the forestry industry still fit in the overall picture of the market-oriented and corporatist form of governance.

The interplay of the executive, the judiciary and the legislature, and the way in which those processes interact with wider public and stakeholder engagement, is also instructive. In the Greek environmental case, a tougher policy from the Constitutional Court, reduced the freedom of the executive to ignore European legislation; this rare challenge to discretionary government in turn challenged the environmental NGOs to take a higher public profile, although they failed to consolidate this by establishing their roots in popular opinion. In the follow up to the UK GM crops debate, as earlier in the House of Lords Committee responsible for the Science and Society report, there was some sense that representative democracy was a zero sum game, and that mediation between the public and the executive on S&T policy issues was not a new task of agencies like AEBC, but the established and traditional job of Parliamentarians.

3.5.2 Dynamics of engagement

Engagement can display a wide range of aims, processes, frameworks and dynamics, locating itself upstream or downstream, and demonstrating anticipatory (pre-innovation), participatory (usually at the point of innovation) or even post-participatory features (as when engagement exercises encourage further debate about the exercises themselves).

Although the wider public debates and protests that have surrounded participatory exercises in the Netherlands have developed a wide agenda of issues, formal public participations have always had a downstream focus, being narrowly politically and technically framed: thus the nuclear power debate was framed as being about the siting of reactors rather than broader issues of energy and environmental policy, and GM food about the conditions in which GM products and processes would be acceptable rather than the desirability of GM itself or its place in wider food policy. The Netherlands exception was the broader anticipatory approach in the IT debate of the early 1980s, with a focus on technology policy and preparing the public for technical change, and on establishing an ongoing capacity for technology assessment. However, even this debate was downstream in the sense that IT was assumed to be a technological imperative.

Until the early 1980s biotechnology was not seen as an independent field for regulation in Denmark and as a result the early approach to genetics issues was anticipatory. In

1980, with genetics being introduced to pharmaceutical products as well as to human reproduction, concerns were demarcated between risk, framed as a technical issue, and ethics which was perceived as an issue of general public concern. The establishment of the Board of Technology in 1986 led to the adoption of a wide range of techniques for assessment and citizen involvement applied to an equally wide range of issues, selected from an annual bids process. Both upstream and downstream issues can be seen in the six topics chosen for citizen involvement in 2002: ”GMO’s and the third world”, ”How are we going to assign value to the environment?”, ”Hydrogen in an unremitting energy system”, ”IPR/Copyright”, ”The Cities – a fine place to live”, and ”The Electronic Patient Record”.

In countries with strong corporatist traditions, like Greece, the public is less likely to get involved into the debating of new science and technology issues. This has been a recurring theme in the Greek case studies, especially in the ENGOs case, where, in order to depoliticise the debate, the State attempted the corporatist inclusion of the leading groups.

The UK has witnessed or contemplated most forms of public participation in the last somewhat fevered decade. Agonistic action in particular on GM crops has been influential in prompting media coverage, which in some quarters of the press turned into media campaigns which supported consumer boycotts. The food producer industry was trying to appeal to the government for rationality in the face of prejudice just as consumer forces were rushing to align themselves to a new reality of the marketplace. Supermarkets were aided in anti-GM food policies by similar action by food-processing companies who supplied them.

Arguably the most sustained public deliberation during the period in the UK has been on the idea of deliberation itself. Academics and NGOs were very influential in this and in particular in the framing of the Jenkin Report, *Science and Society*. Since *GM Nation?* there is some evidence of the coalition of interests between academics and NGOs trying to consolidate deliberative processes, push them upstream, and extend their scope to cover decision-making within, for example, the research councils. *GM Nation*? itself was framed and run in a deliberately plural and inclusive way through the neo-corporatist working methods of the AEBC Steering Board, it was a one off experiment and its processes are far from being embedded either in governance or committed to by its institutional participants. Despite all the talk, in practice there is thus too little experience of the framing of public participation in the UK in central government, and too much variety of practice outside it, to draw conclusions at this stage.

Although countries have introduced procedures for incorporating scientific advice into government decision-making, there appear to be no regular patterns across Europe in post-participatory processes.

3.5.3 Transnational dimensions

The UK Jenkin Report, Science and Society, pointed up a paradox in that just as science and technology dramatically increased its offer of products and processes, the possibility arose that this might be prejudiced by public distrust. At that time the UK was playing science governance catch up in relation to many established countries of

northern Europe, but nevertheless the full-hearted way that Jenkin embraced a more dialogic approach to public engagement temporarily catapulted the UK into a 'leadership' role on issues of scientific advice and on participation. The more ambitious claims for participation - as a new social technology which would extend democratic approaches into science and provide new trajectories of socio-technical change enjoying wider public consent - foundered in part on a new paradox: that EU policies and processes, but also those of global trade and economic regimes, can be seen to be the wider framing processes at work. Neo-liberal approaches to competition and trade, in which the need to develop a competitive knowledge economy dominated, strongly determined an agenda of issues, and set restricted frames for public engagement on them.

This new paradox recurs in our case studies. We see the problem of the articulation of public concerns being out of step with increasingly transnationally defined technology policies in the Netherlands, whilst Finland becomes a model of the knowledge economy, as one where participative mechanisms largely do not need to be invoked. Swedish trust in their own scientists leads to an expanded 'republic of science' where the wider social choices surrounding new technologies are left for the scientists themselves to judge and manage. Even in Denmark, the reference point on European pluralism and public participation on S&T, the Danish Board of Technology underwent a period of political threat. European restrictions on opt-out were seen to provide constrained room for manoeuvre of the UK government in relation to GM crops.

Of course, in other cases transnational borrowings and reference points helped to challenge existing positions and open up space for debate. In 1993, as the suspicion arose of the existence of BSE cases in the country, Portuguese authorities invoked scientific uncertainty on how to diagnose the disease as an argument to declare its non-existence. In 1996, however, as a consequence of the Europeanization of the BSE controversy, the Portuguese political authorities were forced to accept the existence of the BSE risk and of cases in the country.

In Portugal and Greece the reference to a European framework of environmental rights, to European regulations and the transposition of European directives to national law opened up new areas for civic participation and for the intervention and legitimacy of environmental movements and associations. In fact, in some cases, social movements are taking advantage of the opportunities created by European legislation to reinforce and promote environmental citizenship, thus becoming a potentially important factor for new and more effective forms of citizen participation. It is noteworthy, however, that the Portuguese government and – to a lesser extent – Parliament failed to respond to public and civic mobilization. Initiatives within Local Agenda 21 are practically non-existent; the Aarhus convention took a long time to be ratified by Portugal, and it is not uncommon to find contradictions between the positions of the Portuguese government in international fora and its domestic actions.

Further, Europe itself becomes a space for study, analysis and social learning. Here the EU itself and in particular the Citizens and Governance in Knowledge-Based Society and the Science and Society streams of FP6, have been important contexts of learning. Portuguese social movements took advantage of their short and recent history to draw in a selective way on other European experiences, appropriating and adapting some of the most innovative initiatives and avoiding responses that had failed in other contexts.

The UK studied practice elsewhere in reviewing its agenda in science and society; Norway explicitly took the Danish Board of Technology as a model for its own Technology Board, although not with full success. The DBT itself was based equally on the experience of the Dutch Rathenau Institute and the US Office of Technology Assessment and borrowed much of the wide range of its engagement processes from practice elsewhere[25]. The overwhelming majority of borrowings of institutions and processes appear to be from within Europe and this may contribute evidence to the existence of a distinctive European model. However, as we will see, Europe still contains significant divergence.

EU funds have made significant contributions to the science budgets of Portugal and Greece, and expertise and positions taken outside the country have been important reference points for NGOs and others challenging specific government policy positions. However, the foreign tag on counter-expertise has not always played well in domestic politics, and this is particularly true in Greece where national solutions have particular political salience. In addition, it appears that the Greek environmental NGOs, in attempting to read a European programme into their domestic politics, may have neglected opportunities to learn about Greek popular priorities in the environmental field.

3.5.4 Convergence and divergence

In their most open form, deliberative approaches to scientific governance might be expected to open up a variety of issues and values, reflecting the diversity we have found in national systems across Europe. They would be bottom-up agents of divergence.

But our case studies have made us aware of the importance of the framing of deliberative exercises. Framing can be inclusive or restrictive with regard to the choice of issues, the selection of participants, the construction of evidence and the significance of results in determining policy outcomes. Such framing can reflect and enhance the significance of local concerns, or it can reflect European or global agendas.

As we already noted under 3.5.3, global neo-liberal pressure towards economic competition within and between the triads of Europe, Japan and the U.S. and in relation to developing East Asian economic power, is one of the strongest drivers towards contemporary convergence of national and world regional systems. The analyses that support these developments are variants on the old linear model of innovation, tying economic success closely to achievements in science and technology. Our reading of the Portuguese cases seems to apply across most of the countries we have studied. On the one hand, it is an environment that promotes market modes of governance - many countries that were used to dealing with scientific governance issues primarily in other terms, like the Netherlands and Denmark, are forced to acknowledge and adapt to this

[25] Not just the well-known example of the consensus conference, but also ”future panels”, ”hearings of citizen’s groups”, ”perspective workshops”, ”future search conferences”, ”questions and answers”, ”policy exercise – role play”, and ”interdisciplinary work groups”

change. On the other hand, it is one in which agonistic modes of governance will be increasingly significant. So the wider economic policy environment may look for consensus within societies and convergence between them, but may promote dissensus and divergence.

In terms of the pressures for convergence, the implications of international economic competition for scientific governance is not a new issue. Discussion amongst European governments of the extent to which public scepticism towards science and technology is an obstacle to the creation of an 'innovative knowledge society' dates back over 20 years.[26] However, there is little doubt that global regulatory regimes and pressures within Europe from the Lisbon agenda have given market governance additional impetus. In consequence it has been argued that the deliberative agenda and the Danish model of participatory science and technology governance are being subsumed into the discourse of economic growth - changing the deliberative mode towards more discretionary and educational modes, co-existing with the market mode as for instance in the GM labelling case. Thus Danish consensus conferences mix ideals of deliberation between citizens and consumer contributions to policy.

Finland may provide a example of this market convergence taken a step further. Even though the Finnish policy makers are certainly aware of ethical, environmental and health issues and seek to address these, they seem primarily keen to know how national competitiveness can be maintained by investing in biotechnology production (as the successor to ICTs). As the case study of biotechnology demonstrates, strong market orientation has prevented a principled discussion of the rights and responsibilities of the state, industry and academic researchers in issues of biotechnology. Scientific citizenship has a very restrictive reading in Finland.

Following convergence down this route we might expect deliberative mechanisms to develop in future into a restricted role in providing information on the socio-technical space open for market motivated and market or discretionary delivered solutions. However, there are other possibilities open. Looking behind the surface, the limits of consensus may be in the course of being reached. The case of biotechnology controversies in Denmark reflects fundamental political disagreements about what constitutes the good society, as do the conflicts between GM and organic production in the UK. Such developments present a challenge to governance – that of coexistence rather than consensus. They may leave behind politically fragile settlements whose legitimacy can be called into question**.**

The other product of the global competitive environment is agonistic response. Agonistic governance, however, depends on the capacity of citizens and civil society organizations and movements to mobilize and intervene to respond to the effects and consequences of the dynamics of privatisation and marketization. Furthermore, some forms of agonistic action, like consumer resistance to GM foods in the UK and Denmark, may strengthen market responses by suggesting that mechanisms like labelling, allowing informed consumer choice, are the only forms of regulation the state needs to consider.

[26] To the Versailles Economic Summit of the EU in June 1982, which had on the agenda public resistance to technical change.

Some states are not yet fully subject to the deliberative turn, and although presenting different features, they suggest that convergence is a slow process. Norway, self-consciously identified as a laggard, conservative state, demonstrates a view of technology strongly anchored in regulatory law and practice. The ethics, social utility, sustainability, and the precautionary principle that defines the restrictive and 'conservative' regulatory policy adopted by Norway, may also at the same time be seen as a 'provident' policy, as these concerns have increasingly become parts of European regulatory policy. More deliberative modes of governance in S&T policy have emerged in Norway during the last decade with the establishment of an institutional structure of S&T policy by which some completely new institutions have been charged with a specific responsibility to stimulate public debate and facilitate broader public participation in processes of science and technology policy. As these develop they may take a different course from the market led – and market-constrained - initiatives of other countries.

Sweden, it is argued, is heading firmly in the opposite direction. A resurgence of commitment to scientific autonomy has led to the national decline of a politics of socially responsible science. If showcasing anything, Sweden appears no longer home to industrial democracy, but rather a re-purified techno-scientific authority in government. A re-purified authority sitting uncomfortably with the current European level concerns with the public accountability of science and the democratization of expertise (Elam and Glimell 2004) with the mission to relaunch collective scientific opinion as a concentrated source of social power. If neo-liberal research policy at the beginning of the 1990s sought to lever Swedish science out into society, neo-classic liberal research policy after 1998, then, has aimed to place the socialization of science in the knowledge society under a firm scientific control.

Some years ago, a prominent STS scholar in Sweden, Aant Elzinga, outlined a model of research policy as a triangle drama between Government, Industry and Academia. He concluded by predicting that the new twist in the triangle drama during the 1990s might be that, as Swedish science furthers its hybridization with industry, it successively re-purifies its authority in government (Elzinga 1990). There is, according to our account, convincing proof that this is what actually has occurred; to an extent that has radically altered the international bearings of the country. Thus, while the emergent ethical, legal and social aspects of innovative practice within the fields of information-, bio- and nanotechnology today typically tend to hang precariously in-between the worlds of science and politics, in Sweden they are at present instead being treated as firstly new challenges for science in the management of its own self-regulation. To a higher degree than elsewhere, Swedish scientists are being entrusted with the task of standing guard over the ethical, political and commercial dimensions of their own research practices. In a wider perspective, this fits into a pattern of re-envisaging Sweden as the seat of boundless scientific initiative, rather than of progressive industrial democracy.

Then we come to the countries like Greece and Portugal, where deliberation – at least as sanctioned by the state – has yet to get a foothold. We see Greece as a distinctive political culture, self-conscious in its exceptionalism. To start with, *past knowledge matters*. The framing of new issues depends more on past, national experience (which should be viewed as governance 'experiments') than on an osmosis-effect from developments in other countries or at the EU-level. This claim is substantiated when

comparing the Greek ENGOs and Biotechnologies case-studies. Second, t*he national way of 'doing politics' is important.* New issues do not include in their kit-bag new models of governance. Accordingly, the predominant (or historical) *ethos* of policy making and public involvement in it plays a crucial role. In countries with strong corporatist traditions, like Greece, the public is less likely to get involved in debating new science and technology issues.

Portugal is in a unique position, having deliberately 'de-selected' popular participation as a contribution to democracy in the period of 'normalisation' which followed a plethora of popular and citizen initiatives in 1974-75. Portugal today represents discretionary scientific governance with a strong educational component, and no institutions for experimenting with participatory procedures. Unlike Greece, agonistic struggle is seen on particular issues and in the co-incineration case enjoyed a kind of victory after a general election changed policy. This capacity for mobilisation, and its local roots, are one potential for new approaches to scientific governance; another is the contradiction between the attention to the promotion of scientific education and culture, and the absence of the Ministry from most public controversies on S&T; and a third is the discrepancy between the positions on controversial issues such as environmental problems taken in European forums and those for internal consumption.

Of the countries we have studied Norway and Portugal may be those most likely to produce new trends in scientific governance.

4 Conclusions and implications

4.1 Three models for understanding policy change frameworks

An international observer of science, technology and social relations might well conclude from our report that Europe has become a decidedly anxious continent. Biotechnology has in particular represented a focus for public concerns over scientific and technological change. Anxieties with regard to genetic research have materialised in many European countries (notably, Denmark and Sweden). Genetically-modified (GM) food has been the at the centre of substantial public controversy (for example, in the UK and The Netherlands) since Monsanto's much-criticised decision in 1996 to release GM soya onto the European market. In the 1970s and 1980s it was possible to portray North America as highly sensitive to risk issues and to contrast this with a risk tolerant Europe (Douglas and Wildavsky 1983; Irwin 1985; Vogel 1986). Since the late 1990s, Europe has apparently assumed the role of technological sceptic and risk critic. Certainly, concerns over GM and biotechnology in general do not seem to have been so widespread or politically significant in, for example, the United States as they have become in many Western European countries.

Looking at developments in European scientific governance, one may wish to consider three broad frameworks for understanding the current state of policy practice and discussion.

Policy development with respect to public participation in scientific governance is often understood in terms of a ***'sequential'*** model in which the old expert-driven style of scientific governance is replaced by a 'new' approach based on public participation and engagement (what Jasanoff has labelled 'the participatory turn': Jasanoff 2003). Our main conclusion from the STAGE project is that such a presentation of scientific governance in Europe as undergoing a uni-directional shift from expert driven to public participation across Europe is useful but insufficient. This sequential model must at least be corrected to acknowledge the *diversity* of European approaches to governance in this area.

If one does take this diversity into account a *heterogeneous* (or ***'multi-modal')*** model emerges from our work. The studies considered in STAGE suggests that European scientific governance may be better characterised in terms of the co-existence of several policy modes. This model does not contradict the sequential framework but instead suggests that the sequential model is partial in its emphasis on deliberative governance over other co-existent approaches (including, notably, the market perspective). Contrary to the sequential model the multi-modal model does not suggests a binary (or zero sum) relationship between deficit and democracy.

A third framework to be considered could be labelled the ***'critical'*** model. While the previous two models quite properly draw our attention to the particular form of scientific governance being enacted across Europe (whether in a binary or multi-modal framework), the critical model takes us beyond the specifics of current institutional practice to ask more fundamental questions. What underlying questions of science and social change are being raised within scientific governance? What broader issues of

contemporary culture and political/legal governance are being suggested (either implicitly or explicitly)?

4.1.1 From deficit to democracy: the sequential model

What we have labelled the *sequential* perspective on the changes that have occurred in European engagement with science mirrors social scientific criticisms of the previous 'deficit' approach for its failure to take public views seriously – or else treating the wider publics as an object of education rather than as valid participants in decision making (Irwin and Wynne 1996). However, the move from 'deficit to democracy' can also be seen as a response to the perceived failures of previous policy approaches – and especially the mishandling of larger publics. As the official report into the UK handling of mad cow disease (BSE) concluded, one fundamental failure of policy institutions was their inability to deal openly and directly with public concerns (Phillips et al 2000). It took a number of years before the implications of such criticisms became more widely accepted among policy makers. Because of the food scandals the UK was relatively early when it comes to taking the critique from social scientists seriously. Other European policy elites flowed suit resulting in a situation in which at least parts of science policy bureaucracies across Europe endorsed the newly emerging view of public participation. This happened at about the same time that European leaders converged on a political agenda that should deal with the transition of Europe into a full-fledged knowledge economy on a - roughly speaking - neo-liberal basis.

It is certainly possible to identify a shift in the general tone of recent European documents on scientific governance towards consultative and deliberative principles: ie, as expressed in the above quotation, towards the notion that public confidence is essential to technological development and that 'engagement' is fundamental to the achievement of this.

Perhaps the most considered statement of the 'new' policy approach came with the UK House of Lords Select Committee on Science and Technology's 2000 report on Science and Society. The often cited report noted the 'crisis of confidence' in society's relationship with science but also emphasised the 'new mood for dialogue'. Direct dialogue with the public should 'move from being an optional add-on to science-based policy making' and instead become 'a normal and integral part of the process'. However, the 'presumption of openness' is not intended to block scientific progress but instead to create a more open and reflective culture where new scientific possibilities can be fully realised.

The endorsement of the importance of public participation in the UK had echo's in other countries as well as in Brussels. Even in countries like The Netherlands where experiments with public participation had been going on since the late 1970, the British experience led to renewed enthusiasm to engage lay citizens in public debate. Evidence of the shift from deficit to democracy can also be found (at least partially) at European level (Hagendijk 2004)[27]. The 2001 White Paper from the European Commission on

[27] Hagendijk, R.P. (2004) 'The public understanding of science and public participation in regulated worlds', Minerva, 2004 (1), p. 41-59.

European Governance discussed issues of building public confidence 'in the way policy makers use expert advice' (CEC 2001). [28]The European Commission's 2002 action plan on science and society offered a similar blend of praise for science, public concern over the pace of scientific change, and the perceived need to instil 'a sense of trust' (CEC 2002). The Commission document concluded with the ambitious objective of changing 'the relationship between science and society'.

In this situation, it is tempting to inquire as to the purpose of public engagement if it is not simply to win over sceptical public groups to market-driven economic expansion and innovation – or else create the impression that the publics have been fully consulted and so silence critics. Through many official statements there is a characteristic ambivalence about the priority that will be given to public views in relation to scientific and economic evaluations of new technologies. In The Netherlands and other countries there is also a second type of ambivalence with respect to the parts accorded to stakeholder representatives and 'lay citizens' in public deliberations about innovation policies. Meanwhile, one recurrent question raised by public groups concerns the practical relevance of consultation exercises: will government really change its policies as a consequence of public inputs?

In many of are case studies this is a recurrent question that is continually discussed among participants alongside the substantive issues. And in many countries governments are keen not to commit themselves to the outcomes of public engagement exercises they cannot and should not even want to control. In this respect initiating open public debate while maintaining the government's final responsibility is an inherently risky strategy when the goal is to combat public distrust. Despite the overwhelmingly sceptical/cautious public debate in the UK, the government response was to 'allow the technology to develop within a strict regulatory system… Ultimately the market will decide whether GM crops are a success or not.' (DEFRA 2004 p.29)[29]. Inevitably, such disparity between public views and the Government's subsequent policy resolution will encourage those who view the move from deficit to democracy as more ornamental than real.

4.1.2 Scientific governance as heterogeneous terrain: the multi-modal model

So far, we have presented discussions of scientific governance mainly in bi-modal terms (deficit or democracy? 'public' or 'technological/economic' drivers?). The case studies from the STAGE project show, however, that is far too simple a characterization of the situation in Europe. In order to build a fuller picture of European developments within scientific governance, we need a broader analytical framework. One may call this the multi-model framework.

[28] CEC, *Science, Society and the Citizen in Europe* (Brussels European Commission, 2000), 16.

[29] (UK) Department of the Environment, Food and Rural Affairs, *The GM Dialogue: Government Response*, March 2004

The multi-modal model latches on to the typology used in the STAGE network (Hagendijk and Kallerud 2003)[30]. The typology allows us to raise all sorts of empirical and analytical questions about instances of public engagements with science. It allows us to compare the roles assigned to 'public' groups within each governance mode. Is 'the public' being constructed as active or passive; as consumers or as citizens; as homogeneous and stable or as fractured and dynamic? Each mode 'performs' the relationship between scientific/technological innovation and wider society in a distinctive manner.

The multi-modal model does not offer a unitary paradigm of scientific governance in Europe but instead a more complex – but distinctive in international terms – pattern of diversity, co-existence and contradiction/complementarity. This fits with the conclusion that European scientific governance cannot be interpreted as a simple pattern of convergence or a linear, uni-directional development from one form to another. Rather, each country can best be described as a unique mix of several modes.

In making this point about the mix of governance modes within a single nation, however, it is important not to underplay patterns of national difference across Europe. Thus, there is indeed a modal mix within the UK but this is relatively distinct from the situation in, for example, Denmark which has historically placed less emphasis on market governance. In both Denmark and Norway, there has been enthusiasm for a more inclusive form of corporatist governance where a range of oppositional voices can be included in scientific governance. In Finland, it would appear that the market mode has become progressively more important. Portugal and Greece can be seen as particularly dependent on the discretionary mode. Governance is characteristically represented in these latter countries as primarily a matter for government which can act in the common (or 'public') interest of progress and welfare.

Furthermore, it seems that the different national styles of governance are not stable, but rather in periodic transition. Thus, Sweden may be moving increasingly to a discretionary/educational mix. Although there seem to be patterns of mutual influence, it is also clear that different countries follow different trajectories, individually shaped by local, national cultures. In this context, it is also interesting to consider how directly 'European' institutions (especially the European Commission) fit with the typology. The suggestion again is that these typically combine several modes (sometimes within one policy statement) with the market, educational and deliberative approaches often being expressed. The multi-modal model suggests therefore that it is this co-existence of modes that represents the European framework (or style) of scientific governance. In that sense also, Europe represents a distinctive social and institutional laboratory – although, given the close link between scientific governance and wider political and institutional cultures, it cannot be assumed that what works in one setting will necessarily work elsewhere.

The current political tendency is to make different 'modal appeals' simultaneously: as when institutional rhetoric shifts - at times, very abruptly - between public engagement

[30] Rob Hagendijk and Egil Kallerud. Changing Conceptions and Practices of Governance in. Science and Technology in Europe: A Framework for Analysis. STAGE (Science, Technology and Governance in Europe) Discussion Paper 2. March 2003. In annex 2 to this volume.

and greater international competitiveness without pausing to consider their possible connection or tension. A nice illustration of this might be found in the rhetorical differences between the documents outlining the Fifth and Sixth Framework programmes and the recent documents about the Lisbon Strategy and the key document preparing the debate about the Seventh Framework. While the mid term review documents the urgency of policies to catch with competing countries and regions (instead of overtaking these), the central 7th Framework document published so far stresses industry science partnerships instead of public participation. No doubt this may be corrected in later documents, but appropriate as such adjustments may be they will once again show the multi-modality of scientific governance. Of course, a more cynical interpretation of such 'modal appeals' is that talk of public engagement will, in practice, play a subservient role to the rhetoric of the market and international economic competitiveness. It follows that serious reflection should now be given to their mutual accommodation in policy practice as well as what that implies for political theory. There is little evidence that this process of critical reflection has so far begun. In analytical terms, it is most appropriate to view 'modal disjunctions' as external manifestations of contestations over scientific governance between a range of stakeholders and strategic concerns.

Discussion of the multi-modal model (or typology) highlights the more complex – and divergent – set of governance practices that exist across Europe. It may well be that it is this pattern of co-existence and divergence that distinguishes the 'European paradigm' of scientific governance. However, the results of the project also point to wider issues for scientific governance. Both the sequential and the multi-modal model take much for granted about the nature of scientific governance in modern societies. The results of the project demonstrate that this should be taken into account.

4.1.3 The critical model: underlying themes and issues

The third approach to be considered here could be labelled the ***'critical'*** model. The previous two models quite properly draw our attention to the particular form of scientific governance being enacted across Europe (whether in a binary or multi-modal framework). The critical model as outlined here asks more fundamental questions which take us beyond the specifics of institutional practice. What underlying questions of science and social change are being raised within scientific governance? What broader issues of contemporary culture and political/legal governance are being suggested (either implicitly or explicitly)? Rather than taking such basic questions for granted – or even assuming that 'scientific governance' is a discrete area of social and institutional activity – the critical model raises more fundamental issues for policy and practice in this area. Central to these will be the very notion that it is possible for national and international institutions to 'govern' scientific and technological change.

There are many potential starting points for a critical perspective on contemporary scientific governance. As we have seen, it is possible to challenge the claims being made for the shift 'from deficit to democracy': are public engagement exercises merely tokenistic, does the deficit presentation of the wider publics as ignorant and emotional still prevail? Certainly, exercises in active public engagement remain exceptional events

across Europe - and usually focused on high-profile issues such as GM food rather than more mundane matters of scientific regulation.

The multi-modal approach offers at least the basis for a richer account of European policy practice but this in turn raises further questions about the relationship between these modes and also the possibility that certain approaches are more influential than others. Simply listing the 'agonistic' and 'market' modes alongside one another tells us nothing about their relative influence. Across all these approaches, there is the important question of the precise *framing* of governance initiatives (Irwin 2001). General principles of operation may be less important than the structure and design of, for example, a particular engagement exercise: who gets to decide what to ask and in what form?

Going further, it is possible to challenge the very language of 'scientific governance'. How broadly should the concept of governance be defined? Does it include anti-GM protesters as well as government officials, ordinary consumers and senior industrial executives?[31] This discussion also raises questions of the distinctiveness of 'scientific governance' from 'governance' in more general terms. What is there about, for example, biotechnology regulation that marks it apart from other areas of political and industrial controversy? 'Governance' certainly implies a move away from a focus on governmental officials alone towards recognition of the role played by a range of actors in science and technology development (scientists, industrialists, consumers, campaigning groups, the mass media). However, as a term it is also open to variable and shifting definition within specific circumstances (which can of course be both a strength and weakness depending on the context of usage).

And finally, it is possible to challenge debates and reflections about participation and democracy that abstract too much from the specific content and context of a debates. On the theoretical and intellectual side such critical engagement may challenge abstract deliberative theory as it renders invisible that way how the demarcations between economic, political and risk issues are being reproduced and occasionally redrawn, demarcating and structuring the space and opportunities for deliberative, agonistic and corporatist forms of governance as a result. Liberal theorizing about deliberative democracy tends to forget about how little of the dynamics and effects of public engagement have to do with the abstract principles and how much debates are two-tier affairs in which substantial and procedural considerations are mixed as well as rhetorically separated and played against one another by every player occasionally. At a more practical or rather technocratic level a similar challenge could be levelled at technocratic attempts to benchmark instruments and formats for public participation exercises in such a way as if particular approaches may indeed become stylized into the one best way to achieve a particular participatory goal. Such a technocratic and instrumentalist view is inherently at odds with the idea of taking lay concerns into account in a trustworthy and authentic manner.

[31] A point raised by Arie Rip in his comments on the STAGE results at the final STAGE conference in London.

4.2 Challenging contexts

Discussions about public participation and especially about deliberative democracy sometimes seem rather vague and optimistic. They may seem rather idealistic and naïve in some cases or rather boringly academic and conceptual in others. This is especially the case when the broader social and political challenges that motivate, structure and condition specific initiatives for public engagement are left out of consideration. Taking these challenges into account invites us to step outside the internal functioning of scientific governance and address wider issues. These challenges can be summarized under three broad headings: the *global* context, the context of *innovation*, the *social, economic and cultural* context of science.

One of the most fascinating aspects of contemporary discussions of scientific governance concerns the manner in which they generally continue to operate at a national level in the face of technologies that are determinedly *global* in origination and application. Put very bluntly, there is something anachronistic in the idea that one nation such as the The Netherlands, Norway, Austria or the UK can adopt a wholly-independent policy on GM food. On the one hand, all countries are already enmeshed in trade agreements and regulatory structures (notably but not exclusively at European level) that severely constrain its freedom for autonomous action. On the other, decisions taken elsewhere by international industrial organisations (with Monsanto as the obvious example) can effectively remove the possibility of individual nations going 'GM free' (by in this case mixing 'GM' and 'non-GM' foodstuffs at source). Despite such global inter-connections and dependencies, national autonomy can still exist in certain areas – in setting controls on research ethics or on forms of medical interventions. However, even here global economic competitiveness is likely to play a part and free citizens are ultimately at liberty to travel across national boundaries.

The notion that scientific governance can operate exclusively at national level – or that national differences in governance style will have an overwhelming impact on scientific innovation – is therefore very much open to question. At the very least, it must be recognised that there are significant limits to national independence in this regard and also that the degree of 'relative autonomy' will vary across issues and contexts. However, such a conclusion raises further questions about the operation of deliberative governance in particular: how is it possible to put democratic principles into practice within globalised industrial systems? Despite substantial shifts in the global context for science and technology, the nation-state remains a major (and probably *the* major) focus for governance initiatives. Quite clearly, this represents a significant challenge to effective scientific governance.

Turning to the second governance challenge, one immediate way of opening up the *context of innovation* is to question the timing of specific consultation exercises. It can certainly be argued that serious public discussion often only occurs *after* the underlying basic processes of scientific research and industrial development have already crystallized. As so often occurs within exercises in public engagement, at the point when the commercialisation of GM crops was opened up to wider debate, substantial investment had already taken place, product development was at an advanced stage (at least for the first generation of GM products), and the basic choices over technological design had been taken. Despite the good intentions of debate organisers around Europe,

it is difficult at such an advanced stage in the innovation process to have anything other than a yes/no (or stop/go) decision. Effectively, the characteristic timing of discussions forces public groups into a reactive (and often obstructive) role. Equally, the presentation of technological decision-making as a 'great debate' ignores the pre-existing commitments to technological progress even as it actively excludes public groups from a larger influence over future priorities. As Beck notes, public groups do not generally get invited into the corporate boardrooms where our technological futures are effectively being planned (Beck 1992)[32].

Most forms of engagement offer in this sense a very constrained debate with little possibility of influencing future research priorities, encouraging other forms of product development or 'socially shaping' science and technology in a proactive fashion. Broader questions of the *need* for new technologies and the possibility of *alternative products and processes* become sidelined (or avoided altogether). In this situation, there have been calls to move public engagement 'upstream' ie to engage earlier with ethical, social and political concerns around science and technology (Wilsdon and Willis 2004).[33]

Although there can be important advantages to 'upstream' engagement, it should be noted that this inevitably raises what Collingridge termed the 'dilemma of control': when change is possible, it may be too early to know what changes to make; when the need for change is quite apparent, it can be too late (and too expensive) to make change. There is also the distinct possibility that upstream engagement will suffer from the same limitations that have been identified in current public engagement initiatives – for example, offering a restricted framework for debate or being disconnected from more practical processes of scientific governance. Upstream engagement is unlikely to be an all-purpose remedy to the current challenges faced by deliberative practice. However, its discussion does alert us to the longer term possibilities for public oversight and participation, and to the wider issues of research and technology and commitment that are at stake.

This discussion of upstream engagement and institutional pre-commitments leads us directly to the third challenge to contemporary scientific governance: what can be termed the *social, economic and cultural context* of science. At the heart of many of these discussions there is an underlying (and generally unresolved) question about the relationship between science, democracy and the market place. The current tendency is for deliberative democracy simply to add a layer of 'public debate' to existing institutional processes without acknowledging potential tensions between scientific innovation and democratic engagement or considering larger questions of what it would mean to engage democratically with science and technology (see for example Jasanoff 2003)[34]. The characteristic and often bi-polar framing of 'downstream' public debates and the focus on rather specific (usually governmental) decisions at that stage also ignore the larger culture of science and the values, visions and expectations that lie

[32] Ulrich Beck, The Risk Society. London: Sage 1992.
[33] James Wilsdon and Rebecca Willis, *See-through Science: why public engagement needs to move upstream*, London, Demos, 2004

[34] Sheila Jasanoff, 'Breaking the Wave in Science Studies' *Social Studies of Science,* 33 (3) June 2003.

behind this. At this point, questions of political power and the (in)ability to influence research and innovation agendas through public deliberation figure prominently. Furthermore, there is a tendency to present both 'science' and 'the market' as neutral, objective forces with 'the public' as the repository of shifting values and emotions.

In exploring the social, economic and cultural context of science, therefore, attention is drawn to the relationship between contemporary governance structures and the wider settings within which scientific and social change are being enacted. This not only raises the question of whether *any* national policy mode can hope to govern (or even shape) internationally-driven processes of scientific/technological development and innovation. Certainly, analysis here suggests the inherent limitations of presenting scientific governance as a matter of discrete national decisions taken at the point of potential implementation. But more importantly it also points to considerations that encourage a particular framing of the debate while ignoring or downplaying other questions or dimensions.

4.3 The typology revisited: The deliberative agenda

As mentioned in earlier parts of this report, the typology of modes of science governance should not be seen as a meta-framework for judging (or comparing) national styles of science governance, in order to assess their current state of development according to a sequential model. Instead, the typology is employed as a heuristic model, which makes it possible to expand the understanding of the various patterns of convergence and divergence across Europe.

It is important to stress that the use of the typology to characterise different case-studies or the national styles of governance is likely to be contested (one commentator's 'deliberative' mode may appear 'educational' to another). These are fluid judgements, open to contestation. This suggestion is strongly supported by our empirical findings and implies that a reflexive discussion of the typology is a very important outcome of the STAGE project. One mode, in particular, was considered important at the outset – deliberative governance. When reflecting upon our work in the present section, we have therefore chosen to put specific emphasis on this mode and focus especially on processes of deliberation and engagement within Europe. What lessons can be drawn from our case studies for the conduct of future engagement initiatives?

In all the countries studied, scientific governance has been on the agenda as an increasingly important aspect of policy making. Furthermore, ideals about public participation have surfaced in all countries, although there are significant differences in the extent to which such ideals have actually been implemented. Thus, countries such as The Netherlands, Denmark and the UK have been relatively energetic in this regard whilst deliberation has been less influential as a governance mode in Portugal, Greece, Sweden and Finland. In this context, it should be acknowledged that the need for public engagement has in some cases originated within the policy establishment – as, for instance, has largely been the case with GM debate in UK and the Netherlands - or been articulated within civil society - as was demonstrated in the case studies from Greece and Portugal.

The cases also raise important issues about the relationship between wider public participation and scientific review of the same issues. One common way of dealing with this is for government to separate the 'public' and 'scientific' discussions of an issue (for example, the UK decision about whether to proceed with the commercialisation of GM crops). The alternative is to bring scientific experts and members of the public more directly together in order to allow an exchange of views and assessments (this is partially attempted within consensus conferences). Based on these impressions we find it necessary to consider the purpose, the actual conduct as well as the outcome of deliberative engagement in this discussion of the various forms of implementing the ideal of public participation.

4.3.1 The purpose of deliberative engagement

One important difference between the cases seems to be a question of whether public engagement is supposed to be an *end in itself or a means to a particular outcome* and the case studies demonstrate a rather diverging picture in this respect. As an *end in itself* public engagement seems to be introduced primarily as a way of empowering participants and creating a culture of scientific citizenship. As *a means* it seems that deliberative initiatives can be employed both to extend corporatist efficiency (by resolving potential conflicts through negotiation) and to learn about consumer/citizen preferences in order to make socially robust public policy. In this context a number of points seem relevant.

First of all it is important to consider the relationship between engagement initiatives and the innovation agenda as for instance expressed in the Lisbon strategy. In some cases, notably in Sweden and Finland it seems that engagement with the public is primarily suggested as means to *support and sustain* a high rate of technical innovation. The mix of corporatist and educational modes in these countries suggests that engagement initiatives are a special way of educating and enrolling the public in the continuing process of change. This is perceived as a necessary precondition for the creation of a 'knowledge society' in which scientific research is easily disseminated and absorbed by relevant groups of actors in society at large. In other examples it seems that engagement initiatives are framed as a kind of counter power to the innovation agenda. This is most obvious in the case of Norway, where religious values and a sceptical public seems to be incorporated as a kind of legitimate stakeholder in the inclusive corporatist negotiations about the future regulation and exploitation of technological possibilities. A kind of middle position is demonstrated in the case of the Danish consensus conferences and the high profile British and Dutch GM debates, which seem to be exploring the limits as to how far the innovation agenda can be pushed.

Secondly, it is important to be aware of the framing of the scientific citizenship, which is created in the various engagement initiatives. This is specifically true with regard to the role of scientific information and the need for education. The Dutch nuclear energy debate is an example of a setup in which participants had to let themselves be educated by scientific knowledge in order to be permitted entrance to the arena of discussion. Although much criticism of the deficit model has influenced later participatory designs so as to be less rigorous about the demands for 'scientific literacy', the question of how to balance and combine dissemination and discussion of scientific knowledge is not an

easy one. There is a persistent tension in the definition of scientific citizenship regarding the question of admittance, which is demonstrated in the many procedures and arguments about who the participants of engagement exercises ideally should be. In what specific capacity do 'lay' people add to the process: is it because they are seen to have valuable knowledge that can add to the scientific knowledge or is it because they are seen to be a possible neutral judge between diverse knowledge claims, since they are perceived to be without vested interests? In the latter case the issue of education becomes prominent as it seems that what is perceived as a 'neutral' citizen is often a previously 'unengaged' citizen. In these cases 'information' is often presented as the means to empower and engage the citizen, but this raise the controversial issue of how to choose and present the kind of information that should perform this task.

Thirdly there is an interesting issue about the locus of consensus or 'rationality' in the engagement exercises. The framing very often uses a universal 'we' as the acting subject, yet it is very unclear how this 'we' is defined and how it will come into existence. In some of the large scale deliberative experiments as for example the Dutch GM debate, the 'we' seems to be synonymous with the general public will. In this case it seems that representatives of the public are asked to participate as citizens taking the perspective of the common good and consider a particular aspect of science as one, albeit a very controversial one, among many policy areas. In other cases, the 'we' seems more restricted to the actual parties included in the deliberative exercise. This is true of the Danish model of consensus conference, where a citizen's panel is chosen to speak on its own behalf as citizens that have been presented with various and conflicting knowledge claims. In this case the creation of the 'we' is an outcome of the search for consensus regarding a specific scientific or technological field and it is therefore not necessarily synonymous with a more general public will.

In close connection to the two previous points, a fourth issue is the need to consider the relationship between participatory mechanisms and political 'market research'. The cases imply that in some cases, participatory methods comes to be seen as - or at least criticized for being - a way of exercising consumer choice. In this context, it is necessary to discuss the difference between consumers exercising their rights to choose based on individual preferences, and the ideal of deliberation by citizens committed to the perspective of a common good based on rational arguments. Since the framing of the engagement will be shaped very differently in these two modes, confusion between them can cause a lot of distress and distrust as in the Dutch GM debate. Secondly, the perceived 'value added' by an engagement initiative is very different in these modes. If it is primarily a means to conduct political market research the value added will primarily occur within the political system as knowledge about the preferences in public opinion. On the other hand, the ideal of deliberation seems to promise that value added will be in the form of better and more legitimate decisions as well as increased level of integration between science and society.

The overall lesson from these various considerations is that it is very important to consider the framing of the engagement initiative with respect to the relation to an innovation agenda, the particular expectations towards scientific citizenship on behalf of the participants, and the way the exercises are supposed to add value to the political process. Failure to consider and communicate these various expectations might influence the conduct or the outcome of the deliberative exercises in negative ways and

make them vulnerable to various forms of criticism. Closely connected to these considerations about the purpose of the deliberative exercises, however, is also a lot of issues regarding the actual design and framing of these exercises, which we discuss in the next section.

4.3.2 The conduct of deliberative engagement

It seems to be an overall lesson from various case-studies that claims about procedural (un)fairness, accusations of manipulation/bias as well as the questioning of motives represent an important and integral part of debates over science governance. In the UK, for instance, parts of industry denounced the outcome of the GM Nation? public debate by stressing that the organisation of the exercise had allowed too much space for agonistic viewpoints from radical participants rather than maintaining a more controlled deliberative process. Passing judgements on forms of participation and governance is therefore a deeply embedded and significant part of the controversies. It is a rhetorical reservoir of arguments that can be used by different stakeholders in order to sustain particular interests and viewpoints in the policy processes. The present discussion of the actual conduct of deliberative engagement is therefore not a meta-perspective that will result in a recipe of 'successful engagement'. Rather, it is a summary of the important themes and points of conflict, which have been revealed by the various case studies. The observations group themselves around three different issues: the exercising body and its relation to government, the framing of the issues for deliberation, and the specific procedures followed in deliberative exercises.

Regarding *the exercising body*, it is important to emphasise the concrete situations in which public engagement in scientific governance is introduced. In the case of government-induced deliberative exercises, the case studies present a continuum stretching from a situation in which they are employed as way of trying to soften or avoid *agonistic* stalemate (as the debates about GM in Netherlands and UK demonstrate) or as a way of dealing with *anticipated conflicts* in a governance structure which is primarily corporatist or discretionary (as in the country cases from Sweden and Finland). Besides this continuum we also find situations in which deliberative exercises are sported by various non-governmental actors as a way of raising a voice of resistance in situations which are primarily discretionary (as for instance in the Portuguese case study on waste handling). Each of these situations poses very different challenges about the relationship between participatory initiatives and conventional policy institutions.

In situations of civil society action the question is quite clearly whether, how and to what extent government will make itself sensitive to participatory engagement. As the Greek case studies demonstrate (sporadic) action on behalf of civil society are very likely to be dismissed in order for government to continue a predominant discretionary mode of governance. In Portugal, however, it seems that non-governmental organisation of participatory elements has had a higher impact on predominant models of governance.

In situations of government induced or government-lead initiatives the question is how to situate the participatory initiatives within the existing policy-framework: should such initiatives be kept at arm's length from government or more fully integrated? The arm's length conduct of participatory initiatives is relatively common – with a semi-

independent agency (e.g. the Danish Board of Technology, The Norwegian Board of Biotechnology or the UK Agriculture and Environment Biotechnology Commission) charged with conducting initiatives at a distance from government. From a governmental perspective, such a structure allows a very visible independence and autonomy for deliberative initiatives. However, this relationship can leave the agencies in question vulnerable to political change – and might create a situation where they are seen as optional extras to the policy process rather than a central feature.

While it is understandable that governments will wish to keep their options open in terms of awaiting the actual outputs of a deliberative exercise before committing to take the findings seriously, such a non-committal stance encourages a climate of suspicion and distrust ('they'll only accept the result if it tells them what they want to hear'). Once a government states that the goal of a participatory exercise is to have policy impacts, then government should be committed to incorporate (or at least pay close and explicit attention to) the outcome – otherwise the exercises might very well produce adverse effects in terms of lack of trust and engagement. One theme across our cases was a persistent scepticism about the extent to which engagement exercises were 'real' or 'legitimatory'.

A vital aspect of any participatory process is the actual *framing* of the debate, ie deciding which questions to ask, what sources of evidence are necessary, how the key issues are to be defined. Many of the case studies demonstrate a wish to separate the formulation and discussion of problems in two different phases, presumably in order to establish a common understanding of the problem, before solutions are discussed. However, the cases clearly demonstrate the impossibility of this rationalistic approach, particular in controversial circumstances. Part and parcel of these controversies are conflicting notions of what is problematic and the conflicts are therefore as much about the formulation of problems as they are about the consideration of different solutions.

The chosen framing is especially important when the issues dealt with can be encapsulated in a variety of ways: is the nuclear power debate in Sweden about the science and technology of radioactive waste disposal or the maintenance and encouragement of the larger nuclear fuel cycle (including military uses)? Very often, ethical, political, scientific and legal issues are not easily separated so that implicit decisions are made to prioritise certain questions over others and to define the issues in particular ways. Our suggestion is that this phase of problem definition and framing is central to the policy process and the outcome of the exercises. If deliberative initiatives are to be worthwhile then we recommend that public groups should participate in the initial stage of problem definition (ie in deciding what needs to be discussed and how) rather than being forced into a sometimes-problematic framework.

It is also important for those sponsoring deliberative initiatives to take a broader look at the kinds of evidence that will be considered relevant and important. There is still a tendency to see public groups as contributing only to ethical and political discussions rather than having legitimate evidence and forms of knowledge to offer. Strict separations of 'public' and 'scientific' review can also mean that legitimate questions (eg about the need for particular innovations) do not get fully addressed.

With regard to the specific *procedures* followed in the deliberative exercises, they have to be seen as fair and open. On a very general level, this means that all relevant (legitimate) parties have to be able to participate in procedures which are perceived to be without unfair restrictions. This, however, is clearly ideal formulations and they are continuously contested in the concrete cases: what are relevant parties, and what should count as unfair restrictions. With regard to the relevant actors, 'exclusion by composition' seems to be a common theme within the case studies, although it takes different forms. In the Portuguese case study about regulation of reproductive technologies it appears as obvious that several relevant stakeholders from the public were excluded from participation by the design of the policy-process. In other cases, however, we find different ways of excluding actors. In the British and Dutch GM debates we find an explicit wish to engage with 'neutral' citizens rather than pronounced stakeholder groups with strong viewpoints. It should be clear that this is also a form of exclusion by composition, since it was explicitly argued that these stakeholder groups would distort the process of public deliberation. In actual deliberative exercises it is probably impossible to create a design which no actors will find excluding, but the important challenge must be to be as inclusive as possible within *a given formulated purpose.* The Danish consensus conferences can be seen as a good example of this as they are perceived as having a high degree of legitimacy regarding their procedures.

On a general level, there seems to be a tension between efficiency and legitimacy in the design of participatory procedures. Deliberative exercises need to be steered, but on the other hand this steering can be overdone with a consequential loss of credibility. In many of our cases, considerable effort was needed to keep the initiative on-track and alive. As with the Dutch GM discussion, debates are not always successful and it would be useful to conduct further research into the circumstances surrounding success and failure. But we will suggest that it is not enough to look at the specific design of the participatory procedures. The framing of the issues and the relation between deliberative exercises and conventional policy institutions are equally important for the relative success of deliberative engagement.

4.3.3 The outcome of deliberative engagement

In general, it is difficult to identify a clear pattern of convergence with regard to the relation between policy formulation and actual participatory outcome. The case-studies do not suggest a straightforward connection between the conclusions of specific participatory exercises and changes in policy. However, the identification of a causal relationship between deliberative 'output' and policy change is less straightforward than is often presented: we are typically dealing with complex multi-variable situations where it is often hard to identify a single 'cause' of policy change. Rather we should see the relation as one of mutual shaping and policy evolution. The central question behind the following observations is therefore to identify and discuss possible influences on scientific governance brought about by deliberative experiments.

On a general level the case studies do sustain that the introduction of deliberative engagement have effects on scientific governance – at least in changing the character (and often the content) of debate and policy-making. The cases suggest that the

introduction of various forms of participative exercises shape expectations towards greater inclusion of stakeholders. They also make the framing of problems as well as the organisational structure of policy-making appear as prominent issues. These changes in expectations and attentions, however, does not necessarily make policy formulation any easier – in fact quite the opposite seems to be a common outcome. Deliberative engagement can therefore not be seen to be a shortcut to the creation of social consensus.

We regard this observation as a central one. In many of our cases there was quite clearly a governmental desire to achieve social consensus through deliberation with the further aim to regain public trust. In fact this view that greater engagement is a route to rebuilding public trust appears to be widespread across Europe. But this view that the deliberative mode can in itself (ie without wider institutional change) settle public concerns about the direction and form of socio-technical change is not supported by our cases. Instead, it could be suggested that rhetorical statements about the need for deliberation which do not also consider the full institutional implications of this mode are likely to lead to alienation and increased scepticism. Stakeholders experiencing lack of support for their views have a tendency to use accusations of a hijacked debate as a means of rejecting the exercise. In this way, deliberative exercises run the risk of making antagonisms even more pronounced. It is also possible that deliberative efforts might actually make latent conflicts more explicit. This in itself may be a good thing provided the debate does not go astray as a result. It often happens in such cases that the important and substantive issues disappear behind incomprehensible battles over procedural issues and attempts to get media attention in ways that distract from rather than stimulate the substantive debate

In all circumstances, the case studies suggest that deliberation can be as much a source of conflict as a means to reach a solution. How should we interpret this? Is the ideal of deliberation too contested, contextually-sensitive and flexible to be of any intellectual or policy value? It is too early to say, but our case studies bring out the following key features of deliberative forms of engagement:

- A **partiality** within the conduct of deliberation across Europe: only particular (generally high-profile) issues have been selected for deliberative discussion. Initiatives tend to be rather small-scale and marginal;

- A **conflictuality** within the cases: despite the enthusiasm among government bodies for deliberation as a means of consensus generation, we find considerable areas of dissent and disagreement;

- A **fragility** to these initiatives: deliberative processes have not become embedded in government but often appear to be at the point of termination. For example, both the Danish Board of Technology and the UK Agriculture and Environment Biotechnology Commission have been under threat at different points during our work.

The interpretation of these points as a defeat of the deliberative ideals, however, depends on the relative weight placed on consensus and institutionalisation. We propose that neither of them should be regarded as crucial for the deliberative agenda to have

positive effects on policy-making. Consensus may not necessarily be a desirable (let alone achievable) policy objective. And institutionalisation of a deliberative agenda might make the efforts bureaucratic and instrumental, hereby removing the political vitality from the initiatives. Rather than viewing these three characteristics as flaws, they could be perceived as necessary in-coherences and loci of vitality in the deliberative experiments. Following this argument the antagonistic elements, the confusion between the different modes and the constant threat of collapse is a central part of keeping participatory exercises alive. These challenges might be the very same characteristics that give participatory exercises their capacity to invoke (and provoke) change – although the promises of deliberation might never be fulfilled as such. However, these partial, conflictual and fragile tendencies need to be balanced with a policy framework which is open to the issues raised, flexible in the face of competing assessments, and committed to taking the outcomes of deliberative exercises seriously. We do think that the questions suggested by the STAGE network need to be reflected on more fully by policy institutions which still have a tendency to make statements about the need for greater deliberation without thinking through the consequences of such a significant shift in political and institutional culture or its relationship to other modes of scientific governance.

Our general argument is that there is a distinct character to current European debates over scientific governance, and the infusion of deliberative ideals is a central part of this character. At a specific level, each of the cases – and indeed each of the nations studied – has its own distinctiveness. We are not trying to blur or deny significant differences between the countries and contexts under discussion here. Instead, our argument is that Europe represents a unique fusion of governance styles – and in particular offers the most sustained attempt world-wide to incorporate deliberative and democratic ideals within scientific governance. We recommend that European (and international) policy institutions should take full advantage of the learning opportunities this presents.

4.4 The shifting research agenda

Our work suggests a number of areas for future research on scientific governance:

4.4.1 Scientific Governance under Global Markets

Markets, consumer participation and civic engagement

There is a need to consider further the relationship between participatory mechanisms and marketization, and the extent to which consumer framings of deliberation are dominating the deliberative agenda. A wider issue for systematic exploration is the political space enjoyed at different levels of decision-making under global trade and regulatory regimes. How limited is the scope for constructing bottom-up agendas from deliberative exercises, and what are the best means of introducing these constraints to those who may otherwise believe that they face unconstrained choices?

Civic engagement and representative governance

Our cases raise questions concerning the best relationship between participatory initiatives and conventional policy institutions and processes. Amongst the questions

which need to be explored are: Should such initiatives be kept at arm's length from government or more fully integrated? Does the inclusion of deliberative engagement within the work of government departments or their agencies restrict the legitimacy or effectiveness of parliaments to represent constituents or scrutinise the executive? Similar issues arise for the relationship between NGOs and their members.

4.4.2 The early identification of future controversies

We recommend that further research be conducted into questions of 'technology specificity' – especially with regard to new and emerging technologies. Technological characteristics alone cannot explain patterns of social response and we resist the idea that certain technologies *cause* public controversy. Instead, our case studies suggest much more complex patterns of social construction and response. Further reflection on our case study material could be a useful starting point for the early identification of future controversies.

4.4.3 Participatory Processes and their Outcomes

Framing and selective focussing

One vital aspect of any participatory process is the actual 'framing' of the debate ie deciding which questions to ask, what sources of evidence are necessary, how the key issues are to be defined. This is especially important when the issues dealt with across the network can be encapsulated in a variety of ways: is the nuclear power debate in Sweden about the science and technology of radioactive waste disposal or the maintenance and encouragement of the larger nuclear fuel cycle (including military uses)? Very often, ethical, political, scientific and legal issues are not easily separated so that implicit decisions are made to prioritise certain questions over others and to define the issues in particular ways. Our suggestion is that this phase of problem definition and framing is central to the policy process. If deliberative initiatives are to be worthwhile then we recommend that public groups should participate in the initial stage of problem definition (ie in deciding what needs to be discussed and how) rather than being forced into a sometimes-problematic framework. Research is necessary to test this approach.

Managing the expert- lay divide

The cases also raise important issues about the relationship between wider public participation and scientific review of the same issues. One common way of dealing with this is for government to separate the 'public' and 'scientific' discussions of an issue (for example, the UK decision about whether to proceed with the commercialisation of GM crops). The alternative is to bring scientific experts and members of the public more directly together in order to allow an exchange of views and assessments. This is partially attempted within consensus conferences but the development and testing of further models is necessary.

What evidence, whose evidence and the qualities of evidence

It is also important for those sponsoring deliberative initiatives to take a broader look at the kinds of evidence that will be considered relevant and important. There is still a tendency to see public groups as contributing only to ethical and political discussions rather than having legitimate evidence and forms of knowledge to offer. Strict separations of 'public' and 'scientific' review can also mean that legitimate questions (eg about the need for particular innovations) do not get fully addressed.

4.5 Policy recommendations

At the risk of over-simplifying a large body of evidence, it is worthwhile to summarise some of our findings in the form of relatively specific policy recommendations. The number of these is somewhat arbitrary and the relationship to STAGE-based evidence is admittedly variable. However, we offer the following as a contribution to policy discussion around these issues.

1. ***Don't promise what you can't (or won't) deliver. Do be clear in advance about the institutional response to and uptake of any exercise.*** Policy institutions embarking on a deliberative exercise should be as explicit as possible in advance about the status of the exercise and its recommendations. Failure to do this can lead to public disillusionment and scepticism (one of the most common questions asked by members of the public when participating in such exercises is 'will this make any difference?'). This also suggests that institutions should think carefully before embarking on any exercise about what they are trying to achieve (clarifying issues or achieving political closure?);

2. ***Don't assume that consensus is a practical (or desirable) policy objective***. There would appear to be a common rhetorical move across Europe from 'engagement' to 'consensus formation' (and the concept of 'consensus conference' has been very influential here). We see no reason in itself for consensus being more appropriate to policy than the identification of significant areas of disagreement and dissent. It may also be that the search for consensus within contested public issues is doomed to failure (and risks being seen as artificial);

3. ***Don't treat deliberation as a one-off hurdle***. There is a tendency for governments in particular to view 'public participation' as an obstacle to be negotiated and then left behind as 'normal' bureaucratic processes resume. It would be better to view 'engagement' as a regular interaction designed to ensure that policy objectives and public assessments do not deviate over time. In this way also, the wider culture of governance cannot operate in isolation from (or ignorance of) public concerns;

4. ***Don't confuse a small number of high-profile engagement initiatives with the wider culture of European scientific governance. Institutions should consider the relationship between different governance modes.*** As our presentation of the governance typology above underlines, contemporary scientific governance in Europe can best be characterised as multi-modal with the deliberative mode

simply one among many (and certainly not the dominant mode). This also suggests that any particular governance mode must co-exist with (often several) others – the 'market' mode is especially significant. Inevitably, this means that compromises and balances must be made. Currently, these seem to be implicit and indeed unconscious rather than explicit and reasoned;

5. ***The form – and framing – of engagement initiatives is crucial to the outcome***. As a number of our cases demonstrate, the question is not simply *whether* public discussion occurs but crucially also *in what form* that takes place. The current tendency is for government to impose a framework on deliberation which suits its own short term policy needs rather than engaging with public problem definitions and concerns (as when 'technical' issues are artificially separated from 'ethical' problems or questions of 'need' or policy alternative are defined out of discussion). Our recommendation is that considerably greater attention should be given to the 'pre-stage' of any deliberation – with public inputs especially valuable at that point;

6. ***There is still a tendency to polarise 'science' and 'the public'***. Despite substantial criticism of the 'deficit' model of science-public relations, there remains a strong tendency for official bodies to present the public as both homogeneous and remote from scientific matters. Over-generalised talk of 'science and society' tends to reinforce this unhelpful schism. There is an urgent need to embrace more pluralistic and overlapping models of science-public relations by, for example, acknowledging the diversity of European publics and the considerable differences in scientific evidence across multiple contexts of policy formation;

7. Linked to the previous point, ***there remain substantial and unresolved tensions around the relationship between 'public engagement' and 'sound science'.*** As we have stressed at a number of points in our report, further policy attention needs to be given to the inter-relationship between contrasting governance modes and also to the wider relationship between public policy making and scientific advice. There is considerable lack of clarity right now about how scientific advice should feed into deliberative debates. The tendency is to keep science remote from engagement but this in turn places substantial constraints upon public discussions and arguably diminishes the effectiveness of science and technology policy making;

8. ***Transparency and engagement are not enough***. Whilst for many policy makers deliberation is seen as an end in itself, for many members of the public it is primarily a means to wider institutional and policy change. So far the implications of deliberative governance for the operation of scientific institutions have been barely considered. The assumption that deliberation is simply an add-on to current policy processes may come under increasing challenge in the future;

9. ***It is important to consider what lies behind public concerns over these issues***. In particular, there is a political tendency to reduce diverse public concerns over the form and direction of proposed innovations to a 'risk' framework. It is then

relatively straightforward to present such concerns as uninformed and mistaken. Such an approach is ultimately provocative rather than helpful and will cause further problems of public alienation from policy processes. Once again, the importance of planning the 'pre-debate' stage is emphasised. Equally, policy institutions will need to be more consistently attentive to public questions and issues as they arise;

10. ***Institutional learning is generally neglected.*** There is a tendency for initiatives to be completed and then immediately consigned to history as policy actors quickly move on to the next challenge. It is essential that the experience of deliberative initiatives is brought together on a regular basis in order that lessons can be learnt from common experience. Given the richness of European experience in this area, there is considerable potential here for further reflection and policy development.

5. Dissemination

Dissemination has been by means of both collective and individual efforts.

5.1 Dissemination/engagement efforts involving the team as a whole

Collectively, our dissemination has involved:

- the initial Copenhagen Conference (with 50 participants, 27 from Denmark and another 23 from 12 other countries) in January 2002;
- a 100 page Proceedings of the Copenhagen Conference, published by the Department of Sociology and the Biotechnology Group of the University of Copenhagen;
- The STAGE website (www.stage-research.net)) on which have been put up the objectives of STAGE, two keynote papers from the Copenhagen conference, the first two conceptual and methodological discussion papers by Elam & Bertilsson and Hagendijk & Kallerud, and the 30 discussion papers incorporating the results of the case studies;
- six presentations on a STAGE organised double session at the EASST 2002 Conference in York, UK. Our sessions, entitled '*Responsibility, Uncertainty and the New Governance of Science'* comprised the following presentations:
    - Rob Hagendijk, Myrthe van Egmond – *Public Participation: New Methods, Old Politics? The 2001 GM Food Debate in the Netherlands*
    - Mark Elam, Hans Glimell – *The Latest New Atlantis in the North: Mapping the Current Confidence of the Swedish Technoscientific Community*
    - Egil Kallerud – *Controversy Over Institutional Design and Structure in Norwegian Governance of Genetic Technologies*
    - Alan Irwin – *Democracy of Technology and Technologies of Democracy: Constructing the Scientific Citizen*
    - Moses A. Boudourides – *Policy Networks for Science and Technology Governance*
    - João Arriscado Nunes, Marisa Matias – *Precautionary Tales of Biomedicine and the Environment – Managing Risk or Acting under Uncertainty?*

    The sessions were attended with some 70 participants at peak and provoked lively discussion.
- seminars at each of the STAGE workshops in Coimbra, Göteborg, Oslo, Patras, Helsinki, and Amsterdam in which we engaged with local issues of scientific governance with local scholars, policymakers and practitioners

- a policy workshop in Brussels in October 2004 designed to distil lessons from our work for Members of the European Parliament and staff of the European Commission (for details see annex 1)

- a London Workshop in December 2004 with the purpose of putting our work into an academic context (for details see annex 1)

- we have an outline agreement with Professor Roy Macleod, editor of Minerva, for a special issue of that journal on the STAGE work

5.2 Dissemination/engagement efforts through individual team members

In addition, individual members of the network have disseminated work related to or inspired by STAGE as follows:

Books and book chapters. papers, etc

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Presentations at conferences, workshops, seminars, etc and wider dissemination activity.

Marja Alestalo and Karoliina Snell. Presentations at the XV World Congress of Sociology, Brisbane, Australia, July 7-13, 2002, through the Research Committee of the Sociology of Science and Technology
(RC23). Main coordinator: Marja Hayrinen-Alestalo
Session 2: Changing Interpretations of Knowledge;
Session 3: Ambivalent Legacies and Rising Challenges in the Human Genome Area;
Session 8: Academia-Industry Engagement in the Knowledge Area

Margareta Bertilsson. Coordinator of a panel *The Bio-sciences, Ethics, and Society*, Murcia, Spain, Sept. 2003, European Sociological Association Conference.

Margareta Bertilsson. Participation in several Scandinavian, especially Danish seminars, on *The Societal Challenge of the Bio-Sciences*

Margareta Bertilsson Member of panel on *Science and Society*, International Institute of Sociology, Stockholm July 5 – 9, 2005.

I Botezagias: 'From N.I.M.B.Y. (Not-In-My-Back-Yard) to I.H.B.Y. (In-His-Back-Yard)?: the case of waste disposal siting in the Greater Athens' region', presented at 'Nature, Science, And Social Movements' Conference, Department of Sociology, University of the Aegean, 25-28 June 2004

I Botetzagias: 'The Green Margin: Evolution and Prospects of Greek Political Ecology', paper presented at 'The Political System of the Third Hellenic Republic, 1974-2003' conference, Department of Politics, University of Crete, 20-22 May 2004 (in Greek)

M. Boudourides & I Botetzagias: 'Networks Of Protest On Global Issues In Greece 2002-3', paper presented at the ECPR Joint Sessions 2004, Uppsala, 13-18 April 2004,

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Häyrinen-Alestalo Marja (2004): "Markkinaohjatun yliopiston Suomen malli." (The Finnish Model of a Market-Governed University). Seminar on educational policy, organized by the Finnish Social Forum. 3.4.2004. Helsinki, Finland.

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Irwin, A. 'Pesticides and the public'. Presentation to Royal Commission on Environmental Pollution public forum on 'bystander exposure to pesticides'. London. September 25, 2004.

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Irwin, A., 'Nature is dead! Long live Nature'. Presentation to ESRC seminar on 'After Nature?', University of Manchester. February 27th, 2004

Irwin, A., 'Science and Government'. Presented to the 2003 Canada-UK Colloquium, Bristol. 21st November, 2003

Irwin, A., 'Scientific governance'. UCL/Centre for Biosciences and Society conference on Public Engagement with Science. Plenary talk. November 5th, 2003

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Snell, Karoliina (2003): "Governing Biotechnology in the Finnish Forest Sector - Combining Social Responsibility, Old Structures and New Technologies." Paper for Biotech Society Conference, Espoo, September 29-30, 2003.

ANNEX 1

(a) The STAGE Team

Denmark

Margareta Bertilsson (Sociology, University of Copenhagen)

Mark Elam (Sociology, University of Copenhagen)

Jesper Lassen (Centre for Bioethics and Risk Assessment, Royal Veterinary and Agricultural University, Copenhagen)

Maja Horst (Copenhagen Business School)

Casper Bruun Jensen (Aarhus University)

Finland

Marja Häyrinen-Alestalo（Research Group for Comparative Sociology, Department of Sociology, University of Helsinki)

Antti Pelkonen (as above)

Karoliina Snell (as above)

Tuula Teräväinen (as above)

Greece

Moses Boudourides (University of Patras)

Iosif Botetzagias (University of Patras, now University of the Ionian Isles)

Dimitris Kalamaras (University of Patras)

The Netherlands

Rob Hagendijk (Universiteit van Amsterdam)

Myrthe Egmond (as above)

Arjan Terpstra (as above)

Paul Wouters (Networked Research and Digital Information –Nerdi - The Royal Netherlands Academy of Arts and Sciences)

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Norway

Egil Kallerud (NIFU, Oslo)

Portugal

João Arriscado Nunes (Center for Social Studies, University of Coimbra)

Marisa Matias (Center for Social Studies, University of Coimbra)

Tiago Santos Pereira (Center for Social Studies, University of Coimbra)

José Manuel Pureza (Center for Social Studies, University of Coimbra)

Maria Eduarda Gonçalves (ISCTE, Lisbon)

Sweden

Hans Glimell (Science and Technology Studies, Göteborg University)

Mark Elam (Sociology, Göteborg University)

Göran Sundqvist (Science and Technology Studies, Göteborg University)

United Kingdom

Peter Healey (Brunel University, now James Martin Institute, Oxford University)

Alan Irwin (Brunel University, now University of Liverpool)

Kevin Edson Jones (Brunel University, now University of Liverpool)

(b) Stage Conferences and Workshops

London Planning Meeting, end August 2001 – coordinator and work package leaders

Coimbra workshop, October 2001 – STAGE team and local guests

Copenhagen Conference – STAGE team and invited guests. Proceedings and two keynote papers published by the University of Copenhagen:

> Vololona Rabeharisoa, Ecole des Mines de Paris - *Forms of Involvement of Patient Organisations into Research: an Overview of Different Models*.
>
> Inger-Johanne Sand, Faculty of Law, University of Oslo – *The legal regulation of new technologies, in the light of changing relations of law, politics and science.*

Oslo Workshop, June 2002 – STAGE team and local guests

Göteborg Workshop, October 2002 – STAGE team and local guests

Patras Workshop, May 2003 - STAGE team and local guests. A seminar on Governance in Greece, comprising the following papers, was published on the STAGE website

> **1. A.Athanassiadou, PhD:** *Human New Genetics*
>
> **2. Iosif Botetzagias, PhD:** *A brief outline of the characteristics and development of the Greek ENGOs*
>
> **3. Dimitris B. Kalamaras:** *Mapping ICTs through newspaper articles in Greece*
>
> **4. George Metakides:** *European Research Programs, Challenges & Policy*
>
> **5. George Neofotistos:** *Innovation Markets and Networks*
>
> **6. Costas Sofoulis:** *Environmental Policies and Environmental Politics in Greece*

Helsinki Workshop, November 2003 – STAGE team and local guests

Amsterdam Workshop, June 2004 – STAGE team and local guests

Brussels Policy Workshop, October 2004 – four members of the STAGE team discussed the lessons for policy and practice with a number of staff of the European Commission, one Member of the European Parliament and one advisor to an MEP

STAGE London closing conference, December 2004 - 35 participants heard presentations illustrating the range of STAGE's work and the comments of discussants from Austria, Portugal, the UK and the Netherlands

ANNEX 2 – Key Discussion Papers

These discussion papers by Elam & Bertilsson and Hagendijk & Kallerud are included in this volume because they represent key elements of STAGE's work which helped us select, undertake and interpret the case and country studies

STAGE (Science, Technology and Governance in Europe)
Discussion Paper 1
March 2002

Consuming, Engaging and Confronting Science: The Emerging Dimensions of Scientific Citizenship

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Contents

1. Introduction: Science and Society Reimagined

It is hard to avoid the conclusion today that neither science nor society are what they use to be, and that perhaps they never were as we have liked to think. The weight of contemporary argument presents us with a profound disjuncture in science and society relations which does not leave our established vision of either domain untouched. Worlds that we believed were best kept apart and clearly demarcated from one another are now seen as subject to multiple forms of voluntary and involuntary marriage and recombination. Science and society are understood to be accelerating towards each other on a proliferating number of collision courses rendering conventional ways of analysing and discussing them in isolation from one another irrelevant and obsolete.

Approaches to the recombination of science and society are now many. As Michael Gibbons, Helga Nowotny, Peter Scott and associates (1994, 2000) present the situation, we are witnessing the emergence of a new mode of knowledge production characterized by the closely contextualized production of scientific knowledge in society. As Bruno Latour (1998, 1999) proclaims, cold and detached cultures of science outside of society are warming into involving cultures of research within, and as Jerome Ravetz (1999) and Steve Fuller (2000) insist (in their different ways) cosy Kuhnian scientific revolutions are being redefined with the advent of increasingly open and extended patterns of post-normal scientific community. In the prestigious pages of *Nature* and *Science* these approaches have already achieved a level of acceptance that they can confidently identify the need for a new 'social contract' or 'New Deal' between science and society (Gibbons 1999, Latour 1998). Scientists, insists Latour, have what amounts to little choice; they can continue to defend a nineteenth century ideal of science or turn to the increasingly urgent task of elaborating 'with all of us, the hoi polloi, an ideal of research better adjusted to the collective experiment on which we are all embarked'.

Calls and entreaties for major reforms in science and society relations and a move away from more élite and authoritarian forms of government towards more open and inclusive patterns of governance are clearly starting to impact on policy discussions. Perhaps most noticeably in the British context, an acknowledged crisis of public confidence in science has opened the way for the growth of a new science and technology policy culture. As the recent House of Lords (2000) 'Science and Society'

report outlined; science's 'license to practice' in society can no longer be taken for granted and can only be extended through the introduction of integrated processes of public dialogue. The summary recommendation is that:

> Direct dialogue with the public should move from being an optional add-on to science-based policy-making and to the activities of research organizations and learned institutions, and should become a normal and integral part of the process (House of Lords 2000, summary recommendation l).

In response to the new 'mood for dialogue' the relative exceptionalism of certain science and technology policy cultures like those to be found in Denmark and the Netherlands has received growing attention. The search is on for international precedents in the democratisation of science and society relations and for institutional innovations that might be adopted more widely to broaden public participation in policy deliberations and decision-making processes (Joss 1999). Outside of established national science and technology policy cultures the European Union appears to be a governmental context particularly well-disposed to the forging of a new 'social contract' between science and society. The strategic goal of the EU to become 'the most competitive and dynamic knowledge-based economy in the world by 2010' based on the creation of a 'real European Research Area' (European Commission 2001a) has generated a particular interest in breaking down barriers to communication between expert communities across Europe and, more generally, in advancing 'sustained dialogue between experts, public and policy makers' (European Commission 2001b). At this juncture, the construction of new and more active forms of 'scientific citizenship' in support of knowledge-based community appears to be gaining recognition as of central importance to the future of the European project.

A criticism levelled against those identifying the current need for major reforms in science and society relations is that they are guilty of mixing descriptive and normative perspectives; suggesting the existence of a new organization of knowledge production while simultaneously working for its implementation. So for example, Michael Gibbons, Helga Nowotny, Peter Scott and associates have been accused of making a political plea for what they otherwise claim to be bearing objective witness to (Godin 1998: 467). Such criticism appears hard to quell, and we can see the use of a polarized rhetoric where the established characteristics of scientific knowledge production are

denounced in the name of 'social and political desiderata' which are their exact opposite structuring not only Gibbons et al's account of a transition from Mode 1 to Mode 2 knowledge production, but also Latour's identification of a shift from 'science' to 'research', and Ravetz's presentation of a progression from 'normal' to 'post-normal' science. Recognizing the performative dimension of these academic discourses forces us to conclude that behind every authoritative account of major changes of science and society relations stands a more or less explicit vision of how the future 'knowledge-based society' should be organized. The work of accounting for change is never innocent of a desire to make a difference to change.

With this in mind, we can say that supporting a call for a new 'social contract' or 'New Deal' between science and society today implies supporting a particular new type of collectivity which defines and delimits itself more completely by its capacity to produce and disseminate new knowledge. Through such a process of (re)definition the respective territories and populations of science and society are reimagined in a way that produces a closer identity between the two: between the scientific community and society at large and between the scientist and the individual citizen. The distance between science and society is collapsing into their mutual embrace and varying depths of entanglement. This new intimacy between science and society is described/prescribed by Michael Gibbons in terms of evolving practices of 'contextualized knowledge production' and by Bruno Latour in terms of all inclusive engagement in 'collective experiment' - but what does it mean to connect so closely our senses of individual and collective identity and destiny to our participation in novel forms of knowledge production? If citizens in future are to understand themselves to a growing degree as 'scientific citizens' what shape should the freedoms, rights, duties and responsibilities of these new citizens take?

2. Innovation and Virtue

In contemporary perspectives describing and advocating science and society in closer liaison the key process held responsible for forcing the two into each other's arms is that of innovation. Against a background of opportunities and risks which cannot be ignored, science and society are being encouraged to join forces in order to initiate; advance; safeguard; regulate; expand or terminate processes of innovation. According to Nowotny, Gibbons and Scott (2000: 36), the current situation is one where societies

'like our own' have accepted innovation 'as a new religion rooted in a continuous drive to bring forth the New'. Having jointly 'opted' for the relentless pursuit of novelty and staked our survival on it, science and society must now learn to live and cope together with the inherent uncertainties that follow (ibid: 37). This vision of science and society jointly choosing and even welcoming the uncertainties of innovation is complemented by one of them being jointly shocked and intimidated by the appearance of unnatural risks and dangers they had never envisaged. However, regardless of whether the vision is one of a high-tech Opportunity Society or a late modern Risk Society (Beck 1992), the central place assumed by innovation in structuring the future of science and society relations remains the same. Contesting the 'goods' and 'ills' of innovation; helping to capture the former while building protection against the latter can be seen as providing a concise description of the landscape the new scientific citizen is to roam.

In light of the key role assigned to the process of innovation in inviting and inducing a new 'social contract' between science and society it is important to come to grips with its nature. According to Schumpeter to innovate is to carry out new combinations; to combine materials and forces in a novel fashion in order to produce new things or the same things by a different method (1968: 65). This work of combination Schumpeter saw as a task *sui generis* performed by a particular type of individual - the entrepreneur. Over the years this approach to innovation has been seen as in need of modification on a number of counts, but perhaps most importantly due to the increasingly high science content of new combinations. New combinations, it is argued, have become more radical as they have become dominated by the novel nature of the materials and forces combined rather than by the originality of the act of combination itself. Innovations have become more closely wedded to inventions (more 'science-based') loosening their identification with the actions of entrepreneurial personalities while strengthening their ties with more impersonal scientific methods and procedures (Freeman 1991, Andersen and Lundvall 1988). Schumpeter himself proposed the growing redundancy of entrepreneurs as their actions progressively broke down all social resistance to continuous change. Innovation was destined to become automatic in the context of science-based production as any 'objectively possible' technological improvement would soon be 'carried into effect as a matter of course' (Schumpeter 1939: 109).

However, with continuing strong resistance to certain new technologies and often widespread disagreement between experts and lay people alike over the benefits of others, as well as marked variations in innovative performance between different societies, it appears appropriate to ask if something does not remain blocking the long-term rationalization and scientification of innovation processes. Schumpeter was clearly in two minds on the issue, and even late in his career he was still apt to draw a very hard distinction between the work of invention and that of innovation. As he wrote in 1928; successful innovation is 'a feat not of intellect, but of will. It is a special case of the social phenomenon of leadership' (1928: 379). Carrying an invention into society is not the same type of task as bringing it into existence in the laboratory. Innovation as Schumpeterian entrepreneurship is a task of economic and social leadership. Entrepreneurs, however, lead not through persuasion, but through their actions. They lead by example; by diverting old or new means of production into new channels against the 'circular flow' of economic life (Schumpeter 1968: 89). Entrepreneurial ability is not connected to the possession of new knowledge so much as to the possession of a particular range of practical talents and virtues. Entrepreneurs succeed in Schumpeter's eyes due to their uncommon command of such strategic qualities as 'personal authority', 'initiative' and 'foresight' (1968: 75). These qualities allow them the freedom of movement they require, beyond the boundaries of economic routine, to set about authoring the new routines that others will eventually come to follow. The ability to exercise virtue becomes a substitute for hard and fast knowledge that cannot be gained in advance of action, and thereby an alternative basis for survival and success under conditions of chronic uncertainty. Arguably, *just because* innovation, long after Schumpeter's death, can be viewed as still stubbornly wedded to virtuous action its long-term rationalization now seems unlikely. Holding this to be so, we can expect that science-based innovations, rather than entering society 'as a matter of course', will due to their heightened novelty and complexity be associated with an expanding and not a shrinking range of virtuous actions.

Although he is meant to be living in a past world, Schumpeter's entrepreneur acts under conditions closely resembling those Jerome Ravetz puts forward as defining the contemporary context of 'post-normal science'. In this context says Ravetz; 'the facts are

uncertain, values in dispute, stakes high, and decisions urgent' (1999: 649). When science is carried beyond the 'artificially pure and stable conditions of laboratory experiment' and into society, established facts, claims Ravetz, tend to lose some of their reliability and instead of 'truth' the new guiding principle for action becomes 'quality':

> For post-normal science, quality becomes crucial, and quality refers to process as much as to product…lacking neat solutions and requiring support from all stakeholders, the quality of decision-making process is absolutely critical for the achievement of an effective product in the decision (Ravetz 1999:649).

Here 'quality' can be taken as a synonym for what in the case of Schumpeter we label 'virtue'. Even when they are science-based, innovations as new combinations cannot be brought together and held together by the power of scientific truth alone, but must rely on the broader achievement of 'quality' ('virtue') in decision-making processes. For Ravetz, the achievement of quality relates to the pursuit of procedures of 'extended peer review' where all those affected by, and implicated in, new combinations should be given the opportunity to participate in decisions pertaining to them. Virtue in decision is seen as a collective good. For Schumpeter, on the other hand, virtue in decision-making means leaving all decisions to the few who are uniquely qualified to take them. Apart from with the banker who is to finance him, Schumpeter's entrepreneur does not negotiate with anyone, he simply shows the way; demonstrates the future. He is a rule unto himself as he rewrites the rulebook of techno-economic life for others to follow. The superiority of his actions, and of the new combinations that result, speak for themselves and need no other defence. Virtue in decision is seen as an individual capacity. What Ravetz and Schumpeter offer us then are the tentative outlines of two alternative polities of science and technology and two very different models of scientific and technological citizenship. Both claim to offer us basic recipes for achieving legitimacy and efficiency in innovative conduct. While Ravetz sees the moral virtues connected to sustainable innovation being both constructed and exercised in public through engagement in open dialogue, Schumpeter (1992: 160) sees them exercised in public, but bred only in private within the confines of the classic bourgeois family Home. For Schumpeter, access to scientific citizenship must remain highly restricted, tied as it must be to class and gender; entrepreneurship and masculine bourgeois culture

end up as one and the same thing. At the other end of the spectrum, scientific citizenship for Ravetz should, in principle at least, be open to 'all those with a desire to participate in the resolution of the issue' (1999: 651). The task that remains is to fill out the dimensions of scientific citizenship further and relate these more closely to particular contemporary contexts of innovation.

3. Science Enlarging Politics

Understanding the passage of science into society as impurely scientific and dependent upon variable patterns of virtuous action defines innovation as an inescapably political process. Schumpeter was able to both recognize and resist this by presenting the enterpreneur as someone who helped expand the general rule of Reason in society through the legitimate force of superior will-power. In the absence of Men of such mythical quality, however, new combinations must be accepted as driven by the stronger or weaker knowledges and convictions of a lesser or greater number of individual and collective actors all demanding recognition. This opening up of innovation to broader participation means that controversy is just as likely as consensus to characterize innovation processes. As science helps expand the scale and scope of innovation processes in society, so it helps expand the scale and scope for potential disagreement in society. As Latour (1998) puts it; by adding new ingredients to collective experiments, science does not promise to put an end to politics, it only serves to enlarge politics further. This becomes even plainer to see when we consider that those holding the strongest convictions concerning the social relevance of any particular scientific novelty do not have to be (recognized) scientists themselves. As Schumpeter's entrepreneur was not expected to create all the forces and materials mobilized in innovation, so we can now expect that some of the most important individual and collective actors dedicating themselves to the task of 'contextualizing' scientific knowledge in society will not themselves originate from within the established bounds of science.

In this regard the growth of medical genetics serves as a good example illustrating how incomplete knowledges and diverse convictions combine in large-scale processes of science-based innovation. According to Rheinberger, the move of molecular biology in recent decades out of academic containment and into a position where it can effectively redefine aspects of medicine, medical care and the concept of illness coincides with the

making of a new cultural movement. The growth of this movement, he maintains, is based in the first instance on the expansion of a 'shared misunderstanding' relating to the import of medical genetics. While expectations grow concerning the future possibilities of gene therapy, what medical genetics is currently delivering is 'healthy genes, not cure, for the whole population'. This 'misunderstanding' is generated and upheld through shared convictions cultivated in place of knowledge which serve to draw together and unite diverse actors who would otherwise have no obvious connections with one another (Rheinberger 1995: 250). In the wait for new cures for chronic diseases, medical genetics is offering firstly a new way of visualizing and cataloguing illness and pathologies. As the tools and procedures for genetic screening and the identification of genetic markers become more sophisticated and precise so the ability to classify individuals and populations according to the presence or absence of genetic flaws grows. Given this new calculability of sickness and health the most significant innovation currently emerging from the field of medical genetics is itself a new kind of uncertainty and a special quality of risk information (Turney and Balmer 2000: 412). This production of 'genetic risks' for widespread consumption is not only to be seen as responsible for propelling medical genetics forward and expanding its relevance, but also for creating new subjects - 'persons genetically at risk' - whose destiny becomes thoroughly implicated in the future development of the field. As Novas and Rose (2000: 488) put it:

> …genetic languages render visible to others and to oneself aspects of human individuality that go beyond 'experience', not only making sense of it in new ways, but actually reorganizing it in a new way and according to new values about who we are, what we must do, and what we can hope for.

As well as being vulnerable to new types of surveillance and new forms of discrimination, growing populations both identified and identifying themselves as genetically at risk are induced and provoked into assuming a far more active interest in their conditions of corporeal existence. Defined by genetic disease they are asked to show a new sense of responsibility in the conduct of their everyday lives and to accept new obligations to help in the betterment of their situation. Caught in the gap between certain diagnosis and unknown cure, the genetically at risk find themselves drawn into

novel networks of interaction with multiple sources of knowledge and experience encouraging them to strive towards some measure of control over their future health. By always being inclined to demand more of the science that defines the quality of their lives, the genetically at risk will be encouraged to view medical scientists positioned as much as their servants as their masters in the long-term search for therapeutic cures. As Novas and Rose (2000: 506) relate in the case of Huntingdon's Disease (HD):

> The responsible-genetic subject becomes active in the enterprise of science. This...entails posting promising new research findings in the webforum. Materially, it often implies donating part of one's income towards funding a cure for HD, engaging in various fundraising activities to support the search for a cure, and a willingness to take part in clinical trials for potential therapies to cure HD…Increasingly, those at risk constitute their own forms of expertise, through support groups for those at risk or affected by HD.

In other words, diagnostic innovations in medical genetics are simultaneously serving to generate both a new knowledge of disease and an increasing number of active and engaged 'co-participants' in the field committed to finding a cure for 'their' disease. Although passivity and resignation to what genetic fate has dealt remains an option, moral incentives will typically be strong urging the genetically at risk to choose the path of hope and to do what they can to improve their situation and that of their fellow sufferers (see Callon and Rabeharisoa 2000). The incentives will be towards choosing active membership in the new cultural movement of medical genetics and becoming another virtuous (politically-active) party to the new combinations it is carrying into existence.

Techniques of genetic testing and screening are producing consuming new science-based identities transforming outsiders into insiders of a new expansive form of scientific community. However, as Novas and Rose (2000: 491) insist, geneticization of identity must be viewed in relation to other cross-cutting identity practices. Therefore, even if new genetic identities remain highly consuming and interpellating, they will still be consumed very differently in different contexts in combination with other competing identity claims relating to class, religion, sexuality, nationality and so on. Here, for example, the case of the 'population-based genomics company' deCode and its marketing of a genealogical database based on the Icelandic population is interesting to

note. Whereas in other national contexts such a venture would without doubt give rise to widespread protest, roughly 90% of the Icelandic population has expressed its support for deCode's project. According to Lene Koch (2002), such collective support for what could be seen as the sale of Iceland's genealogical history, stems from the unique sense of national pride harboured by the Icelandic people in relation to their perceived common descent. This sense of pride, Koch argues, is only enhanced, not diminished, when the fact of common descent is confirmed through new links to scientific practice, and is advertised more widely in relation to a worldwide struggle against chronic illnesses such as cancer and diabetes.

4. From Enlightenment Government to Democratic Governance

Concern and interest in new forms of scientific citizenship has arisen as commitment to a 'canonical account' (Shapin 1990) or 'Enlightenment model' (Irwin 1999, Healey 1999) of science and society relations has declined and become increasingly fragmented. The Enlightenment model is losing support as it appears less as an accurate map of science and society and more as an established ideology working to secure and protect the greater autonomy of scientists and scientific institutions against society. According to the Enlightenment model, the only scientific citizens are the scientists themselves. For science to engage in the production of properly scientific knowledge it must live in a 'free state' and in a domain apart from the rest of society. Historically, science's grip on Truth is seen as having grown progressively stronger as society's grip on science has grown progressively weaker and ever more closely circumscribed (Latour 1999: 258, Shapin 1990: 991). Science has developed by disentangling itself, and purifying itself out of society and because of this any residual reliance on lay or common sense forms of understanding in scientific contexts can only lower the quality, and dilute the authority of the new knowledge being produced. Science is seen as the goose that lays the golden egg, but only under suitably autonomous circumstances and in the absence of undue external interference (Callon 1999: 83, Shapin 1990: 1000, Hilgartner 1990: 520). Abiding by the Enlightenment model, science becomes unproblematically associated with progress giving it privileged rights of access to the future. Thereby a failure to accede to scientific judgement can only be interpreted in negative terms and as representing an ignorant and irrational defence of old ways of thinking in the face of new (Irwin 1999: 19). Also in line with the Enlightenment model, it is only natural that communication between science and society is all one-way: that science speaks to society without society ever being given the opportunity to talk back at science. As Hilgartner (1990) outlines, lines of communication between science and society after the Enlightenment model have been established on the assumption that the production and communication of scientific knowledge remain two highly distinct and qualitatively different activities. First, scientists develop new matters of fact, then others in command of a suitable scientific training disseminate these facts beyond the confines of the professional environment in which they have arisen. Dissemination always remains a troublesome and frustrating activity in that it can never add anything of value

to scientific facts already produced and can only threaten to corrupt and distort these facts in the process of their 'popularization'. Minimizing the degradation of scientific knowledge in transit between science and society requires that science communication be controlled by those in command of a proper scientific training. Only such qualified communicators will be able to guarantee that science for public consumption is characterised by 'appropriate simplifications' and avoids 'damaging distortions' (Hilgartner 1990: 520).

By valuing so highly the autonomy of science and linking this directly to the preservation of the quality and the authority of scientific knowledge, the Enlightenment model amounts to a model for the insulation of science from society. It is a model that guarantees distance between science and society and actively works to avoid or even deny intimacy between the two. In the European context, in the second half of the twentieth century, it was national government (the Welfare/Warfare State) that intervened to consolidate the hold of the Enlightenment model on institutional reality. While science on occasion was expected to communicate directly with the public, the public was only expected to communicate indirectly with science through the appropriate government channels. As Shapin (1990: 1004) puts it, the government of science in support of the Enlightenment model means that 'it is the State that speaks for (or claims the right legitimately to speak for) the public and to voice public interest in the conduct of science'. The growing irrelevance of the Enlightenment model and its tendency to be identified as an 'ideological construction' of science and society relations stems largely from the withdrawal of the State from its role of protecting science from direct contact with society and the new expectations coming from all directions that science re-enter society in order to help support and sustain new cultures of collective innovation. Increasingly, science can no longer lay claim to the future outside of its active participation in successful patterns of innovative endeavour. Through such participation the ability of scientists to remain the sole adjudicators over the quality and strength of the knowledge they are engaged in producing declines apace. Under such circumstances and as the lines of communication between science and society are subject to radical reconstruction the Enlightenment government of science can be seen to be giving way to a range of uncertain alternatives for the future 'democratic governance' of science.

5. Public Understanding of Science and Advanced Consumer Democracy

The publication of the 1985 Royal Society report on the Public Understanding of Science (PUS) signalled the cautious re-evaluation of science's established relation to society under growing concerns surrounding science's contribution to national economic performance and prosperity. Although originally associated with the British context PUS became something of an international movement during the 1990s assuming a particular relevance in the post-Cold War era as States were forced to reimagine themselves as 'States without clear-cut enemies' in a globalizing world (Giddens 1998: 71, Elam 1997). In the Cold War era, science living relatively apart and invisible to society could be understood as necessary for the overall protection of society, not so in the new era. With the passing of bipolarity, the Enemy has been largely replaced by Competitors and an expanding landscape of sizeable opportunities and emergent risks that science must now be visibly seen to be addressing and acting upon. With the growth of the PUS movement the vision of science as partly locked away from society for society's own good has given way to one where science and society increasingly inhabit each other. As the tone of the new vision was set back in 1985:

> Science and technology plays a major role in most aspects of our daily lives both at home and at work. Our industry and thus our national prosperity depend upon them. Almost all public policy issues have scientific and technological implications. Everybody, therefore, needs some understanding of science, its accomplishments and its limitations (Royal Society 1985: 6).

From the outset PUS was, and has remained a predominantly science-centred and science-led movement for responding to changing circumstances in science and society relations. It has been a movement defensive of science's established authority and autonomy beyond society seeking to represent and protect the integrity of science as it is drawn into ever closer involvement in new patterns of collective innovation. One option for science has been to enter into innovation in the guise of the classic Schumpeterian entrepreneur and apply inherited Enlightenment model authority to the carrying out of new science-based combinations. However, rather than attempt to advance and enforce technocratic-style leadership over new knowledge economies, the PUS movement has emphasized the educational and 'civilizing role' science and scientists can play in the context of the new technological competition. The task of PUS, to begin with at least, was framed as one of combatting public hostility and

resistance to new technology and of creating a keener awareness among industry leaders and major investors of the new technological opportunities scientific research was opening up. As Healey (1999: 71) notes, in its initial guise, the PUS agenda was constituted by a fairly straightforward superimposition of new economic concerns over the Enlightenment model of science and society relations. Instead of defending the freedom of science outside of society, PUS was to defend the freedom of new forms of science-based innovation within society. Innovations which should have found a place in society as a matter of course were seen as being blocked by ignorant and irrational patterns of resistance in society. The PUS solution to this situation was to focus attention on the need for improvements in 'science literacy' in society so that resistance based on public misunderstandings of science might be progressively avoided and eradicated (Irwin and Wynne 1996). PUS accepted that in a democracy public opinion matters in decision-making processes and that the emerging situation was one where publics were increasingly being asked to vote on scientific and technological issues beyond their untrained grasp. As originally imagined, therefore, PUS was to engage in a kind of missionary work striving to bring the light of Popperian-style objective knowledge and a basic level of scientific literacy into the everyday lives of ordinary citizens allowing them to set their sights on the achievement of a higher, but still restricted, scientific citizenship (Hagendijk 2002). Inculcating the public in the 'factual background' to reigning controversies surrounding new technology would in the long-run contribute to greater efficiency in decision-making processes. Science-based innovation had created the need for a better-informed, scientifically-literate, citizenry to protect the legitimacy of existing democracy.

Over time, however, PUS has gradually modified its tune and accepted that bad decisions concerning science-based innovation may also on occasion stem from the unnecessary arrogance and over-assuredness of some scientists as well as from the ignorant and over-emotional attitudes of some publics. The quality of uncertainty accompanying science-based innovation is increasingly viewed as of a different quality and of another magnitude than that conventionally encountered under more controllable laboratory conditions (Callon 1999: 85, Wynne 1999: 8). What is reliable and works in the laboratory is typically far less robust in other places, at other times and categorical assurances about the safety or superiority of science-based new combinations in society

are now something that scientists are learning to deliver with growing caution (e.g. May 1997). In recent years, PUS has been characterised by debates leading to something like an 'enlightenment of the Enlightenment model of science and society relations'. New supplementary knowledges are gaining recognition as important to the survival and success of science-based innovations and the burden of ignorance blighting the carrying out of new combinations is now seen as rather more evenly spread across the lay-expert divide. The PUS movement is now more prepared to take a lack of public confidence in new science and technology seriously and public worries about the unforeseen risks accompanying new technologies as only reasonable (Durant 1999, House of Lords 2000). No longer need the public be seen as unnecessarily resistant, but only naturally cautious and uncertain about consuming major novelties encompassing only recently acquired scientific knowledge. From fighting public ignorance and resistance to new technology, PUS is gradually rededicating itself to the task of winning, coaxing and securing public *consent* for the carrying out of radical new science-based combinations. Rather than simply correcting public opinion from a position of high authority, the new task for PUS is to help the public help itself in forming adequate opinions on controversial issues pertaining to science and technology.

The PUS movement has thus grown more reflexive about its own science-based authority as it has come to learn more about publics it initially presumed ignorant. PUS can now acknowledge that it has itself been ignorant and in command of only a primitive understanding of the processes behind the formation of public opinions towards science and technology. Scientific missionary workers are themselves starting to see the light and the error of their past ways. In a symptomatic analysis of the 'democratic turn' in PUS, Durant (1999: 316) suggests an interesting identity between the contemporary crisis of liberal democracy and the contemporary crisis of science in society. Science and democracy have developed alongside each other, but strangely, while those countries that still have little science/democracy continue to want more, those that have most are experiencing public discontent and disillusionment about developments in both fields. According to Durant, while opinion polls show that most people in Western countries have not lost faith in democracy or science in general, and if anything are even more committed to both than before, where they do have their doubts is over the quality and trustworthiness of current politicians and scientists. Like

in politics, like in science, says Durant, traditional authority figures don't command the same respect anymore and the public are less and less willing to defer to what old-fashioned voices of authority tell them. Following arguments from Giddens, Durant (1999: 317) maintains that what has led to a loss of public faith in politicians and scientists alike is developments in the media and in communications technology in general collapsing the distance between leading politicians and scientists and ordinary citizens. However, in the case of science what is also important is the role being played by science-based innovation in bringing scientists into much closer proximity with many others in the carrying out of new combinations. Scientists simply cannot cut a credible image in the context of science-based innovation unless they change their own understanding of the sources of their authority in society. Distance may have helped lend enchantment, but proximity in innovation is fast-breeding contempt.

Scientists embroiled in innovative enterprise are dependent on the public in ways they were not before and for this reason PUS cannot carry on viewing the public in terms coloured by the Enlightenment model as naturally ignorant and hostile – this becomes a counter-productive scientific understanding of the public. From an initial focus on public resistance to new technology, PUS is now starting to work with a vision of the public as capable of active and mature reasoning on technological issues even if this only tends to lead to greater indecision. Unable to intervene and bring closure by simply telling the public what to think, PUS is now becoming increasingly preoccupied with designing and implementing 'public experiments' and 'public laboratories' for extended discussion and debate of contemporary science and technology. From viewing the public as not really ready or fit for scientific citizenship, PUS is now starting to work more actively (and experimentally) towards constructing environments for the cultivation of a new type of scientific citizen (Irwin 2001). These scientific citizens are imagined as participating in a different type of consumer democracy. Unlike conventional consumers of established products with clearly-defined characteristics, consumer-citizens confronting the novelties of science-based innovation are unavoidably individuals with incomplete information who are being asked to pass judgement on things that literally no one can claim to fully know or understand. The challenge of scientific citizenship is therefore one of political decision-making under conditions of exceptional uncertainty. Under such conditions, and despite the typical urgency with which decisions are required, the raw and spontaneous will of the people

can only be assumed to lead to bad decisions. Rather than already having a firm idea about what they want and what they think, scientific citizens are to be seen as citizens actively in search of their preferences; individuals earnestly striving by means of interior deliberation and dialogue with others to reach a definite opinion on novel scientific matters. It is in this context that PUS is currently carving a new identity for itself beyond, if not completely out of the shadow of, the Enlightenment model of science and society relations. PUS appears today as a movement in the process of becoming one that supports the public (scientific citizens in the making) discover their own points of view on issues relating to contemporary science and technology (Irwin 2001). In line with this new role PUS representatives can argue that rights of scientific citizenship do not follow with the basic right to vote on science and technology issues, but more fundamentally, from the opportunity to discover and cultivate one's own opinions and preferences in relation to such issues. The public is justified in fighting for the right to discover through organized debate and discussion what they really think about contemporary science and technology and PUS is dedicating itself to supporting them in this struggle – a struggle for the further democratisation of scientific democracy.

PUS as a movement largely initiated to defend the interests of science in society is assuming a more 'democratic' identity today by linking a particular vision of scientific citizenship to the creation of new types of educational opportunity in different educational contexts characterised by organized debate and discussion. From a movement previously aiming to bring down the light of science to a backward people, it is mutating into one helping already reasonable people further enlighten themselves. PUS is in the process then of developing and refining a new 'expertise of extended scientific community' (cf Irwin 2001: 15). Its task is to help citizens spend time entertaining the new ideas and novel artifacts that science-based innovation is bringing to society; to help citizens broaden their technological outlook and dare to share in the 'exciting opportunities' (House of Lords 2000: Chapter 1) science is throwing up. However, the test of the new democratic credentials PUS is acquitting itself with will follow from how new programmes allowing citizens to discover their own opinions about science are framed (Irwin 2001, Hagendijk 2002). Clearly, scientists alone cannot help publics discover what they think about science as no one would believe them

capable of remaining neutral in this task. A reasonable diversity of agents and competing experts of extended scientific community is called for, but where will PUS draw the line in creating room for alternative perspectives on science-based innovations to be presented for public discussion? As Irwin points out, a related key issue is that of the constitution of the final audience for new democratic PUS initiatives. Although PUS may argue that citizens remain the primary audience in new consultative and discussion forums, and that these citizens are being empowered by being enabled to discover and more clearly articulate their own opinions, the suspicion remains that those responsible for designing new experimental public forums are ultimately doing so for their own purposes: that public experiments in the new democratic governance of science are ultimately more akin to highly sophisticated exercises in social or market research (Irwin 2001: 13). The 'democratic turn' in PUS can also be understood as a professional coming of age of PUS where new approaches are being developed for more effectively mapping, explaining and acting back on the processes through which public opinions on science and technology are formed. Through designing public experiments where citizens can discover their own scientific opinions by researching and comparing between different perspectives on specific programmes of innovation, PUS can be seen as engaging in research of its own on new lines of demarcation between science and society which might work in future replacing an Enlightenment model which is now recognized as more of a political liability than an asset.

6. Public Engagement with Science and Deliberative Democracy

In its new guise of supporting the right of ordinary citizens (scientific citizens in the making) to be given the opportunity to discover what they truly think about contemporary science and technology, PUS has started to claim its allegiance to deliberative models of democracy originating, in the first instance, out of the work of Jürgen Habermas (1996) and John Rawls (1993). As Durant (1999: 317) outlines the 'democratic turn' in PUS:

> The ideals of equality between scientists and non-scientists and of informed public debate as the preconditions for forging socially sustainable public policies need to be translated into new processes of deliberative democracy.

It is through this process of creating a closer identity between PUS and processes of deliberative democracy that PUS is gradually coming to call itself by another name – public engagement with science (PES). Through PES, science is attempting to win and hold the attention of the public. New deliberative forums are being designed as opportunities for science and the public to spend quality time together. Quality time is needed for the exercise of science communication in the public good. As Durant (1999: 318) highlights, 'the extended time-scale of scientific inquiry does not always sit easily alongside the compressed time-scale of the news media. Equally, the complexities and uncertainties of much scientific research do not always lend themselves well to the sloganising and stereotyping of so much journalism'. PES is tasked with constructing new spaces through deliberative procedures where science and technology issues can be given the public airing they deserve. As Amy Gutmann and Dennis Thompson argue the benefits of deliberation:

> Deliberative democracy is the opposite of soundbite democracy, which probably provides a more accurate description of our current political life. Soundbite democracy suffers from a deliberative deficit. The din and deadlock of public life where insults are traded, slogans proclaimed, and self-serving deals are made and unmade, certainly reveal the deep disagreements that pervade public life. But soundbite democracy does nothing to resolve those disagreements on mutually acceptable grounds and still less to help citizens live with their ongoing disagreements in a mutually respectful way.

There appears to be a growing appreciation among the PUS community of deliberative democracy as a science friendly model of democracy and one which scientists can embrace because, not only does it help make science more democratic, but also bring both legitimacy and productivity gains to the practice of science communication. PES is also recognizable as an adaption rather than a rejection of PUS, as within deliberative models of democracy, deliberation is itself seen as a process for becoming informed and for receiving continuous education and training (Manin 1987: 354, Benhabib 1994: 32). PES can appear as enlightened PUS, corresponding to the adoption of a new pedagogic model supporting interactive learning between science and the public; both sides continually collecting, exchanging and analysing information about each other. Both

sides highly engaged with each other, monitoring each other and adapting their behaviour towards each other on the basis of what they have most recently learnt. Deliberative democracy also appeals to the scientific community for its commitment to building political decision-making on 'rational consensus' rather than 'mere agreement'. The civilized vision of democratic politics deliberative democracy supports is one of the unhurried exchange of arguments between reasonable persons guided by the principle of impartiality (Mouffe 2000: 86, Bloomfield et al 2001: 503). Or as Benhabib (1994: 30-1) expresses it:

> According to the deliberative model, legitimacy and rationality can be attained with regard to collective decision-making processes in a polity if and only if the institutions of this polity and their interlocking relationship are so arranged that what is considered in the common interest of all results from processes of collective deliberation conducted rationally and fairly among free and equal individuals.

Processes of deliberative democracy can be seen as contexts where citizens simultaneously gain new rights of scientific citizenship while receiving the political education allowing them to exercise these rights. Designed in the hope of producing a new rational consensus, PES initiatives inspired by deliberative democracy resemble political laboratories for carrying out controlled experiments in scientific democracy. The sort of ideal laboratory conditions to be aimed for are summarized by Benhabib as follows:

- participation in deliberation is governed by the norms of equality and symmetry; all have the same chances to initiate speech acts, to question, to interrogate, and to open debate;
- all have the right to question the assigned topics of conversation;
- all have the right to initiate reflexive arguments about the very rules of the discourse procedure and the way in which they are applied or carried out. There are no *prima facie* rules limiting the agenda of the conversation, nor the identity of the participants, as long as each excluded person or group can justifiably show that they are relevantly affected by the proposed norm under question (Benhabib 1994: 31).

While the different advocates of deliberative democracy are able to admit that numerous obstacles will always stand in the way of the construction of such ideal democratic laboratory conditions, these obstacles, it is argued, should be approached firstly as of an empirical and practical nature (Mouffe 2000: 88); we should not think ourselves justified in abandoning our democratic ambitions just because the path to achieving them is so demanding. Also as many advocates of deliberative democracy emphasize;

the very act of participating in deliberative experiments produces 'better' citizens and individuals who find it ever harder to withstand the power of a good argument (Pellizzoni 2001: 66, Cooke 2000: 948, Macedo 1999: 10, Warren 1992). As Benhabib again expresses it:

> The very procedure of articulating a view in public imposes a certain reflexivity on individual preferences and opinions. When presenting their point of view and position to others, individuals must support them by articulating good reasons in a public context to their co-deliberators. This process of articulating good reasons in public forces the individual to think of what would count as a good reason for all the others involved. One is thus forced to think from the standpoint of all involved for whose agreement one is 'wooing'. Nobody can convince others in public of her point without being able to state why, what appears good, plausible, just and expedient to her can also be considered so from the standpoint of all involved (Benhabib 1994: 32-3).

As a basis for the 'democratic turn' in PUS and its self-mutuation into PES, deliberative democracy provides a model of democracy where scientists have good chances of appearing before others as already model scientific citizens. By valuing rationality, reserve, selflessness and powers of argumentation, deliberative democracy is a democratic politics played out on scientists' home turf. As Manin (1987: 354) points out, it is presupposed that participants in deliberative forums have received 'a certain degree of instruction and culture' and due to their professional training, scientists are always likely to be significantly advantaged in this respect compared to other participants. Deliberative forums are forums where already reasonable and already articulate citizens can excel (Sanders 1997), and for this reason they can appear to scientists as more acceptable means than others for extending scientific community further into society. They are forums where scientists can make use of their existing 'civility' and acquired intelligence to help secure a new legitimacy for innovation-related research. There is a sense, therefore, in which the PES commitment to deliberative democracy appears to conform to a conscious strategy for developing a new range of political technologies for the preservation of public confidence in science and the further sanctioning of science-based innovation. This strategic approach to the democratisation of science can be read into the proposal of Nowotny, Scott and Gibbons (2000) for science to self-consciously 'move into the Agora'. If science is to secure what they call a 'new social contract with society' it must take it upon itself to become fully familiar with the larger 'contexts of implication' surrounding every major

programme of science-based innovation. Having worked to identify these contexts scientists must see themselves as obliged to acquire an 'intimate and interactive, as well as anticipatory awareness'(Nowotny et al 2000: 209) of the emerging reactions of the wider public to their research. In the absence of such an awareness there is no escaping the prospect of research being subject to regular, unexpected and perhaps even fatal disruption. As Gibbons (1999: c84) expresses it, science engaged in radical innovative pursuits must accept that its authority 'will need to be legitimated again and again' and that the only way to guarantee this is for science to enter the agora and 'participate fully in the production of socially robust knowledge'. Deliberative democracy may be a better model of democracy than others for configuring the agora to the advantage of science and those designing deliberative forums might be conceived of as attempting to exert some measure of social control over processes of collective entrepreneurship related to science-based innovation. If innovation after Schumpeter (1928: 379) still remains a 'feat not of intellect, but of will', then deliberative forums are clearly contexts where a collective will to innovate can be cultivated and directed.

The level of public engagement with science sought through processes of deliberative democracy can be expected to be highly variable depending upon how they are designed and led. On one level, deliberation might be restricted to achieving public consent to specific programmes of science-based innovation. This is PES still very close to PUS where the purpose of deliberation is firstly to officially authorize particular innovative actions. Here scientists might be persuaded to change their minds about some aspect of their own practice, but the major question to be settled through deliberation remains whether or not they should be given the go-ahead. What is under discussion is the legitimacy of a programme of research and once this question has been settled deliberation ends, and public participation in decision-making is for practical purposes brought to a close. This is deliberative democracy in the service of a representative scientific democracy where the legitimacy of the latter is no longer associated with the 'predetermined will of individuals, but rather the process of its formation' (Manin 1987: 352). Institutions of deliberative democracy are clearly potentially useful tools for intervening in the process of the formation of a collective will in relation to science-based innovation and for delimiting public participation in decision-making to isolated choices – votes. Here PES remains more concerned with the 'self-correction' of public

opinions and preferences than with mobilizing public knowledge and experience. Science and society cross paths, deliberate, reach a decision, and then go their separate ways again.

On another level, deliberative procedures for the authorization of innovative actions might be conceived of as just the beginning of public participation in science and technology decision-making and not the end limit. Here the focus would shift from the the advantages of deliberative democracy for producing 'governance virtue' and the legitimation of innovative actions alone, to its potential for generating significant 'cognitive virtue' (Pellizzoni 2001: 66) and 'the conditions whereby actors can widen their own limited and fallible perspectives by drawing on each other's knowledge, experience and capabilities' (Smith and Wales 2000: 54). Here science and society would cross paths, start deliberating, and then continue to become ever more closely entangled with each other. This is what Michel Callon calls the 'co-production of knowledge model' of science and society relations where:

> The dynamics of knowledge is the result of a constantly renewed tension between the production of standardised and universal knowledge on the one hand, and the production of knowledge that takes into account the complexity of the singular local situations, on the other hand (Callon 1999: 89).

In this context, public participation is not simply delimited to authorizing the carrying out of new combinations, but becomes essential to the work of bringing together and holding together new combinations themselves – without public participation things simply fall apart. Under these conditions the horizons of scientific citizenship broaden significantly as the established boundaries between experts and lay people; rationality and irrationality; producers and users of new technology become distinctly blurred. The democratisation of science and technology comes to reflect the growing realisation that the knowledge on which the carrying out of a new combination is based is a genuinely 'social property' and not merely an extension of superior individual capacities and powers (Bohman 1999: 594). This situation of mutual dependence and interactive learning (Lundvall 1992) allows the leadership of innovative ventures to be brought into question as it becomes harder for any particular subgroup or individual to claim they possess sufficient cognitive authority (Reason enough) to decide over the innovative

process as a whole. Deliberation becomes less of a political theatre for wooing public support for innovation and a more decisive means for helping to navigate and negotiate a course for collective entrepreneurship. Science and technology become more fully-recognizable as complex large-scale social enterprises:

> Science is effective not only because it can use the impersonal forces of nature and machines; it also enlists the aid of many different groups and occupations, all of whom are necessary participants in a large collective project…As in any large collective enterprise, there are many points at which the on-going co-operation of many different people and groups of people is required for research to go forward. At each of these points, the credible threat of noncooperation forces a less hierarchical and authoritarian, more decentralized and democratic procedure…Inclusion in the process of decision-making of all those involved in collective enterprises establishes and enhances the critical scrutiny and epistemic authority of experts, while their political authority is diffused and decentralized among the new agents added to the collective enterprise (Bohman 1999: 599-600).

Under the co-production of knowledge as described by Callon and Bohman it can be expected that different types of ’concerned’ groups will arise from within collective research enterprises dedicated to trying to redefine or modify the current priorities guiding research. As mentioned earlier, new groups of individuals identified by medical science as sharing the same genetic risk profile may be encouraged to do more to take their shared fate into their own hands. From being simply ’sufferers’ and ’victims’ of genetic misfortune to which medical science can point when establishing the need for additional research funding, organized patient groups can start to redirect the collective research enterprise by initiating research of their own on ’their’ disease and threatening non-cooperation in relation to the research the established experts wish to pursue (Callon 1999: 90). As procedures of deliberative democracy may be mobilized in the service of representative democracy in securing broad public consent to new programmes of science-based innovation, so they may be modified and used in support of more radical democratic struggles coinciding with new patterns of public confrontation with science and technology.

7. Public Confrontation with Science and Radical Democracy

By linking its own fate to just that of deliberative democracy, the new public engagement with science movement can be seen as not only implicated in the democratisation of science, but in a more widespread process for the renewal of democratic politics as well. Deliberative democracy stands for a broad-ranging programme for 'remoralizing' democratic politics today and the (re)grounding of political life more firmly in 'Ethics' and 'Reason' rather than competition and the aggregation of preferences (Mouffe 2000: 45). In this context, scientific culture can be seen as in some sense exemplary for the future of democratic culture. The traditional élite (anti-democratic) culture of science is not completely foreign to deliberative democracy as it appears to offer some ideal resources for the moral improvement of contemporary democratic life. The problem deliberative democrats have with existing democracy roughly corresponds with the one scientists following the Enlightenment model have always had with society: it is ruled too much by lowly passion; unruly and excessive behaviour; false assertions; manipulative leadership; shady deals and widespread ignorance. Deliberative democracy is therefore about lifting democracy above the levels to which it has sunk. This is clear, for example, in the writing of Giddens when discussing the background to the contemporary democratisation of democracy:

> The state should expand the role of the public sphere, which means constitutional reform directed towards greater transparency and openness, as well as the introduction of new safeguards against corruption. It isn't by chance that governments all around the world have faced accusations of corruption in recent years…Supposedly quite open, liberal democratic institutions in most countries have in practice depended upon backstage deals, privilege and patronage. One of the biggest changes affecting the political sphere is that government and citizens now live in a single information environment. Existing ways of doing things come under scrutiny and the scope of what is seen as corrupt or unacceptable widens (Giddens 1998: 73).

Deliberative democracy is about a recovery of authentic democratic values and the expansion of a more elevated public sphere. In this process, PES takes on a twofold identity; working not only to secure a new democratic face for science in society, but also to bring new standards of reasoning and argumentation from science to public life. In other words, as science 'enters the Agora' in alliance with deliberative democracy it risks enforcing unnecessarily strict rules of public engagement seriously limiting the legitimate forms of expression scientific citizenship can take. Just as passion and outrage were necessarily absent from science according to the traditional Enlightenment model of science and society relations, so they can end up being rendered alien to the exercise of scientific citizenship by the alliance of PES with deliberative democracy. In the latter context, passion and outrage become not only threats to Truth, but also to the achievement of a Fair and Just scientific democracy (cf Sanders 1997).

There is a sense, then, in which a strong reliance on processes of deliberative democracy for reforming science and society relations may be used as a strategy for containing; tranquillizing and foreclosing on the new politics of science-based innovation. Following Chantal Mouffe (1999, 2000) in her critique of deliberative democracy, PES can be accused of attempting to promote a vision of new combinations without real adversaries, greatly reducing the available space for expressions of dissent in innovation processes. Being in opposition to the 'rational consensus' reached in a deliberative forum on new technology becomes again an expression of ignorance and irrationality and testimony to a general 'anti-science' attitude. The scope for conceiving of science-based new combinations otherwise and carried out in line with different priorities is restricted and the political imagination guiding innovation constrained. As Mouffe (2000: 41) insists, the idea of political questions susceptible to being decided rationally and in accordance with an impartial standpoint that is equally in the interest of all speaks against the cultural logic of democratic politics. It abstracts 'the political' out of politics, leaving us in a realm of universal human equality that suggests there could be a 'democracy of mankind', when in practice there can only ever be a democracy for a 'people'. It carries the implication that relations of power can be bracketed out of politics and the conflicts they give rise to reduced to a simple competition of interests possible to harmonize through rational argumentation. Against this vision of politics played out on a neutral terrain, Mouffe (2000: 49) defends one in which:

> Consensus in a liberal democratic society is – and always will be – the expression of a hegemony and the crystallization of power relations. The frontier that it establishes between what is and what is not legitimate is a political one, and for that reason it should remain contestable. To deny the existence of such a moment of closure, or to present the frontier as dictated by rationality or morality, is to naturalize what should be perceived as a contingent and temporary hegemonic articulation of 'the people' through a particular regime of inclusion-exclusion. The result of such an operation is to reify the identity of the people by reducing it to one of its many possible forms of identification.

Translating this vision to apply to the social enterprises carrying out science-based innovations, PES in alliance with deliberative democracy becomes a means for narrowing down the interpretative flexibility of new technology, and under a veil of Morality and Rationality deciding whose will shall count over that of others in the innovation process. Deliberation becomes a way of negotiating who shall be recognized and who shall be ignored in the carrying out of new combinations. As Bohman (1999: 602) points out, in order for the epistemic division of labour supporting innovation to be democratic it is just the definition of knowledge that must be held open for input from all those 'involved and affected'. However, here the problem on many occasions remains that unless attention is explicitly drawn to much of the knowledge labour expended, and the active cooperation offered, bringing and holding new combinations together this will tend to become taken for granted and rendered invisible (Star 1991, Shapin 1989). Demanding recognition; 'acting up' and confronting those currently ruling over the carrying out of new combinations typically remains essential if access to, and influence over, the deliberative forums that matter most is to be won by many groups implicated in innovation. The classic example in this instance is that of AIDS activism where an emergent public affected by AIDS was largely excluded from decision-making processes deciding over their fate (Epstein 1996). Activists successfully challenged the collective research enterprise producing knowledge about AIDS by publicly bringing into question the established moral and epistemic authority of the medical experts presiding over the research process. The continued cooperation between researchers and their patient public came to hinge upon the possibility of

opening up epistemic norms and moral criteria to negotiation eventually offering activists access to various decision-making and funding bodies setting priorities for research.

By connecting scientific citizenship to the alternative model of a radical and pluralist democracy room is created for legitimate forms of public confrontation with science and technology outside of deliberative contexts giving rise to a new vision of the virtuous scientific citizen. As Mouffe outlines, the main issue for a radical democratic politics is not how to erase power from politics (an impossibility), but how to advance forms of power in agreement with democratic values. As a consequence the objective is not to eliminate passions nor limit them to the private sphere for the sake of rational argument, but to mobilize them and welcome their intervention when put to good democratic effect. According to Mouffe (1999: 756), the specificity of modern democracy lies just in its acceptance and legitimation of conflict and the refusal to suppress this through the imposition of an authoritarian order. While radical democracy does not reject the need for degrees of consensus in political life, this consensus will always remain of a conflictual and contestable nature. Radical democracy values dissent in equal measure to consensus and supports the institutions through which both can be manifested. Therefore, as Mouffe expresses it, a radical and pluralist politics advances a ’mixed game’ combining collaborative and conflictual actions and rejecting political practice that concentrates on one to the exclusion of the other (see also Young 2001: 671).

The radical scientific citizen is fully prepared to participate in demonstrations and direct action aiming to secure a currently denied democratic identity in innovation. Street marches, boycotts and sit-ins and other means of publicly confronting those ruling over science and technology are accepted as legitimate practices of democratic criticism. The scientific citizen in the guise of the activist bears witness to current wrongs and injustices in scientific affairs which require that the ordinary rules and practices perpetuating these wrongs must be broken with. Their unjust effects need to be publicly communicated and demonstrated for all to see (cf. Young 2001: 673). Such action can be seen as impelled by reasonable anger and frustration directed at the perceived intransigence of those currently deciding over innovative matters. Thus, scientific citizens are warranted in indulging in public displays of outrage in their attempts to

openly shame and scandalize those currently in authority. It is permitted to be disruptive and disrespectful in public and to create disturbances around collective deliberations which are presently experienced as highly exclusionary in character. While the scientific citizen as activist may be taking a partisan position in defence of a particular individual or group in society, they are also to be understood as assuming a moral stance in defence of general ethico-political principles (like scientific democracy) which are accepted as existing through many different and conflicting interpretations subjecting them to continuous contestation (Mouffe 2000: 103, Young 2001: 673).

In their efforts to publicly expose existing wrongs and injustices, scientific citizens in the guise of activists will be encouraged to assume the role of producers of new science communications working to construct alternative public understandings of science and technology (APUS). Again these alternative oppositional public understandings do not have to be interpreted as purely 'anti-science' in sentiment, and may indeed still remain themselves high in scientific content; instead they should be seen symmetrically, like mainstream PUS, as generally legitimate attempts to impact on the public appreciation of some aspect of science and technology in particular. Like conventional PUS, APUS activities can be viewed as attempts 'to tell the truth before a larger public' (Barry 1999) typically encompassing the introduction of new practices of testifying and witnessing. In both cases, the ambition is to show, or point at, something that demands larger attention; something which needs to accepted as self-evident and real. While in the case of mainstream PUS the pointing is usually towards the technical or experimental virtuosity of established scientists (Collins 1988), in the case of APUS it will typically be towards the 'markers of the unacceptability of another's (scientific) actions' (Barry 1999: 76 – my addition). While PUS has been designed to reassert the independent and unaided authority of established experts, APUS will usually be seeking to open up specific areas of science and technology to broader forms of public participation and representation. Both PUS and APUS are in the business of producing interpenetrating technical and political 'demonstrations' of a non-innocent kind (cf Barry 1999: 77). Both are about the crafting of new tools of politico-scientific persuasion intended to affect the conduct of others.

8. Conclusions

Why the emerging interest in scientific citizenship today and multiple new forms of public participation in science and technology? The answer relates firstly to the new faith being placed in processes of science-based innovation for securing sustainable sovereign territories. In a globalizing world, where States continue to struggle for their existence in the absence of clear-cut enemies, innovation and technological competition are gaining recognition as perhaps the most important forces shaping the creative destruction of sovereign powers (Elam 1997, Giddens 1998). When the future of 'our' society is seen to depend upon science and technology, it is only to be a expected that interests will arise wishing to redefine citizenship in more 'scientific' terms. However, as these interests take hold so both the physical and conceptual territory of government become refigured (Rose 1996).

Scientific citizens participate in the task of deciding what constitute important opportunities and acceptable risks in the carrying out of science-based new combinations. They are members of collectivities that define and delimit themselves more completely by their capacity for producing and disseminating new types of useful knowledge. By creating a closer identity between science and society; the scientist and the citizen; collectivities intent on enabling innovation are liable to experience both a growing socialization of science and an advancing 'laboratorization' of society. This two-way process in support of enhanced innovative capacity will not, however, proceed as a matter of course and will require continuous support. For citizens to identify themselves as 'scientific citizens' they will need to be persuaded to prize new rights and freedoms and to accept new duties and obligations. Scientific citizenship generates the need for a remapping of the moral terrain of science and society relations and the articulation of a new landscape of citizen virtue and vice.

In his classic theory of innovation and entrepreneurship Schumpeter connects the carrying out of new combinations with feats of individual will and the exceptionally virtuous actions of entrepreneurs. The only person Schumpeter's entrepreneur is prepared to negotiate with is the banker who is to finance him, everyone else involved in innovation is depicted as remaining nothing more than slaves and simple extensions

to his will. Schumpeter's entrepreneur takes sole responsibility for deciding how to ride the waves of uncertainty generated through innovation. He leads, others follow; he speaks, others listen. The role of such traditional authority figures in innovation today appears highly restricted as the idea that they could successfully master all the uncertainties arising in the carrying out of new combinations appears highly implausible. With the death of Schumpeter's entrepreneur, it can be argued that, before all else today, success in innovation depends on the creation and maintenance of a collective will to innovate. It depends on the exercise of virtue in governance in the face of inescapable uncertainty. As Hinchliffe (2001:185) maintains, this governance virtue needs to be cultivated not so much for responding to periodic 'uncertainties of knowing', as for achieving a continual 'knowing of indeterminacy' in innovation. When innovation is accepted as founded on a knowing of indeterminacy, those responsible for crafting a collective will to innovate grow more alert to the subtle shifts in public expectations of new technology and how these might be turned to local advantage by new labours of persuasion. Working to refine and enlarge a collective will to innovate coincides also with the task of articulating an attractive vision of science-based community, and a range of positive community values setting 'us' apart from 'them' - our competitors. Different 'concerned groups' in innovation like patient organizations in medical contexts can be seen as generating their own 'will to innovate' based on an alternative 'us/them' dichotomy which both strengthens and complexifies the overall process of collective will formation.

Therefore, partially replacing Schumpeter's entrepreneur in the contemporary context of science-based innovation, we have a growing range of new 'experts of scientific community' (Irwin 2001). These experts are fulfilling an entrepreneurial function by acting as leaders of some vision of extended scientific community, drawing together sciences and publics, and combining them through the medium of some model of active scientific citizenship. Included on the list of vying new experts of scientific community must also be those social scientists currently calling for a 'new social contract' or 'New Deal' between science and society. Such calls are equivalent to practices of scientific statesmanship attempting to articulate as they do what constitutes, and what does not constitute, virtue in scientific governance today.

Among new experts of scientific community, a particular interest seems to exist for deliberative models of democracy thought capable of advancing both innovative efficiency and legitimacy in science and society relations. Models of deliberative democracy appear to resemble appropriate technologies for cultivating virtue-intensive wills to innovate. By emphasizing the place of education and training in deliberation for the production of 'more informed' debate, deliberative democracy can be seen as providing the intellectual foundations for a 'democratic turn' in the public understanding of science movement today and its mutation into a public engagement with science movement. However, a strong reliance on deliberative forums to the exclusion of other forms of political expression in the construction of virtuous scientific citizens may prove counter-productive in the long-run. By building on the possibility of founding decisions in innovation on 'rational consensus' above and beyond 'mere agreement', deliberative democracy is in danger of cutting short and foreclosing on the politics of science-based innovation. According to the alternative model of radical and pluralist democracy, tools of deliberation when used to the exclusion of other forms of political expression become tools of hegemony, not of rationality (Mouffe 2000: 49).

A final issue to contemplate is that while greater public participation in science and technology can only appear positive in the light of the historical dominance of the Enlightenment model of science and society relations, in the long-term the most important issue may be how to help citizens limit their exposure to the claims of scientific citizenship. Just because science and technology are so pervasive in everyday life there is potentially no end to the science and technology related-issues for responsible citizens to engage with. A precondition for active citizen engagement in some area of science and technology must in the end be disengagement, passivity and indifference in another. Ultimately, the rights and freedoms of scientific citizenship will hinge on the ability of citizens to choose for themselves their points of entry into new scientific community. The benefits of participation in any particular field must remain possible to weigh up against the costs. Participation is also always a matter of deciding how much of self to sacrifice in the public cause. This makes powers of choice over levels and sites of participation into prize possessions.

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STAGE (Science, Technology and Governance in Europe)
Discussion Paper 2
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Changing Conceptions and Practices of Governance in Science and Technology in Europe: A Framework for Analysis[35]

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Introduction and summary

In this second discussion paper we explore how the theoretical discussions from the first phase of the project may be turned on the study and comparison of the various case studies. In section one we summarize the main theoretical and methodological arguments made during the first phase of the project.

Section two presents the methodological approach of extended case studies and an overview of the case studies that have been singled out for detailed analyses. In accordance with the design of the project most examples are primarily located in national contexts of governance. Some can be considered to be specific to a particular country and the result of grass roots initiatives in policymaking. Others transcend the boundaries of nationally defined policy processes as they concern transnational issues. The combination of case studies confronts us with processes of convergence and differentiation in the development of new formats of public engagement. More detailed and empirically rich analyses are needed to foreground these dynamic and constructive features. The extended case study approach is intended to do that.

In section three we explore the communicative fields involved in initiatives to enhance public participation in decisions that involve science and technology. What distinctive formats of public engagement with science and technology emerge from the case studies? Along which dimensions do we expect such initiatives to differ from one another? Organizational frameworks adopted in initiatives to enhance public engagement seem to be a key issue and more specifically how such initiatives relate to the formal political arena and government bureaucracy on the one hand and to the public arena on the other. Furthermore, cases will differ in terms of the assumptions concerning state, economy, science and individual liberties that are implied in the framing of issues and options by organizers and participants.

The fourth section develops these expected differences into a six-fold typology of ‘formats of engagements’. These are ideal types and there will be all sorts of grays in between them as soon as one applies the typology to actual cases. The typology is therefore primarily intended as a sensitizing device to focus on the distinctive features of case studies that are of interest for the project in the empirical analyses.

In the fifth and final section we discuss how to relate the typology, levels of governance and questions of convergence and divergence in the case studies and their discussion. This leads to an appendix of topics and aspects to be considered in doing the case studies.

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1. Scientific citizenship - education, deliberation, hegemony

Terms such as 'scientific citizenship' and 'citizen science' have been proposed as a framework for analyzing emerging forms of governance in science and technology (Irwin, 1995). This provides an explicitly normative and constructionist framework for assessing, as well as assisting in the construction of, appropriate structures and practices in terms of core norms and values that should underpin political processes in liberal democracies. Public participation and engagement are emphasized as both inevitable and desirable in the framing and assessment of issues, validation of knowledge and weighing of evidence on which democratically accountable decisions are based.

In recent debate about 'science and the public', several models of this relationship have emerged as a consequence of a reimagination of the science and society relationship (Elam & Bertilsson, 2003). The separation and distance between science and society has collapsed into one of "mutual embrace and varying depths of entanglement" (ibid), as emphasized by concepts such as 'contextualized knowledge production' (Gibbons et al, 1984), and of science and innovation as 'collective experiments' (Callon, et al., 2001), and as 'enlargements of politics' (Latour, 1998). The educational or enlightenment model of public understanding of science (PUS**)**, as epitomized in the infamous 'deficit model', has been replaced within the PUS movement by more reflexive approaches. A 'democratic turn' has taken place, by which the agenda of PUS has been modified and moved beyond its predominantly educational framing. Under conditions of high uncertainty, the hesitations and cautiousness of the public in adopting and accepting major innovations may be natural and well founded. "Rather than simply correcting public opinion from a position of high authority, the new task for PUS is to help the public help itself in forming adequate opinions on controversial issues pertaining to science and technology" (Elam et al, 2003:[11]). Thus, PUS evolves into broader approaches for designing new contexts and arrangements for extended debate and discussion about contemporary science and technology, through which individuals are asked to pass judgment on issues and possible future products about which there is inevitably much uncertainty. The more reflective forms of PUS is then to sustain processes by which the public may form adequate opinions and preferences of their own through informed public debate.

These new PUS approaches are increasingly phrased in terms of deliberative models of democracy. A conception of PUS as *public engagement with science* (PES) has

emerged through critical assessments of various deliberative positions. These represent a more adequate conception of the science/public relationship, in terms of their opening up for more conceptualizations of the science/public relationship that allow a broader range of legitimate forms of public participation, and of promoting more reflexive PUS policy approaches. Nevertheless, continuities with earlier, less reflexive conceptions of PUS may be seen to linger. At least, in some respects and variants, this appropriation by the PUS movement of deliberative conceptions of democracy is an adaptation and extension of hierarchical models and restrictive assumptions about rationality as embedded in PUS. Deliberative democratic theory takes as its model an idealized version of scientific discourse, emphasizing rational consensus and the 'powerless power of the superior argument'. These conceptions and ideals of democratic politics may, thus, amount to a model of democracy which conforms to and favours forms of discourse and participation with which scientists are already well versed: "By valuing rationality, reserve, selflessness and power of argumentation, deliberative is a democratic politics played out on the scientists' home turf" (ibid: 14). Thus, these conceptions of deliberative democracy may reproduce those very relationships of hegemony and hierarchy between expert and lay knowledge, insider and outsider participation, which should be deconstructed and reversed through the broader conceptions of participation and governance that are envisaged.

There is a need, then, to take deliberative conceptions of policy processes one step further, and develop sensitivity to the ways PES conceptions of deliberation and dialogue are some times taken up as part of strategies to reconstruct public acceptance of science-based and -driven innovation. There is a risk with PES conceptions of deliberative politics that the irreducibly political dimension of power and hegemony embedded in political debate and governance practices be obscured. Narrow procedural versions of deliberative democracy may limit the range of legitimate expression of scientific citizenship. The strong preference in PES for deliberative formats of governance and democratic politics should, then, be critically assessed, drawing on alternative conceptions of democratic politics and scientific citizenships, including those of agonistic or radical conceptions of democracy. Such alternative conceptions not only value consensus, but also dissent, and institutions that allow and stimulate dissent to be expressed. Hence, a conception of scientific citizenship is envisaged that allow *alternative public understandings of science (APUS)* to emerge, often outside institutionalized deliberative forums, and through forms of public

confrontation with science that cannot be precluded as legitimate parts of democratic governance and scientific citizenship.

To develop these ideas in the case studies we need a methodology that allows us to analyze the organization and framing of public involvement. The methodology should also sustain and enhance our sensitivity to the ways and forms that relationships of power and hegemony are constituted, played out and contested. In particular the methodological approach should allow a careful scrutiny of cases to bring out the ambiguity of dialogue, openness and transparency, promoted as venues for overcoming oppressive and agonistic politics, while also being amenable to being used to constrain the scope and forms of dissent that are taken into account. The method of extended case studies outlined in the next section should sustain the development of such sensitivities. It should additionally offer a framework for instructive comparisons between case studies.

2. Methodology and case studies

Beyond models of 'the national'

The participants in the project hold that a methodology that starts from a typology of national policy contexts to account for differences between cases would not be adequate. A first objection concerns the reductionism implied in such a typology. It would reify the highly dynamic contexts in which new forms of public engagement with science and technology nowadays develop. We prefer to conceive of participatory initiatives and policy contexts as equally dynamic and fluid. In Europe (as well as in other parts of the world) one sees new initiatives towards enhanced public participation everywhere. Process of mutual learning and mimicking of what is seen as best practice abound both within national arenas as well as transnationally. Such initiatives are part of, or in any case related to, attempts to change and redefine policies and to develop new regulatory and policy frameworks. Policies and policy contexts are on the move at the same time due to adjustments made in response to economic, political, cultural and scientific developments. Our methodology needs to take this dynamism into account and look for the relations between our cases studies and the articulation of wider politico-economic and policy dynamics.

To argue this is not to deny the relevance of accounts that emphasise differences between countries or regions to explain variations, successes and failures. No doubt

there is often considerable truth to such accounts, if only because actors involved in the processes we refer to do themselves account for differences in terms of national differences and model their own actions accordingly. National traditions and culture do play a role, but in ways that are not easily reduced to a limited n-dimensional grid of independent variables on which cases can be said to depend. Parties and people perceive and conceptualize national context and styles and bring these interpretations to bear on the processes in which they are involved. How this works out is hard to say and depends on time, circumstance and who else is around. We hold that such perceptions and interpretations as well as their effects should be part of the empirical analyses, but to do that and retain the richness of local contexts and variations it seems more fruitful not to introduce this or that national policy culture as an objective backcloth to the events and processes in which we are interested.

There are also other objections to use a fixed typology of national contexts. Such a typology of national policy cultures tends to obscure cross–sectoral variations that exist in individual countries. How environmental issues are dealt with in a particular country may be radically different from the ways ICT policies come about and are implemented in that country. Even within the field of environmental policies detailed studies find important differences depending on the specific areas one is looking at, the scientific, professional fields involved and the specific regulatory bureaucracies as they have evolved around particular issues (Halffman, 2003). Another objection is that typologies of national contexts tend to ignore that policy development has become part of much broader, transnational development patterns both in the political economy of the EU as well as in the ideology and practice of civic engagement. With respect to the first it would be unwise to ignore how initiatives to promote public engagements are nowadays a part of the economic and political restructuring of the European and global economy. Many of the controversies and debates about new technologies and their consequences are at the heart of these broader processes of political, economic and cultural readjustments. What goes on in our cases is often as much the product of these changes as constitutive of these processes. A typological approach that takes institutional differences between countries that go back to the mid-nineteenth or early twentieth century as an unproblematic given easily misses these transnational dynamics. To us these transnational dynamics seem quite important, however.

Extended case studies – the methodological primacy of selected 'anchoring' cases

The methodology of the extended case studies allows us to follow the interplay between the initiatives for public engagement and how these draw on policy contexts and contribute to their redefinition at the same time. It acknowledges that each national context displays specificities related to the diversity of histories and policy cultures. It allows us to address the difficulty in selecting and defining quite similar areas and cases for all countries involved in a strict comparative approach. If one looks at the variety of initiatives to enhance public participation with respect to science and technology, one sees an enormous variation in topics and formats of engagement. Variations that are not likely to be sufficiently explained if one compares a limited set of cases in terms of an unambiguously operationalised, yet equally limited set of variables. The solution adopted in this project is to explore in an iterative process which specific dimensions appear to be especially prominent in key cases and then to compare these 'anchoring cases' with other case studies for the same country as well as with cases analyzed as they develop in other contexts.

Starting from this idea, key case studies have been selected because of their expected exemplarity and density. They have been chosen for their "anchoring" capacity, that is, for their ability to provide entry points into other case studies, which may serve as "qualifiers" to the main cases. An overview of these cases is given in Appendix A to this paper. Case studies will be dealt with in their unfolding, their specific histories. Some countries will provide "anchoring" cases that may be used by other countries for comparative purposes. Some such comparative studies may be pursued by scholars outside the STAGE network: the case studies will be more generally available as a resource.

The method of extended case studies - as we have dubbed the approach - does not adopt a naïve ethnographical approach that attempts to make no assumptions whatsoever about the cases studied. Rather, we analyse the cases with a view on the organisational forms that emerge and their implementation. Furthermore, the case studies are expected to bring out assumptions with respect to the relations between state, economy, science and individual liberties that are part of the framing the questions and issues. Such assumptions are not taken for granted in our analyses, nor are they used as explanatory categories to account for the dynamics of the cases. Rather, such assumptions are explored in terms of their interconnections and how their combinations and interactions allow for certain forms of public participation to emerge and not others.

3. Formats of engagement and assumptions about publics and democratic decisionmaking

Political, public and scientific arenas

In most of our case studies, public engagement with science and technology takes place within national political arenas. Even where a strong transnational dimension is undeniable (GM food for example), national political frameworks remain of key importance for public participation. And yet, considerable activity often seems to be going on independently of the formal national political system, for example activities initiated by NGOs, community groups and individual writers and commentators that use the mass media to communicate their views to wider audiences. Scientists and professionals often engage in debates in their own specialized media to discuss policy issues. To grasp the dynamics of controversy and public participation it is important to consider both what goes on in the formal political arena and what organizations and individuals outside the formally political arena do in adjacent fields of communication. It is important to pay attention to this differentiation into distinct fields of communication and engagement. How do things and perspectives developed in one domain translate or spill over into other domains? To analyze such processes and their effects it is helpful to distinguish between the formal *political arena* and the *public arena*. The political area refers to the formal system of political representation and decision-making and includes the activities of political parties as political parties, the government, related bureaucracies and the institutionalized consultations between representatives from industry, trade-unions and government. *Public arena* refers to the realm of the mass media and related forms of communication. Here we find interest groups, civil organisations and individuals who engage with one another in deliberations about social, cultural, moral and politico-economic problems. This public arena is part of civil society.[36] It is as if it were the central marketplace for ideas, information and opinion of civic society. In the public arena mass media (including mass entertainment) dominate, but it is important not to restrict it to what the mass media do. The public arena encompasses all sorts of actors that seek to get the attention of non-institutionalized publics for issues and arguments about the public good. Even groups that are highly critical about the structure of the public arena and the role of the capitalist mass media depend on the public arena to reach larger groups in the population and to mobilize

[36] See Cohen and Arato (1992:ix). To relate the existence of a public arena with the concept of civil society opens up a space for debate on various theoretical issues. For the classical pluralist view see Almond & Verba (1965). For neo-Foucauldian critique see Rose (1999).

them for or against particular causes. Mass media corporations evidently operate in the public arena as well as outside it in the economic field. For political parties one can make an analogous observation.

As Hilgartner and Bosk (1988) have argued, public arenas are not only highly competitive, but they are also highly competitive in ways that distinguish them from the formal political arena. Competition in the public arena is concentrated on the chances to capture the attention of wider audiences or publics. The extent to which mass media publics are able and willing to devote time to particular topics is extremely limited and so is the time during which attention will remain focused on one topic. As a result, groups and individuals compete with one another constantly for attention from the general public or their envisaged target audience. For these and other reasons both the public and the political arena are best conceived as *agonistic* rather than consensual. In so far as they can be said to rest upon shared assumptions these often only surface in struggles to explain and justify positions and views. So, if one looks for the agonistic encounters one will run into common frameworks and implicitly shared understandings soon enough. Whenever a sort of consensus is articulated and supported by participants, it will most probably be temporary, and disappear from view as soon as 'new' issues show up on the 'public agenda'.

One reason why the differentiation between the political and the public arena is relevant to the study of public participation and engagement is that topics and issues prominent in the public arena as may or may not be taken up with similar priority in the political arena. And if they are taken up it might well be in a form that diverges from how the issues and concerned would be framed in the public arena. And of course the reverse may also be true: Issues of considerable priority and relevance in the political arena may not get any attention in the public arena. Current concerns of policy makers with projects to enhance public participation in decision making have to do with the mismatch between public opinion as expressed in the public arena and in public opinion studies communicated in that arena and the politico-economic and administrative agendas drawn up by governments. Although both the political arena and the public arena are agonistic and competitive in nature, it is therefore important for analyses of public participation to acknowledge that they differ in structure and dynamics.

Furthermore, the differentiation between institutionalized political arenas and the public arena can be said to exist in all the liberal democracies included in this project. As all

EU member states are formally liberal democratic states, we find minimally comparable differentiations between the political system, civil society (which encompasses the public arena), the economy and the scientific and professional sectors. Yet, the interesting part of our research is how countries, sectors and individual cases differ beyond this minimal common ground. The question is how public engagement will be framed and initiated differently in various countries and sectors, how this echoes specific differentiations into public, political and private domains and what that implies for the course and outcomes of public engagements. When governments initiate public consultations it is important to investigate how they themselves apparently conceive of the relation between the political and the public arena in doing so. In each case study we have to ask what makes this case a unique example of public participation and ask how this bears upon the differentiation between the political, the state, the private and the public arena as it apparently operates for that case.

To distinguish between the political arena and the public arena, between science and the public arena or between the economy and the public arena, does not imply that they are completely independent from one another nor a realist understanding of such boundaries. They are and remain the outcome of politico-economic and social cultural interactions and the continuities across such 'boundaries' are as much part of how they operate as the differentiation between the one side of the boundary and the other. Liberal democracies presuppose civil society and the public arena and vice versa. Without a public domain and a private sphere that functions in a particular way, liberal democracy as a political system would be impossible (Dean, 1999, Rose, 1993, 1999). In each of the democracies of the EU particular differentiations into distinct fields or spheres, including the 'private sphere' make up the institutional architecture and ideology of governance. To investigate issues of governance and participation or public engagement we have to take into account how the demarcations into distinct spheres part and parcel of public debate and constitutive of the various publics involved and their relative abilities to speak with authority.

Analogous points can be made with respect to the economic field or arena[37] and fields of professional and scientific expertise. They can be said to constitute relatively independent arenas characterized by specific agonistic and competitive forms, differentiated from the political and public arenas. The differentiation between the

various fields or arenas will be anchored in formal institutional arrangements supported by law – but the actual relevance of the boundaries for what is going on may be a matter of constant re-interpretation and struggle inside and across these same boundaries. Once again, the boundaries between such different fields or arenas are as much the outcome of public encounters as part of our understanding of why public engagements take on specific forms in specific sectors and countries.

Reflexively speaking, the very debate about public understanding provides a perfect example itself of the arguments outlined above. In the debate over the deficit model the boundaries between science, civic society and political democracy are redrawn as a part and as a result of the struggle to define public understanding, why it is at all important, who should be allowed to talk, who should listen and how decisions with respect to science and its (ab)uses should be taken.
For our case studies, it is important to establish how issues are positioned by participants vis-à-vis the arenas distinguished. Are the issues defined in terms of a non-continuous distribution of distinct responsibilities and discretion, for example between scientists who are expert and others who are lay people? Do initiatives seek to enroll specific groups in the debates and consultations? Are consultative formats and problem definitions contested or taken for granted? Are experts and particular institutions claiming positions of authority? If so: How and to what effect for the opportunities and forms of participation by others? To what extent and how public engagement remains limited to the topic at hand or branch out into a more principled political struggle (and why this should be the case) is another important topic to be studied empirically.

Our first attempt to formulate a heuristic framework of various types of governance implied in initiatives to enhance public participation will rely on the differentiation between the public and the political arena. How do initiatives relate to that boundary in the organizational approach towards consultation or mobilization? How is the initiative framed with respect to the role and responsibilities of the state, those of consumers, individual citizens and private organizations? Do people contest the initiative with respect to this or is the basic differentiation of roles and responsibilities taken for granted. How is opposition staged and dealt with in various phases of the debate?

[37] Field and arena are used as synonyms and interchangeable in this text. Fields and arenas are supposed to be always competitive and agonistic, if not antagonistic, regardless of the word used.

Inclusion/exclusion

In recent years initiatives to promote public understanding of science have often been initiated by governments in response to public concern or to elicit public opinion and public opinion formation. Most of our case studies involve such initiatives and they are at the center of our analyses. Yet, there are also case studies in which the initiative for debate started with non-governmental groups. Initiatives will differ - regardless of who first instigated the issue and the debate - in the extent to which their approach and definition of the issue aims at inclusion of a wide range of actors or is more exclusionary.

Initiatives will also differ depending on whether they aim to intervene in the public arena as it exists or seek to operate at its margins. If intervention in the public arena is the goal, initiators may either restrict themselves to putting issues on the public agenda or play an active role in the debate itself. Governments may for example prefer to initiate public debates, but stay out of these debates themselves, positioning themselves instead as observers of civil society. Such arrangements may be inspired by the wish to avoid accusations that the government tries to manipulate.

A somewhat different situation occurs when initiatives aim to 'correct' or 'complement' the mechanisms and formats of the public arena so that 'voices' will be heard that would otherwise be excluded from the debate. Such initiatives may include mass media, open meetings, surveys, online debates, phone-in arrangements etc. The new media (websites, email) may be important resources for such initiatives.

If governments seek ways to 'correct' or 'complement' the debates of the public arena they easily become themselves active players in the public arena. This may lead to tensions and conflicts with mass media and NGOs that already have taken positions. To avoid such situations governments may delegate initiatives to intermediate agencies outside the formal political arena. Such intermediary agencies then organize participatory events and to report on them. Direct involvement leading to accusations of manipulation is avoided this way, while at the same time such delegation preempts accusations that the government shows lack of initiative. Recent debates in the Netherlands with respect to biotechnology provide a rather unsuccessful attempt at a hands-off approach that nevertheless sought to correct the functioning of the public arena and the dominant role of NGOs in that arena.

In recent years there has been an upsurge in the activities of such intermediate agencies. A small 'industry' of agencies involved in organising debates, focus group research and consensus conferences seems to be emerging. The formats employed are intended to elicit information about the concerns, views and interests of so-called lay people but in a more systematic and controlled way than would be possible by indirect initiatives that work through the public arena and its organisations. Yet, it is important to investigate how the emergence of this intermediate sector relates to the public arena as it exists independently of government and government-sponsored activities. Only through such an analysis can we address the question whether the upsurge to enhance public understanding and engagement is a form of political marketing or an genuine contribution to public participation and democracy.

Yet another form of public engagement ignores the public arena more or less and focuses instead on the corporatist belt of consultative bodies and advisory committees surrounding the formal political arena. Here the format of engagement is less inclusionary with respect to the general public. The debates and consultations are not so much conducted in the public arena but in more exclusive environments like advisory bodies and consultative councils. Industrial representatives and trade unions often have a considerable stake in such restrictive deliberative formats, but other groups may be represented as well like consumer associations, nature conservancy groups and a whole range of professional organizations and their representatives. These 'corporatist' forms of deliberation will often be employed in sectors with a high degree of organization of the most prominent stakeholder groups (health, food, housing etc.).

Assumptions underpinning and framing debates

Apart from the organisational format of public engagements with science it is important to look as closely at the ways in which the substantive issues for debate are framed by the various parties and how this again relates to conceptions of the boundaries of governance vis-à-vis the public and the private sphere as well as the economy. One may expect a close connection between the format for public deliberation preferred by particular parties and such forms of framing the substantive issues. This not only concerns which groups should be included but also what roles and positions will appear as legitimate.

In some versions the public will be construed as an entity to be educated and instructed with respect to the pro's and con's of new technologies. In other versions they will be construed as a critical audience able to articulate what how their lives will be affected by technological decisions. And in still other formats the public might become an important factor in the actual definition of options and constraints on decision-making. It is not very probable that a format for public engagement that is highly corporatist and relies on institutionalised interest-representation will conceive of the public as a factor to be mobilised as such.

As a part of the case studies it is important to analyse how the issues to be discussed are framed and how particular forms of framing of technical issues are related to specific conceptions with respect to the role of the state, civil society and the private sphere of consumers and producers. If a problem is defined as having to do with regulation of the production of goods for markets and their admissibility, the role and responsibility to be attributed to state regulation and political decision-making beyond basic safety, environmental and health criteria will be limited. Yet there will be variances in the degree of regulation and surveillance by the state or supra-national agencies. If the problem is framed in terms of public ignorance and education the chances that the political decision is defined in terms of enlarged public participation is equally unlikely. If the area of concern is perceived as highly contentious and antagonistic by the interest groups involved public hearings will just reproduce that diversity and not much more.

In all the examples and possibilities just listed the specific substance of the topics of concern is expected to connect to the format of engagement and basic assumptions about the proper ways to address issues and problems. Some of these assumptions are quite basic and may concern for example the autonomy and independence of science vis-à-vis state, religion, society and the economy. Others concern the view one has on decision-making and democracy. Still others have to do with the relation between scientific knowledge and lay knowledge (expertise and public opinion). Of great importance in liberal democracies is the relation between the economy, the state and the private sphere. To the extent that one or more of these assumptions are themselves problematised in the debates on which the case studies focus, the case may become 'antagonistic' because insurmountable struggles surface. In most cases, however, such basic assumptions are not confronted directly, but they do surface- often implicitly- in discussion over formatting and framing of public debates. We do assume that it is possible to analyse these instances with a heuristic typology of forms

of governance that combines such basic assumptions with a preference for specific forms of engaging the public.

A typology of governance

The ambiguous and tangled relationship between rationality and power, discursivity and hegemony, in emergent forms of governance will, inter alia, be analysed on the basis of a preliminary descriptive taxonomy of types of governance. This taxonomy may provide a common frame of reference by which different forms of governance of science and technology may be characterized and related to each other. Each type or mode may be seen to represent typical responses and strategies in policy processes, in terms of selection and combination among options defined by the dimensions and assumptions sketched above. The typology builds upon the discussions in the previous sections and on the paper by Elam & Bertilsson. Especially important is the focus in this paper on the ambiguous relationships between educational and deliberative forms of governance, and its emphasis on 'APUS', i.e., acknowledging agonistic and adversarial forms of participation and governance as legitimate forms of performing scientific citizenship. These categories should, hence, be core parts of our framework for descriptive analyses and normative assessment of forms of democratic participation and governance in science and technology.

The forms of governance included in our taxonomy differ - first and foremost- in the roles and identities they assign to 'the public', how 'its' input is being defined and taken into account in the policy process. The approach does not assume that the 'public' is a given, stable entity that may be seen to exists independently of the processes in which 'it' participates and are taken account, nor that the notion of the 'public' may be an source and basis for assessing the appropriateness of governance conception and practices which they may reflect more or less selectively or adequately, or 'distort' to lesser and greater extent. Rather, the 'public' and its role in the processes of governance are constructed in and through the processes and modes of governance themselves. Each pre-define rules and criteria for the type of negotiation to be conducted, and what kind of voices that should be taken into account. These constructions define criteria of public accountability and responsibility, and make assumptions about whether an active or passive role is accorded to the public in the policy process (Hayrinen-Alestalo, Pelkonen & Snell, 2002). One may see, e.g., that, depending on the type of governance in question, 'the public' is constructed, and taken into account, as a basically passive *population* – e.g., in surveys of 'public opinion'; as *human beings*, when issues are framed in terms of (universal, intuitive) values that decisions must accord with, soliciting active public response, but in a clearly circumscribed framework ; as *consumers*, when appropriate policies are assesses in

terms of (possible) consumer patterns and preferences; or as (active) *citizens*, when the voice of 'the' public is articulated and voiced by active members of constituencies that take part in all sorts of public deliberation on the issues at hand. The performative nature of public engagement with science and technology must be brought out.

Our preliminary typology comprises the following six types:

- discretionary
- educational
- deliberative
- corporatist
- market
- agonistic.

Discretionary governance (DISC)

In *discretionary governance* policymaking takes place with virtually no explicit interaction with 'the public'. Decisions are taken without much formal nor informal input to the process by any group outside the governing bodies themselves. For science and technology policy, this may be seen as 'default' practice to a larger extent than for most other societal domains, where issues are normally more politicised. The institutional structures and practices of science policy has developed under conditions in which extensive implicit public trust has prevailed, based upon an image of science as a neutral and objective basis for making policy, and where science and technology have been seen as sources and drivers of uncontroversial, quasi-universal goals and values – progress, welfare and growth –outside and above contention within the normal political process. Thus, science policy has been able to develop, without loss of public legitimacy, in forms in which discretionary governance has played a salient role. In defining a mode of governance which take place within the confines of state politics, and in which the public – ideal-typically – plays no role at all, it falls *prima facie* outside the scope of STAGE analyses; however, it may be seen to represent a zero-value option against which all following modes are negatively defined. At the same time, forms of public participation, often agonistic, will in many cases arise in reaction to attempts to impose discretionary governance practices; the recognition of the need for broader, participatory processes may also be the direct consequence of learning – 'the hard way' – that discretionary governance practices will be inappropriate and inefficient.

Educational governance (EDU)

Educational governance reflects nascent or manifest tensions between prevailing policies and 'the public', as indicated, e.g., by characteristics of media coverage, voices in public debate, or public opinion (polls, surveys). Educational approaches assume, however, that a main source of and cause for the disturbances lies in lack of adequate information and knowledge. It is a policy approach based on the 'deficit model' or Enlightenment conception of the relationship between science and public/lay knowledge. Here, experts play the dominant, active part, either through information and dissemination, or by 'contribution to informed public debate'. Educational modes of governance differ from discretionary by their acknowledgment of some form of resistance, non-acceptance or -compliance, among the public with policies that are pursued or sought by powerful players; they also acknowledge that this resistance can only be neglected at the risk of loss of political support. While part of the resistance may be excluded as expressions of extreme forms of irrationality – anti-science and -technology – that can be dismissed as outside the scope of what has to be taken into account when policies are articulated and implemented, some forms of resistance must be recognized as having a reasonable basis and needs to be taken into account in the policy process. In its pure form, however, the educational approach frames public resistance to the progress of, and exploiting the opportunities of science and technology merely in terms of ignorance and lack of information. This may not wholly be the fault of the public itself, policymakers and insider players may self-critically acknowledge having neglected their responsibility to educate the public which could have pre-empted the science/public alienation that have made science policy making ridden with complexity and conflict.

Educational approaches do not in themselves draw the policy process unequivocally towards to any one of the three dimensions of the policy process. They may be deployed in high as well as low emphasis on the public arena, as both PR- and public campaign oriented efforts, or in, e.g., educational reform. They do not either necessarily embed a preference for the state politics as against the market, and may be as well be discerned in agonistic configurations, as when NGOs see public consultation arrangements as opportunities for disseminating their message and educate the public on the science of the issue.

Educational approaches are in form and substance strongly *hegemonic*, conceiving the distribution of the essential resources in terms of haves and have-nots, and the negotiation or learning process as strictly linear, from one of the parties to the other.

Deliberative governance (DEL)

In its strong emphasis on consensus, ideals of deliberative democracy connotes a dream to reestablish the conducive socio-political conditions within which science policy could be formulated and implemented in its 'golden ages', i.e., when science and technology benefited from both strong growth and extensive autonomy on the basis of an implicit strong public support. This support was, however, to a large extent based on the black boxing of key policy issues as basically technical in nature, and for experts alone to address. However, under present conditions, there can be no consensus on the basis of black-boxing and implicit trust. The choices are no longer seen to be only or even primarily technical in nature, but have to be framed in terms of their socio-political implications and consequences, and the outcome cannot – under conditions of expert disagreement and counter-expertise – be decided on the basis of superior knowledge and 'best expertise' alone.

As indicated by Elam & Bertilsson, 2003, conceptions of discursive democracy are all-pervasive in contemporary debate about governance in science and technology. A wave of institutional innovations within this policy domain is to a large extent guided by normative assumptions derived from deliberativist conceptions of democratic politics, and focused on the creation of arrangements that may facilitate lay participation, enhance the role of rational public debate, and provide new means to achieve political consensus.

Deliberative governance unambiguously pulls the process towards *the public arena*. It is non-hegemonic in its emphasis on equal access and that no one voice should be seen as a priori more valid than others. Their impact and the outcome of the process should be determined by the *Eigenlogik* of the process itself. Deliberative forms of governance may to various extent be shaped by, and located within, formal *state politics*, as when it is emphasized that organized deliberative input should respond to and inform the political agenda of parliamentary lawmaking, of change of regulatory statutes etc.

A key issue in understanding the relationship between the educational and deliberative

forms of governance is their overlap, to the extent that in many actual cases one shades into the other. These ambiguities may be detected in the familiar goal that organized deliberative initiatives should contribute to 'informed public debate'; here, educational, i.e., dissemination of 'correct' information, and sophisticated arguments, create an entangled amalgam of educational and deliberative elements. There is, as Elam & Bertilsson emphasise, a tension in the process by which deficit model notions have been superseded by notions of public engagement that draw on deliberativist ideas. Ideally, deliberative processes cannot but be open-ended, no party have at the start of the deliberative process an advantage over others in terms of the expected outcome of the process; the dice may, however, be loaded in favor of those with superior resources in many ways, including through better access to customized knowledge and rhetorical resources. What is deliberation in form may thus in fact be a means to maintain hegemony. So, counting on the impact of superior resource availability alone may make powerful actors see deliberation as a low-risk approach/strategy. Remains, in any case, the fact that deliberation in most cases is about advisory input to the political process, while decisions are taken by the empowered agencies or bodies.

Corporatist governance (COR)

In corporatist governance, real differences of interests between stakeholders are recognized to be at stake, and solutions that may bridge the differences are sought within closed processes of deliberation and negotiation. Corporatist governance is a pervasive form of governance in welfare state policy, having emerged as a result of a class compromise, often with social democrat parties in a key role for ensuring the terms of the 'contract' or compromise. Corporatist governance is more or less exclusively located in the *state politics* dimension, its dynamics pulls the policy process away from the public arena dimension, seen as a source of input to the process that may upset the precarious balance struck in the more controlled contexts of corporatist negotiation. Corporatist governance is hegemonic, primarily in terms of its in- and exclusion of players and interests that have their representatives in the negotiation process, i.e., who achieves the status of 'social partner' in the policy domain in question. The power structure of corporatist governance depends, then, essentially on to what extent corporate governance practices are inclusive or exclusive, i.e, to what extent they include, e.g., civic interests such as NGOs. Corporatist governance commit the social partners included, and the debates on the co-optation of NGOs have

emerged as an issue of what price for influence in corporatist arenas to pay in terms of loss of capability in the public arena.

Corporatist governance becomes similar to discretionary governance as both pull the process state politics and away from the public arena. Actually, corporatist governance structures may form an effective basis for discretionary policy making, as a strategy for foreclosing or minimizing the - often costly, e.g, in terms of effective decision making, - detour via the public arena. British politics are often characterized in terms of a strong emphasis on discretionary policymaking, often seen as an antidote to the salient features of adversarial process in US policy; these discretionary structures may be set against, e.g., Scandinavian welfare state politics, which have strongly corporatist underpinnings. Some forms of corporatist governance that have emerged during the last decade or so, e.g., in environmental policy, are *inclusive* to the extent that they comprise extensive formal and informal consultation with civil society, in particular environmental NGOs. The tensions and dynamics of public participation that are addressed in STAGE analyses, may thus also be discerned in this mode of governance as a tension between inclusive and exclusive forms of corporatist practices.

Market governance (MAR)

The idea of market governance is based on the notion that science and technology, among other societal functions, are governed with strong attention put on market orientation. The value of science comes from the surplus value created through its commercialization and market appeal. From the side of the state this type of governance is illustrated in neo-liberal policies that emphasize results and customer orientation and competition. The notion of democracy is also infused with ideas of market competition and it is acted out in the market. In market governance, the public participates in, and on the terms of, the market - as customers and consumers. The public assesses and influences, then, science and technology policy *post hoc*, after the completion of the innovation process, by their decisions to buy or not to buy a product. The script of the consumer role emphasizes rational choice for the public in this capacity to fulfill its integral role in well-functioning markets. Through these choices 'the public as consumer' play an essential and substantial role that may profoundly shape policy choices, both in the next cycle of innovation, and in the establishment of a regulatory framework that complies with consumer rationality. While consumers do not as such have access to the decision making process itself, market sensitive policy making make the consumer role a powerful instrument in exploiting its indirect leverage

on decision making, including by breaking the rules, and strategically exploit the consumer role as another channel for the public voice in the decision making process.

Market governance is then characterized by its inclination to draw the policy process away from the state politics and the public arena dimensions, framing choice in terms of commercial offer and individual consumer demand and preferences. It is strongly *hegemonic*, especially in science and innovation policy, where choices are made in terms of innovative, technological opportunities and on predicted or expected, rather than existing, demand.

Agonistic governance (AGON)

Agonistic governance take place under conditions of confrontation and adversity, when decisions have to be made in a political context where positions are strongly opposed, stakes are high, compromises are not easily found, and conditions are not in favor of processes for arriving at conclusions through negotiation and debate. Then direct action, boycotts, demonstrations etc. may be salient parts of the process. This indicates the limits of interactive-deliberative approaches, where dialogue in search of non-hegemonic, common solutions have stalled. At the same time, the expressions of the 'public voice' do not necessarily transgress the boundaries of acceptable forms of political action in democratic politics. When policy-making takes place under conditions of agonistic politics, and publics frame their voices in accordance with APUS conceptions, less tempered and constrained by the discursive rules and deliberative democracy, deliberative processes may no longer be effective, unless as a means to enroll an undecided 'public' against opponents which will not be particularly susceptible to changing their views. Thus, the argument may be heard that groups that will in all probability not change their views anyway should not be party to the deliberative process (e.g., the Dutch GM food case); they will merely exploit it as an opportunity to disseminate their propaganda, not as a context for reviewing and readjusting their positions within the process. Thus, however, the limits of deliberative politics may reflect on all parties, who have all to be questioned in terms of their willingness to change their views.

In agonistic forms of governance the main events and inputs take place in and are addressed at the *public arena,* and do to some extent adapt to the constraints set by *state politics*. Thus, focus is on efforts to address and change the given framework and its dominant framings, seen as inadequately structured in terms of key concerns of

hitherto marginalised actors. Agonistic participation may, however, be compatible with and draw the process towards the state politics dimension, if agonistic participation is used for enhancing the scope and accountability of state politics decisions, as against, e.g., processes of privatization and deregulation.

Agonistic public participation is *anti-hegemonic*, since not only does it not comply with the terms of a policy framework seen to embody more or less overt forms of hegemony, but also the conflicts at the core of agonistic governance may often be over the very terms and rules of a framework seen as embodying hegemony. Thus, agonistic forms of participation will often be counteractive responses to policy agendas and processes seen as strongly hegemonic, and as too much a form of discretionary and/or exclusive-corporatist policymaking for outsider concerns to be heard and duly taken into account.

Agonistic forms of governance do, by default, to little extent pull the process towards the *market* dimension of the governance triangle; however, consumer protest to pressure corporations to act in environmentally and socially accountable ways be may counter-examples. These forms of market governance nevertheless conform with agonistic participation in bending the rules, here, as the power embedded in the consumer role is appropriated for broader civic or political purposes.

Configurations of models of governance

These broad categories may provide an initial and provisional characterization of cases from which lessons may be drawn about the dynamics of governance. They must, however, be used for this purpose in full recognition that cases often display a mixture or combination of elements listed under the different categories. Moreover, they may be characteristic in the ways that different modes overlap and combine with each other. Furthermore, these categories are not analytically given categories, but provide part of the reservoir of self-presentation and legitimation itself; so, various actors involved in a case will often hold widely diverging views on the nature and definition of the mode of governance ‘applied’ in a given case. What some will see as ‘deliberative’ politics might be classified as, e.g., educational by others, or even as hegemonic and oppressive to an extent which justifies adversarial action.

In order to avoid a premature and rather arbitrary classification of cases it is important to follow an analytic approach in which the definition of the issues at stake, the relevant

facts, the causes of controversy and the political and technological options are the outcome of complex national and transnational construction and negotiation processes rather than their explanation. In such processes there will most of the time be no single control centre directing events.

Having said all this we still hold that it might be fruitful to look at the various cases and how they develop and to ask ourselves how various definitions and interventions pull the situation towards –for example- more agonistic conceptions on what is to be done or more educational conceptions etc.

Section 5

Processes of convergence/divergence

The changing forms and stakes of governance in science and technology take place within general processes of change, which redefine the tasks and contexts of policy development and implementation. Changing governance conceptions and practices reflect, no doubt, a key domain for discerning the effects on society in general, and in the political economy in particular, of the increasing centrality of science and technology in knowledge societies. The attempts to create new forms of public participation in science and technology coincide with drastic economic, social and political changes in many countries inside and outside the EU. These links and impacts must be explicitly taken into account in the way the governance processes are analysed.

Such attempts to develop new forms of participation are an intrinsic part of major processes of politico-economic change driven by the dynamics of the globalized, knowledge-intensive *economy*, and the concomitant search for effective *innovation policies* for enhancing competitiveness within the 'new economy'. This has led to radical changes in, e.g., the state/market relations, by which power relations are being reconfigured, new social divisions redrawn, and new forms of in/exclusion debated and constructed.

The new policies with respect to public participation in S&T in particular, converge with, and is one particular instance of, more general issues of democratic governance, resulting in the need for new national and *transnational* spaces for governance – for deliberation, negotiation and organizing public accountability. Particular important

within the STAGE framework is the EU debate about European governance and citizenship.

While these strong, general drivers of transnationalisation and globalisation may be seen as centripetal forces of homogenisation and convergence, they in fact give rise to complex processes in which convergent and divergent dynamics and responses become interlinked in unpredictable ways. This can be seen by considerable differences between various parts of the (future) EU in terms of the institutional development of science and technology policy instruments, organizations and traditions. This leads to differences in the articulation of public engagement with science across sectors of policy and differences in the receptivity to efforts at mobilisation of the public and motivating the public. The analyses should be sensitive to the complexity of these processes, stemming from the differences and interactions between all levels and arenas of governance – ranging from the global and national, to regional and local, taking into due account the key role played in these processes of processes of Europeanisation.

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Appendix A: Table of cases

	ICT	**Biotechnology**	**Environment**	**Country specific dimensions**	**Other**
Denmark	-	- *Cloning in newspapers* ***- The Øresund Region***	-	[From COMPASS]	
Finland	- ICT policy frames	- Biotech policy frames		[From COMPASS]	
Greece	- ICT policy	- Biotech policy	- Environmental organizations	(Embedded in case studies)	
Netherland	- ICT policy	- GM food debate	- Nuclear energy		
Norway	-	**- Biotech patent directive** - GM salmon	- Energy/climate policy	[From COMPASS]	- Institutional structure
Portugal	-	- Human genetics debate	**- Waste management**	(Embedded in case studies)	- BSE
Sweden	-	- Stem cells - Zenotransplantation	**- Nuclear Waste**	- Liberal S&T policy	- Nanotechnology
United Kingdom	- Mobile phone safety	**- GM crops debate**	-		- Advisory guidelines

Notes.

Bold indicates ‘anchoring study’, otherwise ‘ancillary study’

Appendix B: Checklist for case studies

Framing

Setting the agenda:

- Who called for regulatory action?
- The agenda setting role of economic/innovation policy, as well as of citizen groups (campaigning etc); the role of governmental ideology of economic policy

Framing issues:

- How are issues framed? By whom? What are the consequences as to the formats of participation/consultation, as to institutional responsibility and constraints, and as to definition of what concerned public/interest may be legitimately included/excluded? (e.g., ELSA)
- How do 'purely' technical issues become topics of broader public concern, and *vice versa*? What are the characteristics of the processes by which this is accomplished?
- To what extent and/or in what form are ethical and moral concerns integrated into the pragmatic/technical framework of regulatory action? How are ethical and technical aspects distinguished? Are they 'assigned' to different agencies or (contrary) deliberately kept together or re-united through public contestation?
- How – in what terms (inevitability, consequence, choice, … etc) do different participants phrase options and solutions?

Framing expertise and publics

- Which scientific and technical specialties are involved in defining the issues? How and in what ways are the social sciences and humanities involved?
- To what extent are arguments and definitions presented as 'scientific' and 'technical' and on which specialties and disciplines do various participants draw in doing so?
- To what extent do the 'experts' constitute a separate category of actors in the process and to what extent are they arguing against one another and acting as part of (or on behalf of) other groups of participants?
- How do experts relate to non-experts in the process?
- What is the role/impact of 'public opinion', *inter alia* as constructed in public opinion polls, media, newspapers, websites etc?
- In what ways does the overall management of the process promote a clear separation between expertise and experts and non-experts or the opposite.

Forms and formats of participation

- (The mix of) forms/formats of participation (from formal consultation to protest action)?
- What forms of deliberation/policymaking are promoted/preferred by whom?
- 'Delimitation' of publics: the ways in which technologies of participation include and exclude certain actors/actants i.e. affect their participatory options.
- The formation of 'concerned publics' through framing and institutional appropriation of issues, and the organization of processes
- The consequences of forms/formats of participation, to enhance sensitivity to constraints and hegemony
- What actors/interests are included in/excluded from consultation and decision-making processes (at various stages)?
- What role/position for NGOs and other representatives of the public/civic stakeholder interests (exclusion/marginalization) (at various stages)?

  Note:

  The analytical distinction between frames and formats should not be taken to imply that the substantive content (issues and frames) and formal, procedural aspects of the policy process can and should be considered separately. They are often intertwined and should be analysed as co-extensive, regardless of whether this is explicitly intended by participants in the debates or not. The form and substance of the participation processes should be seen as closely linked to each other.

Outcomes – decisions and effects

- The extent and form of public /civic influence on final decisions
- How are inputs to the policy process translated into decisions?

  Note:

  Much debate about governance focus on ways to design participatory mechanisms by which more groups and interests may have a voice in the policy process. They may be biased in favor of advisory parts of the policy process, while neglecting how and to what extent such inputs and voices actually co-determine the decision outcomes of the process. Key issues that need to be addressed is, inter alia:

The temporality of issue and policy formation

- The overall sequential structure of policy process

  Note:

In order to avoid a premature and rather arbitrary classification of cases it is important to follow an analytic approach in which the definition of the issues at stake, the relevant facts, the causes of controversy and the political and technological options are the outcome of complex national and transnational construction and negotiation processes rather than their explanation. In such processes there will most of the time be no single control centre directing events.