Ciência, Tecnologia e Sociedade
Novos Modelos de Governança

Centro de Gestão e Estudos Estratégicos
Ciência, Tecnologia e Inovação

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cgee   FAPESP   Embrapa   Universidade Federal
de Santa Catarina

Brasília, novembro 2005

Impresso em Brasília, 2005

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Sumário

1. Introdução

O acentuado progresso da ciência e tecnologia do século XX promoveu a prosperidade e criou condições para a melhoria da qualidade de vida da sociedade. Estes benefícios, contudo, ainda não alcançaram grande parte da população do mundo. Saúde, instrução, habitação, alimentos, água e energia e muitos outros aspectos relacionados ao bem estar humano, hoje negados a uma parcela significativa da população mundial, podem ser melhorados e tornados mais acessíveis a um maior número de pessoas através do progresso continuado em ciência e tecnologia.

Para que isso ocorra, as barreiras que dificultam o aproveitamento das oportunidades de uso da ciência e tecnologia para a solução dos problemas que afetam essa parcela menos favorecida da sociedade necessitam ser amplamente debatidas, envolvendo todos os agentes sociais e não somente aqueles pertencentes aos níveis científicos e governamentais.

Ao mesmo tempo em que a ciência e tecnologia avançam, a importância dos aspectos ambientais, de segurança e éticos aumenta: aplicações possíveis de ciência, tecnologia e inovação (CT&I) podem ameaçar o futuro da humanidade e do planeta. E também aumentam as áreas de incerteza e as de certezas contraditórias. Entre as principais controvérsias que vêm pressionando as sociedades modernas destacam-se: os avanços do desenvolvimento econômico e o aquecimento global; questões relacionadas à segurança e ao terrorismo; o controle de doenças

infecto-contagiosas; as nanotecnologias, a biotecnologia e os organismos geneticamente modificados, a clonagem humana e os problemas de bioética relacionados. Esforços internacionais no sentido de buscar soluções para essas questões são cada vez mais requeridos, pois se torna imperativo aproveitar as oportunidades sem, entretanto, esquecer que os riscos devem ser controlados.

Por conta do aumento da complexidade dos problemas que a humanidade enfrenta atualmente, dos imperativos da globalização e do crescimento da competitividade nos mercados internacionais, os riscos que se apresentam encontram-se, muitas vezes, além do controle de um país ou de uma região. Tais questões também estão fora do controle das comunidades científicas e tecnológicas, porque muitos dos problemas a serem enfrentados envolvem, além das questões científicas, outras questões, de naturezas diversificadas, tais como, a revisão dos sistemas sociais e políticos, a construção de consensos que permitam a elaboração de conjuntos de regras e normas legais, a colaboração internacional, a estruturação de redes globais, bem como o estabelecimento de direções sobre o futuro desejado para a sociedade humana.

Com qual base devem ser tomadas as decisões sobre possíveis riscos ou benefícios de tecnologias controversas ou incertas? Quem decide? Estas são questões que emergem como cruciais em paises altamente industrializados, e que está levando a que instituições governamentais e científicas de paises como Reino Unido, França e Alemanha procurem desenvolver experiências

de consulta pública de diverso tipo. Também, considerando-se as tendências de aceleração do progresso em CT&I e as necessidades de promoção do desenvolvimento sustentável, passa a ser necessário que se exercitem visões de futuro, de forma a colocar os desenvolvimentos científicos e tecnológicos na direção da visão de futuro desejada e, sob algum tipo de controle ou acompanhamento democrático.

Os desafios implícitos no parágrafo anterior passam necessariamente pela consolidação de canais de diálogo e reflexão sobre o futuro das atividades de CT&I com os mais diversos setores da sociedade. A busca sistemática de um futuro compartilhado é indispensável para a orientação do presente.

As políticas públicas enfrentam o desafio de incentivar a participação dos cidadãos, em questões que envolvem ciência, tecnologia e sociedade. As decisões devem ampliar-se até iniciativas que contemplem o direito à informação e à participação da sociedade como um requisito fundamental para o exercício da democracia.

Os artigos aqui reunidos discutem as possibilidades e limites de transformar os processos decisórios sobre temas altamente controversos. Eles foram apresentados no Seminário CIÊNCIA, TECNOLOGIA E SOCIEDADE: NOVOS MODELOS DE GOVERNANÇA, realizado em Brasília entre os dias 9 e 10 de dezembro de 2004 contando com o apóio do Centro de Gestão e Estudos Estratégicos (CGEE), a Fundação de Amparo à Pesquisa

do Estado de São Paulo (FAPESP), a EMBRAPA e a UFSC, através do Núcleo Interdisciplinar em Sustentabilidade e Redes Agroalimentares (NISRA). Já a discussao sobre tema foi abordada no Seminário Internacional "Tecnologia, Riscos e Incertezas: Desafios para a Democratização da Ciência", acontecido em Florianópolis (Brasil) de 15 a 17 de abril de 2004, e organizado por Julia S. Guivant e Murilo Flores, com o apóio do Doutorado Interdisciplinar em Ciências Humanas, da Universidade Federal de Santa Catarina (UFSC); a Empresa Brasileira de Pesquisa Agropecuária (Embrapa) e o Conselho Britânico.

No Seminário de Brasília focalizou-se na importância do envolvimento da sociedade no processo decisório, pretendendo contribuir para a ressaltar a necessidade de espaços para discussões abertas, seguindo-se uma tendência internacional de crescente da participação da sociedade como um instrumento estratégico nas tomadas de decisão sobre temas controversos e envolvendo incertezas cientificas. Como parte dos objetivos contam-se os seguintes:

- contribuir para a sensibilização sobre novas percepções sobre as relações entre ciência, tecnologia e sociedade e representantes de setores-chave da academia, governo, indústria, organizações não governamentais, entre outros;
- promover discussões sobre a participação dos cidadãos em processos decisórios fundamentalmente sobre inovações tecnológicas de caráter polêmico dada a incerteza de seus riscos;
- discutir sobre as estratégias mais apropriadas para encaminhar tal debate sobre questões éticas, sociais, econômicas e políticas

nas instituições públicas brasileiras de modo a promover a democratização e socialização da informação;

- ampliar o intercâmbio de conhecimentos e integrar diferentes abordagens identificadas, buscando contribuir para que as atividades de prospecção em CT&I possam se beneficiar de uma visão integrada dos diversos fatores sociais e culturais que influenciam a participação dos cidadãos em questões críticas de ciência e tecnologia;

O Seminário foi dividido em quatro sessões distintas, sendo cada sessão iniciada com a apresentação dos artigos de referência por um especialista selecionado (não os autores), seguida de debates pelos próprios autores e participantes em geral. Os temas das sessões incluíram:

- Desafios para uma nova agenda para tratar as relações entre ciência, formulação de políticas e os diferentes públicos face às controvérsias trazidas pelas inovações científicas e tecnológicas;
  - o o contexto brasileiro
  - o formulação de estratégias mais eficientes para a participação pública no debate científico no Brasil, elaboradas a partir de um referencial global comparativo;
- Caracterização e avaliação de estratégias para a participação pública no debate científico;
  - o o contexto europeu e a descrição de experiências;
  - o o estado-da-arte sobre as avaliações destas experiências;
- Fluxos de informação globais e suas interconexões com o papel da mídia nos processos de comunicação dos riscos associados às novas tecnologias;

- o contexto europeu

- formulação de estratégias mais eficientes para a comunicação pública dos riscos associados às novas tecnologias em relação às controvérsias e incertezas científicas e tecnológicas, elaboradas a partir de um referencial global comparativo;

• Espaços de negociação e diálogo entre a ciência e a sociedade: geração de novas condicionantes de regulação e governança para um desenvolvimento sustentável;

- o contextualização da situação no Brasil;

- o criação de novos espaços de negociação com a sociedade nas organizações para discussão dos riscos associados às inovações científicas e tecnológicas;

- o novos padrões de comportamento ético para pesquisadores e seus trabalhos científicos e tecnológicos;

- o avaliação dos trabalhos de pesquisa e seus impactos na sociedade;

• Prospecção em ciência, tecnologia e inovação e a necessidade de engajamento de atores sociais nos processos de tomada de decisão.

- o prospecção em ciência, tecnologia e inovação e o desenvolvimento regional;

- o experiências nacionais em prospecção em CT&I

Com a publicação dos artigos discutidos no Seminário esperamos contribuir no alerta sobre a necessidade de repensar os processos decisórios frente aos avanços da ciência e da tecnologia, sem por isto ameaçar tais avanços, mas legitimando eles através da criação de canais institucionais para o debate democrático.

Este seria um passo importante na construção de uma cidadania científica no Brasil.

Carlos Vogt – Presidente – Fapesp

José Geraldo Eugênio de França – Diretor Executivo – Embrapa

Júlia Sílvia Guivant – Pesquisadora – UFSC

Marcio de Miranda Santos – Diretor Executivo – CGEE

2. Science, Technology and Governance in Europe: lessons from the STAGE project

Alan Irwin and *Maja Horst*

The STAGE ('Science, Technology and Governance in Europe') project drew on 26 case studies and country syntheses across eight European nations. The examples we explored ranged from genetically-modified foods in The Netherlands and UK to genetic research in Denmark, from nanotechnology in Sweden to environmental policy in Portugal and Greece, and from information technology in Finland to biotechnology in Norway. 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 paper, 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' (CEC 2002) 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 paper we will 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' (Hagendijk 2004, Horst 2003, Irwin 2001). 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 1999) 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 treatment of national practices.

One major aim here will be to examine the balance between national/international 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 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 general 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 of scientific governance. As the following 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 paper represents one attempt to explore this contemporary scientific and governance culture in Europe and to assess the lessons for analysis and action.

A typology of governance

Our argument 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 (developed by Hagendijk and Kallerud within the STAGE project) 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. Generally, the Scandinavian countries can all be taken as examples of this mode of governance. In 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 be moving forcefully towards an educational mode). 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 paper 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 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). The point should also be made that different modes may 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 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 element of debates over science governance. In the UK, for instance, sections 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 (Irwin forthcoming). 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.

One mode in particular was important for the STAGE network – deliberative governance. In the remainder of this paper, we will focus especially on processes of deliberation and engagement within Europe. Certainly, the existence of a European 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 initiatives?

The deliberative mode in European practice

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 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 and the outcome of deliberative engagement in this discussion of the various forms of implementing the ideal of public participation.

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*. 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 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.

First of all it is important to consider the relationship between engagement initiatives and the innovation agenda. 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 corporative and educational modes in these countries apparently makes way for expectations that engagement initiatives represent one among other ways of educating the public. 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 seem to be incorporated as a legitimate stakeholder in the inclusive corporativist 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 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 set-up in which participants had to let themselves be educated by scientific knowledge in order to be permitted entrance to the arena of discussion. Although criticism of the deficit model (for example, Irwin 1995) has influenced later participatory designs, the question of how to balance and combine dissemination and discussion of scientific knowledge is not an easy one. There is a persisting 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 raises 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 draws upon 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 – such as, for example, the Dutch GM debate - the 'we' seems to be synonymous with the general public. In this case it seems that representatives of the public are asked to participate as citizens taking the perspective of the common good and considering 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 citizens' 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 these previous points, a fourth issue is the need to consider the relationship between participatory mechanisms and political 'market research'. The cases imply that sometimes participatory methods come 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. At the same time, 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 the value added will be in the form of better and more legitimate decisions as well as an 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, are also various issues regarding the actual design and framing of these exercises which we will discuss in the next section.

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 (GM Nation? 2003) 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. 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. Our observations cluster around three 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 a means 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 corporativist or discretionary (as in Sweden and Finland).

Besides this continuum we also find situations in which deliberative exercises are supported 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 concerning the relationship between participatory initiatives and conventional policy institutions.

In situations of civil society action the issue 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 is very likely to be dismissed in order for government to continue a predominantly discretionary mode of governance. In Portugal, however, it seems that non-governmental organisation of participatory elements has had a higher impact on dominant models of governance.

In situations of government induced or government-led 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 (eg the Danish Board of Techology, 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 an optional extra 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. 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. 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 an ideal formulation and procedures 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 inclusionary 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 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.

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 focus 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 suggest that the introduction of deliberative engagement will 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, do 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.

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? It might be concluded from the above that the ideal of deliberation is too contested, contextually-sensitive and flexible to be of any intellectual or policy value. Certainly, our cases have identified:

- 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 project.

The interpretation of these points as a defeat for 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. 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.

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 un-resolved tensions around the relationship between 'public engagement' and 'sound science'*. As we have stressed at a number of points, 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 insti-tutional 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.

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3. A governança dos riscos e os desafios para a redefinição da arena pública no Brasil

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Introdução

Desenvolvimentos recentes da ciência e da tecnologia, especialmente na área de biotecnologia têm colocado novos desafios referentes a como deve ser o processo decisório sobre políticas de ciência e tecnologia envolvendo incertezas. Na última década o debate sobre se deve haver e como deve ser encaminhado o envolvimento público neste processo decisório tem estado presente na produção acadêmica internacional. A demanda por uma democratização da ciência, por uma desmonopolização dos peritos, para que se estabeleça um debate transparente e empoderante dos cidadãos tem sido levantada desde a sociologia ambiental (Irwin 2001; Wynne 1996), a teoria social (Beck 1999; Giddens 1991) e a sociologia da ciência (Callon 1998; Latour, 1987,1998; Callon et at, 2001). Esta confluência em torno de superar as dicotomias entre leigos e peritos em inovações envolvendo riscos incertos foi ganhando força significativa no período prévio ao amplo debate sobre os transgênicos. Entretanto, as propostas permaneciam num nível de formulação difuso e impreciso (Guivant, 1998, 2001 a).

Os debates em torno dos riscos dos transgênicos têm 1) introduzido um questionamento público do sistema alimentar como um todo; 2) apresentado a peculiaridade de extrapolar as fronteiras da rede agroalimentar para ocasionar conflitos sociais, políticos, econômicos e científicos, descrédito de cientistas, ameaça de relações de comércio internacional, e 3) gerado demanda por mais debates sobre que tipo de riscos as sociedades querem correr e sobre como e quem deve decidir sobre isto. Esta abrangência imprevista dos riscos alimentares tem ocasionado nos setores corporativos e governamentais a surpresa de que as percepções dos consumidores não podem simplesmente ser consideradas como erradas e suscetíveis de correção científica, mas que devem ser tomadas em conta como "reais" e importantes no processo decisório sobre como lidar com os riscos tecnológicos e ambientais.

Este debate tem estimulado a implementação de diversas experiências concretas de envolvimento público na determinação de políticas públicas em relação a governança dos OGMs[2]. Enquanto que na Europa esta participação tem passado a ser acompanhada pelo reconhecimento do princípio de precaução, nos Estados Unidos a gestão dos riscos se apoiaria na autoridade natural da ciência e na delegação das decisões a órgãos administrativos competentes e independentes. Joly (2001), num artigo no qual discute estas diferenças entre os Estados Unidos e Europa nos conflitos em torno dos transgênicos, argumenta que as mesmas não podem ser atribuídas à defesa de interesses comerciais a curto ou médio prazo, mas sim a concepções

[2] Definição legal no Brasil: organismo geneticamente modificado é aquele cujo material genético (ácidos desoxirribonucléico – ADN, e ribonucléico – ARN) tenha sido modificado por qualquer técnica de engenharia genética, ao passo que esta, por sua vez, é a atividade de manipulação de moléculas ADN/ARN recombinante (art. 3º, inciso IV e V da Lei 8.964/1995). Moléculas de ADN/ARN recombinante são aquelas manipuladas fora das células vivas, mediante a modificação de segmentos de ADN/ARN natural ou sintético que possam multiplicar-se em uma célula viva, ou ainda as moléculas de ADN/ARN resultantes dessa multiplicação, considerados os segmentos de ADN/ARN sintéticos equivalentes aos de ADN/ARN natural (art. 3º, inciso III, da mesma lei).

divergentes sobre a gestão da inovação e dos riscos. O caso do Brasil se aproxima significativamente do identificado nos Estados Unidos Entretanto, nos Estados Unidos contam-se já experiências interessantes de envolvimento público, o que não se observa no Brasil.

Este artigo tem como objetivo considerar, a luz de algumas destas experiências e de como se desenvolveu o debate no Brasil sobre os transgênicos, as condições existentes para uma aprendizagem social que permita pensar espaços para avaliar futuras alternativas de participação pública nos processos decisórios relacionados com inovações científico-tecnológicas controversas.

Modelos de governança dos riscos e da inovação

Dois modelos polares podem ser identificados nas propostas para a governança dos riscos, construídos a partir do cruzamento de dois eixos: um referente à concepção sobre o público e o outro sobre a concepção de ciência (Joly 2001).

Um é o modelo standard, no qual se considera que as diferenças de apreciação dos riscos entre peritos e leigos devem-se a atitudes irracionais destes últimos, atribuídas a víeis cognitivos, a dificuldade de raciocinar de acordo com probabilidades, a aversão à inovação e ao risco, etc. Dentro do que geralmente se identifica como modelo positivista, aqui se estabelece uma separação clara entre fatos e valores. Aos cientistas se atribui uma visão objetiva e neutra dos fatos, enquanto os leigos formulariam suas opiniões desde

um ponto de vista subjetivo. A ciência corresponde a uma prática independente de influencias políticas, econômicas ou sociais.

A confiança nas instituições responsáveis da gestão dos riscos é um ponto central deste modelo. Por isto, considera-se desnecessário a visibilidade de problemas ou dúvidas, para evitar pânicos entre o público leigo. A redução da distância entre as percepções de leigos e peritos realiza-se através da difusão de informações e de educação. A comunicação dos riscos passa a ter um papel de destaque e realiza-se numa direção lineal, de acordo com o que nas teorias de risco se denomina modelo do déficit: os peritos comunicam os conhecimentos para os leigos, para evitar que permaneçam na ignorância e irracionalidade.

O outro pólo, o da visão não positivista de ciência, se distingue pelo questionamento sobre qual concepção de ciência orienta o trabalho dos peritos. Aqui estamos no território da nova sociologia da ciência e dos estudos sociais de ciência. Science is considered as offering a framework that is unavoidably social as well as technical since in public domains scientific knowledge embodies implicit models or assumptions about the social world, tacit commitments about audiences or user-situations which may then serve as unnegotiated social prescriptions. (Irwin and Wynne, 1996).

Em lugar de se perguntar se uma inovação com conseqüências incertas é aceita ou não, esta abordagem propõe questões mais abertas, como: a qual problema responde esta solução técnica?, há alternativas? Quem se favorece com esta tecnologia?. As controvérsias sócio-técnicas não são vistas como obstáculos

mas como oportunidades para explorar alternativas possíveis. O interesse coletivo não é assumido como algo óbvio, mas como produto de negociações, alianças e conflitos sociais. A técnica não é uma fatalidade nem uma fonte de progresso exclusivamente, mas como um instrumento para a construção de um mundo comum.

Pelo fato de haver limites para que os standards dos riscos potenciais possam ser determinados exclusivamente pelo conhecimento científico, não só devem ser tomadas decisões, mas também devem ser restabelecidas as regras e as bases em que se tomam tais decisões: abrindo-se o diálogo e o processo decisório e reconhecendo-se a ambigüidade e a ambivalência e o conflito dos processos sociais como inevitáveis. Para isto, novos espaços de negociação são necessários, que desmonopolizem o conhecimento perito, e nos quais se aceite que o conhecimento leigo não é irracional, porque julgamentos de valor estão presentes em todas as fases do processo de gestão de riscos, especialmente os de graves conseqüências (invisíveis, de longo prazo e irreversíveis) (Beck 1999), dividindo também aos próprios peritos.

Diferentes formas da participação pública

A participação pública pode ser definida "as a practice of consulting and involving members of the public in the agenda-setting, decision-making, and policy-forming activities of organizations or institutions responsible for policy development". (Rowe and Frewer 2004) Num plano mais básico, o envolvimento pode

implicar meramente a comunicação de informação para o público, correspondendo com os pressupostos do modelo Standard. Num plano mais completo podem ser identificados diversos métodos (incluindo diálogo e comunicação em mão dupla), como exercícios de consulta, grupos focais e questionários (ver tabelas 1 e 2), com diversos níveis de formalização.

Um exemplo recente de propostas de estratégias de maior nível de participação é a legislação em paises como Estados Unidos, França e Reino Unido, que estabelece como necessária a obtenção de input do público antes que sejam tomadas decisões em áreas de incerteza (Rowe and Frewer 2000). Em especial no contexto da UE, as estratégias para a democratização da ciência passaram a assumir aspectos mais práticos, com significativo reconhecimento de sua importância tanto por cientistas quanto por representantes políticos e industriais, que estimularam transformações institucionais significativas (por exemplo, a criação de Agencias Nacionais de Food Standards na Inglaterra, França, Espanha e Alemanha), uma crescente consulta pública e encomenda de avaliações sobre as novas tecnologias pelos governos a comitês independentes de peritos (Grove-White et al 1997, 2000; Grove-White, 1999; Green Alliance 2000; Stirling and Grove-White 1999; GM Nation? A public Debate[3]).

[3] http://www.gmnation.org.uk/docs/gmnation_finalreport.pdf

Como Rowe e Frower (2000) explicam, as razões para o crescente interesse na participação pública em assuntos de políticas técnicas são diversos, mas principalmente pode considerar-se que derivam tanto de um reconhecimento de direitos humanos básicos numa

democracia ou o reconhecimento pragmático da importância de evitar políticas impopulares. O beneficio do envolvimento público é que aumenta a confiança pública nos processos decisórios e no compartilhamento de informações. Significativos envolvimentos do público podem contribuir para que os governos democráticos consigam: "(a) to build relationships based on trust, transparency, accountability, openness and integrity; (b) to integrate a wide range of public needs, interests and concerns into decision making; (c) to resolve problems more effectively, through collaborative means; (d) to ensure that decisions and solutions incorporate perspectives, knowledge and technical expertise that would not otherwise be considered; (e) to place issues and projects within a broader technical, social, cultural and ethical context; and (f) to increase the level of public acceptance and ownership of local-level decisions and policies transparency cannot just be wished for – it has to be institutionalized through transparency legislation, departmental policy or, at the least, bureaucratic daily practice "(MacGregor 2003).

Nenhum método pode ser completamente satisfatório, dependendo as escolhas de diferentes fatores, que podem por sua vez mudar em diversos estágios do processo decisório e isto deve ser avaliado e monitorado pelos sponsors e também pelas autoridades que assumem a iniciativa. Um dos dilemas é o de como avaliar a eficiência de um método em diferentes contextos e situações. Ainda há pouca sistematização sobre isto na literatura acadêmica, fundamentalmente orientada para aspectos mais processuais da implementação destes métodos, em lugar de avaliações mais substantivas (Rowe and Forwer 2000).

Também é necessário evitar apelar aos métodos participativos em relação a qualquer assunto público. Sua principal contribuição está relacionada com decisões sobre temas carregados de valores e altamente controversos, e não em assuntos técnicos nos quais possa existir simples desacordo. Pellizzoni (2003) diferencia estas posições da seguinte forma: "The latter can be resolved by appealing to 'facts' – that is, by using shareable kinds of rational argument referred to scientific research, witnesses, past experience, and so on. The former cannot. In this case, the parties in dispute tend to emphasize different facts, or give them different interpretations, so that each party seeks to confute the empirical evidence adduced by the others. There is no consensus either on the relevant knowledge or on the principles at stake. Facts and values overlap."

Mas aqui emerge um problema básico: do ponto de vista do modelo standard de ciência os valores são excluídos como uma possível influencia na análise cientifica. Só se assumem pressupostos relacionados com um modelo de ciência não positivista, os valores são reconhecidos como a base de negociação entre diferentes atores sociais com interesses diferentes. Desde esta perspectiva, grupos de consumidores e de cidadãos devem ser respeitados com posicionamentos independentes. Isto implica por um lado reduzir o bastante questionado papel e influencia da indústria. Mas também implica um outro aspecto menos reconhecido e polêmico, o referente ao controle da participação das ONGs. MacGregor (2003), explicando uma interessante iniciativa assumida por

Health Canada para desenvolver uma aprendizagem sobre grupos de cidadãos em outros paises e sobre a forma em que podem ser implementados com significativos níveis de transparência[4], menciona algumas destas provocativas questões: "What does it mean that those representing the voice of consumers at the policy table do not put as much weight on educating the public as they do on making it easier to get a seat at the table? What does it mean that these representatives seem to be more concerned with making sure government lets them have a seat at the table than they are with making recommendations on how to be sure they have influence at the policy table? Does their strong focus on improving the process so that it is more visible, inclusive, accountable and accessible preclude their ability to focus on advocating public education about health issues? Would not a more informed public make their 'job' easier relative to influencing the policy process for food and health product review?".

TABLE 1 – A Number of the Most Formalized Public Participation Methods

Participation Method	Nature of participants	Time Scale/Duration	Characteristics/Mechanism	Examples/References
Referenda	Potentially all members of national or local population; realistically, a significant proportion of these	Vote cast at single point in time	Vote is usually choice of one of two options. All participants have equal influence. Final outcome is binding.	Biotechnology in Switzerland (Buchmann 1995); waste repository in Sweden (af Wahlberg 1997)
Public hearings/ inquiries	Interested citizens, limited in number by size of venue. True participants are experts and politicians making presentations.	May last many weeks/ months, even years. Usually held during week-days/working hours	Entails presentations by agencies regarding plans in open forum. Public may voice opinions but have no direct. Impact on recommendation.	Frequent mechanism in, for example, United States (Fiorino, 1990), Austrália (Davidson, Barnes and Schibeci (1997); review by Middendorf and Busch (1997).
Public Opinion Surveys	Large sample (e.g., 100s or 1000s), usually representative of the population segments of interest.	Single event, usually, lasting no more than several minutes	Often enacted through written questionnaire or telephone survey. May involve variety of questions. Usage for information gathering.	Radioactive sites in United States (Feldman and Hanahan, 1996); Genetically modified food in the United Kingdom (Vidal, 1998); Biotech surveys (Davidson, Barnes and Schibeci, 1997)
Negotiated Rule Making	Small of number of representatives of stakeholder groups (may include public representatives)	Uncertain: strict dealing usually set days/weeks/months	Working committee of stakeholders representatives (and from sponsor). Consensus required on specific question. (usually, a regulation)	Used by US Environmental Protection Agency (Hanson, 1984), Method discussed by Susskind and McMahon (1985) and Fiorino (1990).
Consensus Conference	Generally, ten to sixteen members of public (with no knowledge on topic) selected by steering committee as "representative" of the general public	Preparatory demonstrations and lectures (etc.) to inform panelists about topic, the three-day conference	Lay panel with independent facilitator questions expert witnesses chosen by stakeholder panel. Meetings open to wider public. Conclusions on key questions made via report or press conference.	Used on Denmark and Netherlands on topics from food irradiation to air pollution (Joss and Duran: 1994; Grundahl 1995); also used in United Kingdom on plant biotechnology (Ellahi, 1995)
Citizen's Jury/Panel	Generally, twelve to twenty members of public selected by stakeholder panel to be roughly representative of the local population.	Not precise but generally involve meetings over a few days (e.g., four to ten)	Lay panel with independent facilitator questions expert witnesses chosen by stakeholder panel. Meetings not generally open. Conclusions on key questions made via report or press conference.	Examples in Germany, United States and United Kingdom (e.g., Crosby, Kelly and Schaefer, 1986; Coote, Kendall and Stewart, 1994; Lenaghan, New and Mitchell, 1996).
Citizen/Public Advisory Committee	Small group selected by sponsor to representing views of various groups or communities (may not comprise members of true public)	Takes place over and extended period of time	Group convenied by sponsor to examine some significants issues. Interaction with industry representatives.	Particularly, evident in United States, for example, in cleanup of wastes sites (Lynn and Busenberg, 1995); Perhac, 1998); see Creighton 1993) for guidelines.
Focus groups	Small group of five to twelve selected to be representative of public several groups may be used for one project (comprising members of subgroups)	Single meeting, usually up to two hours	Free discussion on general topic with video/tape recording and little input/direction from facilitator. Used to assess opinions/attitudes	Guidelines from Morgan (1993). U.K. example to assess food risk (Fife-Schaw and Towe 1995).

Source: Rowe and Frewer (2000).

TABLE 2 – An Assessment of the Most Formalized Public Participation Techniques according to a Variety of Evaluation Criteria

	Referenda	Public Hearings	Public Opinion Survey	Negotiated Rule Making	Consensus Conference	Citizen's Jury/Panel	Citizen Advisory Committee	Focus Groups
Acceptance criteria								
Representative-ness of participants	High (assuming full turn-out at poll)	Low	Generally high	Low	Moderate (limited by small sample	Moderate (limited by small sample	Moderate to low	Moderate (limited by small sample
Independence of true participants	High	Generally low	High	Moderate	High	High	Moderate (Often relation to sponsor)	High
Early involvement?	Variable	Variable	Potentially high	Variable	Potentially high	Potentially high	Variable but may be high	Potentially high
Influence on final policy	High	Moderate	Indirect and difficult to de-termine	High	Variable but not guaran-teed	Variable but not guaranteed	Variable but not guaranteed	Liable to be indirect
Transparency of process to the public	High	Moderate	Moderate	Low	High	Moderate	Variable but often low	Low
Resource accessibility	Low	Low-moderate	Low	High	High	High	Variable	Low
Task definition	High	Generally high	Low	High	Generally high	Generally high	Variable but may be high	Variable but may be high
Structured deci-sion making	Low	Low	Low	Moderate	Moderate (influence of facilitator)	Potentially high	Variable (influence of facilitator)	Low
Cost-effective-ness	Variable/Low	Low	Potentially high	Potentially high	Moderate to high	Moderate to high	Variable	Potentially high

Source: Rowe and Frewer (2000).

Contextualização do debate no Brasil

A partir de 1998 os transgênicos passam a estar no centro de uma polêmica nacional, acompanhando o desenvolvimento do que estava já tendo lugar especialmente no contexto europeu, e envolvendo ONGs, partidos políticos, movimentos sociais, cientistas, setores industriais, entidades representativas de setores produtivos rurais, entre outros.

A arena principal na qual se desenvolve o conflito é a jurídica, a partir da iniciativa do Instituto de Defesa dos Direitos do Consumidor (IDEC) de entrar com uma medida cautelar contra a decisão da Comissão Técnica Nacional de Biossegurança (CTNbio)[5] de liberar o primeiro produto agrícola geneticamente modificado, a soja Round up Ready (RR), da Monsanto. A partir deste momento começa a desenvolver-se o conflito na área judicial. E já passa a ser central um tema que vai permear o debate até o presente: quem decide sobre a liberação e comercialização dos OGMs, e se deve ser exigido para isto a realização de EIA/RIMA (Estudo de Impacto Ambiental/Relatório de Impacto no Meio Ambiente) e da regulamentação da segurança alimentar do produto.

O período que aqui se inicia caracteriza-se pela constituição de dois tipos de coalizões, a favor e contra os termos de liberação dos transgênicos. Por isto este momento pode ser identificado como de proliferação do social (Joly 2001). Os setores a favor e os contrários aos produtos transgênicos começam a se organizar de forma intensa, englobando tanto leigos – aqui incluindo setores de produtores rurais quanto peritos, mas sem aparentemente

[5] A CTNBio foi criada em 1995, ligada ao Ministério de Ciência e Tecnologia, como principal organismo governamental a ocupar-se de "propor o Código de Ética das Manipulações Genéticas", normatizar e apreciar os pedidos das empresas para testes e plantio em solo brasileiro, sendo inicialmente formado por cientistas, representantes das empresas interessadas e representantes de organizações de consumidores –estes últimos deixaram a Comissão por desentendimentos sobre seu funcionamento.

sensibilizar significativamente aos consumidores. Cada uma destas alianças apresenta um caráter heterogêneo não só por articular leigos e peritos, mas, sobretudo por aglutinar atores sociais com agendas políticas diversas. Por sua vez estas alianças articulam-se com outras no plano internacional, mas sem por isto envolver necessariamente identificações sobre outros temas que os transgênicos nem as mesmas interpretações sobre os riscos (Guivant 2001,2002[a], 2002b). Também a mídia passa a dedicar significativo espaço aos debates que passam a travar-se entre estas alianças.

A partir de 2003 o debate passa a desenvolver-se fundamentalmente na arena do poder executivo, como conseqüência da proliferação do plantio clandestino da soja transgênica, fundamentalmente no Rio Grande do Sul, intensificado a partir de 2000. Nesta fase encontra-se uma das peculiaridades mais significativas do caso brasileiro: a aceitação pelo governo do plantio ilegal de soja transgênica como fato consumado e o início de uma série de medidas provisórias (MPs) visando regularizar a situação que estava fugindo (ou foi deixada fugir) de qualquer tipo de controle legal. Frente as iniciativas de legalizar o que era ilegal, o conflito passa a ser mais explícito dentro do governo e entre a coalizão contrária a tal legalização e setores do governo e do Congresso, com algumas mudanças nos posicionamentos de cientistas e de instituições de classe. Um ator que estava silencioso até esse momento entra na arena pública do conflito: a Monsanto passa a confrontar-se não com a coalizão contrária a liberação dos transgênicos, mas com os produtores por causa da cobrança de royalties.

Desde final de 2003 e durante 2004 até o presente, o debate passou a concentrar-se principalmente na aprovação do projeto de lei sobre biossegurança. A arena aqui é a do poder legislativo e executivo, atravessados pelas duas coalizões. A aprovação do Projeto Nacional de Biossegurança na Câmara em março de 2004 foi uma vitória dos que defendem o princípio da precaução e advogam a realização de avaliações de riscos dos produtos transgênicos para a saúde humana e o meio ambiente previamente à sua disseminação. Outro item importante do Projeto é a garantia de apoio à liberdade de pesquisa científica, inclusive de campo, na área de OGMs. Também o PL determina que as normas e licenças de comercialização de produtos de pesquisas devem observar os princípios de máxima cautela e de rigorosa avaliação dos interesses econômicos nacionais, de segurança alimentar, da saúde e de impactos ambientais, conforme previsto na legislação nacional e em consonância com os acordos internacionais vigentes. Para isso, adota as seguintes medidas: 1) reestrutura a composição e limita a atuação da CTNBio em relação à autorização comercial, determinando que ela apenas emita pareceres técnico-científicos (continuaria a definir as regras para a pesquisa com OGM, autorizar os projetos que envolvem OGM, avaliar os riscos e acompanhar sua avaliação) e 2) prevê a criação de um Conselho Nacional de Biossegurança-CNBS pelo Presidente da República, constituído de 15 ministros, que tem a decisão final sobre a liberação dos organismos transgênicos – no que diz respeito aos aspectos de oportunidade e conveniência para sua comercialização.

As pressões e fortalecimento da coalizão a favor possibilitaram que o Senado aprovasse o substitutivo da Lei de Biossegurança em 6 de outubro de 2004 com as propostas apresentadas que concentram o poder de decisão na CTNbio, com 53 votos contra 2 e 3 abstenções. De acordo com este projeto a CTNbio terá 27 membros e ficará encarregada das decisões sobre a pesquisa de transgênicos. A CTNbio terá o poder de decidir se um produto geneticamente modificado precisará ou não do licenciamento ambiental do Ibama, vinculado ao Meio Ambiente, ou de licenças da Anvisa. Caso o Ibama ou a Anvisa discordem da decisão da CTNBio, esta poderá apenas recorrer ao CNBS (Conselho Nacional de Biossegurança), composto por 11 ministros, que arbitrará o conflito. Sobre comercialização, a comissão poderá estabelecer algumas definições, mas a decisão final ficará a cargo do Conselho de Ministros.As decisões da comissão poderão ser motivo de recurso ao Conselho Nacional de Biossegurança, mas os veredictos terão de ser tomados com maioria de pelo menos seis membros. Isto significa que os ministérios do Meio Ambiente e da Saúde não terão poder para vetar decisões da CTNBio, como a liberação comercial de um produto geneticamente modificado.

Por causa das mudanças feitas no Senado no texto do projeto aprovado na Câmara, a matéria volta à Casa de origem para uma nova votação. As maiores chances são de aprovação do PL do Senado, dado o apóio em peso das lideranças do PT, a precária mobilização e sensibilização pública, e a pressão dos ruralistas e agora dos produtores de algodão transgênico.

A coalizão contra a liberação

A partir de 1998, as ações do Idec foram fortalecidas pela aliança com Greepeace, mais outras ONGs e partidos políticos, como o PT, a Sociedade Brasileira para o Progresso da Ciência (SBPC), o Ministério Público Federal, o Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis (IBAMA) e Programas Estaduais de Defesa dos Direitos do Consumidor (PROCON), o MST e representantes de grupos indígenas. Estes grupos sociais e órgãos públicos passaram a difundir nos meios de comunicação, em debates, em manifestos, etc. que havia um significativo desconhecimento sobre os riscos envolvidos com os transgênicos, pressionando para que se assumisse cautela antes de aprovar qualquer liberação de produtos transgênicos (http://www.consumidorsa.org.br).

Dentro da aliança heterogênea contra os transgênicos encontramos atores sociais "convencionais", como o PT, o MST (Movimento dos Trabalhadores Rurais Sem Terra) e a Contag (Confederação Nacional dos Trabalhadores na Agricultura), que incorporam o tema dos transgênicos dentro de seu discurso classista, contra a globalização, o imperialismo, as multinacionais, os Estados Unidos, o Fundo Monetário Internacional, etc. As denúncias contra os transgênicos são justificadas em argumentos econômicos e políticos: quem se beneficia e quem se prejudica? Como defender a sobrevivência dos pequenos produtores rurais e dos assentados contra a globalização e mercados de exclusão social? (Senado Federal/PT, 1999). Para o MST, a utilização de OGMs na agricultura

brasileira é, em primeiro lugar, um fator de dominação econômica, das multinacionais e dos grandes produtores rurais sobre os pequenos produtores, cuja autonomia deve ser protegida. Essas empresas dominariam os processos de produção que envolvem a tecnologia dos transgênicos, da aquisição de sementes à agroindústria. Grandes monopólios seriam formados, gerando um grande processo de dominação das multinacionais, o que deixaria o pequeno agricultor em situação de total dependência e miserabilidade. Tampouco os transgênicos seriam importantes para o combate à fome, que não passaria pelo desenvolvimento da tecnologia de grãos modificados geneticamente, já que é visto como um problema político e não tecnológico.

Como cristalização da coalizão, em 1999 foi lançada a Campanha Por um Brasil Livre de Transgênicos, iniciativa de Action Aid Brasil, agrupando Ágora, AS-PTA, Centro Ecológico Ipê, Esplar, Fase, Ibase, Inesc, Idec, Greenpeace Brasil, Sinpaf, Fórum Brasileiro de Segurança Alimentar e Nutricional. Atualmente o número de ONGs chega a 82. O objetivo principal passou a ser o de conscientizar a opinião pública sobre os riscos que os produtos transgênicos podem trazer para a saúde humana e para o meio ambiente, além de alertar a população para a ameaça que o monopólio de sementes, comercializadas por grandes por empresas multinacionais, representa para a agricultura familiar (www. actionaid.org.br/p/campaigns/foodsec.htm)[6].

[6] O setor supermercadista, à diferença do papel de liderança na coalizão contra os transgênicos, no Brasil manteve-se significativamente à margem do debate.

Aliados diretos das ações legais encaminhadas pelo Idec e apoiadas por Greenpeace têm sido alguns procuradores da

república e juizes, que aderem ao princípio de precaução, junto com a Sociedade Brasileira de Direito do Meio Ambiente (Sobradima). Alguns setores governamentais têm apoiado e fortalecido a posição do IDEC de forma direta ou indireta. Em relação à necessidade de realização prévia de EIA/RIMA para a liberação da soja, por exemplo, o Instituto Brasileiro do Meio Ambiente e Recursos Naturais Renováveis (Ibama) e o Conselho Nacional de Meio Ambiente (Conama) integraram uma ação judicial contra a União Federal.

Os cientistas aparecem claramente divididos nas suas posições. Na fase inicial do conflito contam-se algumas manifestações da Sociedade Brasileira para o Progresso da Ciência defendendo o princípio de precaução, mas mantendo posições muito ponderadas. Glaci Zancan, presidente na época da SBPC, publicou o artigo "O desafio das plantas geneticamente modificadas"nos Cadernos de Ciência e Tecnologia (EMBRAPA). Ela afirmava que "em face das vantagens que a pesquisa na área de plantas transgênicas poderá trazer, essa é uma tecnologia que será incorporada ao dia-a-dia de todos. Sempre que os produtos obtidos vierem a ser cultivados em larga escala ou liberados para consumo, as análises de risco devem assegurar que os riscos sejam mínimos, utilizando para tanto as análises técnicas mais atualizadas e de maior confiabilidade".

No momento das MP, a coalizão passou por um momento de certo fortalecimento. As ONGs questionaram a falta de discussão prévia democrática com a sociedade civil; êxito da pressão exercida

pelos infratores sem qualquer restrição, como o cadastramento de seus nomes e necessidade de comprometimento para as próximas safras; desrespeito à decisão judicial que proíbe o plantio e a comercialização de transgênicos no Brasil; e opção pela liberação para o mercado interno sem conhecimento real sobre a quantidade de soja contaminada existente. A preocupação com a saúde da população foi destacada pelo IDEC e Action Aid. Para o IDEC a MP fere o código de defesa do consumidor ao colocar os interesses econômicos acima da saúde da população.

Em um documento assinado por mais de 80 cientistas, a maioria agrônomos e biólogos, e entregue ao presidente da república, os pesquisadores pedem a derrubada da MP 113/03. E até os setores favoráveis aos transgênicos, como a CNA (Confederação Nacional da Agricultura), questionaram a falta de condições de certificar toda a produção de soja brasileira para verificar a presença de organismos geneticamente modificados, como estabelece a medida provisória que libera a comercialização. Segundo avaliação da CNA, há um pequeno número de certificadoras capacitadas para essa análise e a burocracia gerada pela nova exigência vão impor sérias restrições à comercialização da soja, além de representar uma pressão de baixa nos preços e aumento de custos ao produtor (Folha de São Paulo, 23/03/2003).

No momento da aprovação do PL pelo Senado, a principal crítica gira em torno do papel da CTNBio, que passaria a ser o órgão máximo em matéria de transgênicos. Tanto Greenpeace quanto o Idec aceitam que a CTNBio tem um importante papel

técnico consultivo a desempenhar. No entanto, não deveria ter a última palavra sobre os transgênicos, já que não realiza todas as análises ou estudos sobre a interação desses organismos com o meio ambiente e a saúde da população. Além disso, a CTNBio é apenas uma comissão vinculada ao Ministério de Ciência e Tecnologia que, por sua vez, não tem competência técnica nem legal para zelar pela saúde pública e pelo meio ambiente. Essa função é de competência dos órgãos de controle e fiscalização dos Ministérios da Saúde e do Meio Ambiente.

Avaliando a agenda da coalizão contra a liberação

Esta coalizão tem assumido fundamentalmente os termos de uma agenda definida internacionalmente, em especial a partir das ações desenvolvidas na UE. Esta agenda inclui o principio de precaução[7], a necessidade de avaliação de impacto ambiental, a rotulagem e a participação pública no debate. No debate europeu este último tema é base do debate, implicando uma revisão e questionamento dos modelos de ciência em jogo, tema legitimo em instâncias decisórias chaves, como governos nacionais, grupos de cientistas, setores empresariais e o parlamento europeu. A isto se soma uma sensibilização significativa dos consumidores enquanto cidadãos, agindo de forma suspeita em relação aos transgênicos, em grande parte devido a acumulação de informações sobre outros riscos alimentares fora de controle e previamente negados pelas autoridades.

[7] A defesa do princípio de precaução, ratificado pelo Brasil na Eco 92, passou a ser um dos eixos centrais desta coalizão até o presente. De acordo com ele, a cautela deve ser assumida quando existe incerteza sobre um novo experimento ou nova tecnologia. Considera-se que ainda não foi apresentado nenhum estudo que comprove a segurança desses organismos, já que todas as pesquisas divulgadas seriam de responsabilidade das empresas diretamente envolvidas com biotecnologia, e assim suspeitas para emitirem pareceres definitivos. Entre os possíveis riscos incluem-s a poluição genética, a perda de biodiversidade e o surgimento de ervas daninhas resistentes a herbicidas, o aumento do uso de agrotóxicos e a perda da fertilidade natural do solo. O princípio de precaução deveria ser aplicado, de acordo com o Idec e Greenpeace, também a forma em que são feitas as lavouras experimentais, devido a possibilidade de acidentes ecológicos e contaminações de outras lavouras e do meio-ambiente.

Mas o terreno para esta agenda é muito diferente no Brasil, levando a que as reivindicações relevantes permaneçam sem um enraizamento (*embedeness*) nas condições especificas no país, seja sobre a precária e pouco transparente gestão dos riscos incertos, a limitada *constituency* das ONGs e a dominância de um estilo não transparente e não participativo de formulação de políticas públicas. Ainda que em diversos momentos tenha se levantado a necessidade de um debate público sobre os transgênicos, faltou colocar na agenda um item prévio a este: o referente a como devem ser estes debates, como legitimar os possíveis espaços de participação, como avaliar as melhores estratégias para que possa ser realizado. Isto reforça o modelo Standard de ciência, que justamente exclui a possibilidade de institucionalizar o debate sobre como deve ser o debate público.

Vejamos as ações mais destacadas da Campanha na realização de júris populares. O primeiro, denominado Tribunal Popular Brasileiro sobre OGMs, foi realizado em Fortaleza (CE), em abril de 2001, e coordenado por Action Aid e Esplar. O Júri, composto por 11 pequenos agricultores e consumidores, reproduziu a dinâmica e o aparato de um julgamento para avaliar os impactos de OGMs na saúde humana e no meio ambiente do País e condenou os transgênicos por unanimidade. Para chegar ao veredicto, o Júri popular analisou seis quesitos a partir do julgamento das 12 testemunhas (a Monsanto foi convocada e não compareceu): o problema da fome no Brasil e no mundo; o acesso aos alimentos e a segurança alimentar, a existência de evidências científicas

suficientes para garantir a segurança dos transgênicos para a saúde humana e para o meio ambiente; a emissão de pareceres quanto à liberação comercial dos OGMs com participação da sociedade civil; e informações suficientes que permitam o direito de escolha dos consumidores e agricultores. Na sentença, os Júris recomendaram que os trabalhadores não venham a usar os transgênicos e que seja valorizada a agricultura orgânica, além de incentivos para a agricultura familiar.

O mesmo esquema foi aplicado em setembro de 2001 no II Tribunal Popular dos Transgênicos, realizado em Belém (PA) por ONGs, sindicatos e entidades de apoio à reforma agrária, e pela prefeitura de Belém. Compareceram cerca de 500 pessoas – (menos os representantes da Monsanto). Em março de 2004, em torno de 30 ONGs organizaram o Tribunal Internacional Popular sobre os Transgênicos em Porto Alegre (RS).

Estas experiências têm sido apresentadas pelos organizadores como equivalentes as que tem acontecido em vários países da Europa, servindo para tornar público o debate sobre temas polêmicos, mas que estejam sendo debatidos apenas em círculos fechados. Entretanto, os exemplos aqui descritos mostram uma distância abismal com tais casos. Trata-se de eventos nos quais se assume uma teatralização da justiça, onde se atua com roteiros e diálogos pré-definidos. Acaba desvirtuando-se um potencial espaço para a construção de um debate público sobre os riscos.

A este tipo de estratégias, que procura *mobilização popular e não o questionamento da participação pública no debate*, soma-se a

estratégia recente de Greenpeace frente a futura votação do PL na Câmara. Suas ações estão concentradas na Campanha "Essa não dá para engolir", lançada em outubro em Porto Alegre (RS). A campanha passará por 10 cidades em 9 semanas, a fim de mobilizar os consumidores a exercerem seu direito à informação, exigindo o cumprimento do Decreto de Rotulagem e promovendo uma resistência à entrada dos transgênicos no Brasil.

Sobre a rotulagem também encontramos uma reivindicação com limitado enraizamento no contexto nacional e que leva a um limitado envolvimento dos consumidores no processo decisório. A pesar de que o decreto 4.680, de 2003, prevê a rotulagem de alimentos com índice de contaminação acima de 1%, inclusive em carnes, leite e ovos, além da rastreabilidade, estas não foram implementadas. A indústria teve o prazo prorrogado até o início de abril de 2004 para adaptar as embalagens, com o triângulo de fundo amarelo com a letra T nos alimentos que contêm mais de 1% de OGMs, o que não aconteceu e isto não implicou nenhuma conseqüência legal. A Abia, aliada dentro da coalizão a favor dos transgênicos, reconheceu não ter notícia de nenhum produto comercializado com o rótulo. Além das posições contrárias faltam condições práticas para realizar a separação e identificação. A Agência Nacional de Vigilância Sanitária (Anvisa) reconhece que não possui laboratórios equipados para avaliar a quantidade de elementos transgênicos em cada produto.

Como se posicionam os consumidores no Brasil frente a estas questões? Qual é o nível de insegurança ontológica, utilizando

o conceito de Giddens, que tal gestão dos riscos ocasiona no cotidiano? Tenho trabalhado em outros artigos como fundamentalmente frente a uma proliferação de riscos, a uma falta de conhecimento sobre estes e, sobretudo a uma falta de controle sobre isto, uma atitude bastante generalizada é a de adaptação aos riscos em lugar de seu questionamento. Mas pouco se sabe sobre o que pensam os consumidores. Neste sentido é relevante a quase ausência de pesquisas sobre a percepção pública da ciência, um não-problema no Brasil, que evidencia uma falta de problematização sobre o papel dos cidadãos no processo decisório sobre inovações científicas e tecnológicas controversas de parte de ONGs, formuladores de políticas públicas ou cientistas (Guivant, 2002). Este quadro contrasta significativamente com a relevância que as pesquisas sobre avaliação de tecnologias, sobre as políticas científicas, sobre a economia da transformação tecnológica, etc, têm assumido nas últimas décadas na Europa e nos Estados Unidos, e particularmente em torno dos OGMs. Inúmeras pesquisas de opinião pública procuram captar a aceitação ou rejeição dos consumidores destas novas tecnologias devido as implicações diretas que podem ter nas suas expectativas e crenças. Podem encontrar-se pesquisas encomendadas pelo setor industrial assim como por órgãos governamentais e ONGs, junto com pesquisas independentes, de caráter mais acadêmico. Medir e avaliar as atitudes e percepções do público em relação aos transgênicos não é uma tarefa fácil. Os dados destas pesquisas, que deveriam passar a ser um input fundamental para processos de legislação e regulação das inovações científico-

tecnológicas, têm passado a alimentar, com diferentes leituras de seus resultados, os diversos setores em confronto. Mas, além de questionamentos teórico-metodológicos que possam ser realizados a estas pesquisas, destaco a preocupação de saber sobre como se posicionam os consumidores, os produtores, os cidadãos no geral sobre tais temas.

Entre as poucas pesquisas no Brasil podemos citar as 3 pesquisas (2001,2002 e 2003) realizadas pelo IBOPE sob encomendada de Greenpeace, mas com um conteúdo muito superficial. O IBOPE também realizou 1 sob encomenda da Monsanto. Merece especial destaque uma pesquisa inovadora sobre percepção pública da ciência, especialmente considerando sua metodologia, seu embasamento teórico e seus objetivos, realizada entre fins de 2002 e início de 2003 na Argentina, Brasil, Espanha e Uruguai[8].

[8] Ver Revista Pesquisa, Fapesp, No. 95, 2004.

Estudos mais complexos sobre a percepção pública da ciência são uma base fundamental, não só para delinear cenários futuros no referente ao desenvolvimento de determinadas inovações tecnológicas, mas também para definir as políticas públicas necessárias para atingir os objetivos que se consideram positivos para a sociedade. Em lugar de considerar a tecnologia como uma variável independente, estas pesquisas deveriam procuram situar a tecnologia e a sociedade como variáveis interdependentes, gerando condições para uma melhor participação dos cidadãos nos processos decisórios sobre tecnologias que envolvem riscos incertos, com maior transparência sobre quem se beneficia e quem perde.

A coalizão a favor da liberação

Nesta coalizão encontramos inicialmente três setores: o dos cientistas que defendem os critérios e decisões da CTNbio, o dos representantes das empresas de biotecnologia, como a Monsanto e as associações de produtores rurais. A partir de 2002, representantes do ministério do governo Lula passam a integrar ativamente esta coalizão.

Os representantes das empresas, fundamentalmente da Monsanto, permanecem num plano oculto no calor dos debates. Os que assumem a defesa aberta de seus argumentos são, sobretudo pesquisadores. O apelo é de caráter científico convencional, identificando aos setores contrários como irracionais, desinformados, catastrofistas e contra o progresso. Considera-se que as críticas aos transgênicos "não se baseiam em fatos. As análises de risco dos produtos geneticamente modificados ou derivados deles e outros estudos científicos deixam claro que não há riscos em sua produção ou em seu consumo"[9].

Os cientistas também assumem um argumento ambiental, ao igual que cientistas de outros países, ao levantar que o uso de OGMs reduz o uso de herbicidas significativamente e pode ser a chave para uma vida selvagem mais rica e uma produção mais eficiente de alimentos. Neste sentido, a Academia Brasileira de Ciências assinou, em 1998, um documento juntamente com outras sete entidades científicas internacionais, lideradas pela Royal Society, do Reino Unido. O documento Plantas geneticamente modificadas

[9] Franco M. Lajolo, do Dep. De Alimentos e Nutrição Experimental, USP, em Ciência Hoje, abril 2004, vol.34, n.203: 36.

para uso em alimentos e segurança humana, colocava como principal conclusão que "não há evidência científica de que os alimentos geneticamente modificados aprovados até agora, para consumo humano, possam ser prejudiciais à saúde".

A Empresa Brasileira de Pesquisa Agropecuária (EMBRAPA), por exemplo, classifica a questão das plantas transgênicas em quatro dimensões: a relevância da tecnologia do DNA recombinante para o desenvolvimento sustentável da agricultura brasileira; a garantia da disponibilização de tais tecnologias de forma segura para o consumidor e para o meio ambiente, à luz dos conhecimentos científicos de biossegurança existentes; a possível vantagem comercial para o Brasil da certificação de origem de algumas commodities transgênicas e o direito do consumidor de optar pelo consumo de alimentos não transgênicos (http://www.comciencia.br, 2002).

Em 1997, a Embrapa firmou contrato de cooperação técnica com a Monsanto, obtendo assim suporte legal para conduzir pesquisa de avaliação de eficiência do gene e da construção gênica da soja resistente a herbicida à base de glifosato. O argumento oficial da Embrapa era de que, enquanto a sociedade não decide se aceita ou não os OGMs, o Brasil deve aprofundar seu conhecimento e evitar a dependência de tecnologias estrangeiras. Mas até mesmo na própria Embrapa os transgênicos não são aprovados unanimemente pelos pesquisadores.

Decisivos atores nesta coalizão são os próprios produtores rurais. Gradativamente, começou o plantio clandestino, fundamentalmente

em áreas de Rio Grande do Sul, paradoxalmente durante o período que o PT era governo estadual.

Esta coalizão foi fortemente reforçada por alguns representantes da mídia. Entretanto, os representantes da mídia não foram atores decisivos no debate, nem a favor nem contra. Isto, junto com o baixo papel do setor supermercadista, mostra uma diferença significativa com o contexto do debate na EU.

Além de setores do governo, do PT, outros partidos políticos (como o PPS (Partido Popular Socialista), o PMDB (Partido do Movimento Democrático Brasileiro)) passaram a fazer parte desta heterogênea coalizão. As bancadas pró-transgênicos tomaram como meta acabar com o poder de veto do Ministério do Meio Ambiente em relação à CTNBio. Também foram ativos dentro do lobby pro-transgênicos associações de agricultores e produtores de sementes e cientistas, que mantiveram a voz da Monsanto em silencio. As pressões foram intensas de parte da Federação da Agricultura do Rio Grande do Sul (Farsul), da Comissão Nacional de Crédito Rural da Confederação Nacional de Agricultura (CNA) e de diversas organizações representativas do agribusiness (Confederação da Agricultura e Pecuária do Brasil, Associação Nacional de Defesa Vegetal, Associação Brasileira de Sementes e Mudas, Organização das Cooperativas do Brasil, Associação Brasileira de Agribusiness, Associação Brasileira dos Produtores de Algodão, União Brasileira de Avicultura, Associação Brasileira dos Produtores de Soja, Associação Brasileira dos Obtentores Vegetais, Associação Brasileira de Tecnologia de Sementes,

Associação Brasileira do Comércio de Sementes e Mudas e Associação Gaúcha dos Produtores de Maçã).

Também cientistas tiveram uma mobilização significativa no período do debate do PL na Câmara e no Senado. Treze sociedades científicas (entre elas: Associação Nacional de Biossegurança, Academia Brasileira de Ciências, Associação Brasileira de Biotecnologia, Centros de Estudo do Genoma Humano, Centro Brasileiro de Estocagem de Genes, Sociedade Brasileira de Alimentação e Nutrição, Sociedade Brasileira de Ciência e Tecnologia de Alimentos) encaminharam em fevereiro de 2004 aos senadores uma carta na qual posicionam-se a favor de que a CTNBio "deve ser a única e definitiva instância para julgar sobre a natureza científica da matéria de tamanha complexidade" (Carta ao Senado, Ciência Hoje, abril de 2004).

Avaliando a agenda da coalizão a favor da liberação

Declarações do presidente da Sociedade Rural Brasileira (SRB) resumem algumas das posições e propostas a favor (http://www.srb.org.br/index.php3?news=1671):

1) segurança alimentar garantida, dado que nenhum estudo efetivamente comprovou algum tipo de malefício dos transgênicos à saúde humana. De acordo com o presidente da SRB, o que temos sim são relatórios que atestam a segurança e o mesmo grau nutricional dos produtos transgênicos em relação aos tradicionais.

2) sobre o impacto dos transgênicos ao meio ambiente afirma que

são necessários estudos realizados pela CTNBio, em todas as regiões do País, que possam efetivamente avaliar o impacto dos transgênicos ao meio ambiente.

3) o mercado é quem deve decidir se dá preferência à produção tradicional ou transgênica. Ou seja, se pagará um diferencial por este ou aquele produto. Para isto o Brasil deveria trabalhar com ambos os formatos.

A estes pontos soma-se a rejeição do princípio de precaução, identificado como uma ferramenta para imobilizar o país por causa do preconceito. Também se questiona a necessidade da rotulagem, devido ao custo. De acordo com declarações diversas do ministro do MCT, trata-se de um processo caro, que exige a análise de toda a cadeia de produção industrial. Para rotular esses derivados seria preciso segregar todos os organismos transgênicos dos não-transgênicos, desde o momento do plantio até a armazenagem, transporte e processamento. Questionamento equivalente tem sido apresentado por pesquisadores do Cenargem, que consideram graves os custos com a rotulagem especialmente quando se trata destas culturas menores, que não são commodities. Também tem sido questionado o custo da rastreabilidade, essencial para que a rotulagem seja honesta.

A maioria dos atores que fazem parte desta coalizão conflui em afirmar que os transgênicos devem ser tratados de "forma científica, sem ideologias nem partidarizações", apelando-se claramente ao modelo Standard de ciência. A outra coalizão é identificada com posições exclusivamente ideológicas que criam obstáculos legais para eventuais avanços obtidos com a pesquisa, já que

impediriam a transferência de tecnologia para o agronegócio. Se a pesquisa genética não puder ser transferida ao setor produtivo, o país não vai avançar.

O mesmo argumento foi assumido pela SBPC, que já tinha difundido tal posição desde o debate na Câmara, e pelo Conselho Superior da FAPESP. Em documento entregue ao presidente do Senado, José Sarney, pelo diretor-científico, José Fernando Perez, a Fundação "apela aos parlamentares para que ouçam os representantes acreditados da comunidade científica no sentido de transformar o texto da lei em instrumento de progresso e independência tecnológica, evitando assim danos irreparáveis aos mecanismos de geração de conhecimento e de riqueza" (Revista Pesquisa Fapesp, 97, 2004).

Surpreende não encontrar argumentos que questionem esta visão de ciência entre pesquisadores que fazem parte desta coalizão, desconhecendo ou ignorando os termos do debate internacional e os questionamentos a tal modelo de ciência dentro de setores *mainstream*. Em termos de sugestão para entender isto, posso mencionar a falta de questionamento público dos peritos (a diferença da desconfiança crescente que tem sido identificada em numerosas pesquisas e análises teóricas na Europa), e a radicalização do debate com a outra coalizão que, por seu caráter também heterogêneo (incluindo-se aqui as ações e declarações das lideranças do MST, por exemplo) e pelo precário enraizamento de suas propostas no contexto do país, reforça uma interpretação de suas posições como ideológicas.

Comentários finais

A trajetória do debate em torno dos transgênicos expõe um quadro polarizado entre coalizões heterogêneas e com diversas alianças em redes internacionais, a favor e contra sua liberalização. Se por um lado os críticos endossam "o princípio de precaução" e os proponentes endossam o princípio da "equivalência substancial" entre os OGMs e as plantações desenvolvidas de maneira convencional, surpreendentemente em ambos lados podem encontrar-se argumentos que apelam ao mesmo modelo Standard de ciência e de gestão de riscos e inovações. Em ambas coalizões explicam-se as posições contrárias como ideológicas e as próprias como científicas. As referencias são a um tipo de ciência que se apóia fundamentalmente no modelo positivista, como um conhecimento neutro, isento de valores. Os argumentos das alianças contrárias a liberação dos transgênicos não chegam a questionar o papel da ciência nem assumem que a ciência não é livre de valores, preferindo colocar-se no lado de uma ciência menos contaminada de interesses políticos e econômicos.

A aceitação do mesmo modelo de ciência leva a deixar de lado a discussão sobre efetivas formas de consulta e participação dos consumidores, como está tendo lugar em alguns países da EU. No Brasil, para os setores a favor dos transgênicos, os consumidores devem ser melhor informados, de acordo com o modelo do déficit mencionado anteriormente. Isto levaria a aceitação sem restrições dos transgênicos. Interpreta-se o debate como sendo entre as forças do progresso e as obscurantistas. Para os setores

contrários, a demanda por participação pública se restringe a experiências de júris populares, que acabam sendo uma parodia do que poderia ser a democratização da ciência.

Os limites aqui apontados da trajetória do debate sobre os transgênicos podem abrir uma significativa oportunidade para uma aprendizagem social, reconhecendo-se a necessidade de pensar como, de que formas, em que fases, devem ser criadas estratégias de participação pública nos processos decisórios sobre riscos incertos. Isto, obviamente, sem cair na ingenuidade de pressupor que participação pública implica imediata transparência e uma democracia dialógica (Callon et al.), e sem negar a necessidade de um comprometimento de longo prazo de autoridades em encaminhar estes processos de forma imparcial (abrindo espaço para a difusão das diferentes posições sobre o tema em questão). E aqui as nanotecnologias oferecem um terreno propício para isto.

Também devem considerar-se as pressões globais que podem passar a ser exercidas no debate sobre os transgênicos levando a transformações na formação das coalizões e nas relações de poder entre elas. Além de que as discussões sobre OGMs estão tendo lugar em múltiplos fóruns internacionais (Protocolo de Cartagena, a Convenção da Biodiversidade, World Intellectual Property, a OMC, o Codex Alimentarius, the International Plant Protection Convention e a OECD), há a dinâmica das redes globais contra e a favor, que influenciarão as regulações através das fronteiras, num processo de balance de forces nacionais e globais. Como aponta Oosterveer (2003), podem identificar-se no conflito modelos regulatorios que

se apóiam em redes discursivas diferentes, reagrupando coalizões fluidas de estados nação e atores não estatais, procurando de diversas formas influenciar outros estados-nação (como China e o sul da África) para poder controlar melhor a regulação global. Com estes conflitos entre EU e Estados Unidos, as redes das ONGs e organizações de produtores rurais, que propõem medidas radicais contra a produção e comercialização de transgênicos, parecem ficar restringidas uma vez que as legislações nacionais de biosegurança sejam aprovadas. Se estas disputas acabaram com uma regulação global ou diversas regulações nacionais dependerá de balanços de poder entre interesses políticos econômicos diversos, e no progresso dentro da OMC sobre as disputas em curso.

As futuras regulações dependerão também da capacidade de recanalização das ações das ONGs, de novas informações científicas ou/e de incidentes que levem ao pânico alimentar em algumas regiões e, portanto, da reação dos consumidores. Qualquer nova regulação deve incluir as preocupações dos consumidores e estar aberto a reconhecer problemas ambientais. E isto não se refere exclusivamente às características da regulação, mas ao próprio processo de sua definição.

Dado o alto conteúdo político, ético e social das decisões qualquer regulação não será definitiva e as coalizões continuaram a tentar a sua mudança. E finalmente destaco novamente a existência de um processo entre governos, setores industriais, pesquisadores, etc, reconhecendo a necessidade de que a expertise passé a ser mais transparente e confiável (European Commission, 2001).

O envolvimento cidadão (o compromisso em decisões sobre políticas públicas) é um componente central de novas formas de governança já em experimentação. Este envolvimento pode ser interpretado como "the democratization of expertise, without necessarily meaning as the lost of expertise. According to this approach, 'democratising expertise' goes hand-in-hand with 'expertising democracy', that is, providing institutions and citizens with more and more technical and scientific knowledge – usable and of good quality"(Pellizzoni 2003). E, a pesar da ausência deste tema no contexto brasileiro, isto pode ser desafiado dependendo das mudanças mencionadas anteriormente nos fóruns internacionais de negociação seja de OGMs ou de outras inovações tecnológicas controversas.

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4. The Spiral of Scientific Culture

Carlos Vogt

I

Fernando Azevedo, in his 1943 classic, *Brazilian Culture*, adhering to Humboldt's distinction between culture and civilization, sees in the former a kind of Schopenhaurian will on the part of society to preserve its existence and guarantee its progress, paying heed not merely to the satisfaction of the demands of its material life, but above all and principally of its spiritual needs.

As the author writes, "culture, […], in this limited sense, and in all its philosophical, and scientific, artistic and literary manifestations, being an endeavor of creation, of criticism and of improvement, as well as the dissemination and realization of ideas and of spiritual values, constitutes society's most noble and fertile function, as the highest and purest expression of civilization".

In 1959, in Cambridge, England, C.P. Snow, delivered his famous "The Two Cultures" lecture which, when published, was also to become a classic meditation on the differences which separate a science oriented culture and a humanistic, arts oriented culture.

Notwithstanding, as Professor Leopoldo de Meis rightly points out in his instructive and timely *Science and Education – The Mankind versus Technology Struggle*, published in 1998, in the course of history there have been several discordances regarding the

dichotomy outlined by Snow, including that of the American writer John Burroughs, for whom "the true poet and the true scientist are not estranged", that of Max Planck, who considers that "scientists must have a vivid intuitive imagination for new ideas not generated by deduction, but by artistically creative imagination", and even that of Einstein, when he writes:

> "Where the world ceases to be the scene of our personal hopes and wishes, where we face it as free beings, admiring, asking and observing, there we enter the realm of art and science. If what is seen and experienced is portrayed in the language of logic, we are engaged in science. If it is communicated through forms whose connections are not accessible to the conscious mind but are recognized intuitively as meaningful, then we are engaged in art. Common to both is the loving devotion to that which transcends personal concerns and volition…"

II

From our point of view, although there are fundamental theoretical and methodological distinctions between science and art, they have something very powerful in common. It's a matter of the ultimate goal they share, namely the creation and generation of knowledge, through the formulation of concepts which are abstract and at the same time, however paradoxical it may seem, tangible and concrete. In the case of science that tangibility and concreteness is manifest in logical demonstration and in experimentation; in the case of art, through the sensitization of the concept in metaphor and in what is experienced.

That is why the expression 'scientific culture' sounds more suitable to us than the various other attempts to designate the broad and increasingly widespread phenomenon of scientific publication and of the insertion of the themes of science and technology into our society's daily life.

Better than scientific literacy, the popularization/vulgarization of science, the public understanding/awareness of science, the expression 'scientific culture' has the advantage of encompassing all that whilst in addition encapsulating, in its field of significations, the idea that the process which involves scientific development is a cultural process, whether it is considered from the point of view of its production, of its diffusion among peers or in the social dynamic of teaching and education, or even from the point of view of its publication in society, as a whole, for the establishment of the necessary critical relationships between the citizen and cultural values, in his day and historically.

Louis Berlinguet, in his preface to *When Science Becomes Culture*, the collection of papers presented at the international symposium on the theme, held in Montreal, Canada, in April 1994, writes:

> "In the past, the small group of scientists, who, with great difficulty, examined the primary laws of our universe, was hedged in by society. With the expansion of knowledge, in the words of Pierre Fayard, what occurred was 'a Copernican revolution which tends to make it so that science revolves around the public, and not the other way round'. Today, whether we like it or not, our daily lives are caught up in science and technology. This being the case, it's

better to try to bring them under control rather than remain passive in the face of their developments".

How can this control be achieved without becoming directly involved in the process of production, of diffusion or of teaching and learning science?

The answer is "Through scientific publishing", that is, through the active participation of the citizen in this broad and dynamic cultural process in which science and technology increasingly enter our daily lives, in the same way that fiction, poetry and art form a part of the social and symbolic imagining of our reality and of our dreams, multiplying in our unique and provisional existence, the infinity of lives and life experiences which we live through without ever having actually lived them.

III

When we talk about *scientific culture* we need to understand at least three possible meanings which the very linguistic structure of the phrase offers:

1. Culture of science

Here it is possible to detect two semantic alternatives:

a) culture generated by science

b) science's own culture

2. Culture through science

Two alternatives are also possible:

a) culture by means of science

b) culture in favor of science

3. Culture for science

In the same way, this contains two possibilities:

a) culture oriented towards scientific production

b) culture oriented towards the socialization of science.

In the last of these cases, we would have in a) scientific diffusion and the training of researchers and new scientists and in b) part of the educational process not contained in a), such as that which occurs, for example, in secondary education or in first degree courses and also in museums (education for science), in addition to publishing, responsible, albeit in broad terms, for the cultural dynamic of society's appropriation of science and technology.

These distinctions sketched here certainly do not exhaust the variety and multiplicity of means of the individual's interaction with the themes of science and technology in contemporary societies, but may contribute to a clearer understanding of the semantic complexity which is contained in the expression scientific culture and the phenomenon it designates in our age which is also characterized by other current denominations shaped in general by the fundamental role of knowledge in the political, economic and cultural life of these societies: the knowledge-based society.

IV

In my introduction to Isaac Epstein's book *Scientific Publishing – 96 notes*, I point out how apposite it is for the author to quote the famously spirited and subtly ironic gibe with which Bernard Shaw celebrates the distinction between the specialist and the generalist and their relationship with knowledge in modern times: specialists, are the ones who know increasingly more about less, to the point of knowing everything about nothing, while generalists are the ones who know increasingly less about more, to the point of knowing nothing about everything.

Might that not be knowledge's vertigo? Is society fated to live totally beyond a grasp and understanding of that which today, more than ever, since it is also a source of wealth, structures and determines the whole of our labor relations, our cultural and ethical values, and our daily expectations?

The distinction dear to the tradition of logical positivism which opposes the context of justification to the context of scientific discovery, establishing sharp epistemological differences between what is intrinsically proper to scientific endeavor and that which fences it in as an historical eventuality, external to its norms, rules and elemental laws, this distinction, within what we are referring to here as *scientific culture*, is also gradually losing strength, if only for the fact, among other things, that science through its transformations, has progressively begun to incorporate the very relationship between phenomenon observed and the observer, as a field of research.

Important changes in scientific parameters, such as those analyzed by Popper and by Kuhn, also led to significant cultural consequences for those who make science, for those who teach how to make science and for those who seek to bring about an understanding of how and for what purpose science is made. These changes also determine, in the general scheme of values that characterize the majority of contemporary societies, the dynamic of the cultural process of science and technology known as scientific and technological culture.

How can this be measured? Be evaluated? Be interpreted?

Since it was first brought to light and named, there has been a huge quantity of studies produced, a rapidly developing body of economic and sociological literature, a significant volume of data gathered, surveys carried out on the public perception of science, statistics collected on the number of visitors to museums devoted to the theme, studies of its occurrences in the media and the take-up amongst readers, and, above all, an enormous epistemological will to define, worthy of all great innovations and new, generally multidisciplinary, fields of knowledge, as is the case of that area which the expression *scientific culture* seeks to highlight.

V

The dynamic of so-called *scientific culture* might be better understood were we to visualize it in the shape of a spiral, the spiral of *scientific culture*, as we propose to call it.

The idea is that we should represent it in two dimensions evolving from two axes, one horizontal, that of time, and one vertical, that of space, and that we could establish not merely the constitutive categories, but also the principal players of each of the quadrants which its movement progressively draws graphically and defines conceptually.
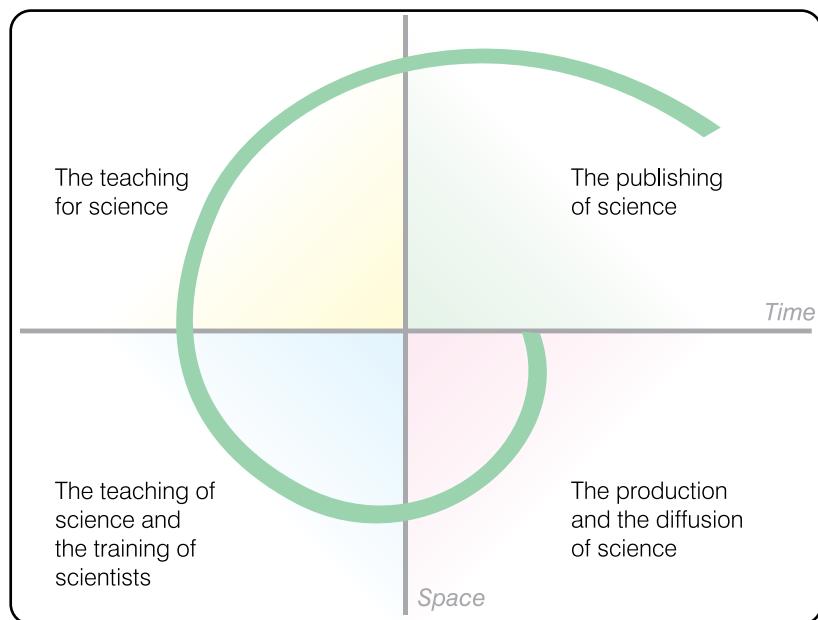
Taking as point of departure the dynamic of **production** and the circulation of scientific knowledge among peers, that is, of **scientific diffusion**, the spiral traces as it evolves, a second quadrant, that of the **teaching of science and the training of scientists**; it then proceeds to the third quadrant and configures the set of actions

and predicates of teaching for science and returns, in the fourth quadrant, completing the cycle, to the axis of departure, to identify there the activities pertinent to **scientific publishing**.

Each of these quadrants can, in addition to this, be characterized as a set of elements which, distributed among them, through the evolution of the spiral, also contribute to the better understanding of the dynamic of the process of scientific culture.

Thus in the first quadrant, we would have as destinators and destinatories of science the scientists themselves; in the second, as destinators, scientists and teachers, and as destinatories, the students; in the third, scientists, teachers, the managers of museums, and cultural presenters of science would be the destinators, with students and, more broadly, the youth public, being the destinatories; in the fourth quadrant, journalists and scientists would be the destinators and the destinatories would be made up of society in general and, more specifically, of society organized in its different institutions, including, and principally those of civil society, which would make the citizen the main destinatory of this colloquy of scientific culture.

At the same time, we would have other players distributed throughout the quadrants.

Thus, by way of illustration, we would have in the first quadrant, with their respective roles, the universities, research centers, government bodies, grant agencies, congresses, scientific journals; in the second, acquiring further functions, once again the universities,

the system of primary and secondary education, the post-graduate system; in the third, the museums and science fairs; in the fourth, the magazines that publish science, the pages and editorials of publications oriented towards the theme, television programs, etc.

It is important to note that in this form of representation, the *spiral of scientific culture*, on completing its cycle of evolution, returning to the axis of departure, nevertheless does not return to the exact point on that axis, but to a point further out owing to the knowledge and involvement on the part of citizens in the dynamic process of science and of its relationships with society, thus opening on its arrival at the point of departure – there being no discontinuity in the process – a new cycle of enrichment and active participation of the players in each of the moments of its evolution.

As a result of this movement which the *spiral of scientific culture* represents it is worth recording the birth of institutions oriented towards questions of science and technology and in which the participation of its citizens is strongly represented, as in the case of the CTNBio in Brazil, for example, which with its regulatory powers bears testimony to the country's biodiversity.

Ultimately, what the *spiral of scientific culture* seeks to epitomize, in its own way, is basically the essential dynamic of the inherent and necessary relationship between science and culture.

The spiral as metaphor (*)

The graphic representation of facts related to the activities of scientific and technological research in Brazil on a spiral is, essentially, an exercise in synthesis. If observed from the period after the Second World War, when a greater intensity and organization of Brazilian production in this area began to emerge, these facts give rise to interesting reflections on the structures of the Brazilian system of Science and Technology.

In reality, it was the reverse path which led to the formulation of the spiral concept as a means of understanding the acquisition of Scientific Culture in this way, spiraled, with its origins in the production and diffusion of science among scientists. In this metaphorical image, through interventions and appropriations perhaps less scientific, in a narrow sense and, at the same time, increasingly more social, in a broader sense, knowledge reaches students at every level through their teachers and through the very researchers themselves, it continues to be diffused in the teaching for science – now involving science centers and museums, which reach broader and more heterogeneous publics –, so as, finally, to strengthen the specialization in scientific publishing, practiced by journalists and scientists. Progressively, the evolution of the spiral of scientific culture continues, in time and space, and is still producing, through the chain of actions and through the natural expansion of social participation, regulatory bodies which regulate the functioning of the CT&I system represented, for example, by committees and advisory boards in different spheres of government.

(*) presentation prepared by Carlos Vogt and Fernando Cunha

5. Environment in the Information Age: The transformative powers of environmental information

Arthur P.J. Mol

Introduction

While the amount of available environmental information is growing on almost all environmental issues for all kinds of decision-makers (private and public, institutional and individual) through increasing monitoring practices, information storage capacity, information transport and scientific understanding, agreement on how to deal with environmental problems seem to be out of reach on an increasing number of issues. The recent discussions with respect to Lomborg's (1998) study *The Skeptical Environmentalist* , but also discussions on GMOs and Climate change, seems to underline the uncertainties some claim to be inherent in today's scientific studies, monitoring practices, measurement and abatement strategies on the environment. In addition to governmental decision-makers at all levels facing conflicting interpretations and uncertainties, citizens and consumers are almost on a daily basis confronted with contrasting claims with respect to the environmental or health consequences of products and social practices, without having one clear authority that shifts true from false information and claims. Is more environmental information paralyzing environmental protection and reform?

Information has been of crucial relevance for environmental policy-making and reform ever since Rachel Carson (1962) started a new wave of environmental concern and reform with her path-breaking work on pesticides. Environmental information[10], and especially natural science based information on the natural environment, has been – and still is – a formative factor in designing environmental reform measures and strategies. During the seventies and eighties social scientists studying the environment have largely neglected the subject of environmental information. It has only been from the late eighties onwards that environmental social scientists started to pay significant attention to information in understanding efforts at environmental restructuring and reform. There are two main reasons to reconsider the contemporary role of information in environmental reform. First, up to now attention of social scientists for environmental information has been rather specific and biased to particular – though valuable – lines of reasoning. Second, developments in today's modern societies challenge us to rethink the role of information in environmental reform. I shortly elaborate on the two reasons.

In the eighties is has been especially the work of social constructivists and the studies related to the Risk Society hypothesis that brought environmental social science scholars to focus on the role of science and information in environmental crises.[11] Both traditions investigated the changing role of science, scientists and experts, and scientific information in social practices and institutions, focusing on the loss of authority of and growing ambivalence

[10] The concept of environmental information refers not only to information on the state of the environment, or on the 'additions and withdrawals' (the emissions and exploitation of natural resources). The recently adopted EU Directive 2003/4/EC on public access to environmental information (OJ L 041, 14/02/2003) defines in article 2 environmental information as written, visual, aural, electronic and other material forms of information: (i) on the state of the environment; (ii) the factors, emissions and withdrawals influencing the state of the environment; (iii) environmental measures and policies; (iv) reports on the implementation; cost-benefit and other economic analysis; (v) the state of human health and safety, including food chains, built structures, cultural values etc.

[11] Freudenburg (2000) has argued that social constructivists have been especially preoccupied with deconstructing (expert) environmental information as used in advancing environmental reform, and less so with criticizing claims of polluters to defend the status quo.

on scientific information. The ambivalence towards science and scientific information had for a long time been kept internally, within the scientific domain. It was the opening of these ambivalences to wider domains in society that resulted in increasing (feelings of) uncertainty among decision-makers and lay-actors in society. Consequently, information and knowledge became inherently contested and could/should be deconstructed, contributing to and emphasizing the disputable role of scientific information to environmental reform. In their detailed, sophisticated and innovative analyses on the changing role of information in dealing with environmental challenges these schools-of-thought were rather one-sided in neglecting to a large extent the formative role of information/knowledge in environmental reform. At the same time, those social scientific analyses and contributions that emphasized constructive roles of environmental information in dealing with environmental crisis did so too often in a rather naïve – simple modernity – way. Either they stressed the need for information collection by environmental experts and authorities to develop a solid – natural science – basis for environmental policies and reform. Or the emphasis was on information dissemination following a rather simple attitude-behavior model, where often voluntary programs invited polluters to rearrange their daily routines of production and consumption into more sustainable directions (cf. Moxen and McCulloch, 1999).[12] Hence, all together a rather specific social science perspective of environmental information, moving between deconstruction and 'simple modernity'.

[12] Arguably, the analyses of the use of information by environmental NGOs in their media strategies and campaigns are among the relatively more 'sophisticated' studies in these traditions.

Second, this relative one-sided attention of environmental social scientist becomes al the more pressing and problematic now that modernity is taking a different turn. General and theoretical sociologists such as Anthony Giddens, Manuel Castells and John Urry[13] have pointed to the fact that Information and Communication Technology, global networks, information flows, and transparency and accountability, are becoming increasingly crucial and essential elements of contemporary global modernity. Information, and its networks and infrastructures, is increasingly being interpreted as one of the essential categories in understanding social processes in entering the new millennium. Castells' (1996/1997) label *Information Age* is telling in that respect. Up till now this has not been reflected thoroughly in the environmental sub-disciplines of the social sciences, while the centrality of information cannot but affect social practices and institutional developments related to environmental reform. Does it mean a radicalization and globalization of uncertainty and ambivalences? Are their new dynamics and modes of environmental reform developing?

In investigating the role of information in contemporary environmental challenges, this article takes a particular point of view. In contrasting and balancing the (dominant) view that more information results in more uncertainties and ambivalences and thus often in stalemate positions when it comes to radical measures for environmental reform (cf. Section 2), this paper analyses how the 'Information Age' (may) contribute(s) to emancipatory, democratic and transformative practices of environmental reform (section 3). Examples from new and innovative environmental reform practices

[13] Others have preceded or followed their line of investigating (cf. Sassen, 1994; Gunaratne, 2002), resulting in what we have labeled elsewhere a sociology of networks and flows (Mol and Spaargaren, 2003.

in production and consumption chains (section 4) illustrate the potentials and actualities of what I will label an informational mode of environmental reform. Such a new mode brings also new challenges and questions, and thus a new agenda for research (section 5).

Information, uncertainty and (environmental) sociology

One does not need to carry out an in-depth analysis of information processes to realize that the amount of environmental information being produced, the availability of environmental information for large segments of industrialized and industrializing societies and the transport and processing of environmental information around the globe have all increased tremendously in the last two decades. This enhancement is triggered by both the increased attention for and interest in environmental quality, and the advancement in information technologies that enable rapid and long distance transmission of information. The question is of course, what are the consequences of this increase of environmental information? Various scholars agree that this development goes beyond a mere quantitative increase, and rather lead to qualitative changes in how society deal with its environmental challenges. But there exist different interpretations and understanding of the nature of this qualitative transformation. There is a particularly strong strand in the environmental social sciences that relates these increases in information and information handling processes to the emergence of structural uncertainties in environmental reform.

In his analysis of the emergence of a *Risk Society* Ulrich Beck (1986) forcefully puts radical uncertainty on the agenda of late modern societies. This radical uncertainty is especially, though not only, linked to dealing with environmental and food safety problems. While initially Beck draws heavily on a selective number of examples (Tsjernobyl, BSE, climate change, GMOs), his later analyses on structural uncertainty move partly beyond such a limited set of (environmental) issues, claiming that these uncertainties are related to the overall structural characteristics of late modern society, and not so much to a particular set of (new) environmental challenges.[14] As conventional science has lost its Enlightenment character as well as its authority with respect to monitoring, measuring, interpreting and making truth-claims on environment and health risks, and no other authority has stepped in, late-modern society is faced with an almost inherent uncertainty with respect to these (and other) dangers and risks. The constantly incoming new information and contra-information forms one of the causes of science losing its authority and contributes to growing feelings of uncertainty among large segments of the population. For all risks, dangers and environmental threats experts are challenged by contra-experts. With no scientific and undisputed mechanism for closing these debates, lay-actors among others are left in uncertainty about the actual risks of eating meat, organic food, or GMO food. Being able and capable to deal routinely with both structurally contested information and uncertainties seems to have become one of the key competencies of late-modern citizen-consumers. Following his work on the Risk Society, Beck's project of reflexive modernity

[14] But Beck remains ambivalent as to the definition of environmental and food safety problems that can be understood with the notion of the Risk Society. The expropriation of the senses, the 'Fahrstuhl-effect', and the lack of trust are all developed with respect to a specific new category of risks, for which the old institutions of high modernity seem no longer relevant. The question is whether these notions have the same relevance for, for example, domestic solid waste, industrial water pollution, and eutrophication caused by farmers.

aims to analyze how modern society deals with these informational uncertainties, both individually and institutionally, by constructing reflexive practices and institutions that build trust. Here we see the contours of a more positive interpretation of growing information, in which new information constantly questions and challenges existing patterns, structures and knowledge, without necessarily leading to apocalyptic prophecies.

Ulrich Beck in his *Risk Society* only indirectly emphasizes the increasing role and influence of information processes on the making of a new social order.[15] This is different in Castells' (1996/1997) famous trilogy *The Information Age*. With the help of extensive empirical and historical evidence gathered all around the world, Castells tried to substantiate the claim that in the 1980s and 1990s the network society emerged as a new social morphology. The new institutional makeup of the network society is to be understood in direct relation to a new layer or dimension emerging within and in between our societies. This new layer is called the 'space of flows' and it should be understood not as a new layer in the geographical meaning of the word, but rather in terms of a new kind of time-space organization of social practices. The space of flows refers to new social dynamics – to new concepts of time, space and power. The global flows of information, and of capital, money, and persons, along the global social and infrastructural networks have major consequences for the global social order and to a major extent structure the 'space of place', its analytical counterpart.[16] Networks and flows rather than states become the structural elements to understand the functioning of what Castells calls the informational

[15] This did change somewhat in his more recent work on reflexive modernity and globalization (cf. Beck et al. 1994; Beck, 1997), although the core of his analysis remained the same.

[16] With the space of places Castells (1996: 378, 423ff) refers to the place-based spatial organization of social life, as commonly perceived and experienced by the majority of citizens in advanced and traditional societies.

economy and the informational society. While Castells himself did hardly relate this new social constitution to increased or structural informational uncertainty[17] (nor to environmental risks[18]), in building upon Castells John Urry (2000, 2003) further explores and radicalizes the notion of uncertainty in his sociology of networks and flows. Although he judges Castells' trilogy on the rise of the network society as the best effort so far to analyze networked modernity, Urry sets himself the task of elaborating and refining the conceptual apparatus as used by Castells. In stead of Castells dichotomy of space of place and space of flows, Urry suggests to approach spatial patterns in three ways or modalities, distinguishing among regions (i.e., objects geographically clustered together), networks (relations between nodes or hubs, stretching across different regions) and finally fluids (spatial patterns determined neither by boundaries nor relations). Where Beck basically relates (informational) uncertainty to contested science and knowledge and Castells does hardly problematize information flows in terms of being fundamentally uncertain or contested, Urry puts uncertainty in a much broader perspective of global fluids. Uncertainty is not only related to measurements, information, facts and risks, but has become a structural property of global flows/fluids that constitute a global complexity. A global complexity that is inherently unpredictable, unmanageable, unexpected, chaotic, constantly on the move, unknown and thus fundamentally uncertain.[19] As such uncertainties relate to the outcomes and effects of all kind of social (and material) networks and flows, and – in contrast to Castells – information flows and ICT are no longer interpreted as being of

[17] Uncertainty in Castells' analysis is not related to science and scientific knowledge, but to uncertainty of economic producers in a globalized network economy, where they lose sight and control on what is happening in their social and economic environment (cf. Castells, 1996: 153, 190, 193).

[18] Castells did not really relate his analysis on information to environmental and health risks, except for a small chapter on environmental resistance of environmental movements - with straightforward scientific information - against the 'space of flows' (cf. Volume 2 of The Information Age). With that Castells locates the environment in the space of places, restricting any profound analysis of environmental information in global flows.

[19] From a different analysis Wallerstein reaches the same conclusion in claiming that the mutation of the World-System has now arrived "in the true realm of uncertainty" (Wallerstein, 1991: 15).

such fundamental origin to the coming of a new – fundamentally uncertain – social order.

While acknowledging the significant contributions of the Risk Society literature and the sociology of networks and flows to our understanding of how global information (and other) flows structure the complexity of late modern society in dealing with – among others – environmental and food risks, we should not interpret this in one-dimensional, pessimistic, and structuralistic/ deterministic categories. The coming of the 'informational society' has definitely contributed to growing feelings and experiences of uncertainties, to knowledge claims that can be (and sometimes are) revised any moment, and to new difficulties and controversies in environmental regulation and control. And Urry's analysis of flows/fluids structurally determining an inherently uncertain global complexity indeed seems to make agents almost irrelevant. But, at the same time growing information generation, availability, processing, dissemination, access and use open up new practices, possibilities and institutions for dealing with environmental and health risk, for ecological modernization and reform. Beck's reflexive modernity analysis, for instance, has set the scene for a whole area of studies, suggestions and – to some extent – practices for alternatives to normal science approaches: citizen's science (Irwin, 1995) democratic science, lay-actor involvement, dialogical science, participatory science, etc.

While the growing flow of information does relate to uncertainties and the undermining of 'simple modernity' institutions such

as normal science and the nation-state, it at the same time contributes to democratization, counter-surveillance and new forms of governance, decision making and control in dealing with environmental risks. In elaborating especially the latter side below, this article aims to complement a too pessimistic/deterministic view of how managing environmental risks becomes contested, jeopardized and paralyzed through information flows.

Informational mode of environmental reform

Information has always been a crucial element in environmental protection and reform, as indicated above. But since the 1990s something special is at stake with the role of information in society's attempts to protect the environment. To clarify this it is most useful to draw upon Castells' (1996: 21) distinction between an information economy and an informational economy. According to Castells, *information* economy refers to the role *information* plays in economic processes. Information, in its broadest sense of communication of knowledge, has always been critical in all economies. Informational economy, in contrast, refers to a specific form of social organization in which information generation, processing and transmission become fundamental sources of productivity and power. The informational economy is not just referring to the importance of information in economic processes, but points at a fundamental transition of the economic order, resulting in a new technological paradigm and a new social organization (often referred to as networking logic and network

society). The economy has become informational because the productivity and competitiveness of units or agents in this economy fundamentally depend on their capacity to generate, apply and process information. And here Castells, and with him various other scholars[20], point at a historical discontinuity. The emergence of a new technological paradigm, organized around flexible and powerful information technologies and linked to processes of globalization, results in a fundamentally different social and economic order.[21]

A parallel can be drawn with respect to the changing role of information in environmental reform. While information has always been of crucial importance in environmental reform, recently an informational mode of environmental reform has started to emerge. This new mode of environmental governance and reform is strongly dependent on and triggered and constituted by enhanced capacities of environmental information generation, transmission, access and application. Information now starts to become a constituting and transformative factor in environmental reform, in stead of just an enabling condition. Information gains in 'power' and impact as a resource in structuring social practices of environmental protection and reform, vis-à-vis other authoritative, economic and technological resources. Polluting practices start to change for the better through the monitoring, measurement and collection of environmental information; the transparency and making public of environmental information; and the access, use and application of environmental information.

[20] In this analysis of theories of the information socities Webster (2002) provides an informative overview of the different scholars and schools of thought that see information as becoming a crucial factor in social transformations. Surprisingly, this volume makes no reference to the role of information in environmental risks and reforms.

[21] Here we should also draw a distinction between the post-industrial society scholars such as Daniel Bell and Alvin Tofler on the one hand, and on the other those scholars who relate the informatization of economy and society to processes of globalization and technological transformations (e.g. Castells).

The emergence of a new, informational mode of environmental reform is strongly dependent on two wider developments in late modernity. First, with developments in ICT the capacity has increased among actors to collect, handle, store, spread and access (environmental) information over larger geographical scales in shorter amounts of time. This allows information to become a fundamentally more important factor in processes of environmental restructuring and reform. It is not so much the substantial content of information that makes a difference and begins to give environmental information transformative capacities. The transformative capacity of information in environmental reform is rather caused by the enhanced possibilities and capacities of environmental information collection, processing, transmission and use; the increase in the amount of people and institutions having access to and making use of information; and the time-space compressing of information flows in a globalized world order.[22] Second, with wider changes in late modernity – such as those often referred to as globalization, disenchantment of science, and governance – some institutions lose their automatic monopoly position as trustful and credible organizations and agencies on environmental protection. It is especially the state[23] and science that have changed dramatically in this respect. Consequently, in an era where 'simple modernity' mechanisms, doctrines and institutions prove not always adequate and sufficient, state actors, economic organizations and civil society representatives are forced and have started to redefine and reposition their role in generating and sustaining environmental trust. Informational processes play a

[22] It goes without saying that these variables have not the same loading for all countries (cf. Zoot, 2001; Gunaratne, 2002), resulting in geographical variations in the importance and relevance of an informational mode of environmental reform.

[23] Although some scholars interpret this as the withering away of the 'environmental state', in most industrialized and industrializing market economies, we cannot witness a sharp decrease in state institutions on the environment, in legal and regulatory activities of these state institutions, or in state capacity for the environment (except for a few incidental cases such as Russia). Or, in other words, in general industrialized countries are not moving towards an environmental de-institutionalization with respect to the state.

key role in (re)building trust and in legitimizing activities that have become increasingly subject to questioning and doubt.

This informational mode of environmental reform comes is in line with what has become known in the USA (e.g. Konar and Cohen, 1997; Kleindorfer and Orts, 1998; Case, 2001) – but also beyond that (e.g. Wheeler, 1997) – as informational regulation[24]. While there are significant relations, similarities and overlap, and constructive cross-fertilizations between the informational regulation literature and what I label an informational mode of environmental reform, the former concept distinguishes itself from the latter in: (i) a stronger emphasis on the legal foundation of information disclosure[25]; (ii) a more narrow interpretation of information disclosure in terms of policy instruments or tools, as alternatives for strict regulatory or strict economic policy instruments; (iii) a framing of information use strongly related to the environmental state, or the relation between state and civil society; (iv) a legal[26] and economics approach to understanding informational regulation (cf. Case, 2001), rather than a political science or sociological perspective. With the concept of an informational mode of environmental reform we aim to develop a sociological/political science perspective on the key role of informational processes in environmental reform, closely linked to wider developments in the transformation of the late modern order: globalization, information and communication technologies, ecological modernization, and the redefinition of the role of science and the state.

The redefinition of the role of the state in environmental reform links an informational mode in environmental reform with the

[24] Following Tietenberg (1998) and Kleindorfer and Orts (1998), Case (2001: 10775) defines informational regulation as "rules requiring mandatory disclosure of information on environmental operations or performance of regulated entities to third parties. Such regulation seeks to enlist the aid of such nongovernmental forces as economic markets and public opinion either in complement to, or as a substitute for, traditional regulatory strategies of government standard setting and enforcement."

[25] Often strongly related to the US Toxics Release Inventory, following the 1984 Union Carbide accident at Bhopal in India (cf. Case, 2001; Sand, 2002), and other national and EU Pollutant Release and Transfer Registers.

[26] Especially the contributions to informational regulation in the so-called reflexive environmental law approach relates to the argument developed in this article (cf. Stewart, 2001; Orts, 2001).

literature on shifting governance.[27] For one, the actors involved in the informational mode of environmental reform go beyond the environmental state and include consumers, customers, NGOs, communities, media actors, producers, business associations, insurance companies and the like. Second, the dominant nation-state level in conventional environmental reform is complemented or even bypassed by supra – and sub – national informational modes of environmental reform. To be more precise: the crucial role of informational flows and the importance of non-state actors make nation-state borders significantly less relevant in environmental reform. In that way, informational reform is closely related to ideas of multi-level and multi-actor governance, although these latter concepts seem to miss part of the essence of the change in environmental governance that is at stake. New environmental reform practices and institutional designs are not only (or mainly) different from the older ones in that more actors and more levels are involved. The fundamental difference is that informational flows and processes start to move to the very center of environmental reform dynamics, now that conventional institutions are questioned for (i) deficiency in sustaining trust, (ii) losing legitimacy, and (iii) showing reduced effectiveness. The lost monopoly position of the nation-state and normal science in environmental governance results in more levels and more actors on stage.

[27] This broad literature is strongly represented in the environmental social sciences, for instance in ecological and political modernization studies, in the literature on subpolitics, and in the recent policy science debates on multi-level and multi-actor governance.

Information and ecological modernization

The growing importance of information in practices and processes of environmental reform can also be understood and interpreted from an ecological modernization perspective. This provides us with an additional – now environmental – argument and logic to understand this informational mode in the field of environmental reform The ecological modernization literature has interpreted the changes in processes of environmental reform in industrialized societies from the mid 1980s onwards in terms of the growing articulation (or differentiation or growing independence) of an ecological rationality (cf. Mol 1995; Spaargaren, 1997). In practices of production and consumption environmental considerations, ideas and interests are more and more articulated independently from other (economic, political and social) rationalities or interest, resulting in the environmental redesign of these practices, or the institutions that govern these practices. This emerging ecological rationality can and should be distinguished from a (still) dominant economic rationality in consumption and production processes. This growing importance of environmental interests and considerations in social practices and institutional developments has been illustrated in a number of empirical studies (cf. Mol and Sonnenfeld, 2000; Spaargaren, 2003).

In processes of production and consumption the dominant economic rationality and interests have always been articulated especially via markets and prices. Economic preferences, economic

interests and economic power are articulated and coordinated in terms of money and markets. Ecological modernization scholars (cf. Andersen, 1994), but also environmental and ecological economists (cf. Ekins and Speck, 2000), have worked upon questions of articulation and co-ordination of environmental rationalities along similar lines of money and markets, for instance via environmental taxes and other economic instruments, via economic valuation of environmental goods and services, and via niche market development. Although effective and valuable in a number of cases, in the end this is an indirect, incomplete and also criticized way of articulating environmental rationality and interests.[28] With the growing importance of information in economic processes, and with the expansion (in quantity, time and space) of information transmission, handling and processing capacity, a more direct 'methodology' comes into reach to further articulate the environment in production and consumption. The articulation and making visible of environment via monitoring, measuring and reporting in terms of various environmental indicators forms a much more direct and complete articulation of environmental rationality. In addition, environmental information provides environmental interest a more independent (vis-à-vis economic interests) place in production and consumption processes than economic valuation will ever be able to do. It becomes only then evident that productivity is not exclusively related to an economic rationality. The articulation of environmental interests and rationality in production and consumption processes via environmental information (rather than economic valuation) is only possible

[28] Different kind of methodologies (willingness-to-pay, Green GDPs, etc.) for expressing environmental values and preferences in monetary terms have been heavily debated, especially in those cases where it is pretended that all environmental interests and values could be included in such monetary terms and could thus be subjected to market coordination processes. More limited and pragmatic approaches in using monetary terms to shift markets (both demand and supply) in more environmentally sound directions have proven useful and sometimes effective.

once information starts to play a crucial role in constituting and transforming such processes. This is in fact exactly what happens in informational modes of environmental reform. While economic aspects of products, production and consumption are visualized, emphasized, communicated and coordinated via prices and markets, an informational mode of environmental reform points at the possibilities and practices to use environmental information to visualize, emphasize, communicate and co-ordinate ecological interests and rationalities in products, production and consumption. It opens up possibilities for further advancements in the process of ecological modernization of late modern societies.

To take the argument one step further we should relate the ecological modernization processes to processes of time-space distanciation. Processes of disembedding, where processes are lifted out of their local place-bound structures and systems to be reorganized many miles away in different contexts, call for symbolic tokens to build trust over large distances. With respect to economics prices and money fulfill the need for such symbolic tokens. If it concerns environmental protection, for instance related to global flows of (green)products or waste when production and consumption are separated in space and/or time, environmental information is the basis for symbolic tokens that can bridge this time/space gap. Articulating environmental rationalities via informational devices and systems is then much more precise and adequate than via economic signals or tokens. Or to put it in Castellian language: informational flows connect the environment in the space of flows with the environment

in the space of place. In that sense Buttel (forthcoming) correctly notices continuities between the ecological modernization literature and the new sociology of environmental flows.

Information in reforming production-consumption chains

In order to explore the nature of such an informational mode of environmental reform and to give evidence that this innovation is more that just a marginal new fashion, the informational mode of environmental reform in the domain of production-consumption practices and chains will be elaborated. The objective of such an explorative analysis is to understand, explain and clarify the diversity and innovative dynamics, and not so much to quantify the frequency, importance or environmental effects/effectiveness of informational modes of environmental reform vis-à-vis conventional environmental reform.

Environmental regulation of production and consumption still rests predominantly on legally-based state regulatory activities with respect to processes, products and behavior. While states have been successful in limiting the domestic environmental effects of point-source productive activities and standardized bulk products, their effort on diffuse producers and consumers, on specialized and new products, and with respect to globalized markets have been less successful. The reorganization of production-consumption chains following tendencies of globalization and post-Fordism (flexibilization, chain inversion, consumer empowerment,

fragmented markets, etc.) has rendered conventional nation-state regulatory activities at some points ineffective and inefficient, jeopardizing legitimacy of and trust in the environmental state. It is especially here that we witness the emergence of informational activities and flows that play a significant role in environmental reform. These environment-oriented informational activities and flows are sometimes state-initiated and even legally-based, sometimes only state-sanctioned after being initiated and developed privately, sometimes only facilitated by states and are sometimes performed completely beyond and outside the state.

At different access points in the production-consumption chain environmental information is articulated and made visible, resulting in distinct information flows. This goes together with various activities of information collection, monitoring, measuring and handling; different strategies of reporting, presentation, transparency, transmission and dissemination; various ways of verification, auditing and control to assure the reliability and completeness of information; and multiple uses and users of this information. As different public and/or private actors can perform tasks of information generation, information collection, information handling, information transmission and communication, information verification and information use, different – context dependent – arrangements can be identified in informational modes of environmental reform regarding production-consumption chains. Finally, we see that increasingly these arrangements and information systems are no longer place-bound in globalized production and consumption

systems. Different practices of information generation, handling, reporting and use – can and do – take place at different locations, mediated by global networks. Consequently, (global) flows of information can be witnessed between nodes in (global) networks and 'governed' by different socio-material scapes.

Examples

A few examples can clarify the transformative dynamics and powers of informational processes and information flows in new forms of environmental reform. I elaborate shortly on labeling systems as new symbolic tokens, information systems at the producer/consumer interface, environmental reporting and auditing schemes of producers, environmental monitoring systems, and environmental disclosure via pollutant registers and informational campaigning via NGO networks.

Perhaps the most well-known examples of informational activities in production-consumption chains are eco-labeling and product-information programs. Most advanced industrialized states have now one or more state-recognized and sanctioned eco-labeling programs (e.g. on organic food, wood, recycled products, etc.), and incidentally international state-run eco-labeling programs are being developed (e.g. in the European Union). But besides these state-sanctioned and often state-organized eco-labels and product information schemes, a blossoming of private initiatives can be witnessed. From local or national producer/sector

organized initiatives, to truly global innovative industry-NGO eco-labeling initiatives such as Forest Stewardship Council and Marine Stewardship council.[29] Each label and product-information system has its own arrangement of actors collecting the information, organizations verifying information, routes for transmission of the label or product information, and users that are addressed with information. This diversity and omnipresence of labels and product information, as well as the diversity of arrangements that come along with them, have triggered fierce debates and controversies on verification, public and private responsibilities, scientific basis, effectiveness and trade barriers, without however jeopardizing the further development and growth of labeling practices and related information flows up till now. And continuing to push for further environmental reform is it not to the same extent in all sectors.

At the access points were the consumer meet the producer, environmental information is displayed via various innovative ways: on products, on displays (at retailers or waste handlers), on separate information sheets, in interactive ways on the Internet or on site, via (moving) pictures, or through 'packed' messages that touch unconsciously consumer preferences for naturalness. Such environmental information related to production location, product contents, production circumstances, product use and product disposal articulates environmental rationality at these access points and thus contributes to environmental improvements, in various ways and through diverse dynamics. Less common yet is that through the use of webcams consumers can look at actual production circumstances 9for instance in organic farms, at oil

[29] A rich literature from various disciplines has emerged on the various forms, impacts, and arrangements involving public, private and mixed labeling schemes (cf. Magat and Viscusi, 1992; Oosterveer, 2003).

producing platforms) miles away, at any moment they prefer. In that way producers make their production practices transparent and at the same time partly restore the close loops that existed between producers and consumers decades ago.

Annual environmental reporting by companies, not unlike the annual financial reports, is another emerging tendency in informational reform in industrialized countries. Larger companies collect environmental information with respect to their activities, publish this annually and verify this information by so-called environmental accountants. State authorities to some extent and in some situations sanction this process and then informational regulation seems more closely related to conventional environmental regulatory regimes. But informational modes of environmental reforms via such reporting are also coming from neighboring communities, environmental NGOs, credit institutions, insurance companies, and customers, which request and use - or have the possibility or the 'threat' to use - environmental reports in their diverse relations with producers. At the same time tendencies of benchmarking, of comparing company environmental performance via environmental reports by NGOs or research institutions, and of exporting these practices to other geographical places in the network society move this informational reform further away from conventional regulatory governments. Typically these environmental reports do not so much report on fulfilling legal requirements or standards, but rather legitimize the company performance by showing continuous environmental improvements on a variety of environmental quality

indicators, diminishing complaints, and environmental R&D efforts and investment plans for the future.

In the conventional regulatory system the state relies on state-run, expert-led and natural science based monitoring systems to see whether, where and when enforcement needs to be intensified and policies have to be adapted. Under conditions of informational reform new monitoring systems and mechanisms start to appear, and not only in the advanced industrialized settings. Complaint systems (via letters, telephone lines and/or the Internet) and surveys are actively stimulated and organized by state authorities to set priorities in policy-making and enforcement agendas.[30] But also communities, environmental NGOs and social scientists organize non-natural science based monitoring systems via citizens, consumers and more specific segments of society (cf. railway travelers, hikers in nature) to pressure states, set new agendas, mobilize public opinion and reform environmental polluters.

While most existing environmental governance systems still favor administrative and corporate secrecy, and thus monopolize environmental information in the hands of governmental authorities and corporations, initiatives on mandatory disclosure is growing. Especially since the 1998 UN/ECE Arhus Convention, the Rio Principle 10 and the Access Initiative[31] OECD countries have speeded up regulation on Pollutant Release and Transfer Registers (cf. Sand, 2002). Strongly supported by the ICT developments this has resulted in the USA (but increasingly also in other countries such as Australia, the UK and the Netherlands and recently the

[30] See O'Rourke (1999), Phung Thuy Phuong and Mol (2004), Wheeler (1996) and Martens and Ho (2004) for examples of complaint systems and community driven regulation in Vietnam and China, two still strongly state-dominated systems.

[31] See the website http://www.pp10.org.

EU; cf. Howes, 2001; Sand, 2002; Burg, 2004) in direct access to standardized, site-specific, up-to-date and user-friendly environmental emission and performance data of thousands of American companies, via the Scorecard site.[32] Not only does it allow citizens to search their neighborhood for polluting sources, compare these facilities and neighborhoods with other in the USA, and pressure companies for improvement via NGOs, congressmen or the EPA. It also moved journalists, polluters themselves and governmental authorities into environmental action, leading to environmental improvements (Roe, 2002; Karkkainen 2001; Natan and Miller 1998; Cohen, 2000; Sand 2002; Burg, 2004).[33]

There are also less systematic forms of informational activities that press for environmental reform, such as those practiced by environmental NGOs. With global information flows and world wide networks of organizations, these NGOs are capable to spread information on unsustainable production practices rapidly around the globe and combine that with media and other campaigns at different localities of the network society. In that sense, the global flows of investment and financial capital in the global economic networks start to find their parallels in the global environmental information flows in a global civil society network. Consequently, informational pressure for environmental reform is no longer articulated only at the location of poor environmental performance. And best practices and benchmarking are no longer restricted to the investments of multinationals in wealthy localities in OECD countries, but also reflect upon production sites in developing economies.

[32] www.scorecard.org, launched by the Environmental Defense Fund in 1998; www.eper.cec.eu.int, launched in February 2004 by the European Union.

[33] Sand (2002: 4-5) and others relate the "success story" of the TRI and the scorecard site in the US to one or more of the following characteristics: (i) electronic communications via the Internet; (ii) reversal of the burden of proof for exemptions; (iii) enforcement by citizen suits; (iv) standardized data, facilitating comparison and 'performance benchmarking'; (v) reputational effects of such competitive ranking on a firm's behavior.

Information flows in environmental networks

These informational practices on environmental challenges, and the institutions and arrangements governing these practices, show a large degree of variety. But together they also share – or better: make up and construct – a common perspective. Environmental information becomes increasingly decoupled from legally-based state activities and programs for changing attitudes (and via that presumably behavior). In stead environmental information starts to gain transformative powers by itself in a much more direct way. These powers are of course not 'actor-loose' and we should not be trapped in a system theoretical analysis, as some of the contributions to the sociology of networks and flows seems to do (cf. Mol and Spaargaren, 2003). But a sociology-of-networks-and-flows perspective helps to understand that an informational mode of environmental reform has no longer simple causalities between a sender of environmental information and a receiver of information, or between an expert-led monitoring of (company) emissions and environmental qualities, and a state-led environmental action. A complexity and variety of arrangements - of networks and flows - relate information gathering, information handling and transmission and information access and use in environmental reforms. A perspective of networks and flows help us to understand and conceptualize that states have certainly not become irrelevant in informational reform, but they have lost their almost monopoly position, which was so strongly build up during the second wave of environmental reform in the 1960s and 1970s. If we read the

innovative contributions of Castells, Urry and others in that way, they open up new promising perspectives in understanding the emergence of an new phase in the protection of the environment. A phase that has new challenges and asks new questions.

New modes, new challenges, new questions

Every new development, approach or mode of environmental reform brings along new challenges, new questions and new conflicts. Intensive social and policy science research over the last 25 years has made us aware of the shortcomings, limitations and strengths of the conventional regulatory regime of environmental governance. If we can indeed identify in environmental governance the emergence of a new informational mode of environmental reform, strongly triggered by wider developments in late-modern society, a whole new range of questions and challenges come to the fore. The emergence of an alternative – or rather complementary – informational reform opens up a new research agenda, of which I will outline three pressing sets of questions.

The first set of questions and challenges go back to where we started: structural uncertainty. How do we deal with uncertainties that seem to form a structural property of models and practices of informational reform? What kind of new (science-policy) arrangements, decision-making structures, guiding heuristics and principles, and 'closure mechanisms' are, can be and should be developed? Should we not start to distinguish uncertainties in

different categories, and relate these categories to strategies of dealing with uncertainties, both at the individual and institutional level? These question are far from new. A rich literature is emerging on the various points raised, which I will not try to summarize. With an outlook to information regulation we should of course not become blind to these conventional approaches that have dominated questions of environment and information/knowledge.

A second set of questions is related to transformations in what used to be labeled policy network and communities. With information becoming a key resource in environmental governance and reform, power relations will start to change. Monopolies on information, information handling capacity, information generation and transmission capabilities, access to information and information publication are becoming key resources in power struggles around informational reform. To some extent it becomes increasingly difficult to limit environmental governance to a small inner-circle policy community, where polluters and environmental authorities negotiate and decide upon environmental reforms. Information, and also environmental information, might be monopolized in other hands, as we see in other political domains (e.g. Berlusconi, CNN, Murdoch).

But it can also means that monitoring of, measuring and access to environmental information diversifies, as van den Burg and colleagues (2003) and van Vliet (2002) have illustrated. It is than no longer environmental authorities and polluting producers that monopolize monitoring and access to environmental information. Citizens, consumers, insurance companies, environmental

NGOs and others gain a position in the 'information battlefield', strengthening their position in new arrangements of informational reform.[34] This opens up new possibilities and new challenges for democratic environmental governance, for surveillance and counter-surveillance, for inclusion and exclusion, on all levels (local to global) and without any predetermined outcome.

A third set of questions emerge with respect to the design of informational reform. It becomes clear that under conditions of the Information Age governance and control, also with respect to the environment, are in need of fundamental rethinking. Conventional models of nation-state organized environmental governance and control will increasingly become inadequate. Theoretically, Urry (2003) has drawn the most far reaching and radical conclusions of such a position, in considering state, societies and governance no longer adequate concepts in his 'new rules of sociological methods'. The more empirical and environmental literature on informational *regulation* - in contrast - draws lessons with respect to the design of informational regulation and information disclosure, especially relating to effectiveness, efficiency and costs (e.g. Tietenberg, 1998; Tietenberg and Wheeler, 1998 and other economists) and to performance, access and democracy (e.g. Sunstein, 1999; Case 2001; Cohen, 2000). If informational reform forms (part of) the answer to that, what material and social infrastructures are needed with respect to effective, efficient and democratic informational reform on the environment? What requirements does this pose to governance arrangements, monitoring and transparency, information handling capacities, and the capacities and capabilities of state environmental

[34] On a global scale the movement on Access to Information, Decision-making and Justice, related to principle 10 of the Rio declaration and in line with the European Arhus Convention (www.pp10.org), give evidence of the growing struggles for environmental information. On a national and local level public disclosure and access to monitoring data are often debated, and not only in the open European countries (see for Asian countries for instance Dasgupta and Wheeler, 1996; Wang et al., 2002; Hong et al., 2003).

authorities? And last but not least, how should this be reflected in legal frameworks, soft law and policy-making practices and strategies of environmental states and international organizations?

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6. Political consumerism for sustainable consumption practices:

Rethinking the commitments of citizen-consumers with environmental change

Gert Spaargaren

Introduction

What do citizens do – or not do – with the tremendous increase of information about the environmental dimensions of their everyday life? Are they using the information to make conscious choices for the greening of their individual lifestyles and for more sustainable patterns of housing, food, and mobility? Do the environmental information flows help constitute new forms of political engagements to put pressures on providers and regulators in order to increase – in both qualitative and quantitative respects - the levels of provisioning of more sustainable technologies and products? Are citizen-consumers using environmental information-flows to enhance their understandings of the processes of change toward a more sustainable modernity? Or do we witness a growing indifference towards eco-information on labels, certificates etc? Does the endless stream of warnings about environmental threats and risks result in people turning their back on sustainable development issues? Are citizen-consumers frightened off by

the puzzling amount of more complex and more contradictory information flows about the risks stemming from the modern industrial systems of production and consumption? Why in the first place should citizens believe the information stemming from expert systems which repeatedly prove to be not very trustworthy when it comes to the effective handling of environmental risks that might threaten the health and well-being of citizen-consumers and ecosystems alike.

In the debate about the risk-society as it developed in sociology and political sciences from the mid 1980's onward, the dis-enchantment of science and technology in reflexive modernity was discussed and illustrated in some detail with respect to the role of expert-systems in modern societies. As Anthony Giddens (1990), Ullrich Beck (1986) and Brian Wynne (1982) in particular have made clear in numerous publications, the authority and political powers of expert-systems came under pressure since and as far as they claimed to be based on 'undisputed science and technology'. After Chernobyl and a series of food-crises in Europe, we have become aware of the fact that modern risks tend to escape the control of some of the very institutions and expert-systems that were designed to manage these risks.

With the roles of expert-systems becoming questioned and disputed in public discourse, also and particularly so the confusion and anxiety of lay-people about the role of modern science and technology amplified in relatively short time. The risk-society is felt most severe and acute at the level of decision making in everyday

life. People are aware of the fact that they can no longer trust their own senses in making solid judgements about the risks associated with their lifestyles and everyday life consumption patterns and that they have to rely on scientific experts to help make sensible decisions in daily matters. People also know at the same time that these scientific experts and expertise-systems are bereft of the re-assuring authority bestowed on them in earlier periods of modernization, aptly labeled by Ulrich Beck as the phase of 'simple modernity'. In the more recent period of 'reflexive' modernity, making choices has become less easy and less supported by societal institutions. Choices we have to make on the meat we eat or give to our children, the transport modality we use for traveling, the neighborhood we settle down etc. are choices about which risks to accept and which risks to avoid and they have to be made under conditions of partial and non-secure information being available. Our everyday life is organized with the help of a series of individualized life-style (or life-political) choices that are based on our personal balance of anxiety and trust in the information and the expert systems of modernity, a precarious balance which in its turn will be affected by the outcomes of our choices. We know that everyday-life is an inherently risky affair and that there are lesser guarantees than before, but we cannot refrain from living it (Bauman, 2000; Beck & Willms, 2004).

In the next section, we will use an empirical example to explore the processes of choice at the level of everyday life in some more detail, looking specifically at the role of environmental information and the way informational flows are formatted or framed by both

NGO's and expert systems in contemporary societies. We will conclude from this discussion that there is a need to reflect on the specific roles of 'citizens' and 'consumers' as drawn upon by many actors in shaping the environmental politics of everyday life. Due to the globalization of production and consumption and the changing role of the nation-states in matters of production and consumption, we argue that the old sets of expectations, rights and responsibilities as they came along with the notion of 'citizens' and the notion of 'consumers', no longer suffice. To make sense of the relation between expert-system knowledge and information on the one hand and the ways in which this knowledge is used (or ignored) by lay-people in shaping there everyday lives, there is – as we argue in section three - the need to develop social scientific concepts which enable us to make sense of some of the multi-level and complex forms of citizenship and consumerism in the making. We end with a section on political consumerism and sustainability transitions in everyday life, since it are these two key concepts which – taken together and defined in relation to each other, might help to bridge the gap between informational strategies in expert-systems and the handling of information by lay-actors in everyday life.

Shopping for sustainable food: an example.

In a recent debate about the dangers of pesticide-residues on fresh fruits in Dutch supermarkets, the environmental organization Milieudefensie (Friends of the Earth) was accused by some health experts of being indirectly responsible for 'killing people'. This assault

was raised by some experts who believed that Milieudefensie is fighting the wrong battles (minor risks stemming from residues) with the wrong enemies (retailers with a pro-active environmental performance record), resulting in unforeseen casualties. What had happened? The environmental movement launched a public campaign about pesticide-residues on fresh fruits and vegetables in Dutch supermarkets. For a number of randomly selected products, these residues were investigated by scientific experts on behalf of the environmental movement. Several times, residues were shown to be present above detection level and sometimes even above the agreed upon standards. Especially 'foreign' food e.g. food stemming from globalized production and consumption chains were shown to be 'contaminated' some times and in some specific supermarkets. Based on these 'scientific facts', the environmental movement started to campaign among the public, using the instruments of 'yellow' and 'red' cards to identify and act upon those retailers which were found guilty of selling 'contaminated' or 'poisonous' fruits and vegetables. As Milieudefensie would have it, the result of this campaign would be that retailers intensify their control systems or – even better so – change over to organic fruits and vegetables in their stores. Some health experts however feared that as a result of the public campaign, the more probable result would be that we end up in the Netherlands with a situation of less people consuming less fresh fruits and vegetables. The number of health victims resulting from this unintended diet-change would by far exceed the number of health victims expected to result from the consumption of (low level) pesticide residues on apples and grapes.

The campaign on pesticides-residues can be seen as a very attractive and successful form of raising public attention and awareness (and membership of environmental organizations of course) for several reasons. First, health issues of course are among the best established environmental consumer-concerns, and fresh fruits and vegetables are historically connected to these health concerns in a very direct and specific way. Second, fresh fruits are an important and visible part of the supermarket assortment in the Netherlands, exposed in attractive and visible ways mostly at the early entry parts of the supermarket. Third, fresh fruits and vegetables are a product-group that plays an important role in the sustainability transition in the domain of food-consumption in the Netherlands since for many products within this category there are more sustainable alternatives available at reasonable prices. Fourth, by including citizen-consumers in their strategies of monitoring and controlling retailers for (the lack of) safe and healthy food offerings, Milieudefensie was able to connect environmental commitment and activism to such an ordinary routine as shopping in the supermarket, a model of 'political consumerism' that was successfully employed in Sweden in the late 1990's as well (Micheletti, 2003) .

There are however also some strategic risks, dilemmas and limitations involved in this public campaigning on poisonous food[35]. Over the past five years, in the context of the 'sustainability transition in food consumption', several of the major retailers had committed themselves to the goal of substantially enlarging the amount of sustainable (mostly organic) products in their outlets.

[35] The strategic relevance of anxiety of poisonous substances in everyday life is not limited to food, as can be concluded from a major (2004) advertisement-campaign by Greenpeace, calling upon (also young) people to have their mobile phones and personal computer checked for poisonous substances…).

These commitments were partly the results of pressure and lobbying by one of the major environmental organizations Stichting Natuur en Milieu (SNM), which is operating as a professional lobby and action-organization at the national level primarily. Although working together in the food- pesticide-campaign, the grassroots-activism-part of the environmental movement on the one hand and the professional lobbying part of the environmental movement on the other, seem to be running into a number of conflicting aims and perspectives. Retailers of course do not like the red-card public campaigning strategy, since it would give them a bad image. Their willingness to participate in discussions with the environmental organizations about voluntary measures to increase the quality and quantity of sustainable food products in the stores diminishes. You cannot play against a player who just has been sending of. Second, the question about ' acceptable uses of pesticides' also arises within the environmental movements themselves, now that organic or pesticide-free production is offered by radical parts of the movement as the only feasible alternative to mainstream, intensive agriculture. Third, in what way should the environmental movement address the claims of some producers and consumers that the choice for 'Dutch- origin-food' is the best response to the complexities of globalizing food-chains.

The example discussed here brings together several of the major items we want to explore in this paper. It illustrates the contested nature of information on the environmental (risk) dimension of one of our everyday routines, shopping for food. It also shows that

the 'fluid' roles of 'consumers' and 'citizens' are used in specific combinations and in the context of innovative grassroots-level strategies we will come to discuss later under the heading of 'political consumerism'. Environmental movements and some market-based actors are engaged in direct negotiations and conflicts about how to give shape to and enhance the mutually agreed upon sustainability transition in the food sector, without the direct guidance or supervision of the national state. Finally, the example illustrates some of the complicating aspects of globalization, with (control of) pesticide-use in agricultural production varying considerably in different parts of the global network society.

In the next sections we will explore the social science literature in search for new concepts and perspectives which enable an in depth analyses and understanding of the ways in which environmental information is used by different actors in different ways to bring about sustainability transitions in everyday life.

Citizens – roles and Consumer – roles: a short review of the literature[36]

In this section we start with an introduction into the debate on ecological citizenship as it emerged in response to the nation state loosing its dominant and exclusive role in environmental policy making. Having outlined the role of citizens in the political sphere, we then go on to discuss the role of consumers in the sphere of the market. Sustainable consumption is an important element of

[36] The next two sections are based on Spaargaren and Martens (2004).

environmental politics but cannot be organized exclusively or even primarily by government organizations at different levels of the network-society. The consumption-roles should be defined in the context of chain-related processes, so we argue. We conclude this section with a short discussion on supposed conflicting roles of citizens and consumers in the area of sustainable consumption.

Ecological citizenship

When in advanced societies the electricity grid breaks down or the drinking water system is temporarily out of order, people tend to get angry not just because it's unpleasant to see your daily life being disrupted but perhaps even more so because people feel they are entitled to an uninterrupted supply of these necessary underpinnings of their daily routines. This basic attitude of having the 'environmental right' of access to clean water, proper waste-management services and a guaranteed supply of electricity is the result of a history of more than hundred years of utility-provisioning in Europe. A history in which the role of the nation-state has been of overriding importance. The state guaranteed access for all citizens to these goods and services under a set of fixed, state-determined circumstances (Vliet van, 2002). Only when monopolistic public provisioning begins to give way to liberalization and privatization, the established and taken-for-granted character of these ecological citizenship-rights come to be discussed and in some respects are (re)discovered by a generation that grew up with these rights as basic and customary.

When European citizens in the future will have the right of choice in utility provisioning, when they will be free to buy for example their green electricity from a 'foreign' utility companies or even an international environmental NGO, how will these ecological citizenship rights be guaranteed and what will be the role of the nation-state in this? If the citizen develops into a consumer and when the regulation governing the provisioning of water and electricity is set at the European (EU) level for more than eighty percent, who will be held responsible when the grid breaks down or when providers do not live up to the contractual obligations? Do we phone the municipality, the police, the private utility companies' local or international office, or just the newspaper to air out our complaints?

This example illustrates some of the changes in citizenship and politics as discussed by David Held in his 'Democracy and the Global Order' from a sociological point of view (Held, 1995). The interesting aspects of ecological citizenship are not about 'voting green' or becoming a member of a green party or NGO. Neither is the most important or interesting aspect of the ecological citizenship debate to be found in 'ecological rights' as the fourth and most recent set of comprehensive civil rights following earlier generations of (civil- political- and socio-economic) rights in a way as outlined by Marshall (1973). Ecological citizenship is about the societal frameworks for individual[37] rights and responsibilities with respect to sustainable development. As Held argues, citizenship rights in Europe historically emerged in the context of the debate on (the sovereignty of) the emerging nation-states which 'granted' rights to individuals who were assigned a series of rights and

[37] Although these rights and responsibilities are 'attributed to' individual human agents, it goes without saying that the formation and reproduction of these civil rights and responsibilities are not an individual affair and must be studied at the level of social practices.

responsibilities they could legitimately claim or articulate in relationship with the state. So the framework to make the rights 'work' was defined along the axis individual – nation-state.

Against this background we should ask ourselves with the help of what kind of frameworks can and should the citizenship- rights best be organized now that globalization threatens the classical, 'modern' framework as provided by the nation and the nation-state. Nation-states have become enmeshed in many regional and global networks of environmental governance and are confronted with environmental threats to the 'ecological safety' of their citizens that are beyond the control of the individual nation-state. The discussion that Ulrich Beck set in motion in the social sciences about the 'ecological risks of reflexive modernity' – using Tsjernobyl, BSE and GMO's as examples next to the well-known cases of the ozone-layer and global warming – was not only meant to illustrate the changing role and authority of modern science and technology but also and especially to show that these risks are beyond the control of individual nation-states. Not just the nation-state is no longer an exclusively 'national' phenomenon, also what an 'individual citizen' is must be reconsidered when we include in the analyses the kind of citizenship rights people are articulating when voting for or against the EU (elections), Brentspar-politics (consumer-boycot) or the WTO (demonstrations).

As we will argue in more detail in the final section, the challenge for the environmental social (political) sciences is to develop new frameworks for ecological citizenship rights and responsibilities.

While the classical framework of national, emancipatory politics will have an important role to fulfil also in future environmental policy, it needs to be complemented by the frameworks of life-politics on the one hand and arrangements for transnational and global environmental governance on the other. Since the notion of life-politics is meant to emphasize the more direct relationships in global modernity between 'the personal and the planetary', this concept – so we will argue - has an important role to fulfil as successor or at least complement of the citizen-nation-state framework of the classical, emancipatory politics.

Sustainable consumption-behaviours

In some respects the debate on sustainable consumption behaviours overlaps with issues of ecological citizenship rights. In the aftermath of the Rio-conference attempts have been made to determine the 'amount of environmental space' or the 'ecological footprint' that not only regions and nations but also (future) individual consumers should be permitted or entitled to. The question 'how much is enough' (During, 1992), or reasonable, or necessary in terms of overall levels of consumption cannot be decided upon with the help of ecological-technical knowledge alone. Notwithstanding the sociologically spoken 'naïve' solutions – one (wo)man one resource-vote – offered by most environmentalist studies on footprints, these questions of course have to be addressed at the political level as well (Wackernagel and Rees, 1996).

Although consumer-roles and citizenship roles are interconnected, sustainable consumption issues most of the time are discussed in the context of markets and chains or cycles of production and consumption. So for example when talking about sustainable food-consumption, the role of different actors in production-consumption-chains – from farmers to retailers to consumers to (organic) waste-managers – are at the centre of analyses. As consumption in this respect is the correlate to production, sustainable consumption must be conceived of as the necessary complement to the ecological modernisation of production. If consumption processes at the downstream end of production-consumption-chains are ignored, the de-materialisation of production and consumption practices – with a factor-4 or factor-10 – will only be understood halfway. Or even less than halfway, since according to some commentators the dynamics at the consumer-side of the production-consumption chains are becoming by far the most decisive elements in modern consumer societies. Consumer-behaviour is becoming important not just because Life Cycle Assessments tell us that major environmental leakages occur in the consumption (and waste) phase of the cycle. Consumption dynamics in the 'Age of Access' (Rifkin, 2000) are worth studying because they are decisive for the future organisation of production-consumption chains. So the ecological modernisation of production in present day modernity pre-supposes knowledge about and strategies for the ecological modernisation of consumption.

Against this background of the increasing need to understand modern consumption dynamics, it is a pity that it took so long before

the environmental social sciences started to develop in depth analyses of (sustainable) consumption. Many environmentalists for a long time were happy adhering to the fundamental critique of consumerism and consumer-society as developed by some Frankfurter Schule- sociologists some decades ago (Marcuse, 1964). These contributions are formulated in rather general terms, addressing the fundamental values and overall structure of capitalist consumer-society, offering as a solution the downsizing of consumption and the development of radical alternatives to western consumerism. Questions as how to design concrete politics for sustainable consumption are dismissed since they are considered as managerial strategies missing the fundamental points and misleading in their tendency to 'blame the consumer' (Princen et al., 2002).

In the 1990's consumption studies in the social sciences were boosted by the serious attention of a number of scholars from different disciplinary background joining a Lancaster based international network to study 'Consumption, Everyday Life and Sustainability' (Shove, 2003). The big challenge was to develop a perspective on consumption behaviour beyond the existing economic and psychological explanations which only look at individual parameters to explain the social phenomenon of consumption. In the infra-structural perspective to (sustainable) consumption as put forward by this Lancaster network, the key elements are:

i)   the need to understand consumption behaviour as an ordinary, every-day-life affair that is

ii) made possible by socio-technical systems of provision (Fine and Leopold, 1993) which deliver the goods and services under specific conditions of access to citizen-consumers who

iii) use these goods and services to organise their daily lives as knowledgeable and capable agents in a meaningful way, thereby

iv) reproducing culturally mediated levels of Comfort, Cleanliness and Convenience they have become accustomed to over the course of their lives.

When we set ourselves the task in the final section to develop some new concepts and basic principles for analyzing the commitment of citizen-consumers to environmental changes in everyday life, we will take this infra-structural perspective on consumption behaviour as our starting point. Before doing so, we have one question on citizen-consumers left which still has to be addressed: how do the two dimensions relate or go together. Where does the citizen evolve into a consumer and vice versa? How does the hybridisation of these formerly distinct societal roles relate to the process of globalisation?

Citizen or Consumers?

An often heard complaint made by companies that are offering sustainable products and services at slightly higher prizes when compared to the conventional products, is the fact that consumers – notwithstanding their frequent and loudly voiced 'green preferences' – in the end go for the cheap alternative. From this recognisable example there is derived a more general

discrepancy between citizenship-roles and behaviours on the one hand and consumer-behaviours on the other (Spaargaren, 2003a). As citizens, people express great concern about the environment, about food-safety, about fair incomes for small coffee farmers etc. As consumers however, they refuse to put these firm sayings into action and always choose the cheapest product. How realistic are these complaints and how immune are consumers to socio-political considerations when shopping for their daily needs?

There are different aspects or dimensions to be distinguished when analysing the discrepancy between 'citizen-norms' and 'consumer-behaviour'. In many cases, the gap between 'saying' (citizens) and 'doing' (not-buying) tends to be discussed as representing a specific case of a broader phenomenon, referred to by social psychologists as the gap between attitudes and behaviour. In the so called attitude-behaviour paradigm within the (environmental) social sciences, this individual attitude or behavioural intention is used to 'predict' future behaviour[38]. As we tried to argue before (Spaargaren 1997) however, this attitude-behaviour approach to consumer-behaviour can be said to be a cul-de-sac for several reasons, the main reasons being the isolation of behaviours from their social contexts and the fact that most behavioural routines are conducted at the level of 'practical consciousness' instead of being consciously or discursively organised at all times and all places.

When working within this specific attitude-behaviour set of theoretical and methodological premises, the gap between opinions and behaviours is put at the centre of analyses and reproduced as a

[38] In a similar vain, one could argue, do economist try to determine the 'value' of (public) environmental goods by asking individuals how much he or she would be willing to pay for the objects or services under study.

theoretical dilemma which first and foremost refers to individual norms and (lack of) responsibilities. The individual citizen says he or she cares for the environment, but the same person as consumer fails to live up to these norms. However, when instead of the attitude-behaviour scheme the infra-structural perspective to consumer-behaviour is taken as a starting point, the gap is analysed not just in terms of a lack of concern from the side of citizen-consumers, but also and primarily so in terms of the quality of provisioning of consumer-behaviours by social structures. The complaints of companies about 'unwilling customers' is investigated against the background of (the lack of) consumer-empowerment in the process of 'green provisioning'.

A second and more interesting aspect of the citizen-consumer discrepancy is the fact that companies which are complaining about the lack of green buying power are in fact arguing that green political preferences should be expressed more frequently and consistently via consumption behaviours. And with this plea for more fluid barriers or boundaries between citizenship roles and consumer-roles, they find many social scientists at their side. In contemporary societies, the borders between citizen-roles and consumer-roles are 'under reconstruction', and less rigid and recognisable than before, due to the impact of globalisation (Urry, 2000). The confusion about people acting as citizens and/or as consumers is seen as the result of a concrete set of historical developments affecting the relationship between states, markets and 'civil society'. It is to the influence of globalization on changing

roles of citizen-consumers in environmental change that will be our topic in the next section

Citizen-consumers in Global Civil Society

In the discussions and consultations on 'global civil society' as they were organised by the London School of Economics, the roles of change-agents at the grass-root level, beyond or in between states and markets, is put at the centre of analyses (Anheier et al., 2001; Glasius et al., 2002). The fluid borders between the roles of citizens (in the context of state policies) and consumers (in the context of market-based policies) in global modernity is discussed against the background of the emergence of a Global Civil Society.

The increased importance of the 'third sphere' of Global Civil Society is analysed in the LSE-yearbooks as civil society based responses to globalisation. Four types of responses are discussed in some detail. At the extreme ends we find 'uncritical support' (Trans-National Corporations and other main carriers of globalisation) and 'outright rejection' (both left-wing and right-wing radicals) of globalisation. In between these extremes there are the positions of the 'reformists' (trying to 'civilise' globalisation) and the 'alternatives' (protesting against globalisation by organising their own, local, alternative, 'organic food' type solutions) (Anheier et al, 2001, pp.10).

As will be clear from this categorisation, civil society based responses to globalisation are discussed in the LSE- round-table

conferences very much in terms of the new political roles, protests and division lines in global modernity. While emphasising the political responses to globalisation, the yearbooks offer little reflection and conceptual space for reactions to globalisation based on the role-prescriptions and expectations of (global) consumers. Especially when reformists[39] strategies are at stake, we would argue that the 'eco-civilisation of globalisation' also demands the development of countervailing power in the context of the greening of chains of production and consumption as they have become organised over global levels of time-space. If such a countervailing power would be organized with the help of ENGO's at different parts of the world, it will be difficult to decide where exactly in global civil society the citizens-role develops into the consumer-role and vice versa. 'Buying green' will likely develop in the future into an umbrella category of environmental actions, covering both consciously organised forms of environmental behaviour shaped as political activism, as well as routinised everyday consumption behaviours that go without saying.

It will be obvious that for all the different forms of engagement, the development of new communication and information technologies in the network society – the world of www, dot com and mobile phones – very much enhances the possibilities of actors and institutions in the Global Civil Society to get involved in processes of political consumerism. As illustrated by Van den Burg (2003) among others, the internet offers opportunities for groups of citizen-consumers to exert more direct and effective control over producers – companies and governments alike – both in their negative roles

[39] Those who are familiar with the debate on ecological modernisation in environmental social sciences will recognise the similarities between the distinctions made in the LSE-books between reformists and alternatives on the one hand the eco-modernist versus demodernisation strategies as discussed in environmental sociology on the other (Spaargaren, 2000; Mol and Sonnenfeld, 2000).

as polluters or providers of environmental risks as well as in their positive roles as providers of eco-labels, green electricity schemes and other green products and services.

When the monitoring of environmental performance in production-consumption cycles is organised no longer exclusively along the established lines of providers-interests but also and increasingly so with the aim to service the empowerment of citizen-consumers, people are offered the chance to engage themselves in more direct and diverse ways with processes of environmental change. The environmental score-card – informing citizens in the public domain about sources of environmental risks in their direct living environment – would perhaps be on the political side of the spectrum, while interactive internet-sides on best available green electricity schemes find themselves on the consumption-side of the spectrum.

In search for Arena's for Lifestyle Politics: Political Consumerism

In her stimulating book '*Political Virtue and Shopping; Individuals, Consumerism and Collective action*', Michele Micheletti (2003) sets herself the task of analysing the phenomenon of 'Political Consumerism' in some detail. Political consumerism is regarded as a new form of governance, developing in response to the erosion of some of the existing (national) frameworks for policy making. We need new forms and tools for political commitment

in reflexive modernity. Up till now, most of the literature on governance and new forms of political participation is focused, so Micheletti argues, on the political realm. Much less attention is paid to political consumerism as representing the different forms of political engagement of groups of citizen-consumers emerging *in the context of the market, in the societal spheres governed by cycles of production and consumption*. We are short of models, formats and institutional forms to engage citizen-consumers with major processes of change towards a more sustainable modernity since many of the relevant changes take place in the market. As the theory of ecological modernization would have it, there is developing new flows of products and new flows of information in the context of sustainability transitions in many different sectors of society.

For citizen-consumers to be able to use these new products and information we need new formats for offering the products and information in a consumer-oriented way and to develop new arena's for political action targeted at market actors, consumers and behavioural practices.

These new forms of governance deserve special attention from the side of sociology and political science since they emerge as a direct response to some of the processes described above: the globalization of production and consumption, the erosion of old, nation-state based politics and the hybridization of citizenship-roles and consumer-roles in reflexive modernity. Especially in the case of the management and control of environmental risks and

qualities, states are no longer able to deliver a sufficient job now that globalization takes command. So we need new forms of (life) politics in which citizens 'take politics in their own hands' (Micheletti, 2003, p5). New forms of policy making through multilayered politico-economic networks have to be developed to repair the deficits of the old politics. Political consumerism carves out new arenas for the engagement of individual citizen-consumers, who engage themselves with politics or 'the public affairs' from the perspective of daily life.

Political consumerism is about new ways to approach the notion of political responsibilities and engagements of individuals in reflexive modernity. Nowadays, citizen-consumers take responsibility for 'political affairs' in a much more direct way when compared to the classical frames for political decision-making like voting and party-membership. Political consumerism is more direct, more volatile and for that reason less binding when compared to the old politics. It is low-entry politics, mobilizing people who would not likely become politically active other ways. It appeals to (young) people who find themselves marginalized or alienated from formal political settings (idem, p17). Daily shopping behaviours (many times done by women) for example might develop into a form of responsibility taking (buying organic within self-imposed limits of prize/ product-domains etc) which ties together the public and the private in new, unconventional ways. Where old politics are time consuming, bureaucratic and hierarchical, these new forms of politics are open to self-expression, informal and egalitarian. The

flexible, non-obligatory and network like character of this new kind of politics makes it attractive to new groups of citizen-consumers.

What's new about political consumerism it is the fact that 'private' matters or concerns (like health issues) are connected to 'public' matters or concerns (for example safe food) in non-conventional ways. Two ways are distinguished by Micheletti in this respect. First, sometimes private concerns can be considered as good starting points for the renewal of politics, since "citizens find that their everyday interests, problems and concerns are part of the struggle and debate over the public good" (idem, p.22). People sometimes act from a seemingly egocentric perspective, following their private interest as defined from a narrow, individualistic point of view, and end up doing something good for the public interest as well (Beck, 2004). Second however, there is a form of political consumerism which does not start from private virtues but from public virtues and ideologies which are then becoming translated into the everyday personal engagements citizen-consumers can develop with market actors: they bring their 'classical politics' to the new arenas and fill in the personal (shopping) consequences as they derive from or are implicated in the grand stories or ideologies of environmental change. In both cases, political consumerism "ties together self interest and public interest in uncommon interpretations of political life in real life practices" (idem, p. 19).

The central aim of political consumerism is to change practices of production and consumption. These changes can be located both at the bottom end of production-consumption-cycles as

well as higher up in the chains, at practices enacted primarily by providers. In both cases citizen-consumers can be important change agents. In a direct way, by making specific choices for 'green' products, technologies and services themselves. But also indirectly consumer-power can be made effective, for example by making seen and heard in an organized way the political or ethical preferences of citizen-consumers with respect to the products, technologies and services to be developed by providers in the next future. Political consumerism is about ways to make new linkages and to create new forms of feed-back between different parts of production-consumption chains. These new, more direct linkages are made possible by and depend upon new informational flows revealing the relevant environmental aspects of the behaviour of both citizen-consumers and providers.

The most important instruments for political consumerism are informational flows or packages which make possible the direct responses of citizen-consumers to developments in the chain. Labelling and certification schemes (controlled and reinforced by ENGO's or consumer-oriented pressure groups next to classical actors like the state) are crucial instruments for political consumerism. With the help of these instruments, it is possible to develop citizen-consumer power vis à vis providers through organized *buycotts* and *boycotts*. With the instrument of boycott we are very familiar in the environmental field especially since the Brent-Spar case attracted the attention of several scholars to illustrate new, sub-political forms of policy-making in globalizing modernity (Beck, 2004). It seems however that some (internet based) environmental

boycotts are developing into worldwide 'politics at a distance' with little or no daily life activism involved. For that reason Micheletti, in her focus on influencing production-consumption-practices in a direct and personal way, puts a lot of emphasis on buycotts as instruments of positive discrimination for sustainable products, technologies and services. Now that providers in most markets for consumer-goods and services develop more sustainable products and technologies next to conventionally produced products, there is a growing demand for informational strategies and technologies which enable citizen-consumers to detect assess and acquire and use the more sustainable products.

The dominant informational strategy at the moment is of course the use of all kind of labelling schemes, certification schemes and schemes for green investments and savings. Especially eco-labelling has become big business. Big business, but as yet badly organized. The sheer number of labels, their diverging formats, the strategic uses made of them by different stakeholders et cetera all contribute to citizen-consumers hardly considering the information offered. For that reason, many environmental scientists argue that labelling is best to be regarded as an 'internal' strategy of providers to regulate competition for green markets. One should not bother too much citizen-consumers with these ill-defined information packaged. Survey research is done to confirm the fact that consumers do not 'read' ecolabels most of the times.

One response to the confusing array of new informational packages is to play down their significance and ask for (government) regulation

instead. The other response would be to further develop political consumerism along the lines as suggested by Micheletti and others in the so called 'Nordic network for political consumerism'. We think the latter strategy to be not just the most promising and preferable, but also one of the few possible options left, now that many products and services are produced and consumed outside reach of 'old regulators'. Information has become constitutive for practices of sustainable consumption. For this information to be reliable and accessible for major groups of citizen-consumers, it needs to be organized in a way that consumer-interests are taken into account. Green labels, certificates, brands etc. have to be made trustworthy in the eyes of the citizen-consumers. To organize this 'trust-economy', the formats and schemes discussed by Micheletti et al. under the heading of political consumerism provide a good starting point, which needs to be developed in future research en theory in at least two main respects.

First, political consumerism needs to be more directly connected conceptually to the notion of lifestyle and lifestyle politics as developed by Giddens and as applied in theory and research on sustainable consumption by a group of researchers in the Lancaster network on consumption and everyday life. When connecting political consumerism to lifestyle-processes and dynamics in a conceptually more elaborate way, political consumerism can move away a little bit from the ethical (moralistic?) outlook emphasized by Micheletti and rooted in sociological theory. Especially the relation between forms of consumerism developed and targeted at

different segments of peoples lifestyles (between sustainable food and sustainable mobility or housing etc) and the ways in which political consumerism links up with individual motives, knowledges and attitudes of citizen-consumers, are worth being developed in more detail.

Second, the fact that political consumerism is about new, low entry, everyday-life related forms of political engagement, developed mainly in the context of production-consumption chains, does not mean that there is no relevant 'institutional' dimension to it. In fact political consumerism is about new institutions, beyond some of the old or existing institutions for engaging citizen-consumers in (market-based or 'consumption') politics. The example discussed in section two on the pesticide-residues in Dutch supermarkets shows that ENGO's are crucial actors in developing new institutional forms of 'political consumerism'. ENGO's are key players when it comes to evaluating labels, commenting upon research, developing new institutions for information-provisioning on green products and services. When being drawn into this informational economy of trust in green products, technologies and providers, environmental organizations and movements worldwide will be faced with all kind of nasty dilemma's and choices. We think this is the price to be paid for a considerable increase in power for both citizen-consumers and ENGO's as it is to result from the emergence of lifestyle-politics and political consumerism.

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7. Voltas e reviravoltas nas relações entre ciência e público

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Introdução

I. Carlos VOGT – *The spiral of scientific culture*

Carlos Vogt abre seu texto perceptivo sobre as relações entre ciência e cultura apontando para a tensão entre as duas noções: a ciência natural faz ou não faz parte da cultura em sentido corrente, ou seja, o de belas artes e belas letras? Segundo o diagnóstico formulado por C.P. Snow em 1959, seriam domínios separados: uma cultura científica e uma cultura humanista e artística.

Para sustentar a idéia de que esses domínios do pensamento não se encontram assim tão distantes, Vogt cita Albert Einstein: "Onde o mundo deixa de ser o cenário de nossas esperanças e desejos pessoais, onde o encaramos como seres livres que admiram, inquirem e observam, ali adentramos o reino da arte e da ciência. Se o que é visto e experienciado for retratado na linguagem da lógica, estaremos engajados na ciência. Se for comunicado por meio de formas cujas conexões não estão acessíveis à mente consciente, mas são intuitivamente reconhecidas como significativas, então estaremos engajados na arte. Comum a ambas é a devoção amorosa àquilo que transcende as preocupações e a volição pessoal...".[41]

Vogt se inclina pela proximidade entre as duas noções, na esteira de Einstein: há distinções teóricas e metodológicas fundamentais, sim, mas ambas criam conhecimento pela formulação de conceitos paradoxalmente tangíveis e concretos:

- A ciência, pela demonstração lógica e pela experimentação;
- A arte, pela sensitização do conceito na metáfora e naquilo que é experienciado.

O processo que produz desenvolvimento científico é um processo cultural. Por isso se deve falar, segundo a proposta de Vogt, de *cultura científica* para designar a inserção de temas tecnológicos e científicos na vida social, e não tanto de:

- Alfabetização científica
- Popularização/divulgação científica
- Compreensão pública da ciência

A ciência e a tecnologia estão no centro da vida social e por isso devem ser postas sob controle, e não induzir passividade. Esse controle não se faz com envolvimento direto na produção, difusão, ensino ou aprendizado de ciência, mas com a *publicidade científica* ("scientific publishing", no original em inglês). Esta é a noção central do trabalho de Vogt.[42]

A expressão *cultura científica* engloba três sentidos principais, na acepção de Vogt – cultura da, pela e para a ciência, cada um com subdivisões:

4. Cultura *da* ciência

c) cultura gerada pela ciência

[42] Algo que, acrescento, também poderia ser chamado de crítica de ciência (assim como se fala de crítica de música, de teatro, de literatura etc.), conforme Jesus de Paula Assis (Ciência&Ambiente, v. 1, n. 23, jul.-dez.2001. Santa Maria, RS: Universidade Federal de Santa Maria. pp. 49-60).

d) cultura própria da ciência

5. Cultura *pela* ciência

a) culture by means of science

b) culture in favor of science

6. Cultura *para* a ciência

c) cultura orientada para a produção científica

d) cultura orientada para a socialização da ciência

A dinâmica que se estabelece socialmente entre esses vários campos de ação cultural é sintetizada por Vogt na imagem de uma *espiral da cultura científica*:

Quadrante 3
O ensino para a ciência

Quadrante 4
a publicidade da ciência

Quadrante 2
o ensino de ciência e o treinamento de cientistas

Quadrante 1
a produção e a difusão da ciência
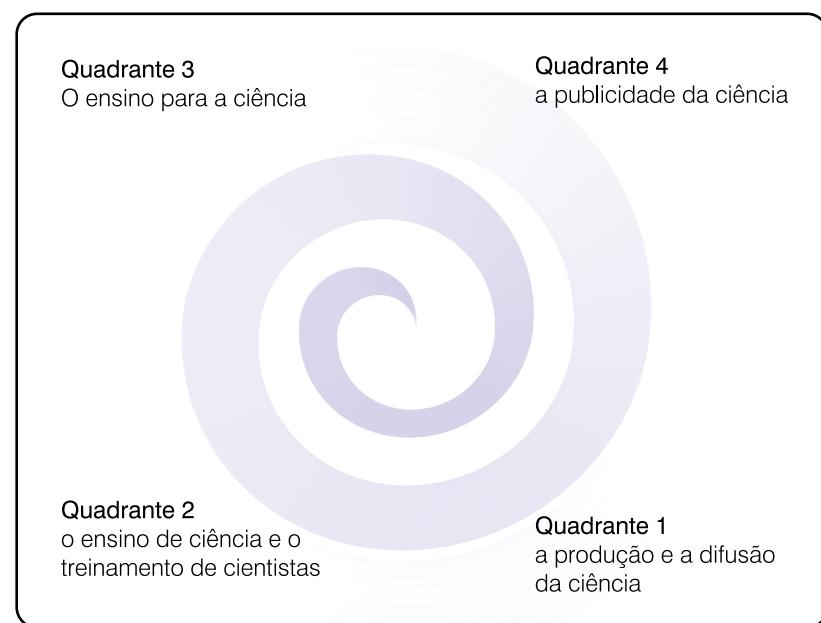
Cada quadrante tem seu ciclo interno entre emissores e receptores:

- Primeiro quadrante – cientistas falam para cientistas; universidades, centros de pesquisa;
- Órgãos governamentais, agências de fomento, congressos e periódicos científicos;
- Segundo quadrante – cientistas e professores falam para estudantes; universidades, sistema de ensino primário e médio, sistema de pós-graduação;
- Terceiro quadrante – cientistas, professores, administradores de museus e animadores culturais ("cultural presenters") falam para estudantes e jovens; museus e feiras de ciência;
- Quarto quadrante – jornalistas e cientistas falam para a sociedade e suas instituições; revistas, jornais, programas de TV etc.

O ponto central dessa imagem para representar o processo cultural em torno da ciência numa dada sociedade é que a espiral descreve um ciclo de aprendizado, ou seja, de acumulação e ampliação de escopo, de modo que nunca volta ao mesmo ponto.

Além disso, ela comporta um momento de *feedback*, entre o quarto e o primeiro quadrante, que normalmente não é tomado em consideração pelo pesquisador-padrão, afeito que está em suas práticas ao modelo tradicional emissor(autoridade)-receptor (leigo).

Uma primeira questão sugerida pela argumentação de Vogt diz respeito ao que, exatamente, se busca sintetizar na espiral: seria ela descritiva ou prescritiva? Resume e sintetiza uma situação

ideal, de fluxo desimpedido das informações e interpretações científicas, ou o processo real de circulação, necessariamente imperfeito e por isso estruturalmente dependente da recirculação e do aprendizado?

Na esfera pública brasileira, por exemplo, podem ser facilmente diagnosticados curto-circuitos em todos os quadrantes e na transição entre eles. Mas a percepção dos pesquisadores é que a falha maior, o ponto em que a engrenagem do carro alegórico da ciência emperra, está na transmissão do quarto para o primeiro quadrante. Tal falha seria da responsabilidade sobretudo dos jornalistas, acusados de "sensacionalismo" (apesar de ter sido a imprensa leiga uma das instituições que mais avançou na sua própria inserção em fluxos globais de informação científica de qualidade). A acusação pode ser considerada injusta, porque a imprensa em geral está do lado da pesquisa (na realidade, deveria ser mais crítica ainda).

[43] Uma questão desenvolvida na obra de alguns dos sociólogos mais destacados da atualidade, como Anthony Giddens e Ulrich Beck.

A questão central, hoje, é a da *desconfiança*[43] (de parte) do público diante da pesquisa científica, decorrente da ausência (real ou apenas percebida) de controle sobre ela. Uma conclusão possível, a partir da espiral desenhada por Vogt e da questão por ela suscitada, é que pesquisadores e tomadores de decisão em ciência deveriam empenhar-se mais no quarto quadrante, falando diretamente ao público não tanto segundo o modelo superado do déficit, em que lança seu discurso de uma posição superior (de autoridade), mas num contexto mais *participativo* (como em conferências de consenso e audiências públicas). Para isso, devem

porém dar-se conta de que, na esfera pública contemporânea, as razões científicas (valores cognitivos) têm sem dúvida um grande peso, mas não necessariamente precedência.

Dito isso, é importante fazer a ressalva de que esse movimento voluntário de abertura da pesquisa científica ao público não deve ser confundido com uma rendição dos imperativos cognitivos da ciência aos humores e sabores da opinião pública. Como diz David Dickson, editor do portal SciDev.Net: não se trata de testar hipóteses ou interpretar experimentos em assembléias, mas de admitir influência do público na adoção de agendas de pesquisa, por exemplo:[44]

"Esta falta de confiança é parcialmente baseada nos fatores políticos descritos acima. Um dos subprodutos de políticas governamentais que encorajaram pesquisadores científicos a perseguir agendas voltadas para o mercado é que seu trabalho é cada vez mais encarado como sendo determinado pelos fatores dominantes que impulsionam tais agendas, a saber, o lucro privado. Este é certamente o caso, por exemplo, de qualquer cientista que deseje engajar-se na pesquisa sobre o uso de engenharia genética de plantas que poderiam incrementar a segurança alimentar."[45]

"Mas um segundo fator que também pode gerar desconfiança é a atitude 'nós é que sabemos' da parte da comunidade científica. Esta, novamente, tem sido com freqüência a característica daqueles engajados na pesquisa de culturas alimentares geneticamente modificadas, que têm argumentado que os benefícios dessas culturas é auto-evidente. Otimismo tecnológico

[44] The need to increase public engagement in science", 30 de novembro de 2004 (http://www.scidev.net/Editorials/index.cfm?fuseaction=readEditorials&itemid=138&language=1).

[45] This lack of trust is partly based on the political factors described above. One of the by-products of government policies that have encouraged scientific researchers to follow market-based agendas is that their work is increasingly seen as being determined by the dominant factors driving such agendas, namely private profit. This is certainly the case, for example, of any scientist who wishes to engage in research into the use of the genetic engineering of crops that could increase food security.

excessivo desse tipo –a crença na bala mágica, para usar uma metáfora médica – não tem lugar num mundo precavido diante de alegações de cientistas de que seu trabalho apenas resolve e não cria problemas."[46]

[46] But a second factor that can also generate distrust is a "we know best" attitude on the part of the scientific community. This, again, has frequently been a characteristic of some of those engaged in research on genetically modified food crops, who have argued that the benefits of such food crops is self-evident. Excessive technological optimism of this kind — the belief in the magic bullet, to use a medical metaphor — is misplaced in a world that is increasingly wary of claims by scientists that their work only solves, and does not create, problems.

II. Arthur MOL – *Environment in the information age*

Arhur Mol começa seu texto apresentando um paradoxo: há cada vez mais informação ambiental disponível para tomadores de decisão (monitoramento) e para o público (visões conflitantes sobre riscos), mas não há autoridade para decidir as controvérsias nem capacidade para superar as incertezas.

Pensadores de índole construtivista, a partir dos anos 1980, enfatizaram a perda de autoridade e a ambivalência crescente da informação científica, afirma Mol. Quando isso alcança e se dissemina em meio ao público, acaba minando o processo de reforma ecológica. Mas essa era uma perspectiva enviesada, segundo Mol, pois ignorava o papel *formativo* da informação. Os críticos teriam permanecido no plano limitado da *modernidade simples* (aquém da *modernidade reflexiva* de Ulrich Beck, Anthony Giddens e Scott Lash).

Mol se insurge contra essa visão que acredita dominante, segundo a qual o aumento da informação apenas multiplica incertezas e ambivalências, conduzindo a paralisias. Diz que a Era da Informação (Manuel Castells) contribui para práticas de reforma ambiental emancipatórias, democráticas e transformadoras:

"No ponto em que Beck relaciona basicamente incerteza (informacional) com ciência e conhecimento contestados, em no qual Castells quase não problematiza fluxos de informação quanto a serem fundamentalmente incertos ou contestados, Urry posiciona a incerteza em uma perspectiva muito mais ampla de fluidos globais. A incerteza não está apenas relacionada a mensurações, informação, fatos e riscos, mas se tornou uma propriedade estrutural de fluxos/fluidos globais que constitui uma complexidade global. Uma complexidade global que é inerentemente imprevisível, inadministrável, inesperada, caótica, constantemente em movimento, desconhecida e, portanto incerta."[47]

Para Mol, Urry não deve porém ser interpretado de maneira unidimensional, pessimista ou estruturalista-determinista. De novo, ele recorre à *modernidade reflexiva* e suas propostas de práticas alternativas à ciência normal:

- Ciência dos cidadãos
- Ciência democrática
- Envolvimento de atores leigos
- Ciência dialógica
- Ciência participativa etc.

Parafraseando Castells, Mol diz que hoje há um *modo informacional de reforma ambiental*, em que tecnologias de armazenamento e acesso a informação permitem sistematizá-la para domínios geográficos cada vez maiores. Introduzindo aqui um primeiro comentário, essa perspectiva parece correto à luz de algumas

[47] Where Beck basically relates (informational) uncertainty to contested science and knowledge and Castells does hardly problematize information flows in terms of being fundamentally uncertain or contested, Urry puts uncertainty in a much broader perspective of global fluids. Uncertainty is not only related to measurements, information, facts and risks, but has become a structural property of global flows/fluids that constitute a global complexity. A global complexity that is inherently unpredictable, unmanageable, unexpected, chaotic, constantly on the move, unknown and thus fundamentally uncertain.

experiências vividas no Brasil: vide a importância adquirida por ONGs com capacidade técnica de georreferenciamento, como IPAM (Instituto de Pesquisa Ambiental da Amazônia), ISA (Instituto Socioambiental) e IMAZON (Instituto do Homem e do Meio Ambiente da Amazônia), para monitorar a questão do desmatamento na Amazônia, ou para participar da definição de áreas prioritárias para a criação de unidades de conservação, ou ainda para mapear e delimitar terras indígenas.

Retornando a Mol, em sua perspectiva a governança ambiental passa a requerer o envolvimento de atores não-estatais: consumidores, clientes, ONGs, comunidades, imprensa, produtores, associações de classe, companhias de seguros etc. Aqui também é possível recorrer a exemplos nacionais, como o Sistema DETER, de monitoramento em tempo real do desmatamento da Amazônia, não só para a fiscalização pelo IBAMA (Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis) como para ONGs e leigos (mas que infelizmente é por demais inamistoso para público leigo). E, além disso, há lugar ainda para um clássico contra-exemplo: a CTNBio (Comissão Técnica Nacional de Biossegurança), que não se lançou de fato para alcançar essa esfera extra-estatal, preferindo ao contrário uma representação tradicional dentro de um contexto estatal e a limitação (*framing*) do debate a aspectos estritamente tecnocientíficos de biossegurança.

Ainda à guisa de comentário, é possível vislumbrar no texto de Mol uma certa convergência com a espiral de aprendizado de

Vogt e a necessidade de controle público, como na seguinte passagem: "...um modo informacional de reforma ambiental não comporta mais causalidades simples entre o emissor de informação ambiental e o receptor de informação, ou entre o monitoramento especializado de emissões (de empresas) e de qualidade ambiental e a ação ambiental de cunho estatal. Uma complexidade e uma variedade de arranjos – de redes e fluxos – relaciona a coleta, o tratamento, a transmissão, o acesso e o uso da informação nas reformas ambientais."[48]

Resta, porém, como um resíduo, a seguinte questão: Essas práticas alternativas, informacionais, democráticas, surgem como evoluções orgânicas do status quo, mecanismos saudáveis de autocorreção inerentes ao movimento de reprodução do capital em escala global, ou seriam elas frutos da resistência ativa oposta de fora do sistema?

III. Gert SPAARGAREN – Political consumerism for sustainable consumption practices

Spaargaren parte da mesma moldura conceitual usada por Mol (baseada em Giddens, Beck) para abordar a ansiedade cotidiana que acompanha decisões de consumo, em que as pessoas leigas não contam mais com a confiança em sistemas especialistas da *modernidade simples*. Na *modernidade reflexiva*, o peso recai todo sobre elas. Os papéis tradicionais de "cidadão" ou de "consumidor" já não dão conta de resolver o problema.

Quando provedores de bens ambientais, doravante encarados

[48] … an informational mode of environmental reform has no longer simple causalities between a sender of environmental information and a receiver of information, or between an expert-led monitoring of (company) emissions and environmental qualities, and a state-led environmental action. A complexity and variety of arrangements – of networks and flows – relate information gathering, information handling and transmission and information access and use in environmental reforms.

como direitos, se encontram globalizados, o Estado-nação perde o monopólio da fiscalização de seu cumprimento. Nesse contexto, pergunta-se Spaargaren, qual seria o novo quadro de referência para a *cidadania ecológica*? Na sua visão, uma solução passa necessariamente pela *modernização ecológica do consumo*, que envolve uma hibridização dos papéis clássicos de consumidor e de cidadão:

"Embora a moldura clássica da política nacional e emancipatória vá ter um papel importante a desempenhar nas futuras políticas ambientais, ela precisa ser complementada pelas molduras da *poltica-de-vida*, de um lado, e de *arranjos transnacionais e globais para governança ambiental*, de outro" (minha ênfase).[49]

Spaargaren oferece como exemplo de consumo politizado uma campanha da ONG Amigos da Terra contra supermercados holandeses que vendiam alimentos "contaminados" com resíduos de pesticidas, com base em testes encomendados pela ONG; boa parte é de produtos "globalizados". Especialistas em saúde pública acusaram a ONG de afastar consumidores do consumo de vegetais e frutas, contribuindo para a piora da sua saúde, certamente um efeito não-pretendido de sua ação em princípio bem-intencionada.

Ora, a primeira questão suscitada pelo exemplo de Spaargaren é a seguinte: faz sentido pesquisadores defenderem a noção de que informação e transparência devem ser omitidas do público? Por outro lado, o texto parece dar mais ênfase para essa dimensão

[49] While the classical framework of national, emancipatory politics will have an important role to fulfill also in future environmental policy, it needs to be complemented by the frameworks of life-politics on the one hand and arrangements for transnational and global environmental governance on the other.

quase privada da modernização, mas a Política com P maiúsculo, ela também agora globalizada, não seria estrategicamente mais importante? Ao menos pelo alcance de seus efeitos, talvez. Formulando a questão em outros termos, mais ao gosto da retórica: um Protocolo de Kyoto vale quantas decisões de comprar madeira certificada?

Spaargaren parece apostar numa convergência entre a Política e as subpolíticas: "'Compras verdes' vão se desenvolver no futuro, provavelmente, em direção a uma categoria abrangente de ações ambientais, cobrindo tanto as formas conscientemente organizadas de comportamento ambiental, moldadas como ativismo político, quanto comportamentos de consumo cotidiano rotinizados e sem questionamento."[50]

O ensaio de Spaargaren sugere uma série de questões instigantes. Por deformação profissional, por assim dizer, a primeira delas seria: Se o consumo politizado se tornou peça central da necessária modernização ecológica, qual seria o papel do jornalista que se ocupa de informações tecnocientíficas? Disseminar informações úteis para a tomada de decisão do consumidor, ou o que se chama de jornalismo de serviços, como testes de produtos e indicações de novas e mais saudáveis/sustentáveis opções de consumo? Ou insistir num modelo de capacitação (*empowerment*) sistêmica dos cidadãos-consumidores, para que adquiram as fontes de informação e as capacidades cognitivas necessárias para demandar – seja de fornecedores, via consumo, seja do Estado, pelo voto – padrões sustentáveis de consumo? O conceito

[50] 'Buying green' will likely develop in the future into an umbrella category of environmental actions, covering both consciously organized forms of environmental behaviour shaped as political activism, as well as routinised everyday consumption behaviours that go without saying.

mais tradicionalmente emancipatório do jornalismo sugere uma inclinação para a última alternativa, mas é forçoso constatar que hoje boa parte do jornalismo científico, lamentavelmente, tende para uma versão prescritiva, sobretudo em revistas de ampla circulação, que se concentram sobre as últimas modas em saúde etc. Muito incentivo ao consumo, e pouco *empowerment*.

Outra reflexão relevante suscitada pelos dois últimos textos aqui analisados questionaria se não haveria um viés histórico-cultural muito forte nas análises e propostas de Mol e Spaargaren. A suspeita é que elas seriam válidas somente para aquela minoria européia, americana e japonesa efetiva e *criticamente* incorporada nos fluxos globais de bens e de informações. Encarado o problema deste ângulo, caberia perguntar: O que seriam equivalentes realistas dessas iniciativas numa paisagem político-informacional como a brasileira? Não se trata é claro de negar que o Brasil esteja inserido na globalização, nem que esteja necessitado de modernização ecológica, mas de imaginar quais seriam as formas cabíveis e eficazes de *empowerment* para uma massa de cidadãos cuja prioridade muitas vezes é de ser, antes, *incluído* no circuito de consumo.

Talvez seja mais uma limitação da terminologia, "consumo politizado", que dá muito peso para o *consumo*. Isso é suavizado, no entanto, por Spaargaren: "O consumo politizado diz respeito a novas maneiras de abordar a noção de responsabilidades e engajamentos políticos de indivíduos na modernidade reflexiva. Nos dias de hoje, consumidores-cidadãos assumem a responsabilidade

por 'assuntos políticos' de uma maneira muito mais direta, em comparação com as molduras clássicas da tomada de decisão política, como o voto e a inscrição em partidos."[51]

4. Algumas conclusões e sugestões para debate

O tema da seção cabe rememorar, era *Fluxos de informação globais e suas interconexões com o papel da mídia na comunicação à sociedade dos riscos associados às novas tecnologias*. Com base nele, cabe assinalar que os três textos se mostram muito complementares, ao menos segundo minha leitura, e permitem algumas reflexões instigantes sobre o tema, ainda que cada um deles apresente limitações de escopo.

A espiral da *publicidade científica* de Vogt, por exemplo, suscita várias iluminações sobre o papel da imprensa e de outros meios de comunicação, mas relativamente poucas sobre fluxos de informação globais na modernização científico-ecológica. Já Mol e Spaargaren trazem muitos pontos de reflexão sobre a informação globalizada, mas tratam só marginalmente do papel dos meios de comunicação (mais como canais difusores de informação bruta, e menos que como atores do processo, ou fornecedores de interpretações).

Seria preciso, assim, arriscar a formulação de algumas explicações possíveisl para a discrepância/complementaridade entre os três textos analisados. Apesar da globalização d vários órgãos de comunicação, que alcançam e formam a opinião em escala quase

[51] Political consumerism is about new ways to approach the notion of political responsibilities and engagements of individuals in reflexive modernity. Nowadays, citizen-consumers take responsibility for 'political affairs' in a much more direct way when compared to the classical frames for political decision-making like voting and party-membership.

planetária (CNN, Fox, The Economist, NYT, FT), a mídia ainda é predominantemente local, regional e nacional. Um dos fatores limitantes, decerto, tem um fundo cultural: a língua. No plano dos consumidores-cidadãos, da prática subpolítica cotidiana e mesmo da grande Política, seria o caso de dizer que ainda pesam mais os *processos culturais* em que Vogt põe ênfase. Em que pese a generalização do inglês como língua franca da esfera pública internacional, ela ainda funciona como uma barreira de entrada importante, restringindo portanto o alcance dos fluxos globais de informação na reforma ambiental efetiva –vale dizer, democrática e participativa.

Para concluir, parece útil também recapitular alguns pontos de contato e consenso entre os três autores. Em primeiro lugar, que a informação sempre teve um papel formativo e emancipador, agora exponencializado pela globalização e pela modernidade reflexiva. Segundo, que a ambivalência e a crise de autoridade dos saberes especialistas não podem ser revertidas, apenas superadas por meio da capacitação cognitiva e informacional de cidadãos-consumidores. Terceiro, que esse processo de capacitação envolve a constituição de redes de informação que são globalizadas, sim, mas local e criticamente dependentes de *gate-keepers*, instituições e pessoas que operam nos dois planos ao mesmo tempo (além de ONGs, *scholars*, artistas e jornalistas).

Por fim, algumas palavras sobre o papel dos jornalistas e dos meios de comunicação, sem com isso querer insinuar que eles tenham um papel preponderante ou central no aprofundamento dos fluxos

globais de informação e empowerment. Antes de qualquer coisa, cabe-lhes prover a articulação de fluxos locais com os globais, para transcender limitações paroquiais do debate. Depois, fazer a tradução da linguagem dos saberes especialistas para o plano da linguagem cotidiana, sem a qual não se obtém capacitação dos cidadãos-consumidores leigos. Por fim, introduzir e aprofundar o elemento da *crítica de ciência* na espiral de aprendizado de Vogt.

Sem essa âncora crítica, que deve também ser ajustada e torneada pelas outras áreas de conhecimento e atuação na esfera pública (em especial a comunidade dos pesquisadores), a multiplicação de discursos sobre os fluxos globais de informação corre o risco de converter-se em uma mera apologia reificadora.

8. Towards the Progressive Governance of Nanotechnologies: Developing the role of the social sciences

Phil Macnaghten

This collection concerns the changing relationship between science, technology and society and the need for new models of governance. In this paper I discuss the particular case of nanotechnologies – a new generation of potentially controversial technologies – and the novel challenges these pose for processes of democratic debate and regulation (Better Regulation Task Force 2003; Royal Society/ Royal Academy of Engineering 2004; Wood et al. 2003). Nanotechnologies already look set to become the next focus for heated debate about the relationship between new science, technology and society, and this raises radical challenges for conceptualising a future role for a progressive social science agenda. This paper outlines what such an interdisciplinary policy-focused social science agenda might look like, what theoretical resources would be necessary, and what interdisciplinary working practices would be required. This paper is informed by a recent initiative to develop a major UK research centre on nanotechnologies and society. At the same time, wider issues are discussed concerning governance, public engagement and the contribution of the social sciences in on-going dynamic policy deliberations.

Nanotechnologies as a challenge for society

In the past two years, a policy and media debate about nanoscience and nanotechnologies has emerged, characterised by competing visions of promise and threat. For their advocates, nanotechnologies are seen to have huge economic and social potential, ushering in a 'new industrial revolution' that will include breakthroughs in computer efficiency, pharmaceuticals, nerve and tissue repair, surface coatings, catalysts, sensors, materials, telecommunications and pollution control (European Commission 2004; House of Commons Science and Technology Committee, 2004; NSF 2001). Worldwide research funding for nanotechnologies is increasing rapidly, and is estimated to have reached $8.6 billion in 2004 (Lux Research 2004).

At the same time, ethical, social and environmental concerns which originated with dystopian fears of 'grey goo' (Joy 2000; Drexler 1986) are rapidly taking on a sharper focus around the potential toxicity of nanoparticles and the need for tighter regulation (Nature 2003; Royal Society/RAE 2004). NGOs have criticised the vested interests that lie behind the science, and Prince Charles has raised the spectre of thalidomide in an effort to encourage a more precautionary approach (ETC Group 2003; HRH The Prince of Wales 2004).

Such bipolar characterisations are of course an oversimplification. The questions, challenges and opportunities that surround nanotechnologies will take many forms. Indeed, the very definitions

and constitutions of nanotechnologies are themselves the subject of lively debate, within the scientific community and beyond (House of Commons Science and Technology Committee 2004).

As conventionally understood, the term 'nanotechnology' refers to the design or manipulation of structures and devices at a scale of 1 to 100 nanometres (or billionths of a metre). Yet scale is one characteristic that unites the diverse activities and applications commonly referred to in this way. In light of this, the Royal Society suggests that we should refer to 'nanotechnologies' in a plural form – a convention adopted in this paper (Royal Society/RAE 2004).

However, a crucial further issue is the novelty and unpredictability of what occurs at this scale. When broken down into such small particles, the properties of materials can change in fundamental ways. Gold and silver are good examples. Normally inert and unreactive, at the nanoscale gold acts as a highly effective catalyst, and silver displays bioactive properties (Smith 2004).

Working at this scale requires a high degree of interdisciplinarity, and nanoscience increasingly extends across a range of fields, from chemistry, physics and biology, to medicine, engineering and computer science. Yet while the term 'nanotechnology' may be relatively new, much of the science behind it is not. Many existing chemical processes have nanoscale features, and nanotechnologies have been used to create computer chips for the past 20 years. From a social science perspective, this raises important questions about the processes through which such terminologies are being

defined, contested and continually adapted in relation to external economic and political drivers.

Given the novelty of what becomes possible at the nanoscale, it is perhaps unsurprising that nanotechnologies are giving rise to new, and potentially profound, social questions. These have moved with remarkable rapidity onto the political and regulatory agenda in the UK, across Europe the United States and beyond. Additional complexities flow from the convergence of nanoscale innovations in different domains: notably, the life sciences, cognitive sciences and information technology (Nordmann 2004; Wood et al, 2003; European Commission 2004).

The publication in July 2004 of the UK Royal Society/RAE report on nanotechnologies signals the start of a new phase in these debates. Learning from recent experience with biotechnology, policy-makers and scientists are looking to social science to help provide improved insights into the implications of nanotechnologies, including forms of public engagement which create more socially robust technologies. This poses significant challenges and opportunities. Given widespread public ambivalence towards science, is it possible to create frameworks of governance that can sustain economically vibrant, socially-legitimate and environmentally sustainable technological enterprises? How are individuals and institutions, confronted with rapid technological change, to imagine new social possibilities, and choose among them wisely? And how may all of this pan out for the poor, for developing world countries, and for the development process generally (Meridian Institute 2005).

A number of initiatives have begun to develop anticipatory and more socially-intelligent processes of regulation, public dialogue and technology assessment with regards to nanotechnologies (Macnaghten et al. 2003; DTI/OST 2005; Willis and Wilsdon 2004; Guston and Sarewitz 2002). From the outset, the aim is to develop interdisciplinary approaches which will embrace the complexities of nanotechnologies, and their emergent social relationships. Understanding the implicit assumptions, values and visions – or 'imaginaries' – of key actors is a central part of this challenge, since these are often significant in shaping research and innovation trajectories (Hedgecoe and Martin 2003).

In the UK, following a series of controversies – such as BSE, MMR and GM crops and foods – there is growing institutional recognition of the need for public involvement in the social and ethical dimensions of science and technology (Better Regulation Task Force 2003; House of Lords 2000; RCEP 1998). More recently, policy discussions have started to focus on the need for public engagement to take place 'upstream' in processes of innovation, at a stage when it can influence research decisions, and before entrenched or polarised positions emerge (Grove-White et al. 2000; Wilsdon and Willis 2004). For example, the UK government's new ten-year strategy for science and innovation includes a commitment 'to enable [public] debate to take place "upstream" in the scientific and technological development process, and not "downstream" where technologies are waiting to be exploited but may be held back by public scepticism brought about through poor

engagement and dialogue on issues of concern' (HM Treasury/ DTI/DfES 2004: 105). This argument has now been adopted in relation to nanotechnologies by the Royal Society, Lord Sainsbury and the Office of Science and Technology (DTI/OST 2005; Royal Society/RAE 2004).

These commitments to 'upstream' public engagement in processes of scientific-technological innovation are a significant shift, and raise many unresolved questions for social science as well as for science itself. At what stages in R&D processes is it realistic to raise issues of public accountability and social concern? How and on whose terms should such issues be debated? Are dominant institutional discourses of risk, ethics and 'social responsibility' adequate for addressing these issues? Can citizen-consumers exercise constructive influence over the pace and direction of technological (and related social) change? How can these questions be reconciled with the need to maintain the independence of science, and the economic dynamism of its applications?

As societal debates over nanotechnologies gain in momentum and intensity, it is important that the insights of social science are brought to bear. In the next section I outline some key theoretical resources.

Theoretical resources

Social science historically developed alongside the new industrial order, which was based upon novel technologies of steam based

power, the railways and the factory system. Marx analysed this new technological society as it unfolded around him in mid-nineteenth century Britain. However, during the twentieth century, social science has often struggled to keep pace with new and emerging technologies. It was slow to provide intelligence and reflexive analysis of the implications of personal automobility, the splitting of the atom, and the significance of early computing.

A key challenge for the social sciences is to take the reflexive governance of technologies as a central concern, in order to provide insights that are simultaneous with scientific, technological and social changes. How to be ahead of the game, to explore in real-time how the assemblage of heterogeneous material and human relations implied by nanotechnologies may bring about profound social transformations?

However, analysis of all such 'technosocial orders' presents significant challenges to existing ways of doing social science, especially in seeking to examine a categorically social realm as distinct from physical and material elements (Latour 2004). Historically, the academic literature has framed technology as 'black-boxed' and well-defined, with an independent asocial logic that results in 'impacts' or 'effects'. Social questions are often narrowly framed as 'impacts' or 'risk' issues, placing the site of social science inquiry firmly 'downstream' of innovation processes (for a recent nanotechnology example, see European Commission 2004). However, various approaches in science and technology studies (STS) have shown how technologies cannot be black-

boxed and separated from sets of constitutive social relations (see Wynne 1988; Pinch and Bijker, 1984; Law and Hassard 1999).

'Constructive technology assessment' (Rip, Misa and Schot 1995) and 'real time technology assessment' (Guston and Sarewitz 2002), also problematise the determinism of black-boxed technology. Both approaches focus on how 'technical' processes often make implicit upstream assumptions about the social uses to which the technology will be put: under what conditions, by which kinds of actor, and with what aims (Law and Bijker 1992; Grint and Woolgar 1997). STS theorists suggest that a fundamental characteristic of any technology is its heterogeneous, hybrid mix of material, social and discursive relations, pure and applied sciences, and social expectations or assumptions, which may assume prescriptive force (Latour 2004; Law 1999; MacKenzie and Wajcman 1999).

A further requirement is to examine the 'complex' nature of technological systems. The *Gulbenkian Commission* first advocated breaking down the division between 'natural' and 'social' science since both are characterised by complexity (Wallerstein 1996). Likewise physicists Laughlin and Pines summarise how 'We are witnessing a transition from … reductionism, to the study of complex adaptive matter' (cited Buchanan 2002). All technologies involve complex emergent forms of organisation and behaviour, and nanotechnologies will be no exception. Complexity interactions have been likened to walking through a maze whose walls rearrange them as one walks through. Central to complexity-based dynamic systems is the idea of emergence – that there are entirely new

levels of organisation which can emerge from the complexities and non-linearities of prior interactions.

This is what makes prediction problematic. It is also a reason why the inability of government and other institutions to predict consequences is becoming increasingly acute and socially visible. To move beyond such prediction-bounded outlooks, a different orientation is needed that highlights the key role of 'imaginaries' or expectations of the future, and explores how these shape emerging scientific, technological and policy fields (Brown and Michael 2003; Grove-White et al. 2004; Hedgecoe and Martin 2003; Rose 2001; Whatmore 2002; van Lente, 1993). Among the characteristics of such imaginaries are unverifiable claims about technologies that have yet to materialize; a drive for commercial exploitation of knowledge; ongoing institutional innovation; and projections of social adaptation expressed as firm predictions. Various combinations of these processes are visible in the imaginaries that surround nanotechnologies (Wynne 2003).

Another central phenomenon for emerging technologies is the discourse of the so-called global knowledge economy. Although the idea of a knowledge society was first promulgated in the 1970s (Bell, 1974), one implicit aspect of this shift has been poorly recognised. As scientific knowledge has become a more central economic concern, it has also become a focal point of cultural and political identity and conflict. For example, conflicts at the World Trade Organisation over the terms of global trade reflect, *inter alia*, deep differences over the saliency and authority of scientific risk knowledge as a form of

international order. Likewise, public controversy over GM crops in Europe can be understood as a manifestation of unease with the predictive claims of modern science.

These neglected cultural dimensions are often expressed and mobilised by new social movements (de Sousa Santos, 2003), which challenge prevailing knowledge discourses, not only in terms of propositional truth-questions, but at a deeper human level. Such movements often contest the implicit aspirations and purposes of prevailing institutional knowledge-trajectories, which tend to be taken for granted by government and corporate actors (HM Treasury/DTI/DfES 2004).

Research needs to focus on how 'new technologies' take shape and are categorised within the continual flux of inventions and innovations. How do they become objects for investment? At what point does the state develop policies to promote or block their development? What local, regional and international dynamics shape the way that innovation processes develop? How can the insights of political economy help to understand the links between nanotechnologies, globalisation and the politics of knowledge?

Towards a social science of nanotechnologies in society

The emergent, undetermined nature of nanotechnologies – technoscience 'in-the-making' (Latour 1987) – calls for an open and interdisciplinary model of social science research. I now

discuss five potentially rich veins of social science research activity including the articulation of particular domains of inquiry:

- *Imaginaries: What are the scientific imaginaries of emerging nanotechnologies and what role do these play in innovation processes?*

- *Engagement: In what ways can processes of public dialogue open up and help to shape 'upstream' R&D of emerging nanotechnologies?*

- *Governance: How can we develop frameworks for the governance and regulation of nanotechnologies that are more anticipatory, resilient and socially intelligent?*

- *Globalisation: What are the emerging patterns of nanotechnological innovation worldwide, and what social and governance challenges will these pose?*

- *Emergence: How can frameworks of theoretical reflection be extended to embrace emerging innovations at the nanoscale?*

I. Imaginaries

One key element of such inquiry is to explore the scientific imaginaries of emerging nanotechnologies and to ask what role these play in innovation processes.

The term 'imaginary' shares the sense of vision and fantasy implied by the term 'imagination'. But it dissolves the opposition of the imagined and the real: whether an imaginary is based in fantasy or in evidence remains an empirical question rather than one to be settled *a priori* (Marcus 1995; Verran 1998).

As well as shaping the expectations of individuals, imaginaries are mobilised through ongoing public discourses and enacted in everyday practices. They are multiple, partial and often internally inconsistent (Fleck 1979; MacKenzie 1992; Squier 1995, Suchman and Bishop 2000). Emerging technologies, surrounded by ambivalence and conflicting narratives of utopia and dystopia, provide fertile ground in which the moral dilemmas of modernity are rehearsed. While some visions are repeatedly promoted – progress/cornucopia, a world of leisure or the conquest of disease – others may be repressed, such as the narratives of Frankenstein or *Brave New World* (Bloomfield and Vurdubakis 1995).

Scientific practice has traditionally been seen as insulated from such cultural forms, yet whether implicitly or explicitly it is routinely influenced by them. A major object is to explore what form this influence takes. How do imaginaries shape trajectories of scientific research? What role do they play in the allocation of funding? How do they mobilise public and private interest and opposition? And how can social science help open up such imaginaries to wider public scrutiny and debate. In the context of a general dialectic between openness and closure that characterises any process of innovation, the aim is to open up nanotechnological imaginaries *before* they are closed down and 'black-boxed' through commitments to specific products and applications.

Nanotechnologies are framed by scientific and engineering imaginaries that have longstanding antecedents (see for example Shapin 1994, Noble 1977; 1997). Their promise is infused with

dreams of perfect engineering, of complete control over the physical structure of matter and, eventually, the creation of autonomous, self-replicating entities. Such imaginaries render nanotechnologies visualisable and to some extent already familiar (e.g. the macro-level machine expressed at the nano-level). The ability to operate at the nanoscale – atom-by-atom – symbolises an expression of power. It represents the material world subordinated to human will with unprecedented degrees of precision and control.

At the same time, this vision of total control is something of a double-edged sword if not an Achilles heel. For the empirical invisibility of nanotechnology, beneath the threshold of the human senses (rather like genetic modification and nuclear technology before it, see: Beck 1992, 2002; Erikson 1994), makes it almost impossible to verify whether it is in fact under human control - thus providing fertile ground for voices of opposition; for instance, dystopias that build upon Drexler's imaginary of self-replicating 'grey goo' as a central motif. Indeed, whilst this notion of 'grey goo' is dismissed by mainstream nanoscientists (Royal Society/RAE 2004), it has achieved a certain prominence among the British public and media, not least due to interventions by the heir to the throne. In debates over GM food, negative popular imaginaries tended to be dismissed or ignored and it would seem prudent that the same mistake is not repeated in the area of nanotechnology. The question of why 'grey goo' resonates so powerfully is a legitimate and interesting one for social science.

II. Public engagement

An additional key question is to ask in what ways can processes of public dialogue open up and help to shape 'upstream' R&D of emerging nanotechnologies.

Since 2000, when the House of Lords Science and Society report buried the misconceived *deficit model* of public understanding of science (Wynne 1995), 'public engagement' has become the new mantra. Much of this new 'listening mode' for science has been taken up with the aim or expectation of restoring public trust and authority for science. The more radical idea that public inputs might legitimately reshape scientific and technological enterprises has not been a prominent feature of the new discourse of public engagement. The suggestion that public engagement may have several different rationales and objectives, including the stimulation of greater self-reflection *within* science about its own assumptions and expectations, has been made more recently (Wynne 2003). There is also an emerging consensus that engagement processes should be focussed on upstream processes of R&D priority-setting and funding, in addition to the downstream *impacts* of innovation (DTI 2004; Grove-White et al. 2000; HM Treasury/DTI/DfES 2004; Macnaghten 2004; Nature 2004; Royal Society/RAE 2004; Wilsdon and Willis 2004; Wynne 2001)

However, even though there is increased policy and institutional acceptance of the need to move upstream, precisely what this entails remains ambiguous and open to multiple interpretations.

For some, upstream engagement is assumed to be about earlier anticipation and more effective management of risks, impacts and consequences. Such assumptions downplay a critical dimension of public concern, which is that there are unpredicted consequences that scientific risk assessment is incapable of identifying, whether it takes place upstream, downstream or somewhere in between (Marris et al, 2001; Wynne 2001). Instead, publics often want to ask more fundamental questions about ownership, control and responsibility.

It has been recognised that nanotechnologies and their convergences with adjacent domains like ICTs and biotechnologies, make prediction of future effects a decreasingly credible aspiration (Joy, 2000). The claim of reliable predictive control through risk assessment has to be re-thought as the basic reflex response of policy and scientific institutions to public concern or hesitation (Sarewitz et al, 2000; Guston & Sarewitz, 2002). Upstream public engagement may sometimes help to create the conditions for better risk prediction. But this should not be the primary reason for this change of focus. Rather it is that upstream processes are key sites of undeliberated shaping of future worlds, as explained in the previous section. If these are to be elicited, debate and maybe amended, there need to be frameworks of accountability and learning which so far do not seem to exist.

Thus, upstream public engagement has nothing to do with the scenarios painted by self-appointed defenders of science, who suggest that it will require the public to 'peer over the shoulder' of scientists in the laboratory, or to 'decide by referendum whether

the earth goes round the sun' (Durodie, 2004; Taverne, 2004). It can be taken for granted that scientific work cannot be performed by just anyone, but requires specialist training and discipline. But its human and social dimensions still need to be understood.

III. Governance

A further strand of research concerns the need to develop frameworks for the governance and regulation of nanotechnologies that are more anticipatory, resilient and socially intelligent?

Confronted with rapidly advancing and converging nanotechnologies, policymakers and regulators need to identify frameworks of governance that are adaptive and anticipatory, yet which recognize the limits of prediction (Bentley & Wilsdon 2003; Sarewitz et al. 2000). When technological controversies erupt, the usual political response is to look for regulatory solutions, based on scientific techniques of risk assessment. This pattern is already evident in debates around nanotechnologies, which are focusing heavily on regulatory responses to the uncertainties and potential hazards of nanoparticle toxicity (Royal Society/RAE 2004; European Commission 2004).

These responses, using the best science available, are necessary – but crucially, not in themselves sufficient. Further insights and policy innovations need to be developed and explored in practice. As Michael Power has argued, there is now an overwhelming tendency in political and organisational life to reach for the 'risk

management of everything' (Power 2004). However, when faced with potentially disruptive innovations, the danger is that risk assessment – however participatory – merely digs us deeper into the hole that we are trying to escape from. It avoids our real predicament, which is one of ignorance and ambiguity. Debates are too often framed in terms of "Is it safe?", with the implication that the likelihood of certain outcomes is susceptible to rational calculation. More challenging questions which flow from ignorance concern the longer-term social purposes and consequences of a technology's development. *Why these technologies? Why not others? Who needs them, and what human purposes are driving them? Under what conditions will they be enacted; and who sets those conditions? Who is controlling them? Who benefits from them? Can they be trusted?* To date, such questions are rarely asked, let alone answered, or debated.

This concentration on risk is an understandable way of rationalising an otherwise open and daunting set of questions. It reflects what Zygmunt Bauman describes as modernity's "gardening instinct" (Bauman 1991). Yet this desire to tidy the borders of our democracy means that frameworks of governance and regulation may be stripped of meaningful content. Fundamental questions arise from further examination of the implications of the 'global knowledge-economy', self-characterisation of our own society and its established institutions (de Sousa Santos, 2003). What kinds of cultural conflict are now emerging centred on the production of scientific knowledge? Are there forms of politics (e.g. new social movements) which call for new forms of governance? What

new institutional and organisational forms may be appropriate to articulate these inchoate, globally-distributed concerns and democratic aspirations?

From these wider perspectives, conventional discourses of regulation, risk and ethics look increasingly inadequate. New government commitments to 'upstream' public dialogue with science run rapidly into head-to-head conflict with concerns about global competitiveness and the economic potential of UK science. These issues may be difficult to address in a purely national context, especially when public concerns do not correspond with those assumed by scientific advisers and policymakers (Marris et al, 2001).

IV. Globalisation

Fourthly, we need to examine the emerging patterns of nanotechnological innovation worldwide, and what social and governance challenges these pose?

Basic research is required to map the shifting geographies of nanotechnological innovation and knowledge production. As nanotechnologies start to play a more significant role in the global knowledge economy, what new opportunities for wealth creation will they create? Will they contribute to shifts in the global distribution of knowledge, resources and power? What forms will these take? Might they allow developing nations to 'leapfrog' into a new technological paradigm, or might they reproduce inadvertent

forms of epistemic exclusion and public alienation (Castells, 1996)? How will such governance challenges play out across different geopolitical and knowledge sectors? And to what extent will the private appropriation of university-produced nanotechnological knowledge threaten or undermine the creation of an intellectual 'commons' (Drahos 2002)?

It is important to understand how the global development of nanotechnologies will be shaped by the relationship between the different temporalities of technological innovation, regulation and societal deliberation (Jessop 2000). For the first time, risk discourses are intervening in the very process of product innovation, shaping the direction of entire industries in ways which are not easily anticipated. Nanotechnologies are emerging in a situation of 'risk sensitisation', which creates tensions between cycles of innovation and capital accumulation, and the need for governments to respond to public anxieties about possible hazards. Regulation, product testing and more expansive modes of public engagement and dialogue slow down the process of entry to the marketplace, which may sit in tension with the need for investment return. Conventional characterisations suggest that precaution acts as a barrier to innovation. In a European context, several recent studies have shown that this is not necessarily the case, and precautionary approaches can in fact act as a stimulus for new forms of innovation (European Environment Agency 2001). However, it remains an empirical question as to how such interactions will play out on a global scale. Regulation may slow down the product cycle, or

it may provide advantages to some economic actors, favouring larger corporations over smaller start-ups. It may reinforce the economic power of the US and other leading nations, or enable new, niche players to emerge (as for example, Finland became a surprisingly successful player in mobile technologies).

Emergence

Finally we need to develop new frameworks of theoretical reflection to understand the emergence of nanotechnologies that move beyond conceptualising the future in terms of prediction or control.

In moving from a predictive to post-predictive paradigm, social science needs to develop a set of theories and methodologies for relating to the complexities of multiple 'futures' (Prigogine, 1997; Grove-White et al, 1997; Sarewitz, 2000; Wilsdon & Willis, 2004; Urry, 2003). This theme will embrace the need expressed in the EC's *Action Plan for Nanoscience and Nanotechnologies 2005-2014* for 'continuous horizon scanning activity that involves social scientists and other bodies of knowledge as appropriate.'

The central notion here is that nanotechnologies are a set of dynamic systems. They develop collective patterns and non-linear consequences not present within their individual components. Such systems demonstrate both the 'end of certainty' and long-term irreversibilities as they become locked in to certain path dependencies (Prigogine 1997).

In exploring the nature of technological emergence, the goal is to understand the complex role that these systems and their different temporalities play (Adams 1998). A number of social scientists have analysed the role of *expectation* in emerging technologies (see for example: van Lente, 1993; van Lente & Rip, 1998; Brown et al, 2000; Brown, 2003; Brown & Michael, 2003). Such analyses are fundamentally about future promises. They suggest that the emergence of new technologies is characterised by complex and heterogeneous cycles of hope, expectation, hype and disappointment. Understanding the heterogeneous time horizons and expectation dynamics embedded within new technological domains is crucial to how new technologies may materialise and become 'stabilised' as a transportable 'actor-network'. For example, Selin explores the constructions of time within the development of nanotechnologies, and suggests that nanotechnology is, as yet, characterised by unstable processes of becoming (2005 forthcoming).

Twenty years ago, the philosopher Hans Jonas warned that 'Modern technology has introduced actions of such novel scale, objects and consequences that the framework of former ethics can no longer contain them' (Jonas, 1984). At the time, he had in mind the awesome transformations wrought by nuclear and genetic technologies. But his analysis can be applied with equal force to the changes that are underway now at the nanoscale. The questions that Jonas posed can be posed afresh today. If these technologies enable human interventions at a novel scale – the very atoms and molecules that are the building blocks of matter

– does this require an equivalent shift in the scale of our ethical and political imagination?

Conclusion

This paper has sought to outline a prospective social science agenda on nanotechnologies as a particular means to further develop a social science of science, technology and society relations. A programme of research of this kind promises to build capacity in the social sciences in at least three ways.

First, it will do so locally by drawing upon and extending theoretical insights in social theory, postmodernism, actor network theory, science and technology studies, and complexity. Second, it will significantly advance the theory and practice of interdisciplinarity as it applies to collaboration between social science, natural science and engineering disciplines. Third, it will develop a social science that engages with and contributes to policy debates in 'real-time'.

Such an enhanced capability would enable the social sciences to play a strategic role in providing the social research and analysis necessary for the future governance, regulation and public appraisal of emerging nanotechnologies. By clarifying the differential social values and implications embedded within prospective nanotechnology developments such a programme would contribute actively to society's resources for informed debates about such matters.

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9. A Ciência e Tecnologia Agropecuária e a Sociedade de Risco

Murilo Flores[52]

[53] Entendimento baseado em GIDDENS (2002), referindo-se a atual fase de desenvolvimento das instituições modernas, marcada pela radicalização dos traços básicos da modernidade, com a superação da sociedade industrial.

Introdução – a alta modernidade[53]

As ciências sociais foram marcadas por uma alta influência dos estudos macro-sociológicos, comum sentido de linearidade de evolução da sociedade. Esta é uma marca predominante nos estudos e teorias desde o início das ciências sociais, com Augusto Comte, passando por autores clássicos e influentes como Karl Marx e Émile Durkheim. A base desses pensamentos sociológicos esteve sempre determinada por algumas questões como o materialismo histórico, a linearidade do processo histórico e o sentido de progresso na evolução. Os autores desse período do desenvolvimento do pensamento sociológico buscavam a construção de leis gerais que determinam o funcionamento da sociedade, sendo que a ação individual dos atores sociais era considerada como determinada pelos processos coletivos.

WEBER (2001) introduziu o sentido de que as leis gerais podem existir, mas não é necessário que assim seja, e que não são universais. As decisões ao longo da história são tomadas com base em opções que podem transformar os rumos da sociedade, que não teria um sentido único, evolutivo, mas alternativo, a depender das decisões tomadas. Para Weber, o macro não

determina o micro, ou seja, a ação individual não é determinada necessariamente, pelo coletivo, não havendo uma relação linear de causalidade. Ele introduz o sentido social a partir de referências a valores dos indivíduos e das coletividades.

Novas teorias sociais passaram a considerar a ação dos indivíduos e seu papel na construção dos fenômenos sociais. Novos autores como Norbert Elias, Pierre Bourdieu e Anthony Giddens passam a integrar as análises macro-sociais e as estruturas sociais, às dimensões subjetivas e interacionais. Para esse último autor (GIDDENS, 2002), as propriedades estruturais são, ao mesmo tempo, condições e resultados das atividades realizadas pelos agentes que fazem parte desses sistemas, ou seja, apresenta uma visão circular da construção do mundo social. Os cientistas sociais que analisam esse processo de transformação da sociedade compreendem que esta não é somente um meio de repressão junto aos indivíduos ou classes, mas é também de libertação e fortalecimento das potencialidades individuais.

ELIAS (1994) procurou enfocar a ampliação de oportunidades que os indivíduos passaram a ter com o avanço da modernização da sociedade. Enfatizou a idéia de que, no âmbito do desenvolvimento humano, o processo de "individualização é inseparável de outros processos *"...como a crescente diferenciação das funções sociais e o controle cada vez maior das forças naturais não-humanas"*. Na alta modernidade, o indivíduo toma formas mais expressivas e o indivíduo é cada vez menos direcionado a uma vida pré-determinada pelas condições em que nasce. A capacidade de

escolha do indivíduo aumenta dentro da sociedade, diferenciando-a das sociedades tradicionais ou mesmo da sociedade industrial da modernidade simples.

Surgem várias correntes como os construtivistas estruturalistas, que centralizam seus pensamentos na existência de estruturas objetivas independentes da consciência e da vontade dos atentes sociais, os construtivistas fenomenológicos, que focalizam a realidade da vida cotidiana com base nos encontros "face a face", e os etnometodológicos que também têm como base nas relações das atividades cotidianas, onde a reflexibilidade é uma marca das ações práticas da rotina, e os fatos sociais são as realizações dos indivíduos e atores que criam a realidade social. Nos estudos sobre o avanço da modernidade os cientistas sociais superam os entendimentos de que o coletivo determina a ação dos indivíduos e passa a predominar o entendimento entre os estudos sociais de que os avanços ocorrem pelo processo de reflexividade.

Uma das importantes referências no campo das ciências sociais deste trabalho é GIDDENS (2002), que constrói sua teoria sob o enfoque da transformação da sociedade na alta modernidade. Segundo esse autor, a modernidade simples, conforme entendida pelas definições amplamente difundidas se refere a:

"às instituições e modos de comportamento estabelecidos pela primeira vez na Europa depôs do feudalismo, mas que no século XX se tornaram mundiais em seu impacto".

Ela diz respeito ao mundo industrializado, entendendo-se, no

entanto, que esta não é sua única dimensão institucional. Portanto se refere às mudanças ocorridas nos sistemas de produção pela sua mecanização e, no campo econômico, pela consolidação do capitalismo como sistema mundial, que teve a formação do Estado-nação como sustentação aos novos processos de organização da sociedade. Segundo Gramsci, em estudo apresentado por COUTINHO (1999), a ação dos Estados-nação foi sempre fundamental para dar sustentação à organização social produzida na era da modernidade (fase da sociedade industrial), tendo como elemento fundamental seu papel de coerção junto às classes subalternas, de forma a manter a hegemonia das classes dominantes na construção de seus projetos e estilos de vida.

As organizações que nascem no âmbito do avanço da modernidade têm um diferencial característico na sua capacidade de monitoramento reflexivo. Na construção da alta modernidade há uma profunda mudança nos conceitos de tempo e espaço, e o que GIDDENS (2002) chama de "desencaixe das instituições sociais", referindo-se ao descolamento das relações sociais dos contextos locais. Portanto, as transformações da sociedade da alta modernidade favoreceram a construção de um processo de globalização, formando uma dialética "do local e do global. E as instituições permanecem defasadas em relação à sociedade, surgindo em atraso ao processo desencadeado pela modernização reflexiva"[54].

Para essas correntes de pensamento, o processo de reflexividade na modernidade termina por promover uma permanente

[54] Pode-se utilizar o conceito de BECK (1997) para modernização reflexiva, que significa uma mudança da sociedade industrial a partir das ações da vida cotidiana, que ocorre sub-repticiamente e sem planejamento no início de uma modernização norma;, autônoma, e com uma ordem política e econômica inalterada e intacta, ..., abrindo caminho para outra modernidade. As transformações não ocorrem por meio de revoluções, mas através da rotina e se dá com profundas mudanças na sociedade, nos campos econômico, político, social, e no Estado. A essa conscientização da sociedade, onde os indivíduos passam a promover transformações na sua vida diária, GIDDENS (1997) denominou de sub-política.

transformação, com a superação das bases da sociedade industrial, a pressão por mudanças institucionais que respondam aos novos interesses da sociedade e o estabelecimento de que a ciência e a tecnologia oferecem grandes benefícios para a humanidade, ao mesmo tempo em que produzem riscos de alto alcance, muitas vezes globais. A partir daí, começa a surgir entre os cientistas sociais uma preocupação cada vez maior com os processos de globalização desses riscos, que passam a estar incorporados às próprias atividades produtivas da sociedade.

Giddens observa que os riscos da modernidade, na sociedade industrial, tinham a característica de poderem ser calculados, de tal forma que as pessoas podiam se proteger. Na alta modernidade, os riscos são novos, diferenciados, inerentes ao desenvolvimento que os conhecimentos peritos, nesta fase da alta modernidade, são compreensíveis pela população, o que não ocorria na sociedade industrial, onde a sua codificação ao era alcançada pelos leigos. De forma otimista, Giddens acredita que os indivíduos, principalmente de países mais avançados, seriam capazes, a partir da identificação dos riscos, de adotar novos estilos de vida, principalmente no que se refere aos danos ambientais globais.

A sociedade de risco

As transformações porque passa a sociedade no caminho da lata modernidade leva ao que BECK (1997) chamou de radicalização

da sociedade, onde se produz uma nova sociedade não construída através da revolução[58], mas uma sociedade que ele chamou de sociedade de risco. Esse processo, segundo o autor, ocorre sem controle ou desejo das instituições ou da sociedade, mas a partir de sua reflexividade. Na fase da alta modernidade, como foi dito anteriormente, segundo diversos autores, há a superação da sociedade industrial. Há uma transformação da sociedade industrial sem a revolução proposta por diversos autores, através do processo de reflexividade, como resultado de uma ação do cotidiano dos indivíduos. Essa ação da rotina da vida afeta diretamente os aspectos macrossociais da estrutura da sociedade.

Na modernidade reflexiva[56], os riscos escapam do controle das instituições criadas para a proteção da sociedade industrial e, de acordo com Beck,

"o reconhecimento da imprevisibilidade das ameaças provocadas pelo desenvolvimento técnico-industrial exige a auto-reflexão em relação às bases da coesão social e o exame das convenções e dos fundamentos predominantes da racionalidade".

Nesse sentido, Beck apresenta o entendimento de que os conflitos sociais não são mais tratados como problemas de ordem, mas como problemas de risco. Esses riscos, segundo Beck, se relacionam com:

- os recursos da natureza não humana e a cultura humana, que sofrem profundas transformações;
- o relacionamento da sociedade com seus próprios problemas,

[55] O processo de modernização reflexiva que é a base de várias teorias sociais contemporâneas, em realidade se apresentam como uma contraposição às teorias marxistas do fim do capitalismo a partir de sua própria evolução.

[56] Denominação de Beck que equivale à denominação de Giddens de alta modernidade.

por ela mesma produzidos, que terminam por abalar a segurança e a certeza existente dentro da sociedade industrial, a partir da tomada de consciência das pessoas sobre eles;

- a perda dos sentidos de diversos significados sociais coletivos e de grupos, marcantes na sociedade industrial, e que passam a sofrer de *"exaustão, desintegração e desencantamento"*.

A sociedade de risco, como proposto por Beck, possui características que a diferem da sociedade industrial. A primeira delas, e diretamente ligada com a sua denominação, é que há uma desintegração das certezas presentes na sociedade industrial, que construiu um conjunto institucional capaz de promover as regulamentações que lhe garantia estabilidade e segurança. Há o que Beck chama de retorno do sujeito individual às instituições da sociedade, que passam a ser altamente dependentes do indivíduo. O indivíduo, na sua ação, interage e transforma as instituições.

Outra característica importante, fortemente amparada pelos avanços tecnológicos, é a marcante presença de interdependências, inclusive globais. Como afirma Beck, a individualização e a globalização são dois lados da mesma moeda, que seria o processo de modernização reflexiva. O conceito de reflexivo se refere a um processo de autoconfrontação e não de reflexão, o que significa que o processo de modernização ocorre de forma não planejada e compulsivamente. É esse processo de reflexividade, como afirma Beck, que destrói a sociedade industrial, abalando seus alicerces de segurança, que eram garantidos pela institucionalidade presente nessa sociedade.

O que afirma a teoria da sociedade de risco é que os conflitos da sociedade industrial, causados na luta pela distribuição dos bens produzidos e que levou a uma organização institucional característica para atender a essas demandas, são superpostos por outros tipos de conflitos, que colocam outros problemas para a sociedade, decorrentes da própria produção de bens e de sua distribuição. Isso demonstra que, em realidade, a sociedade de risco nasce no seio da própria sociedade industrial, a partir de quando as ameaças por ela constituídas começam a tomar forma de riscos concretos e globais. Exemplos muito claros destes riscos são a tecnologia nuclear, a pesquisa genética, o impacto ambiental causado pelos processos de produção (aquecimento global, poluição de rios e águas subterrâneas), guerras com amplo potencial de destruição, armas de destruição em massa, a miséria fora das camadas de países beneficiários da modernização ocidental, o surgimento de novas doenças de ampla disseminação, etc.

Para BECK (1999), podem ser identificadas três classes de perigos globais: (i) os danos ecológicos criados pela riqueza e os perigos da industrialização tecnológica; (ii) os danos ecológicos causados pela pobreza e os perigos da industrialização tecnológica; e (iii) os perigos das armas de destruição em massa. A esse último, de caráter militar-estatal, ele acrescenta os perigos do confronto do terrorismo fundamentalista ou privado. No entanto, outras ameaças, de efeito não-ecológico, ou derivados de confrontos militares ou para-militares, podem ser percebidos em relação a questões de saúde pública, como a rápida disseminação de

doenças transmissíveis, decorrentes dos modos de vida das populações, como citado anteriormente.

De forma menos otimista que Giddens, conforme apresenta GUIVANT (1998), Beck acredita que *"quando as pessoas se encontram em situações nas quais as alternativas são difíceis de visualizar, tendem a negar sua condição de atingidos. Nem sempre os protestos emergem entre os mais ameaçados, mas entre setores de classe média, com suas normas sobre saúde e segurança"*. Sobre esses danos ambientais, Guivant afirma em seu artigo,

"Estes são os setores que se sentem ameaçados de perder, através da destruição ecológica, o bem-estar conseguido, sendo também influenciados por diversos fatores como densidade populacional, os graus de industrialização, o nível de prosperidade, as regras da democracia, e as condições tecno-econômicas para enfrentar os problemas ambientais".

No campo político, a sociedade amplia a participação política para grupos que anteriormente não estavam envolvidos, tornando mais amplas e mais complexas as negociações na sociedade, o que Beck chama de subpolítica. Produz-se uma metamorfose do estado, reduzindo sua ação por um lado e aumentando por outro, passando a ter como principal papel quem prepara o palco e as negociações, e dirige o espetáculo. A luta de classes continua presente, mas cede espaço para outras formas de luta a partir de temas que transcendem os limites de classes, ainda que estejam presentes as diferenças sociais. Portanto, para Beck está superada a sociedade de classes, sem que se perca o sentido

de que a distribuição dos benefícios gerados pela produção seja diferentemente apropriada pelos diversos segmentos que compõem a sociedade. Nessa perspectiva, essa noção é tanto mais clara quanto mais desenvolvida a sociedade, sendo mais complexa a sua análise em áreas de extrema pobreza. Diferentemente da idéia das forças sociais livres, na sociedade de risco Beck afirma estar presente a auto-organização, que significa para ele, *"uma reunificação dessas forças livres na camada mais profunda da sociedade, na atividade econômica, comunitária e política"*. A Figura 1 apresenta, de forma esquemática e resumida, o processo de construção da sociedade de risco, de acordo com Beck.

Modernidade simples

↓

Modernização reflexiva – autoconfrontação

↓

Superação da sociedade industrial
Contraposição à teoria do fim do capitalismo
Sentido de evolução com o limite da sociedade industrial

↓

Radicalização da sociedade sem revolução

↓

Processo sem controle ou desejo
Instituições não acompanham o processo, ficando defasadas

↓

Sociedade de risco
Riscos escapam das instituições para o controle
e proteção da sociedade industrial,
e relacionam-se com...

↙ ↓ ↘

Natureza
e cultura

Ameaças
e problemas criados

Significados coletivos
e de grupo, que
perdem o sentido

↘ ↓ ↙

Retorno da incerteza – reconhecimento da imprevisibilidade,
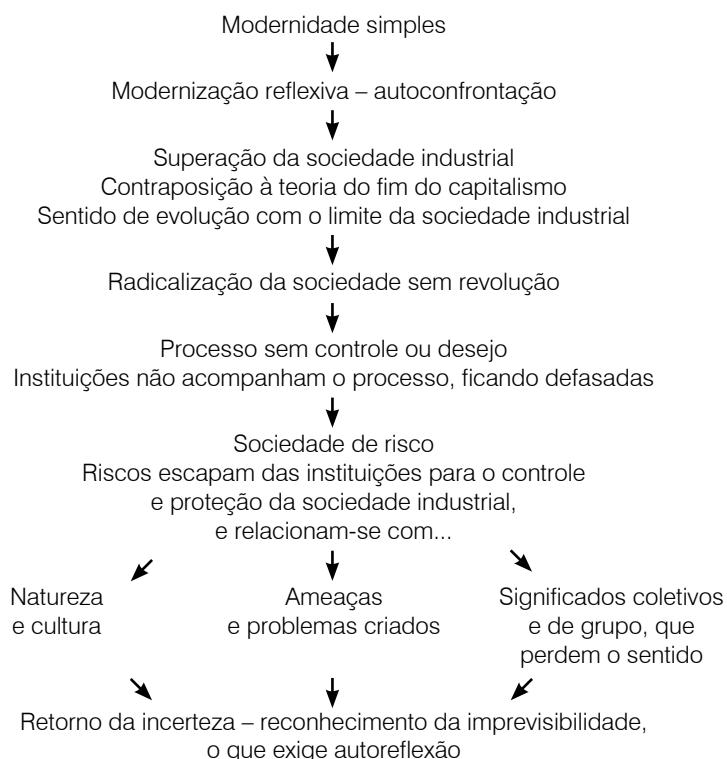o que exige autoreflexão

Figura 1. Esquema e resumo da construção da sociedade de risco.

No campo da ciência, a teoria da sociedade de risco propõe que o processo de C & T provoca uma auto-abertura do monopólio sobre a verdade. Beck questiona,

"porque a própria ciência, que muda tudo, deve ser concebida e conduzida como imutável? Ou talvez seja possível que a maneira pela qual uma mudança na estrutura da ciência seja concebida e rejeitada afaste a possibilidade real de auto-limitação e de mudança no que está disponível e no que é incumbência das ciências?"

Se por um lado o risco aumenta a dependência de especialistas, há uma forte intervenção da experiência pública que está relacionada com o conhecimento da vida cotidiana, o que significaria uma participação da sociedade de forma mais direta no campo da C & T, na medida em que sobre ela incide os novos riscos globais. A necessidade de alto nível de conhecimento, adquiridos por especialistas, se depara com a mobilização da sociedade baseada no senso comum, que exige novos mecanismos de relação entre C & T e sociedade. Portanto, confrontam-se dois tipos de ciência: aquela originária dos laboratórios e baseada no amplo trabalho dos técnicos especialistas, e a que vem da experiência pública, da sociedade, daquilo que Beck chama de *"discursividade pública da experiência"*. O que se pode perceber é que, na teoria da sociedade de risco, há demonstrações de que a participação no conhecimento da sociedade de modo geral, com seus desejos de limitações éticas e de risco, começa a impor uma necessidade de negociação com o saber científico (de laboratório), de forma a estabelecer as condições de implementação do desenvolvimento tecnológico.

Em sai teoria da sociedade de riscos, Beck demonstra que há um processo revolucionário, que chama de *"diferenciação sistêmica funcional"*, para os quais destaca dois exemplos: a revolução feminista e o conjunto de modificações que ela provoca em todos os campos da sociedade industrial, e diferenciação sistêmica da natureza, com a sua transformação em política. São processos que penetram na sociedade e fazem uma profunda transformação desde as relações sociais até as formas de produção, e que se estabelecem fora do sentido clássico de revolução. É o sentido da própria modernização reflexiva.

Para Beck, a sociedade está organizando mecanismos novos para lidar com o desejo daqueles que não querem mais estar ameaçados permanentemente pelos efeitos colaterais e os riscos da modernidade. Para isso, está criando, ainda que de forma muito rudimentar, *"instituições de mediação intersistêmicas"*, que em outras palavras são mesas-redondas ou espaços de negociação dentro da sociedade. Sua consolidação exigirá uma profunda mudança na ordem prevalecente na sociedade industrial, com importantes mudanças institucionais. Serão espaços de conflito, que não eliminarão os riscos criados pela sociedade industrial, mas têm o sentido de buscar a prevenção e a precaução, dando transparência às negociações e decisões. Essas transformações, que atingem tanto os aspectos institucionais da sociedade como o Estado, estão produzindo um efeito de recolocação do papel de negociação das decisões dos rumos da sociedade, que Beck denominou de renascimento do político. A Figura 2 apresenta, de

forma esquemática e resumida, as principais características que compõem a teoria da sociedade de risco, e de como ela provoca as transformações a sociedade.

Individualização/desintegração – substituição de modos de vida

↓

Instituições dependentes do indivíduo – individualização torna-se política

↓

Subpolítica – agentes externos ao sistema político, ou corporativos, participam ou exigem participação nas negociações

↓

Novas combinações: arte e ciência, tecnologia e ecologia, economia e política

↓

Diferenciações sistêmicas funcionais – feminismo, natureza transformada em política

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Ambivalência, resistência e as instituições de mediação sistêmica

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| Desmistificação e dos especialistas | Ampliação da participação e da tomada de decisão | Negociação mediação |

↘ ↓ ↙

Interface e sobreposição da política dirigida por regras e da política que altera as regras

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| Metamorfose do Estado | Autoorganização |
| Estado da negociação | Subpolitização da sociedade |

↘ ↙

Renascimento do político

Figura 2. Esquema e resumo das principais características da sociedade de risco.

GUIVANT (1998), por sua vez, em estudo amplo sobre os diversos autores que analisam as questões do risco na alta modernidade ou na modernidade reflexiva, demonstra que Bauman tem uma outra proposta para controlar a sociedade de risco, que consiste em estabelecer *"uma ética de autocontrole, baseada em princípios morais diferentes dos dominantes na modernidade, na qual cada um deve ser responsável, moralmente, por sua ignorância"*. Bauman propõe, segundo Guivant, uma ética que lida com cenários conflitivos, distante das alternativas baseadas nas certezas científicas. Nesse sentido, para Bauman *"os peritos passariam do papel de legisladores para o papel de intérpretes"*, transformando seu papel na sociedade para que de fato possam se colocar como *"guardiões dos valores morais"*. Apesar de seu pessimismo, Bauman acredita no surgimento de uma consciência moral da humanidade, que viria a controlar a sociedade de riscos.

Questionando a posição da ciência junto à sociedade civil

BORDIEU (2002) afirma que a base teórica e conceitual associada à experiência externa ao universo culto, ou seja, ao conhecimento da vida cotidiana, permite análises cujos resultados são mais desprovidos de limites. No campo das ciências sociais, isto significa que a busca de informações dos atores, associada à obtenção dos dados empíricos, ajuda a construir análises sobre os fatos sociais. Para ele, não levar em conta as análises do que chamou de pré-construções, implica em que o pesquisador social não faz ciência, mas legítima ciência. Outra questão em destaque

nos pensamentos de Bourdieu sobre a questão do senso comum e do conhecimento especialista é que o cientista social deve ainda ter consciência, em sua análise, de que os conhecimentos estão relacionados a valores dentro dos segmentos da sociedade (por exemplo, quando se tem uma relação entre a cultura popular e a cultura dominante).

Os pensamentos de Bourdieu são extremamente significativos para a ciência de modo amplo. Por exemplo, o senso comum nas ciências agrárias é importante quando se procura estabelecer estratégias para o desenvolvimento científico e tecnológico baseado nas culturas comunitárias, no saber-fazer local, como elemento de resgate e fortalecimento multicultural e econômico. O "enfrentamento" entre o conhecimento especialista e o comunitário é essencial para o fortalecimento de estratégias de multiculturalidade, buscada sob diferentes formas pela sociedade civil ou por políticas públicas conduzidas pelo Estado.

Outro ponto importante é a necessidade, que aborda Bourdieu, de se analisar as pré-construções, de forma a conhecer na raiz a questão em análise, de forma a se poder fazer ciência e não apenas legitimá-la. Isto implicaria em dizer que a radicalidade da dúvida deveria estar presente nos pesquisadores que quisessem estar fazendo ciência. Faz um questionamento sobre o curso comum da própria ciência. Para as ciências sociais propõe que haja uma "ruptura epistemológica" colocando sob análise as pré-construções e seus princípios, rompendo com conceitos, métodos e pensamentos, do senso comum e do senso científico,

para realmente fazer avançar a ciência. Para a ciência de modo geral, questionar o que LATOUR e WOOLGAR (1999) chamaram de mitologia na ciência, aquilo que é considerado de domínio dos cientistas, não mais questionado.

Segundo Latour há uma vasta literatura sobre ciência que, porém, não descreve a prática científica e supõe que se considere a ciência como fato adquirido. Observa que não encontrou estudos que demonstrem a análise da ciência a partir de uma observação direta. Além disso, não fazem relação entre a dimensão cognitiva e os fatores sociais dentro das quais está inserida. Em seu texto "A Vida de Laboratório" (1999), resultado de uma permanência num laboratório observando diretamente suas atividades rotineiras, Latour procura demonstrar que a prática de geração de novos conhecimentos não é uma atividade diferente de outras práticas da vida cotidiana dos indivíduos. A partir de sua análise com base em sua formação antropológica, Latour compara as atividades rotineiras de um laboratório com qualquer outra atividade profissional, onde o resultado final é produzir novos artigos científicos que se incorporam ao que chamou de mitologia da ciência, ou seja, aquilo que passou a ser ficou aceito como respondido, com base em metodologias aceitas, sem novos questionamentos.

Em seu trabalho, Latour demonstra que a organização da atividade de pesquisa se dá como tantas outras, onde os pesquisadores procuram elaborar novos artigos, com base em resultados de análises baseadas em equipamentos e metodologias elaboradas por outros cientistas anteriormente,

agregando novos conhecimentos ao conjunto dos que já estão aceitos pela comunidade científica. Afirma que, em realidade, há um processo de "inscrição literária", com o que chamou de uma ação compulsiva para escrever, tanto os artigos finais, como a decodificação dos dados apresentados pelos aparelhos. Na prática, se assemelha a outras atividades de produção.

A grande crítica que faz Latour à forma com que os cientistas colocam a ciência para a sociedade, pode ser observada por suas palavras:

"Os próprios cientistas fazem suas ciências, seus discursos sobre a ciência, sua ética da ciência, suas políticas da ciência e, quando são de esquerda, suas críticas e autocríticas da ciência. Os outros ouvem. O ideal epistemológico é que não haja uma palavra da metalinguagem da ciência que não seja tomada dos próprios cientistas".

A pesquisa que fez, relatada no seu trabalho citado acima, buscou exatamente evitar o discurso dos cientistas, entender como é a produção dos fatos e voltar-se sobre si mesma. Ou seja, buscar a análise da ciência, mantendo-se distante dela, de forma a produzir uma nova compreensão.

O que se verifica nas análises de Latour é que há uma clara intenção de demonstrar que a atividade de geração de conhecimento é uma atividade como tantas outras da sociedade, e procura desmistificar a forma com que os cientistas a colocam diante da população e do saber comum. Demonstra a grande rede de relações formadas

pelo mundo científico, que transmitem bases de conhecimentos entre si, seja através dos textos científicos publicados, seja através dos equipamentos utilizados, que incorporam conhecimentos pré-adquiridos.

CALLON et alli (2001) em seus estudos sobre o que denominou de translação, demonstrou um outro tipo de relação que ocorre na C&T. Ele aborda a relação entre os pesquisadores sociais, os "scallops", os pescadores e a comunidade científica, numa análise sobre o desenvolvimento de novas práticas de produção, com base tecnológica, em St. Brieue Bay. A ênfase de sua análise está nos mecanismos pelos quais os mundos sociais e naturais tomam forma. A isto ele chamou de translação, cujo resultado é a situação onde algumas entidades controlam outras, e que levam a algum segmento falar em nome da própria natureza.

De uma outra forma LATOUR (1999) também aborda a questão das relações sociais com a natureza, no campo da atividade científica. Afirma que na análise sociológica da ciência é necessário "... tratar igualmente e nos mesmos termos a natureza e a sociedade. A isto Latour denomina o princípio da simetria". Ou seja, é preciso analisar a natureza com o mesmo peso com que se trata a sociedade, quando se faz uma análise das ações da pesquisa científica. E, nesse sentido, Latour coloca os próprios equipamentos de laboratório, que são parte não-humana do universo de análise, carregando consigo uma grande carga do que ele chamou de mitologia. Latour propõe uma visão da ciência menos mistificada e mais próxima de práticas rotineiras da

sociedade, ou seja, a ciência deve ser vista como um conjunto de procedimentos rotineiros como outras atividades humanas.

BECK (1997) afirma em sua construção da teoria da sociedade de risco, que a superação da tecnologia dos contextos de utilitarismo militar e econômico, como pode ser visto na alta modernidade e, colocando-se em sua terminologia, *"a sua desintegração funcional e seu estabelecimento como um subsistema autônomo"*, é um dos elementos mais significativos alcançados na modernidade. Nesse novo contexto do desenvolvimento tecnológico, Beck percebe um momento de separação dos poderes que envolvem a tecnologia, passando a ser divididos entre o desenvolvimento da tecnologia e a utilização da tecnologia. Essa separação funcional permitiria o que chamou de *"contrutivismo fantástico, a dúvida interna, e o pluralismo da tecnologia"*, por um lado ligado ao desenvolvimento tecnológico, e por outro ao surgimento de novas instituições para negociação e intermediação, onde os aspectos econômicos teriam uma importância relativamente menos destacada. Ou seja, outras racionalidades que não a estritamente econômica passam a ter novo papel no contexto das negociações.

Beck conclui este pensamento afirmando que *"a tecnologia, a quintessência da modernidade, está organizada de maneira antiquada"*. A partir daí, Beck expõe a proposta de criação das novas instituições que tenham como função as mediações intersistêmicas, colocando em conjunto cientistas e leigos.

Avançando um pouco mais nas proposições de Beck, ele afirma que é preciso aceitar que as decisões tomadas por administradores e especialistas não são sempre percebidas como um benefício para aqueles que deveriam ter sido favorecidos. Os próprios institutos de pesquisa, muitas vezes, imaginam ter desenvolvido trabalhos racionalmente, de forma a produzir um "bem público", mas acabam recebendo forte crítica e rejeição, ou mesmo cautela, pelos que deveriam ser seus beneficiários. Afirma que uma das principais razões é o fato de que "os benefícios e as cargas mais ou menos onerosas da produção ou dos planos da infra-estrutura nunca podem ser distribuídos eqüitativamente". Por esse motivo, afirma que o instrumento tradicional de consulta política em relação à opinião especializada não pode ter resultados satisfatórios.

Ele entende que a determinação de índices aceitáveis de contaminação ambiental ou de saúde, por exemplo, definidos quando se utilizam tecnologias potencialmente danosas (aplicação de agrotóxicos é um exemplo), a ciência estaria dando um aval aos que se utilizam da tecnologia para "poluir um pouco o meio ambiente" ou deixar resíduos no corpo humano. E esses níveis se alteram com novos avanços na ciência, o que implica que o que é aceitável hoje pode não ser amanhã, aos resultados de novas pesquisas. Além disso, demonstra que as análises têm pouca capacidade de poder definir os efeitos de combinações de produtos que entrem em contato entre si, seja no meio ambiente, seja no corpo humano, ou ainda definir seus efeitos no longo prazo.

Em trabalho que questiona diversos pontos da teoria de Beck,

Wynne, de acordo com análise feita por GUIVANT (1998), sugere que os especialistas passem pelo envolvimento em processos de aprendizagem social, de caráter interativo e reflexivo, de forma a que passem a compreender *"as bases socioinstitucionais de toda a definição de riscos"*. Ou seja, propõe também que haja espaços de negociação e debates sociais, para se chegar a resultados sobre níveis aceitáveis e modelação de riscos. Wynne, portanto, sugere que a análise técnica dos riscos esteja inserida numa análise sociológica. Na realidade, esses autores têm em comum o pensamento de que a análise de risco não é um processo exclusivamente técnico. Ele contém valores, inclusive dos próprios especialistas, inseridos nas análises e por isso precisariam de um compartilhamento com os valores da sociedade de modo mais amplo.

Beck, conforme sintetiza Guivant, acredita na formação dos fóruns de negociação, onde se buscaria definir medidas de precaução e prevenção, dando transparência aos efeitos e sua distribuição sobre a sociedade e sobre o meio ambiente. Resumindo-se os pontos importantes nos processos de negociação, que Guivant busca nos trabalhos de Beck, pode-se destacar:

(i) estabelecimento de correlações de standards para o reconhecimento legal de dano;

(ii) os agentes industriais e os especialistas devem ser obrigados a fazer uma apresentação pública sobre seu posicionamento;

(iii) esses agentes devem ter responsabilidade pelos danos e pela segurança técnica;

(iv) definição de sistemas de contabilidade dos danos ao nível regional, de forma a os distribuir entre os setores econômicos favorecidos e prejudicados;

(v) promoção de negociação para o reconhecimento do dano e pagamento como compensação em favor da população envolvida;

(vi) formação de comitês de grupos especialistas de diferentes disciplinas e de leigos.

O que está contido nessa proposta pressupõe que haja um amplo entendimento pela população de que os especialistas não têm o monopólio do conhecimento e da expectativa de todos (referindo-se a valores e ética). Por sua vez e na mesma linha de raciocínio, os especialistas precisam compreender que há outros fatores que transcendem a sua objetividade, quando se busca definir os níveis de risco, e que os fóruns de decisão devem ser abertos permitindo ainda sua permanente reavaliação.

C & T agropecuária – o caso da Embrapa

A Empresa Brasileira de Pesquisa Agropecuária – Embrapa foi criada no ano de 1973, como uma empresa pública de direito privado, com o objetivo de apoiar a modernização da agricultura do país. Durante toda a sua existência, até os dias de hoje, a Empresa fez fortes investimentos na capacitação de seus quadros, principalmente no grupo de pesquisadores, que gira em torno de 2000 técnicos que atuam em diferentes áreas ligadas ao desenvolvimento tecnológico para o mundo rural.

O importante nesse texto é examinar a sua relação histórica com a sociedade, desde seu processo de identificação dos problemas a serem pesquisados, até seu posicionamento sobre temas polêmicos a respeito de ciência e tecnologia. Seu caso é uma importante referência porque reflete o caso de grande parte dos sistemas de pesquisa agropecuária dos países menos desenvolvidos. Em quase toda as primeiras décadas de existência, a Embrapa foi orientada pelo chamado "modelo circular de pesquisa", que determinava que as pesquisas devem começar e terminar no produtor rural. Isso significava que a decisão de se elaborar um projeto de pesquisa deveria estar baseada na expectativa de seus resultados pelos agricultores, ou seja, ela deveria refletir a demanda por tecnologia vinda diretamente do produtor. Também era considerado importante nessa engrenagem, o sistema de assistência técnica e extensão rural, cujo papel difusor das tecnologias geradas era considerado essencial.

Essa estratégia foi fundamental para a proposta de modernização da agricultura, baseada nos conceitos preconizados pela chamada revolução verde. Através dos mecanismos instituídos de pesquisa foi possível incrementar a produtividade em áreas tradicionais, acrescentar novos produtos na pauta de produção brasileira e incorporar áreas anteriormente não acessíveis à agricultura (as fronteiras agrícolas). Porém, alguns pontos importantes passaram a ser observados, como resultado dessa estratégia de ação:

a) exclusão social – a maioria dos agricultores brasileiros, principalmente os classificados como agricultores familiares, ficaram

excluídos do acesso à tecnologia, seja por falta de acesso ao crédito, deficiência na assistência técnica ou, o que é mais relevante para esta análise, a falta de identificação real do problema da agricultura familiar, de sua demanda, que apontem no sentido de soluções adequadas. Ou ainda, de uma análise mais adequada sobre o papel da C & T na construção de possibilidades de mercado para este segmento;

b) linearidade de demanda – além de circunscrever o foco de seu esforço a determinados grupos de agricultores, o modelo circular de pesquisa determinava a um único setor demandante, o dos agricultores, a indicação das prioridades e o retorno dos resultados de pesquisa. Isso significava a exclusão de outros componentes da sociedade que passaram a ter fortes solicitações sobre a pesquisa agropecuária, podendo-se citar os próprios consumidores e os ambientalistas, que incorporaram um conjunto novo de expectativas sobre a geração de tecnologias. Seria demasiado colocar a responsabilidade ao agricultor de compreender todas as demandas, inclusive as que vinham de outros segmentos da sociedade e ser o porta-voz de diferentes interesses;

c) distanciamento da demanda – além dos problemas expostos nos itens anteriores, o modelo circular começou a falhar, dentro dos limites de seu próprio propósito, com a perda de participação dos produtores efetivamente na definição de prioridades, mesmo que focalizado entre grupos mais restritos. Cresceu o número de projetos que tinham como base de levantamento de demanda os próprios pares, ou seja, os demais pesquisadores.

A forte redução de recursos iniciada ao final da década de oitenta, e fortalecida na década de noventa até os dias atuais, tornou mais evidente estes conjuntos de problemas. No início dos anos

noventa, houve uma iniciativa de produzir uma reflexão a partir dessa realidade e encontrar novos caminhos. O modelo circular de pesquisa foi substituído por outro sistema de planejamento da pesquisa, que procurava:

1. estabelecer novos elos com outros segmentos da sociedade que tinham demandas e expectativas a respeito da geração de conhecimentos e tecnologias;

2. criar espaços para novas linhas de pesquisa que tivessem como prioridade a massa de agricultores excluídos do acesso à tecnologia e à informação adequada para seus sistemas produtivos;

3. criar sentido de inter-relação disciplinar para enfrentar os novos (e velhos) problemas advindos dos processos de produção agrícola e das novas demandas da sociedade.

A primeira grande pressão advinda da própria sociedade sobre a Embrapa, com intensa articulação de movimentos sociais e de organizações não-governamentais, foi relativa à proteção ao meio ambiente. Fortemente criticada pela sua veiculação direta aos padrões tecnológicos da revolução verde, confortada pelos expressivos resultados sobre o aumento de produção e produtividade da agricultura brasileira, mas pressionada pelos impactos negativos por eles causados, as preocupações com a relação entre a prática agrícola e o meio ambiente foram gradualmente penetrando nas prioridades de pesquisa. No entanto, as bases conceituais da revolução verde pouco foram alteradas, buscando-se soluções, na grande maioria dos casos, dentro do modelo hegemônico de modernização da agricultura.

Outro conjunto de demandas que surgiu, principalmente na década de noventa, foi o relativo à geração de conhecimentos e tecnologias voltados para s agricultores familiares e suas estratégias e oportunidades de mercado. Houve, como resposta, a articulação de um programa específico para atender a essa demanda, mas sua implementação continuou com a limitação imposta pela cultura interna, e hegemônica na sociedade brasileira por imposição dos grupos dominantes, de prioridade à agricultura fortemente inserida no mercado. A distribuição da aplicação dos recursos para os programas e centros de pesquisa pouco se modificou em relação a seus dados históricos. Por outro lado, o avanço dos estudos na área de biotecnologia, que assolou todas as partes desenvolvidas da C & T no mundo, também atingiu a Embrapa. Novos grupos de pesquisadores, novas linhas de pesquisa e investimentos em infra-estrutura e recursos humanos foram feitos para atender esse novo espaço de pesquisa. Mais recentemente intensificaram-se as relações internacionais baseadas nos esforços para o avanço da pesquisa em biotecnologia, inclusive transgenia, fortalecendo-se relações com grandes empresas multinacionais líderes nessa área.

A situação de uma organização como a Embrapa, nesta fase de alta modernidade, é bastante complexa. Sua pauta se torna muito mais extensa, como se viu anteriormente, já que aos desafios historicamente presentes (como o desenvolvimento tecnológico para a agricultura familiar), novos desafios mundiais em relação à questão ambiental e de saúde pública (como poluição de solo e água, resíduos tóxicos em alimentos, sistemas de produção que

disseminam novas enfermidades, etc.), e o acompanhamento dos investimentos em setores de alta tecnologia, que dependem de elevados recursos (biotecnologia avançada), acrescenta-se a necessidade de se estabelecer novas formas de relação com a sociedade, com o objetivo de apoiar a criação de mecanismos institucionais que permitam a negociação entre o domínio especializado e a sociedade civil.

Este desafio já exerce pressão de fora para dentro da organização, apesar de não ser claramente percebido pelos pesquisadores. Ele tem se manifestado de forma mais clara nos debates ocorridos mais recentemente quanto à discussão sobre a liberação da produção de organismos geneticamente modificados – OGM's (mais especificamente, o cultivo de plantas transgênicas). Este é o caso que pode demonstrar a situação interna no que se refere à discussão sobre riscos. No ano de 2001, a Embrapa se manifestou oficialmente a respeito da questão da pesquisa e uso de plantas transgênicas. Em documento intitulado "Um resumo da posição da Embrapa sobre plantas transgênicas", divulgado através de sua "home page"[57], na internet, a Empresa afirma que *"acredita nos mecanismos criados pela legislação e confia na responsabilidade e seriedade da CNTBio[58] no desempenho da sua função"*, além de expressar que

"é indiscutível a necessidade de aprimorar os mecanismos de interação entre a CNTBio e os órgãos de Fiscalização destes Ministérios, responsáveis pela efetiva autorização para liberação no meio ambiente de organismos geneticamente modificados, quer

[57] www.embrapa.br

[58] Comissão Técnica Nacional de Biossegurança.

sob a forma de pesquisa, importação, transporte, plantio comercial ou industrialização, visando harmonizar a ação intergovernamental na implementação da Lei de Biossegurança, dando-lhe maior eficácia, ransparênciae confiabilidade".

O mais relevante nessa análise não se refere a verificar o posicionamento da Embrapa sobre a questão da liberação ou não de plantas transgênicas, mas de sua firme convicção na capacidade dos órgãos especialistas em deliberar, da melhor forma possível, para a sociedade. Há uma forte afirmação de sua convicção da capacidade das entidades especializadas envolvidas em definir um posicionamento que responderá pelas expectativas da sociedade, em nome dela, através de uma visão científica. No mesmo documento, sua abordagem em relação à participação da sociedade de forma mais efetiva e ampliada, está focada na participação dos consumidores na decisão de consumo sobre os produtos transgênicos. Ou seja, a sociedade civil, através de seu senso comum, toma sua decisão sobre os produtos geneticamente modificados na hora de sua compra ou não no comércio, onde o cidadão é visto como um consumidor, não participando da tomada de decisão sobre seu plantio, como fica claro no texto:

"outro aspecto relevante da questão dos transgênicos se refere à questão de que as informações do rótulo do produto devem ser suficientes para fornecer aos consumidores conhecimento necessário para sua escolha e o direito do consumidor de exercer esta escolha".

Neste caso, o espaço dado junto à sociedade e relação ao tema refere-se à sua participação enquanto consumidora, e no ato do consumo, a opção de escolha. Da mesma forma, não se coloca num posicionamento a favor de uma ampliação da negociação, através de novos mecanismos institucionais, em linhas semelhantes ao que propõe Giddens, Beck ou Bauman.

Mais recentemente, no ano de 2003, a Embrapa se recolocou a respeito das plantas transgênicas. Reconhece a potencialidade desse recurso tecnológico, mas afirma que

"sempre com a preocupação voltada ao bem-estar da sociedade, a Embrapa considera as seguintes demandas para a pesquisa pública em relação a transgênicos: análise genética, saúde alimentar, sanidade humana, segurança ambiental, saneamento básico e certificação de produtos. Defende como fundamentais os princípios de biossegurança e a plena informação aos consumidores.

Sua preocupação com a utilização das plantas transgênicas se modifica, acrescentando elementos de precaução, mas ainda limita os indivíduos da sociedade à categoria de consumidores devendo dar-lhe condições suficientes pata tomadas de decisão sobre consumo, e exclusivamente no ato do consumo, de diferentes produtos. Propões que se ampliem os estudos para analisar os efeitos sobre o ser humano e os outros organismos vivos para dar melhores garantias às análises de risco para o ser humano e o meio ambiente. Ou seja, buscar através de estudos científicos, informações que dêem sustentação ao "princípio da precaução".

Novamente, da mesma forma que em seu posicionamento em 2001, a Empresa não apresenta sinais de uma proposição sobre a necessidade de um confronto entre as informações especializadas e o conhecimento e o interesse leigo. O que faz supor que há um entendimento de que a posição técnica especializada é suficiente para basear a tomada de decisão, mesmo que a própria posição da área de ciência e tecnologia sofra alterações com a ampliação de estudos, com maior ou menor tolerância a riscos. Da mesma forma não acrescenta novos elementos para a construção de instrumentos (como "códigos de ética dos pesquisadores") para o trabalho com a problemática dos riscos sócio-ambientais.

Apesar do princípio de precaução sinalizar para uma atitude mais defensiva quanto ao uso da tecnologia, exigindo a ampliação dos conhecimentos técnico-científicos sobre seus riscos, há um vasto caminho a se percorrer para se conseguir o que afirmou BECK (1997), de que os especialistas ou peritos *"precisam compreender que há outros fatores que transcendem sua objetividade quando se busca definir os níveis de risco"*. Ainda que sob o enfoque do princípio da precaução, que pressupões mais estudos para subsidiar as análises de risco, o conhecimento leigo, o senso comum, e os valores da sociedade não aparecem como componente do processo decisório,. Não há indicação de que este confronto (leigo-perito) seja uma pré-condição na tomada de decisão sobre riscos no âmbito de projetos e programas de pesquisa.

Esse posicionamento é coerente não só com sua história de relação com a sociedade, conforme exposto de forma resumida,

como também com a posição do Governo Federal, que tem se manifestado pelo próprio Presidente da República de que não deve haver um "debate ideológico" sobre o assunto, que deve tomar contornos "puramente científicos".

O que se observa é uma iniciativa de colocar os conhecimentos especializados de forma disponível para a população, enquanto consumidora de produtos agrícolas. Este processo, no entanto, não trabalha uma relação da ciência e tecnologia com a sociedade na definição do tipo de tecnologia de interesse geral, baseada em sua percepção sobre os riscos. Confere ao cidadão e à sociedade de modo geral um papel exclusivamente de consumidores, momento no qual, no exercício do consumo, toma a decisão sobre a compra ou não desse tipo de produto, mas que já terá sido produzido, e a tecnologia já utilizada. Ou seja, o exercício de cidadania fica limitado ao espaço do consumo-cidadão.

Ainda que isto represente um avanço no sentido de dar opção à população na escolha do produto a ser consumido, reduz a potencialidade da relação sociedade civil e ciência e tecnologia na prévia decisão sobre os níveis de riscos aceitáveis. Baseia-se sempre nas análises científicas dos riscos da tecnologia, de forma exclusiva, como instrumento de decisão para o bem-estar da sociedade. Não se observa nem o fato das posições dos cientistas e pesquisadores estarem revestidas de seus valores pessoais, nem com o fato de que os resultados de análises de impactos têm suas limitações e são constantemente revistas ao longo da evolução do conhecimento científico. Ou seja, o que para

a ciência é hoje uma "verdade", amanhã poderá ter uma posição diferente por força de avanços nos estudos e novas conclusões.

O caso dos produtos transgênicos é apenas um exemplo atual de tecnologia que coloca em discussão, ao nível global, as questões dos riscos incertos. Muitos dos padrões tecnológicos na alta modernidade têm como componente expressivo a alta carga de riscos, que produzem fortes incertezas na sociedade. A complexidade dos sistemas que envolvem a integração sociedade e natureza, formando um sistema sócio-ambiental (DAVIDSON & BERKES, 2003), torna cada vez mais imprevisível o impacto causado por ações, tanto antrópica como naturais. A linearidade entre causa e efeito que orienta as ciências modernas dá lugar a uma complexidade de ramificações que torna muito mais complexo o estudo dos impactos, sendo mais adequado o trabalho com possibilidade de cenários baseados em estudos interdisciplinares (MORIN, 1990).

É certo que não se pode esperar que uma única organização produza as mudanças institucionais que as transformações na sociedade estão exigindo. É preciso mais que isso. Será necessária uma ampliação do debate sobre o tema, alcançando setores mais amplos da sociedade, inclusive no espaço político, para ser iniciado um processo mais consistente de participação do senso comum nas decisões sobre riscos. Mais complexo ainda quando, uma organização possui um tipo de cultura organizacional de relacionamento de forma ainda muito restrita na sociedade, mantendo importantes relações com os próprios setores de

pesquisa e órgãos de fiscalização, e com os agricultores. No entanto, no quadro da alta modernidade ou da modernização reflexiva, o universo é mais amplo que este quando a finalidade é o estabelecimento de interlocuções da ciência e tecnologia, considerada a capacidade que seu uso tem de produzir efeitos que afetam amplamente a sociedade, inclusive podendo transcender os limites político-geográficos dos Estados-nação, levando muitas decisões para fóruns muito mais ampliados.

Comentários finais

Pode-se perceber que historicamente importantes iniciativas vêm ocorrendo na Embrapa no sentido de buscar a construção de novas prioridades e mecanismos de participação da sociedade em suas atividades de pesquisa. No entanto, a imposição da objetividade dos resultados das análises de risco produzidas pela própria ciência e tecnologia ainda é determinante para os técnicos na tomada de decisão. E isso vem ocorrendo com forte apoio das instâncias mais elevadas de tomada de decisões nas estruturas do Estado. Para avançar de maneira decisiva no sentido de estreitar os espaços de entendimento com a sociedade civil e buscar sua colocação na vanguarda da discussão sobre os riscos incertos no Brasil, a Embrapa poderia se propor a:

1. estabelecer estreitas relações com organizações que estão se dedicando a estudos sociais, que têm como objetivo a compreensão de como podem ser formadas alianças entre o setor de desenvolvimento científico e tecnológico e o senso comum;

2. conhecer o pensamento dos pesquisadores sobre sua percepção sobre os riscos da ciência e tecnologia e de como entendem a sociedade na relação com o campo do desenvolvimento científico e tecnológico;

3. iniciar a formação de quadros no campo da sociologia da ciência para dar suporte às diversas áreas de pesquisa e aos seus administradores, com base em estudos e análises, para o estabelecimento de novas formas de relação com a sociedade, de forma a estarem voltadas à construção de espaços de negociação sobre riscos, colaborando para que a Ciência e Tecnologia, de forma mais ampla, inicie processos que venham a fortalecer o trabalho de negociação entre especialistas e leigos no Brasil;

4. a partir dessas relações, buscar a formação de novos parâmetros para o entendimento sobre riscos, mais sintonizados com as expectativas da sociedade, mantendo-se permanentemente atualizada sobre as expectativas e os valores da sociedade;

5. estabelecer estratégias internas de formação de Comitê encarregado de apoiar um posicionamento da organização a respeito de temas ligados ao desenvolvimento de tecnologias que envolvem riscos incertos, bem como de coordenar a construção de um conjunto de elementos sobre esses riscos, que componham um determinado padrão de ética que poderia orientar os pesquisadores em sua atuação diária;

6. formar equipes de trabalho com características interdisciplinares de forma a iniciar estudos que tenham como finalidade compreender os efeitos sobre sistemas complexos (sistemas sócio-ambientais), causados pela aplicação de tecnologias, de modo a que se possa construir cenários possíveis e, a partir destes, definir estratégias de gestão.

O desafio que se propõe à Embrapa é altamente relevante para a ciência e tecnologia agropecuária como um todo, considerando sua importância no cenário do desenvolvimento da tecnologia agropecuária no Brasil, sua importante inserção na pesquisa da América latina (principalmente os institutos nacionais de pesquisa agropecuária dos países) e dos organismos internacionais voltados para o desenvolvimento científico e tecnológico. Ou seja, seu papel no desenvolvimento da tecnologia agropecuária para as áreas tropicais do mundo. Uma iniciativa bem estabelecida e com a formação de importantes alianças, pode promover um processo de expressiva repercussão, que poderia representar resultados importantes para o avanço da construção de novas instituições, particularmente voltadas para a negociação entre a ciência e tecnologia e a sociedade de modo geral.

Uma determinação como esta, com o sentido de iniciar um processo de criação de novas relações entre a ciência e tecnologia e a sociedade civil, requer uma compreensão interna da organização, por parte dos próprios cientistas e pesquisadores, de que sua informação especializada é apenas um componente no processo decisório, transcendendo, portanto, aos órgãos especializados. Este possui outros componentes sociais que fazem parte do conjunto de informações necessário para a tomada de decisão sobre os riscos que, por sua vez, não podem estar baseados somente na manifestação de segmentos organizados.

É importante, no entanto, ressaltar que muitos outros desafios para a Embrapa ainda estão em sua agenda de compromissos, com

a necessidade de serem fortalecidos. Os desafios da exclusão social se juntam a diversos outros ligados a diferentes, e mais complexas, demandas da sociedade. Ao lado desses, coloca-se o desafio de se estabelecer novos procedimentos para a tomada de decisão sobre os riscos incertos a serem assumidos pelo uso de tecnologias. Para se estabelecer novos mecanismos, começar pela compreensão dos pesquisadores de que o olhar dos cientistas não é o único é um bom começo.

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10. Negotiation and dialogue between academy and society: Generation of new regulation and governance conditions for a sustainable development?

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Abstract

In this article the authors reflect on judgements about the legitimacy of participatory democracy, on the basis of an original experiment that they conducted in France in 2001 and 2002, in the field of agricultural research. This pilot experiment for the co-construction of a research programme on genetically modified vines was initiated by the French National Institute for Agronomic Research (INRA), which sought to open up deliberation on its research to outside stakeholders and the general public. It provides the basis for an analysis of the required conditions for the production of a well-argued opinion by a hybrid group (of researchers, professionals of the wine sector and ordinary citizens), and of the manner in which the operation was received in the wider public sphere and by stakeholder groups – in this case the agricultural and especially wine-related sector and NGOs engaged in anti-GMO campaigns.

Introduction

After World War II innovation was generally considered to be an essential and obvious component of French agriculture. The diffusion of new techniques was part of a forced modernization process. Scientific and technical rationalization of agricultural activities was strongly supported by the Colbertist State and farmers' unions in a neo-corporatist model of joint management of agricultural policy. Science and innovation were legitimate because scientific and technical progress rhymed with economic and social advancement. However, with the multiplication of health and environmental crises in the 1990s a far more complex relationship between farmers and innovation started to emerge; one that is increasingly mediated by public debate.

This new context stems from the combination of three types of change. First, agriculture is the emblematic example of the change from a society of progress to one of risk, as described by Ulrich Beck[i]. Agreeing that risks are a product not of fate but of science and techniques – and thus of the institutions supposed to guarantee our welfare – changes our conception of modernity. From a high level of trust in progress, accompanied by the delegation of collective decisions to political elites and experts (simple modernization), we switch to a more reflexive and critical attitude. This is in no way comparable to a supposed return to obscurantism, for science is as essential in the risk society as it was in the progress society. However, an exterior/interior inversion takes place: the hypotheses, models and conditions of production of knowledge are debated

outside, while secondary, unintentional effects become an object of research. Paradoxically, this new context is characterized less by risk in the traditional sense than by uncertainty[ii], a lack of sources of expertise, complexity of the phenomena involved, and challenges to the framing of expertise[iii].

The second change stems from the progressive de-sectorization of agriculture. At a time when the working population is constantly decreasing and its political influence waning, agriculture as a system of action, accustomed to monopolizing the definition of its own problems, norms and practices, has to accept a regime of co-responsibility with other sectors. Agricultural policy is no longer determined by the agriculture ministry only; it is also negotiated in relation to the environment and health, and with European institutions, regional authorities, etc. Environmental and consumer organizations intervene in various arenas to weigh on this construction since agriculture produces or manages numerous goods that concern a wide public. The evaluation of those goods depends on values that are deeply entrenched in a society's history, in its food tastes, in its relationship with nature, with landscapes and with life, etc.[iv]

Finally, during the same period the type of knowledge produced – the epistemic content – and the forms of organization of research have been profoundly altered. With the 'molecularization' of life forms we are witnessing a spectacular upsurge of genomics and high throughput biology. The key figure of the agronomist – a symbol of 'research in the open field'[v] – is giving way to

sequencing platforms and calculation centres. In parallel, the Colbertist conception of government research is gradually being challenged[vi]. The regulation of research activities is influenced by several forms of polarization: an academic polarization that has a growing influence in researchers' careers; a market polarization that stems from a process of privatization of a large proportion of genetic knowledge and resources; and a civil polarization reflected mainly in the mobilization of anti-GMO organizations.

After playing an essential part in the development of a productivist agricultural model during the post-WWII boom, agronomic research is faced with a new set of constraints. First, it has to maintain a sound position in international academic competition, something which is not incompatible with a strong industrial partnership. At the same time, it cannot disregard the potential impact of its innovations since agronomic research is by definition finalised. Yet market evaluation is too limited??? to meet the challenge of sustainable development. Likewise, it is necessary to take into account a plurality of visions of the world and not be confined to economic rationality only. That is why, in the past decade, an institution like the Institut National de la Recherche Agronomique (INRA)[vii] has embarked on paths that may seem contradictory: heavy investments in genomics in partnership with the agricultural profession and ag'biotech companies; commitment to research on risk evaluation, especially by means of agri-ecological modelling; and experimentation with new ways of opening up scientific and technical choices.

The latter direction is essential from the point of view of public engagement and the transformations of relations between science and democracy[viii]. Even though INRA's research policy still corresponds largely to the linear innovation model, the organization has also adopted a more reflexive attitude, based on participatory devices involving the various stakeholders. How can a public-sector research institution appropriate methods that allow research options to be debated? How is citizen participation articulated with the authority of science, on the one hand, and the claim for research freedom, on the other? What are the interactions between these experiments in participatory evaluation and the mobilization and protests of NGOs?

In this article we discuss these questions in relation to an interactive technological assessment (iTA) experiment that we conducted at INRA, at the request of its directors. Internationally, it was the first experiment in public dialogue on GMOs conducted by a leading research institution. It differed from traditional research partnerships in so far as the objective was to discuss research orientations – and not only its implementation[ix]. The analysis of this original experiment should therefore stimulate reflection on the role of participative technological assessment in the promotion of sustainable development.

Origins of the project and negotiating social scientists' intervention

In December 1999 the satirical newspaper Le Canard Enchaîné published an article headed "Des bulles transgéniques dans le champagne", in which it revealed that Moët et Chandon had run open field experiments with genetically modified vine root stocks. In a context of intense protest against GMOs, the reaction by the management of LVMH, Moët et Chandon's parent company, was immediate: the test plants were removed. The company's researchers then suggested giving the experimental material to the INRA researchers who had participated in the project, so that the tests could be continued on the Institute's property.

For INRA a decision of this nature was problematical. In the vine and wine sector the issue of research orientations is particularly complex. Since wine is a traditional and highly symbolic product, the introduction of new techniques is negotiated with professionals and very strictly regulated. In the case of GMOs, many actors fear that the introduction of transgenetics could tarnish the image of wines, especially in France. Yet French vines suffer from many diseases that require the use of large quantities of pesticides. In some instances such as the disinfection of the soil, the only effective molecules are so toxic that they are currently being banned. The use of genetic resistance (introduced by transgenesis or not) can thus help to improve wine growing. Finally, due to the characteristics of plant variety creation, current research options may have a commercial impact in twenty years' time only.

INRA was faced with this problem while, within the GMO controversy in France, the legitimacy of public research trials had been challenged since the summer of 1999. Moreover, INRA's new directors – from August 2000 – considered that it was necessary to open deliberation on the orientation of research programmes to non-scientific actors. In this context it was necessary to design and establish an original system of dialogue to illuminate the directors' decision. Our team was contacted in January 2001. From 1996 we had undertaken several research studies to further insight into the public controversy over GMOs[x] and to analyse various experiments in participatory assessment of technologies, including the Citizens' Conference on GMOs organized in France in 1998[xi], as well as similar experiments organized in different European countries[xii]. Several conclusions were drawn:

- the involvement of ordinary citizens sheds original light on scientific and technical problems; they frame problems more broadly than do experts since they are not limited by disciplinary boundaries, their questions help to identify certain limits of experts' models, and their judgements reflect sensitivity to values and common sense;

- in a logic of procedural justice, it is necessary to very clearly define the organizational rules of these experiments in order to guarantee their credibility, from the point of view of both participants and non-participants, particularly: rigour in the choice of participants, deliberation process conducted independently without any bias, transparency of the device, and independent evaluation;

- finally, the articulation between the device and the decision must be clearly defined from the beginning of the experiment.

On the basis of these findings we suggested that INRA set up a method to organize real forward-looking deliberation.

We chose to adapt a method of Interactive Technological Assessment (iTA) designed in the 1980s in the Netherlands[xiii]. ITA is comparable to the citizens' conference method in that it is based on in-depth deliberation in small groups. However, the working group is composed not of ordinary citizens but rather of actors involved in the technological trajectory under consideration: from research upstream down to final use, via regulation, development and transfer processes. The method also takes into account the diversity of world views rather than statistical or institutional representativeness. We chose the iTA method because our objective was to enlighten INRA's decision rather than launching a wide-scale public debate. It was therefore necessary to favour the possibility of socio-technical exploration, theoretically far stronger with a hybrid group than with a citizens' conference panel. Moreover, in this method the group constructs its own questions and chooses its field of exploration, whereas in a citizens' conference selection of the field is strongly influenced by the two week-ends of training. Finally, even though we applied this validated method, ours was the first operation of its kind in France. We therefore designed it as a real experiment.

The challenge was twofold: decision-making aid for INRA's directors, and the implementation of a device to produce knowledge on participatory technological assessment. This put us in a position of 'research-intervention' characterized by the combination of

involvement in an action and the production of knowledge on that action. It was also important for us clearly to define our relationship with INRA's directors, for even if the intervention of the institution's researchers was justified in a logic of capitalization on the experiment by the same institution, the question of its independence vis-à-vis the sponsor – also engaged in the public debate – was raised. Two further devices, in addition to the working group, were therefore created: first, an Evaluation Committee composed of social scientists from outside the institution, specialized in the analysis of controversies and participation, was responsible for the independent evaluation of all operations, from the design of the methodology through to the announcement by the president of INRA; and, second, a web site devoted to the operation, as a medium of traceability and transparency, published the outputs of the different stages of the project, including the evaluation committee's report[xiv].

We were obliged to produce a result (a report by the working group) and to run the entire project (constitution of the group, working methods, etc.) independently. The working group's report, to be submitted to INRA's directors, had to be made public. INRA would not be bound by the group's conclusions and its directors were solely responsible for their decisions. However, they would have to publicly explain, in writing, their analysis of the report, their view of the contexts, and the decisions that they intended to take subsequent to this operation.

The Interactive Technology Assessment experiment

Forming a working group

The objective was to form a widely diverse working group, with individuals who had very different ways of apprehending the problem and conceiving of solutions. We substituted a selection based on what we called 'world views' for one based on institutional mandates. The idea was to experiment with a form of debate that clearly differed from regular debate between institutional representatives – who have a large degree of political legitimacy but whose positions on a problem leave little leeway for negotiation, precisely because they are highly institutionalized. Our selection consisted in in-depth sociological interviews to obtain the opinions of people directly concerned by or interested in this research (wine professionals, researchers, members of consumers' unions and environmental organizations) as well as those of people apparently not concerned (i.e. lay persons), on a number of issues directly or indirectly related to: viticulture, the judgement of what a good wine is, the implications of transgenesis, and the role and status of science – including their positions regarding INRA and this experiment.

Of these respondents we then invited six wine professionals (deliberately chosen because they had no union mandate but 'represented' the constraints of their profession, through their daily practice), four researchers (from within and outside INRA, working on transgenesis and/or wine diseases via different disciplinary approaches) and four people with no professional involvement

(ordinary citizens or lay persons). In this respect our experiment differed from the composition traditionally used in the Netherlands, where the group's size is deliberately limited to facilitate more in-depth interaction.

The interviews and composition of the group took place from September 2001 to March 2002.

The course of the experiment and the results

The group's deliberations, moderated by a specialist in group dynamics with experience in this type of device[xv], were held in seven full-day sessions, between April and September 2002. The initial question put to the group by INRA's directors concerned the appropriateness of running open field tests on transgenic root stocks potentially resistant to Grapevine Fanleaf Virus – GFLV –, one of the diseases that wine growers have to deal with[xvi]. Initially the members of the group appropriated the question by reformulating it and broadening the frame of the problem to work on four main topics: the symbolic nature of the product and its impact on market relations; the characteristics and constraints of the production system; economic and political aspects; and the current state of research on vines and wines, including but not only GMOs. These very rich debates were sustained by the input of members of the working group, documents, and interviews with experts requested by the group.

The group's report consisted of two parts: i) observations and issues; ii) recommendations and points to monitor.

Of the numerous points in this report, we have selected only a few here to represent the content of the work:

- regarding the symbolic value of wine, the feeling was that, apart from the diversity of products and modes of consumption, no clear boundary existed between the different segments of the wine market and that therefore: 'A genetic modification on vines intended for 'technology wines' (vins alimentaires) could have effects on wines consumed for pleasure and high quality wines'[xvii];

- the working group highlighted an attachment to the diversity of systems of production (biological, technical and cultural diversity); regarding the threats related to vine diseases, it recommended the development of varied forms of control, with a view to contributing to the different methods of wine growing;

- concerning more specifically the state of research, the group criticized the lack of comprehensive and cross-cutting approaches, and emphasized the need for research that furthered understanding of interaction between the plant and its environment.

Even though there was consensus on these points, discussions on the precise question of the appropriateness of open field tests were tenser and the group was divided around two opposing positions: one was in favour of the testing under restrictive conditions; the other was against it, even if such conditions were satisfied. Opponents saw testing as 'a signal to society that the door's open to the introduction of GMOs in wine growing; it could therefore spoil the image of wine'. Several members of the group felt that this split into two opposing camps was probably caricatural since it occurred in the last phase of the drafting of the report. At that stage it was

too late for further discussions or for each member of the group to state an individual standpoint on what some of them subsequently saw as a continuum rather than a 'for/against' polarity. Thus, some 'pro-test' members agreed with certain arguments in the 'anti-test' response, and vice-versa. But for INRA's directors, who received not only a few 'yes' and a few 'no' answers but an argued report, the message was important: not everyone trusted the institution's ability to guarantee an impervious boundary between research and applications.

Response by INRA

The working group's report was submitted to INRA on 11 September 2002. The directors' decisions were publicly announced on 20 January 2003:

1. In view of the implications identified as regards vine diseases, INRA will undertake open field GMO vine tests only for lowering the use of pesticides. […]

   In the sensitive context of vines and GMOs, INRA will not decide to develop a GMO innovation, even for pesticide purposes, before receiving a clear mandate by the profession. The profession will, moreover, first have to convince the various social opinions concerned of the soundness of the control and monitoring mechanisms for such uses.

2. In cooperation with the professionals, INRA will create a 'joint committee on viti-vinicultural research' composed of INRA scientists and scientific or technical representatives of the profession.

> This committee will be responsible for drafting proposals on the guidelines for INRA's future research programmes on vines. It will start its work, in 2003, on research policy and strategy concerning pesticides and practices in this respect. […]

3. In this framework, open field testing near Colmar on the GMO vine's resistance to court-noué will be established for five years, subject to authorization by the competent ministries and after the CGB's approval[xviii]. This test corresponds to priorities concerning pesticides. In a cautious and restricted approach, it makes it possible to maintain the applied research dynamic and public expertise. […]

The test protocol will be determined by scientists, then debated by a local monitoring committee and made public.

For INRA, this announcement marked a significant change.

In the first point, it outlined elements of a new doctrine concerning the orientation of its applied research. For open field tests, the directors completed the principle of restriction: considering the symbolic value of vines and wine, the institute undertook to limit itself to objectives of which the social utility seemed to be sure. They also redefined INRA's role in the innovation process. It was no longer the promoter of innovation that it had been in the 1950s to 1970s (e.g. for hybrid maize). Its role was to explore diverse alternatives in order to broaden the range of options and to enhance knowledge on the impact of innovations. INRA thus reasserted its knowledge-production mission and redefined the boundary of its activities: innovation choices were to be made by the social actors concerned.

In this context the second point was very important. The experiment

highlighted the lack of legibility of viti-vinicultural research. How were priorities defined? How were necessarily specialized and fragmented approaches incorporated in order to find solutions to producers' problems? In the case of GMOs, the fear was that the prevailing orientation would be influenced by an instrumental logic (transgenesis, genomics, etc.), at the expense of comprehensive research. The establishment of a joint viti-vinicultural committee to debate and analyse research orientations was intended to allow the diversity of the vine/wine worlds to be taken into account.

Finally, INRA considered that the open field project corresponded to the principles established above. It therefore announced the decision to continue the test, accompanied – and this was very new – by the establishment of a local monitoring committee to discuss the research protocol and monitor the test from beginning to end.

Transformation of the results: an incomplete process

The impact of this operation of 'co-construction of a research programme' has to be considered from several complementary viewpoints: comments in the media immediately after the end of the experiment; the reactions of the protagonists in the controversy on open field tests; and the apparatus set up by INRA consequent to the experiment.

Experimenting with a deliberative device could not be conceived of without concrete involvement. Although the working group was consultative, its opinion did concern a decision that INRA's

directors had to take, and not an imaginary situation or a hypothetical scenario in which the participants would have found it difficult to invest their energy and simply their time[xix]. But for the same reason, the information reported in many media focused essentially on the final decision to authorize the open field testing suspended a few years earlier[xx]. By contrast, the national and regional general-interest press and the specialized scientific press (e.g. La Recherche, Science et Vie) did emphasize the innovative nature of the device, although without going into details.

At the same time the experiment was severely criticized by several associations that denounced 'a programme to manipulate opinion'[xxi]. The iTA-vine experiment seemed suspect from the outset, in the eyes of those actors who wanted a debate involving their own representatives, with equal representation. They therefore rejected the very principle of an experiment that excluded spokespersons for constituted groups from the working group.

The absence of a public debate phase helped to strengthen this feeling. Abandoning control of the device to sociologists acting in a confined space was diametrically opposed to the public debate model that these actors wanted. Some referred to the idea of an 'alibi group' convened by INRA to justify a decision 'that had already been taken'.

This radical criticism is also explained by the transformation of controversies around GMOs. In the two years that this operation lasted, the issue of open field tests became one of the main points

of dissension in public debate on the subject. Like certain media, the associations most actively mobilized in the debate considered the operation only from the point of view of announcing the resumption of the tests. Mounting tension between INRA and the anti-GMO organizations was not unrelated to this reaction[xxii]. For the opponents, this device and its result – resumption of open field tests on a vine resistant to GFLV – were the Trojan horse of GMOs in the vine world. The very possibility of reaching agreement on the conditions of a collective experiment was thus rejected.

In this conflictual context the construction of a robust device (stipulation of INRA's commitments, autonomy of project leaders in conducting the operation, independent evaluation committee) and INRA's explanation of its decision carried little weight. There was a wide gap between the productivity of this type of group and the intensity of the reappropriation of its results by anti-GMOs actors, in a context of public controversy. That is why one of the keys of this operation lay in the nature of INRA's commitment and in its ability to implement its decisions.

The local test monitoring committee was set up in March 2003. It met three times and carried out in-depth work on the research protocol. The fact that over half of the experiments in the final project were proposed by the committee attested to the participative dynamic created by the various actors' involvement. For the president of INRA's Colmar centre, the experiment of co-construction of research had major strategic implications. Wine growers in Alsace became deeply involved in the operation. Fearing

negative consequences for their wines, they actively discussed the protocol (How to eliminate potential risks? How to generate useful knowledge?) and interaction between the test and the Alsatian environment (especially the location of the test).

The joint committee on viti-vinicultural research was set up in the first quarter of 2004, after several months of protracted institutional negotiations that reflected the difficulties of the profession in reaching agreement on the terms of representation.

In compliance with current regulations, an application was submitted to the Agriculture Ministry in January 2004. The assessment committee (Commission de Génie Biomoléculaire – CGB) responded favourably in May. In line with a procedure set up from the summer of 2003, the application and the approval were open to public consultation for two weeks, on the government's inter-ministerial site on GMOs (ogm.gouv.fr), in July-August. However, contrary to custom, to date (November 2004) the Agriculture Ministry has still not given its decision – which amounts to a de facto refusal to authorize the test, without any clarification as to its position. The strong opposition of some wine producers, especially of the highest quality wines, has probably weighed on this non-decision[xxiii].

Apart from the announcement effects and criticism immediately subsequent to the conclusion of the pilot experiment, the question of the medium-term effectiveness of this type of participatory device is raised. As in the case of the 1998 Citizen's Conference,

it neither structured general debate on GMOs nor influenced the traditional modes of political decision-making. Yet it did trigger real reflection within INRA on the organization of its research and the concrete implementation of new devices involving researchers and professionals.

Conclusion

The analysis of this experiment highlights certain strategic and political issues in reflection on technical democracy. For the various reasons mentioned in the introduction, the public investigation model that associates science as the holder of the monopoly on reason, and the State as the guarantor of the general interest, is facing many limits. Since they cannot allow the uncertainties of public debate to hold sway, they have to take new initiatives in terms of public participation. Experiments in public participation are traditional institutions' response to this new situation.

As a complementary form of public debate for practising technical democracy, the iTA-Vigne experiment illustrates three general properties of this type of device: the first concerns the object of the debate; the second concerns the institution sponsoring it, and the third concerns the closure of the device.

As regards the object of the debate, public criticism levelled at our experiment highlights the difficulty of organizing participation on issues that are neither too 'cold', that is, where the stakes are not

high enough to ensure the actors' involvement, nor too 'hot', that is, so controversial that positions are already set and the product of the experiment has no legitimacy in the eyes of those with the most firmly entrenched positions[xxiv].

This leads us to the question of the credibility of the organizer of the exercise. In the case of the iTA-Vigne experiment, we have seen that INRA was considered to be a stakeholder and therefore as wanting to manipulate the operation. This is a systematic risk since differences between the parties involved in the device and the result of the exercise can be expected; the 'little' world is not supposed to reproduce the 'big' one. A solution would be to delegate the organization of these exercises to an institution that cannot be considered as a stakeholder, for instance the Danish Board of Technology. However, the risk would then be a loss of effects expected internally, in terms of changes in the functioning of research structures.

Finally, strong tension existed at the very heart of the device between an objective of production of opinions and a constant aim to achieve in-depth dialogue and argumentation between the different world views present. This tension became stronger as the closure of the experiment approached (for the working group this meant drafting a report). It triggered two complementary movements: a search for unanimity to standardize positions, and a split around suddenly more structuring oppositions. As in traditional political or scientific institutions, the final production hardly reflects the complexity of debates.

Thus, even if the limited space of an experiment like ours makes it possible to escape the shortcomings of public debate democracy so often described[xxv], we have shown the specific problems that it poses in terms of formulation of the object of the debate, the choice of participants, the modalities of closure, and institutional inscription. As the pilots of this type of device, it is our responsibility to make these choices so that the 'little world' thus created can serve as a cognitive and political laboratory for the 'big world'.

[i] Beck, U. (1986). La société du risque. Sur la voie d'une autre modernité. Paris, Aubier, 2001, for the French translation (first German edition in 1986, *Risikogesellschaft*, Suhrkamp Verlag, Frankfurt am Main).

[ii] Wynne, B. (1992), "Uncertainty and environmental learning. Reconceiving science and policy in the preventive paradigm", *Global Environmental Change*, pp. 111-127.

Wynne, B. (1992), "Misunderstood misunderstanding: social identities and public uptake of science", *Public Understanding of Science*, n°1, pp. 281-304.

[iii] Hatchuel, A. (2001). "Agir public et conception collective: L'expertise comme processus démocratique". Pour une expertise démocratique. F. Goux-Baudiment, Heurgon, E., Landrieu, J.,. Paris, Editions de l'Aube: 15-38.

Bertrand, A. (2002), "The Good Scientist, The Bad Layman and

the Ugly Smuggler. How to transgress the boundaries of science", EASST conference "Responsibility under Uncertainty: Science, Technology and Accountability", York, 31 July - 3 August 2002.

[iv] Joly, P. B., Paradeise, C. (2003). "Agriculture et alimentation: nouveaux problèmes, nouvelles questions." Sociologie du Travail 45(1/2003): 1-8.

[v] Callon, M., Lascoumes, P., Barthe, Y., (2001). Agir dans un monde incertain. Essai sur la démocratie technique. Paris, Seuil.
Gibbons, M., Limoges, C., Nowotny, H., Schwartzman, S., Scott, P., Trow, M., (1994). The New Production of Knowledge. London, Sage.

[vi] Aggeri, F., Hatchuel, A., (2003). "Ordres socio-économiques et polarisation de la recherche dans l'agriculture: pour une critique des rapports science/société." Sociologie du Travail 1/2003: 113-134.

[vii] INRA is a public scientific and technical research institution founded in 1946. It employs 8,500 permanent staff (of whom 3,000 are scientists) and 1,500 PhDs. It carries out applied research on agriculture, food and the environment. Its mission is to produce basic knowledge and to contribute towards innovation processes, expertise and public debate.

[viii] Callon, M. (1998). *"Des différentes formes de démocratie technique."* Annales des Mines – Responsabilité & Environnement n° 9: 63-72.

[ix] In a recent contribution Grin et al. (2004) analyse an experiment in deliberation, in research projects on sustainable agriculture

projects. The deliberative dimension of these projects remains limited for two reasons: i) the choice of not opening these devices to lay people and ii) the weakness of procedural rules guaranteeing the transparency of dialogue and delegating a high level of responsibility to the deliberative authority.

Grin, J., Felix, F., Bos, B., Spoelstra, S. (2004). "Practices for reflexive design: lessons from a Dutch programme on sustainable agriculture" *Int. J. Foresight and Innovation Policy* 1(1/2): 126-149.

[x] Joly, P. B., Assouline, G., Kréziak, D., Lemarié, J., Marris, C., (2000). L'innovation controversée : le débat public sur les OGM en France. Grenoble, INRA – Rapport à la DGAL (available on Internet: http://www.inra.fr/Internet/Directions/SED/science-gouvernance/).

Marris, C., Wynne, B., Simmons, P., Weldon, S. (2001). "Public Perceptions of Agricultural Biotechnologies in Europe". Paris, Final report of the PABE research project funded by the Commission of European Communities (contract n°FAIR CT98-3844). Available on www.pabe.net.

[xi] Marris, C., Joly, P.B., (1999). "Between consensus and citizens: Public participation in Technology Assessment in France." *Science Studies* 12(2): 3-32.

Joly, P. B., Marris, C., Hermitte, M.A. (2003). "A la recherche d'une "démocratie technique". Enseignements de la Conférence Citoyenne sur les OGM en France." *Nature, Science et Société* Vol.11(1): 3-15.

[xii] Joly, P. B., Assouline, G., (2001). "Assessing Public Debate and Participation in Technology Assessment in Europe". ADAPTA

PROJECT, European Commission Contract n° Bio 4 - CT 98 0318, Final Report, Grenoble, INRA/QAP Decision (available on the site: http://www.inra.fr/Internet/Directions/SED/science-gouvernance/). Brunet, S., Bergmans, A., Bertrand, A., Biren, P. (dir) (2002), L'expertise en questions. Gérer l'incertitude dans la société du risque, Bruxelles, Peter Lang, "Non-Prolifération".

[xiii] Grin, J., van de Graaf, H., Hoppe, R., (1997). Technology assessment through interaction. A guide. Den Hag, Rathenau Institute (available on http://www.rathenau.nl).

[xiv] The project's web site can be consulted at: http://www.inra.fr/Internet/Directions/SED/science-gouvernance/ ITA-Vignes

[xv] Guy Amoureux also moderated the French citizens' conferences in 1998 on GMOs and in 2002 on climate change.

[xvi] However, agreement does not exist within the profession on the impact and consequences of this disease. This example illustrates the importance of a process of explanation and sharing of 'world views' within the group.

[xvii] The notions of 'wines for pleasure' and 'food wines' are commonly used in the viti-vinicultural profession to distinguish modes of consumption and wine production.

[xviii] Commission du Génie Biomoléculaire, consultative expert committee on GMO-related risks, under the authority of the

Agriculture and Environment Ministries which by law have to be consulted before any authorization to disseminate GMOs outside a laboratory.

[xix] For some members of the group, devoting seven full days to these meetings was a heavy constraint.

[xx] The following are only a few of the many articles published subsequent to the press luncheon organized by INRA, attended by the working group and the chairman of the evaluation committee who commented on the course of the experiment:
'L'INRA va reprendre ses essais de vigne OGM en plein champ' (AFP, 20/01/2003)
'L'INRA se tourne vers les vignes transgéniques 'avec modération'' (Le Figaro, 21/01/2003)
'OGM : nouveaux essais à Colmar' (*Dernières Nouvelles d'Alsace*, 21/01/03)
'L'INRA veut planter en plein champ une vigne transgénique en Alsace' (Le Monde, 24/01/03)
'Le 'oui mais' à la vigne OGM' (L'Express, 30/01/2003).

[xxi] 'L'expérience pilote OGM-Vigne: Un programme de manipulation de l'opinion' – 1°February 2003, document signed by: Nature et Progrès, Confédération Paysanne, ATTAC, FNAB, Fondation sciences citoyennes, France Nature Environnement, Fédération Rhône-Alpes de Protection de la Nature Ardèche, GIET, Greenpeace, Mouvement de culture Biodynamique, OGM Danger (www.infogm.org).

xxii The opinions of the President and Managing Director of INRA on GMO open field tests, published in *Libération* on 23/9/2002 were severely criticized by certain organizations. See 'OGM : Opinion Grossièrement Manipulée' (www.infogm.org).

xxii The organization Terre et Vin du Monde, to which wine estates internationally renowned for the quality of their wines belong(Romanée-Conti in Burgundy, Château Latour in the Bordelais, Vega Sicilia in Italy), was very active. It organized a press conference when the public consultation was launched in July 2004. See: Gasparotto, L. 'Les grands crus en guerre contre les OGM', *Le Figaro*, 9 July 2004.

xxiv An experiment on a 'cold' issue produced the same findings: Bertrand, A. (2002), "Débattre sur un sujet marginal : la diminution de la fertilité masculine", in S. Brunet *et al*. (op. cit.), pp. 187-203.

xxv The shortcomings of a 'public debate democracy' are mainly produced by the constraints of publicization of social problems – which tend to be framed according the grammar of the media arena – and by strategic constraints (such as resource mobilisation). On these issues, see for instance:

Padioleau, J. G. (2000). "La société du risque, une chance pour la démocratie." Le Débat 109 (March-April 2000): 39-54.

Hatchuel, A. (2001). , op.cit.

11. Foresight, engajamento social e novos modelos de governança

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Introdução

Governança e foresight são temas de estudo relativamente recentes que apresentam pontos polêmicos: de um lado, as questões relacionadas à abertura democrática, expertise tecnológica e liberdade científica; por outro lado, sendo o futuro imprevisível, a noção que prevalece é de que os estudos do futuro são pouco efetivos. A questão do engajamento social, na realidade, refere-se a uma mudança de padrão no comportamento dos cidadãos que passaram a ser mais participativos e cientes de seus direitos. Contudo, é a junção dos três conceitos que dá maior consistência e credibilidade às partes.

Em primeiro lugar, está a questão da imprevisibilidade do futuro – dizer como será o futuro, não é possível ou viável. No entanto, buscar identificar como o futuro tende a ser e trabalhar com a noção de 'futuros possíveis"não apenas é factível, mas adquire grande importância na atualidade e se constitui em um diferencial para as organizações e países que buscam construir o seu futuro e não serem apenas reféns do destino. Neste sentido, a construção do futuro, a partir da percepção das oportunidades do presente, é,

de modo genérico, o que vem sendo conhecido como *foresight*.

Um segundo aspecto aparece quando se observa a emergência das questões relativas a novas institucionalidades e necessidades de coordenação das novas formas de organização da pesquisa e da inovação, bem como das novas formas gerenciais e das mudanças de foco, do curto para o médio e longo prazos nas organizações, nas estruturas governamentais e em seus inúmeros elos e relacionamentos.

Por último, observa-se que, nas últimas décadas, tem havido uma mudança no padrão no comportamento dos cidadãos que passaram a ser mais participativos e cientes de seus direitos. Questões relativas ao meio ambiente, por exemplo, passaram para o centro do debate político, sendo discutidas também pelo homem comum, saindo da esfera estrita da ciência e tecnologia. Essa mudança de comportamento tem sua lógica na medida em que o cidadão comum sofre diretamente os efeitos de mudanças ambientais. A participação do indivíduo, portanto, em temas que afetam a sociedade como um todo se faz sentir cada vez com mais intensidade.

Assim, emergem, não somente as necessidades de discussão sobre o engajamento da sociedade nos processos de tomada de decisão, como também, retornam à cena, os conceitos de governança, de macro coordenação e de construção de canais de comunicação verticais, no corpo governamental.

Segundo Irwin (2003)[60], "na sociedade do conhecimento, uma

[60] The Innovation economy: the technologies and new ideas that are changing the world. Business Week, Oct.11, 2004, p. 90-202.

governança democrática deve garantir que os cidadãos sejam capazes de fazer uma escolha baseada em informação das opções disponíveis para um desenvolvimento científico e tecnológico responsável".

É nesse contexto que governança, engajamento social e foresight se unem na busca de visões do futuro e dos caminhos que devem ser construídos para transformar essas visões em realidade, o que só se justifica se feito pelo e para o cidadão.

Este trabalho procura abordar questões de governança, foresight e engajamento da sociedade de forma conjunta e mostrar de que maneira e em que bases esses conceitos vêm sendo utilizados. Apresenta um caso de sucesso de sua aplicação na Irlanda, no qual se verifica que a construção de canais ou vias de comunicação verticais e os processos de macro coordenação em diversos níveis facilitam o processo de governança e possibilitam que as oportunidades tecnológicas encontradas possam ser validadas pela tomada de decisão e transformadas em ações concretas.

A economia da inovação

Da mesma forma que se colocava há alguns anos atrás para a área científica "publish or perish" hoje a questão passa a ser "innovate or perish". A pressão pela inovação, pelo desenvolvimento de novos produtos e processos se faz sentir todos os dias em todos os ambientes pela velocidade com que novos produtos aparecem

e são substituídos. O século XX foi marcado por uma intensa onda inovadora que mudou a forma de o homem se relacionar com o mundo, transformou as noções de tempo e espaço e inseriu na vida cotidiana objetos, artefatos e cognições que faziam parte da ficção científica. Para citar apenas alguns exemplos, a televisão, os antibióticos, as viagens ao espaço e as tecnologias de informação e comunicação em muito ajudaram a mudar a configuração do mundo. E, atualmente, quando uma nova revolução se avizinha, ao se refletir, por exemplo, nas nanotecnologias e biotecnologias cujo potencial de produzir mudanças ultrapassa nossa imaginação, a sociedade humana se depara com as dificuldades de aceitação do novo, do inesperado e de todo um universo imaginário que irá povoar os dias do futuro.

A revista Business Week[61], em edição especial, apresenta uma visão do futuro da inovação e das novas idéias, tecnologias e atores que irão, mais uma vez, mudar o mundo, e dentre estes, destacam-se:

- Nanotecnologia – a partir da habilidade de criar novos materiais pode transformar as áreas de saúde, manufatura e computação;

- Energia – novas tecnologias, como o hidrogênio, podem se tornar economicamente viáveis em menos tempo do que se imagina.

- Biologia – o impacto da economia da biotecnologia pode eventualmente se equiparar ao do microchip, enquanto avanços na medicina podem ampliar as fronteiras da longevidade;

Esta pesquisa ainda destaca regiões do globo que continuam a ser ou irão se tornar líderes mundiais em tecnologias de

[61] Crichton, Michael. Prey. New York: HarperCollins, 2002.

vanguarda, a saber: Vale do Silício (convergência da tecnologia da informação com a bio e a nanotecnologia); Ásia (o Japão passará a ter a companhia de países como Índia e China); Europa (as empresas européias permanecem fortes em áreas chave como a telefonia celular).

Ainda segundo a Business Week, dentre os países em desenvolvimento, surgem como líderes potenciais no desenvolvimento tecnológico: Índia, China, Rússia, Israel, Cingapura, Taiwan e Coréia do Sul. O que os caracteriza é um forte investimento em P&D (entre 1% a 4,7% do PNB) e em educação.

Neste contexto de pressão pela busca de processos e produtos inovadores, a população, mais consciente dos efeitos colaterais indesejáveis de determinados medicamentos, do uso muitas vezes predador da terra, do desenvolvimento de tecnologias que operam com alto nível de risco, começa a questionar o desenvolvimento científico e tecnológico em seu nascedouro e reivindica participar das decisões sobre seu uso.

Esse é um fenômeno que está acontecendo em algumas dessas novas áreas como a nano e a biotecnologia: atualmente o que se observa são discussões sobre se um país deve ou não autorizar o plantio de organismos geneticamente modificados; se as pesquisas sobre clonagem devem ou não ter continuidade etc.

Michael Crichton, conhecido escritor de ficção científica, aborda, em seu livro Prey[62], a questão da convergência entre diferentes campos tecnológicos: processamento em rede distribuída,

[62] Crichton, Michael. Prey. New York: HarperCollins, 2002.

nanotecnologia, biotecnologia e ciência comportamental das comunidades de insetos socialmente organizadas, como abelhas e formigas. Enfocando o processo evolutivo, elabora cenários bastante plausíveis, mas ressalta que *"things never turn out the way we think they will"*.

As possibilidades levantadas por Crichton, embora remotas, repercutiram na percepção pública e influíram nos questionamentos feitos aos governos sobre os riscos das novas tecnologias, especialmente no que se refere à participação da sociedade na decisão sobre o que pode e o que deve ser desenvolvido. O relatório *"Nanoscience & Nanotechnologies: opportunities and uncertainties*[63]*"*, de julho de 2004, da *Royal Society e Royal Academy of Engineering* reflete bem esta preocupação. As recomendações deste relatório envolvem exigências sobre aplicações industriais, questões regulatórias, éticas e sociais, efeitos adversos para a saúde, segurança e o meio ambiente, bem como responsabilidades e o diálogo público. Ademais, no que se refere às questões éticas e sociais, as recomendações incluem a criação de programas interdisciplinares para investigar as expectativas éticas e sociais que advêm dos desenvolvimentos das nanotecnologias, bem como, incluir considerações sobre implicações sociais e éticas como parte do treinamento formal da pesquisa científica.

No que se refere ao diálogo e participação da sociedade, as recomendações são que os conselhos de pesquisa desenvolvam trabalhos mais qualitativos sobre percepções públicas em relação às nanotecnologias e que o governo inicie um diálogo público em torno

[63] Nanoscience and nanotechnologies: opportunities and uncertainties. London: The Royal Society & Royal Academy of Engineering, 2004. Disponível em http://www.nanotec.org.uk/finalReport.htm . Acesso em 03/12/2004.

do seu desenvolvimento e estabeleça um grupo de trabalho que inclua representantes de diferentes segmentos da sociedade para avaliar as tecnologias novas e emergentes e identificar, em estágios embrionários, como devem ser tratadas áreas de riscos potenciais.

Torna-se evidente, portanto, que é necessário conciliar a necessidade de acompanhamento e monitoramento do desenvolvimento científico e tecnológico com a preocupação que se deve ter com a natureza e o homem. E mais que isso: a sociedade, cada dia mais consciente, deve ser incentivada a participar da decisão sobre como vai ser desenhado o seu futuro.

[64] O'Hara-Devereaux, Mary. Navigating the badlands: thriving in the decade of radical transformation. San Francisco: Jossey-Bass, 2004. 332 p.

O'Hara-Devereaux (2004)[64] destaca que novas tecnologias e suas subseqüentes inovações não causam diretamente uma mudança social; em vez disso, criam problemas e dilemas que levam a sociedade a buscar novas soluções a partir de um conjunto de escolhas possíveis. A construção de um futuro promissor inclui toda a sociedade, mas é necessário fazer mudanças radicais na forma como se trabalha e se vive, com foco em fazer as coisas certas, de modo global e sistemático. A participação não é opcional. O novo ambiente com suas contínuas disrupções força a novas escolhas para cumprir a missão de construir uma nova era.

[65] Plumptree, Tim. What is Governance? Disponível em: http://www.iog.ca/page.asp?pageID=3&htmlarea=home. Acesso em: 18/11/2004.

O que é governança?[65]

O termo "governance", em sua conotação atual, era quase desconhecido até o final do último século. Uma vez que as palavras

adquirem significado com o uso ao longo do tempo, não surpreende que no presente haja debates sobre o seu significado. Não existe uma definição única, mas convivem várias idéias sobre o que deve significar ou o que pode significar em diferentes situações.

O termo governança pode ser compreendido como o conjunto de idéias que podem dar norte às atividades humanas – a toda forma de ação coletiva. O que distingue a governança da gestão diz respeito a como as grandes (ou estratégicas) decisões são tomadas – decisões para atingir objetivos importantes, manter relacionamentos chave e fornecer feedback – e quem toma as decisões. Uma definição que consubstancia essas idéias complexas é esta:

Governança é o processo por meio do qual as sociedades ou as organizações tomam decisões importantes, determinam quem deve ser envolvido e como devem prestar contas.

Este termo é usado em conexão com várias ciências sociais contemporâneas, especialmente as ciências econômicas e políticas. Originou-se na necessidade das ciências econômicas (em relação à governança corporativa) e política (em relação à governança do Estado) para todos os conceitos amplos capazes de abranger os diferentes significados não cobertos pelo termo tradicional "governo".

O processo de governança – tomar decisões e prestar contas – baseia-se tipicamente em um sistema ou em uma estrutura que envolve elementos formais (constituição, legislação, políticas,

convenções) que definem como o processo deve funcionar em um contexto particular. Mas, na prática, as tradições informais, as práticas aceitas, ou os códigos não escritos de conduta que as pessoas seguem são igualmente importantes em determinar como a governança funciona.

Com referência ao exercício do poder de uma maneira geral, o termo governança, tanto no contexto das corporações quanto do Estado, abrange a ação pelos poderes executivo, legislativo (por exemplo, congressos nacionais) e judiciário (por exemplo, cortes e tribunais nacionais). O termo governança corresponde à chamada forma pós-moderna de organizações econômicas e políticas.

"A boa governança" pressupõe a habilidade de um governo de manter a paz social, garantir a lei e a ordem, promover ou criar as condições necessárias para o crescimento econômico e assegurar um nível mínimo de segurança social. Contudo muitos governos novos não percebem os benefícios a longo prazo de adotar políticas eficazes do governança. Mesmo nos casos onde os governantes reconhecem o valor de tais políticas, frequentemente falta-lhes a capacidade de executá-las.

Na prática das instituições públicas, a boa governança deve se refletir na capacidade de macro-coordenação, na construção de fluxos de comunicação verticais, de modo a garantir que a base de execução dos processos não esteja recebendo e trabalhando com informações espúrias ou desgastadas ao longo da cadeia de informação.

A União Européia estabeleceu seu próprio conceito de governança, em seu *"White Paper on European Governance"*[66] em que o termo "governança européia" refere-se às regras, processos e comportamentos que afetam a maneira como os poderes são exercitados no nível europeu, particularmente no que se refere à abertura, prestação de contas, participação, eficácia e coerência. O White Paper estende a perspectiva para além da Europa e dá elementos para o debate sobre governança global. Sustenta a idéia de que a UE deve procurar aplicar os princípios de boa governança a suas responsabilidades globais e se esforçar para impulsionar a eficácia e fortalecimento das instituições internacionais.

Cada vez mais se destaca, portanto, a importância da participação do cidadão e de o governo ser exercido de forma a refletir as expectativas e ansiedades da população. Foi essa compreensão que ajudou a sedimentar na UE a prática dos exercícios de foresight, na busca da construção de futuros possíveis através de um processo participativo que foi amplamente utilizado na estratégia do 'enlargement', ou seja, do projeto de ampliação da EU, e que deu maior segurança nas decisões tomadas em relação à receptividade pela sociedade como um todo e aos desdobramentos que poderiam ocorrer.

Governança e desenvolvimento

As estruturas e a qualidade da governança são determinantes críticas da coesão ou do conflito social, do sucesso ou da

[66] White Paper on European Governance. Disponível em http://europa.eu.int/comm/governance/index_en.htm. Acesso em 18/11/2004. O White Paper trata da forma como a UE usa o poder outorgado pelos seus cidadãos.

falha do desenvolvimento econômico, da preservação ou da deterioração do meio ambiente, bem como do respeito ou violação dos direitos humanos e das liberdades fundamentais. Estas ligações são amplamente reconhecidas por toda a comunidade internacional e demonstram a importância da governança para o desenvolvimento.

A declaração do Milênio das Nações Unidas[67] indica que a criação de um ambiente indutor de desenvolvimento e de eliminação da pobreza depende, entre outros, de uma boa governança dentro de cada país, de uma boa governança no nível internacional e na transparência dos sistemas financeiros, monetários e comerciais. No Consenso de Monterrey[68], os chefes de estado concordaram que a boa governança, em todos os níveis, é essencial para o desenvolvimento sustentado, crescimento econômico sustentado e erradicação da pobreza.

A era de mudanças tecnológicas aceleradas da qual a sociedade moderna faz parte tem nos avanços da tecnologia da informação e da biotecnologia e nos avanços prometidos das ciências cognitivas e da nanotecnologia muitas promessas e expectativas, e também muitos riscos, que vão desde a maneira como é produzido e processado o alimento, ao tratamento das doenças humanas, até formas de comunicação e de compreensão da natureza.

Um das formas de trabalhar em conjunto os conceitos de governança e foresight está em avaliar o potencial transformador das novas tecnologias, considerando os desafios originais que se

[67] United Nations Millenium Declaration . Disponível em http://www.un.org/millennium/declaration/ares552e.pdf. Acesso em 01/12/2004.

[68] Consenso de Monterey: implica em um comprometimento dos países desenvolvidos e em desenvolvimento de cumprir suas responsabilidades em áreas chave como comércio, auxílio e construção institucional. O Consenso marca uma nova parceria entre os países desenvolvidos e em desenvolvimento visando o atingimento das metas do milênio. Ver em: Summary report: Implementing the Monterrey Consensus: Governance Roles of Public, Private and Advocacy Stakeholders. Disponível em: http://www.worldbank.org/wbi/corpgov/csr/pdf/monterrey_econference.pdf. Acesso em 01/12/2004.

apresentam para a governança. Estas considerações se estendem além da governança e da tecnologia e incluem considerações práticas de como manter o controle da sociedade sobre a tecnologia, bem como as instituições, estruturas e processos criados para maximizar os benefícios da tecnologia e minimizar seus riscos. Se tais tecnologias são realmente transformadoras, seria suficiente considerar a governança somente em termos de como as tecnologias devem ser controladas ou também considerar os efeitos da tecnologia sobre a governança (e sociedade) mais amplamente? Como a estrutura de governança necessita mudar para se adaptar aos desafios de um mundo transformado pela tecnologia? Como o poder da tecnologia moldará diretamente nossas estruturas de governança?

Foresight e governança

O conceito trazido pelo *foresight* busca uma visão compartilhada de futuro e a promoção de ações e fatos que venham a promover a sua construção a partir do presente e vem sendo a abordagem adotada pela maioria dos estudos prospectivos nacionais e regionais em andamento no mundo. Entre as tendências atuais relevantes neste campo de estudos, uma é a de promover o engajamento dos principais agentes e relacionamentos, a partir do início de qualquer processo de natureza prospectiva, de modo a garantir o seu envolvimento, conhecimento e comprometimento com as questões discutidas e as recomendações alcançadas de forma a garantir o apoio destes atores por ocasião da tomada

de decisão, da negociação e implementação das estratégias identificadas.

Foresight inclui meios qualitativos e quantitativos para monitorar pistas e indicadores das tendências de desenvolvimento e sua posterior evolução, e é melhor e mais útil quando diretamente ligado à análise de políticas e suas implicações. O *foresight* prepara para as oportunidades futuras. No governo, *foresight* não define políticas, mas pode ajudar as políticas a serem mais apropriadas, mais flexíveis e mais robustas em sua implementação, em tempos e condições que se alteram.

Além disso, a construção de canais ou vias de comunicação verticais e os processos de coordenação em diversos níveis pelos quais flui a comunicação – processo chave na era do conhecimento – e que facilitam o processo de governança devem ser observados, de modo a garantir que as possibilidades tecnológicas encontradas no decorrer do processo possam ser validadas pela tomada de decisão e transformadas em ações concretas.

[69] Mais informações podem ser encontradas em http://www.cordis.lu/foresight/home.html. Acesso em 30/11/2004.

Do ponto de vista da União Européia[69], foresight é definido como uma atividade que conjuga três diferentes dimensões de um mesmo processo: o pensar, o debater e o moldar o futuro para orientar a tomada de decisão. (Santos & Santos, 2003)

- *Pensar o futuro:* os possíveis eventos futuros são examinados a partir de tendências de longo prazo e especulações sobre fatos novos e inesperados. São monitoradas especialmente as tendências da ciência e da tecnologia, porém mudanças na

economia, na sociedade, na geopolítica e na cultura são também variáveis consideradas;

- *Debater o futuro:* em geral o processo de pensar o futuro no foresight é de natureza participativa e requer o envolvimento de diferentes stakeholders, incluindo autoridades públicas, empresas e organizações de pesquisa. Tal processo pode ocorrer em diferentes níveis: transnacional, nacional ou regional.

- *Modelar o futuro:* A identificação de futuros possíveis e desejáveis e a interação e o aprendizado provocado nos participantes levam paulatinamente a decisões em diferentes níveis. Dessas decisões se espera sentido e coordenação dos esforços de materialização das visões de futuro construídas.

Uma experiência interessante de incorporação de visão de futuro – neste caso usando o método de cenários – para identificar rumos da governança foi feito pelo Canadá, em 1996.[70] O grupo de trabalho encarregado de elaborar cenários para o futuro do serviço público identificou que estes só seriam relevantes a partir do conceito mais amplo de governança, uma vez que as forças políticas, sociais e econômicas que modelam a governança no país, por sua vez modelam a natureza dos serviços públicos. Assim, o GT desenvolveu cenários de governança onde futuros possíveis para o serviço público poderiam se situar. Uma das conclusões do estudo indica que o conjunto de cenários de governança constitui uma poderosa ferramenta para o planejamento estratégico, como aprimoramento do processo decisório e como um método para ajudar a mudar a forma de se olhar os problemas.

[70] A planning tool for thinking about the future of the public service. 1996. Disponível em: http://www.myschool-monecole.gc.ca/Research/publications/pdfs/psfuture.pdf. Acesso em: 21/04/2005.

Foresight, engajamento social e governança

A pergunta que se coloca é de que modo e em que momento esses três conceitos se inter-relacionam? Pode-se dizer que sempre que houver a necessidade de se ter perspectiva do futuro, buscando a incorporação das visões daqueles que serão seus construtores e que irão usufruir dos resultados das escolhas feitas hoje e que são decisivas para definir como o futuro virá a ser.

A participação dos diferentes atores sociais no processo de construção dos futuros possíveis torna as decisões participativas e incorpora ao processo de foresight diferentes visões, diferentes pontos de vista, que contribuem fortemente para o sucesso de todo o processo e para a qualidade dos resultados finais. É muito comum ao final de um exercício de foresight dizer-se que "o processo foi tão ou mais importante que o produto". Isto significa que a sinergia entre os diferentes atores, o potencial de articulação em rede que a atividade proporciona, a intensidade das trocas e a natureza intrinsecamente democrática do processo trazem benefícios para o indivíduo e a coletividade muito mais amplos que os próprios resultados dos estudos.

Embora os conceitos de governança e foresight sejam muito recentes, bem como sua aplicação de forma conjunta, alguns exemplos de bons resultados vêm contribuindo para a sua crescente popularidade. Um desses exemplos é o caso da biotecnologia na Irlanda, relatado a seguir.

Foresight na Irlanda: o caso da biotecnologia

A estratégia moderna de desenvolvimento adotada pela Irlanda mirou-se naqueles países que adotaram os princípios de sociedade do conhecimento (Finlândia, Taiwan, Nova Zelândia, etc). A partir da década de 60, a Irlanda passou a atrair indústrias de alta tecnologia e concedeu incentivos para que as empresas estrangeiras se instalassem e montassem seus laboratórios de pesquisa tecnológica. Uma população bem preparada e educada contribuiu para o sucesso dessa estratégia.

O Livro Branco da Ciência e Tecnologia irlandês[71], publicado em 1996, ressaltou que uma economia avançada que procura atingir seu completo potencial de inovação deve desenvolver e criar elos de ligação entre os vários componentes do Sistema Nacional de Inovação. A publicação, em julho de 1997, da "Agenda 2000 – para uma União mais forte e mais ampla[72]", refletindo o pensamento da Comissão Européia sobre o seu desenvolvimento no médio prazo, que priorizava as políticas que privilegiam o conhecimento, incentivou a Irlanda a buscar a contribuição da P&D para o desenvolvimento nacional, envolvendo, para isso, também as estratégias de foresight.

Com a realização do primeiro exercício de *foresight* (1998-99) e posterior criação da Fundação da Irlanda para a Ciência (2000) destinada a criar capacidade de pesquisa nas áreas de biotecnologia e tecnologias da informação e comunicação, a Irlanda emerge como país de sucesso em suas estratégias de desenvolvimento.

[71] Department of Arts, Culture, Science And Technology, Ireland. White Paper on Science & Technology: Preparing for the 21st Century. 1996. Disponível em: http://www.dst.gov.za/legislation_policies/white_papers/Science_Technology_White_Paper.pdf.

[72] TecBahia. Revista Bahiana de Tecnologia. Comentários sobre o modelo irlandês de desenvolvimento sócio-econômico. V. 18 N.1 Jan/Abr, 2003, p.5-36.

O *Irish Council for Science, Technology and Innovation – ICSTI* criou um Grupo de Trabalho composto por cientistas, médicos e industriais – *Task Force on Biotechnology* – para examinar as aplicações atuais da moderna biotecnologia, identificar questões que necessitam ser encaminhadas em um contexto nacional e preparar um relatório que levasse em consideração as questões científicas, éticas e preocupações públicas.

[73] Irish Council for Science, Technology & Innovation. Report on Biotechnology. Disponível em http://www.forfas.ie/icsti/statements/biotech01/execsum.htm. Acesso em 03/12/2004.

Este relatório do ICSTI em biotecnologia[73] considerou uma série de preocupações em relação à tecnologia do DNA recombinante, cujos impactos na sociedade deveriam ser considerados, como por exemplo, a segurança dos alimentos geneticamente modificados, o impacto das colheitas de OGMs sobre a biodiversidade, os riscos potenciais para a saúde com o uso de genes resistentes a antibióticos em plantas OGMs, a aceitabilidade das espécies transgênicas, o patenteamento de germoplasmas, as aplicações na reprodução humana, a clonagem de animais e as ameaças aos agricultores do terceiro mundo:

Entre as principais recomendações do relatório destacam-se:

i) o acesso à informação sobre biotecnologia deve estar disponível em todos os maiores centros populacionais, ressaltando-se a essencialidade de um centro de informação que possa prover informação atualizada, equilibrada e compreensível sobre as novas aplicações da biotecnologia;

ii) esse centro deve ser capaz de prover informação de qualidade, sem vieses, para o público em geral;

iii) a importância da aceitação dos direitos do consumidor com

respeito a escolha e aceitação informada ou a rejeição aos alimentos transgênicos, apoiando assim a rotulagem obrigatória;

iv) as informações mais profundas e importantes sobre produção, aplicação e comercialização dos organismos transgênicos devem ser disponibilizadas para os organismos regulatórios relevantes;

v) a necessidade de regulamentação da pesquisa e dos testes clínicos no campo da terapia genética;

vi) a instalação de comitês de ética em biotecnologia totalmente independentes, para tratar as questões éticas e morais.

vii) Os resultados obtidos pelo estudo mostraram uma estreita vinculação com as inquietudes e expectativas da sociedade o que fez do projeto uma experiência extremamente bem sucedida. Houve um equilíbrio entre a necessidade de novos desenvolvimentos científicos e tecnológicos e o respeito às questões que afetam os seres humanos e a natureza. A Irlanda conseguiu, com os resultados do estudo, identificar linhas de atuação prioritárias, forças e fraquezas existentes e traçar um plano de ação que lhe permitiu alcançar um lugar de destaque nesta área.

De modo a promover o diálogo entre a biotecnologia e especialistas, governos e sociedade civil, o ICSTI endossa a recomendação de promoção de ampla discussão nacional sobre biotecnologia[74], ação que foi recomendada no relatório do painel sobre saúde e ciências da vida[75], em abril de 1999, assim como a criação de um centro de informação para ciência e tecnologia preparado para fornecer informações sobre usos atuais e potenciais de OGMs.

Esta experiência é uma excelente aplicação dos conceitos de governança, engajamento social e foresight: demonstra que processos de foresight, aliados a boas práticas de governança,

[74] A National Conversation on Biotechnology. In: ICSTI. Report on biotechnology. Disponível em http://www.forfas.ie/icsti/statements/biotech01/conclusion.htm. Acesso em 03/12/2004.

[75] Technology Foresight Health and Life Sciences Panel. Disponível em http://www.forfas.ie/icsti/statements/tforesight/health/role.htm. Acesso em 03/12/2004.

consideradas a percepção pública e o engajamento da sociedade, são abordagens adequadas para apoiar a tomada de decisão e a formulação de políticas e para a promoção da competitividade de um país que inclui o 'pensar a longo prazo' em suas estratégias de planejamento e gestão.

A respeito de biotecnologia e nanotecnologia, particularmente, a percepção pública tem se mostrado bastante sensível e, freqüentemente, se diz manipulada pelos meios de comunicação e grupos de interesse. Isto confere uma característica bastante peculiar aos estudos prospectivos que tratam de temas polêmicos, pois não são apenas os aspectos científicos e tecnológicos que devem ser considerados, mas deve ser privilegiada uma visão holística do tema, que considere, de um lado, as necessidades científicas, tecnológicas, econômicas e comerciais e de outro os impactos que estes desenvolvimentos representarão para a sociedade.

Reflexões finais

O mundo encontra-se no início de um novo milênio, onde algumas ameaças e oportunidades se apresentam. As Nações Unidas divulgaram, em 2000, os "15 desafios do milênio", cujas questões levantadas dizem respeito a preocupações e riscos presentes nos tempos atuais e que envolvem a sociedade como um todo e sua capacidade de construir um mundo melhor e mais justo.

Estes desafios são apresentados, a seguir, como uma reflexão final para que se busque olhá-los à luz dos conceitos discutidos

neste trabalho - governança, engajamento social e foresight – e de como seria possível aplicá-los conjuntamente de forma a transformar os desafios em ações recomendadas.

1. 1. Desenvolvimento sustentável: Como o desenvolvimento sustentável pode ser alcançado para todos?

2. Água limpa para todos: Como é possível prevenir os conflitos sobre a água e ao mesmo tempo torná-la disponível para todos?

3. Crescimento populacional e recursos: Como equilibrar crescimento populacional e recursos disponíveis?

4. Emergência da democracia: Como pode emergir uma democracia genuína de regimes autoritários?

5. Políticas globais de longo prazo: Como perspectivas globais de longo prazo podem ser usadas mais freqüentemente na elaboração de políticas?

6. Informação e Comunicação: Como podem a globalização e a convergência das tecnologias de informação e comunicação trabalharem para todos?

7. Desníveis de desenvolvimento e mercados éticos: Como podem os mercados éticos ampliar o desenvolvimento da economia e reduzir o desnível entre ricos e pobres?

8. Doenças novas ou reincidentes: O que pode ser feito para reduzir a ameaça de doenças novas ou reincidentes e aumentar o número de microorganismos imunes?

9. Melhorar a capacidade de decidir: Como é possível melhorar a capacidade de tomar decisões se as instituições e a natureza do trabalho estão mudando?

10. Conflitos e valores compartilhados: Como podem valores compartilhados e novas estratégias de segurança ser usados para

reduzir conflitos étnicos, terrorismo e eliminar o uso de armas de destruição em massa?

11. Mudanças no *status* das mulheres: Como podem as mudanças no status das mulheres melhorarem as condições humanas?

12. Crime organizado transnacional: Como é possível impedir os grupos de crime organizado de se tornarem empresas globais mais poderosas e sofisticadas?

13. Demandas crescentes de energia: Como as demandas crescentes de energia podem ser atendidas com segurança?

14. Ciência e tecnologia: Quais são os meios mais efetivos de acelerar rupturas científicas e aplicações tecnológicas de forma a melhorar as condições humanas?

15. Ética nas decisões globais: Como as considerações éticas podem ser incorporadas mais rotineiramente nas decisões globais?

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