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# Some Challenges for R&D Policy-Making in the Newcomer EU Countries: Scientific Citizenship and the Social Regulation of Biotechnology

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## Abstract

In this paper most attention is paid to the changing role of citizens in the social regulation of biotechnology. In many ways debates in the EU about the social regulation of biotechnology only represent the 'tip of the iceberg' of the much wider issues of new types of governance of science and technology. The shift to new forms of governance first of all includes the more active role of citizens in R&D policy-making structures. The paper highlights the required and existing institutional mechanisms for putting into practice citizens' participation in science and technology matters. Differences between citizens in old EU member states and newcomer EU member states concerning scientific citizenship are also investigated. Finally, a tentative explanation of the social and historical reasons underpinning these differences is offered.

## Introduction

In many ways debates in the EU about the social and ethical regulation of biotechnology only represent the 'tip of the iceberg' of the much wider social debates about new types of governance of science and technology. With regard to the creation of the new European knowledge society, growing demands are emerging for a shift from 'government' to 'governance' (Borras 2003, 11; Irwin & Michael 2003, 63). Within the framework of the old concept of government it was possible to keep issues of R&D policy under central and hierarchical control. Contrary to this old concept of government, the shift to governance assumes the introduction of horizontal modes of communication and structures of power and especially the inclusion of the public interest in R&D decision-making structures. In the expert

literature there is talk about the creation of a new 'scientific citizenship' (see, for example: Bucchi 2004; Dickson 2000; De la Mothe 2001).

There are many reasons for the above mentioned change in policy discourse. One of them is the changing role of new generic sciences in the emerging knowledge-based societies. For example, biotechnology has been shown to hold a huge socio-economic promise for Europe, yet it also represents a potential threat because of its unforeseeable development. Biotechnology as such is already a very complex phenomenon. It covers a wide range of scientific disciplines, industrial sectors and applications. In addition, biotechnology is connected with a broad range of products and processes. Not surprisingly, the ethical and social aspects of biotechnology are the subject of increased concern to various social actors in Europe.

In the article, most attention will be paid to the changing role of citizens in the social and ethical regulation of biotechnology. Recent debates about the active role of citizens in science decision-making structures are strongly connected with events in the modern development of biotechnology. The recent shift from government to governance presupposes the creation of more articulate and educated citizens interested in different aspects of scientific and technological development.

How strong is the interest in the EU and its member states to mobilise different forms of scientific citizenship? Which institutional mechanisms are required and which ones have already been developed to put into practice the more active role of scientific citizenship? Is citizen interest in more active forms of participation in science and technology policy-making structures the same in the new and old EU member states? Are there any differences in this regard? If there are differences, what are the social reasons for them?

In the paper, I will attempt to give short answers to all of the above questions. Given the topic's complexity, it is clear that in a short paper it is impossible to provide a comprehensive explanation. Notwithstanding this, I hope that the contribution addresses some of the key challenges for R&D policy-making in the newcomer EU countries.

## **Biotech risk and the need to increase citizens' participation in R&D policy-making processes**

The need for European citizens to participate more in the social and ethical regulation of biotechnology arises for many reasons. Let us review some of them.

There is no doubt that recent progress in the field of biotechnology has opened up new social and economic possibilities for the EU. The creators of the new EU R&D policy are increasingly aware that without an effective means of enforcing the commercialisation and commodification of biotechnology (and other generic sciences) Europe's economic competition could be dramatically reduced. The whole 'philosophy' of the European Research Area (ERA) is based on the finding that while the United States and Japan have maintained and even increased their innovative comparative advantage, Europe has fallen behind. The EU's strategy for biotechnological development states that '(...) life sciences and biotechnology, as probably the most promising of the front technologies, can provide a major contribution to achieving the European Community's Lisbon Summit's objective of becoming a leading knowledge-based economy' (Life Science and Biotechnology 2002, 8).

The other side of the coin is that the biotech advances are accompanied by an increase in inevitable risks. It is noticeable that the risks connected with biotechnology are very complex, less easily codified and their management is more problematic. Sometimes it is even difficult to address such risk. We can provide many examples from 'green' biotechnology (GM crops may improve yields, but might do so at the cost of ecological diversity) or 'red' biotechnology (stem cells may help answer the need for new approaches to disease, but might produce their own pathological effects).

One of the consequences of these processes is that people question and no longer simply 'trust' science or expert systems. Or, as indicated by key social theorists such as Anthony Giddens (1990) and Ulrich Beck (2000), modern risk societies are characterised by lower public trust in science and expertise as social institutions that have traditionally managed societal risk. In practice, this was perfectly shown in the revolt of citizens against the use of GMOs in some EU countries.

The recent biotech risk is becoming not only more complex, less easily codified but also ever more global in character. Ulrich Beck warns that many of these risks (ionizing radiation, global warming, ozone depletion, biotechnological dangers) are now moving across national borders. 'The new types of risks are simultaneously local and global, or glocal' (Beck 2000, 218). Let us again mention the example of 'green' biotechnology: there is either not enough food, which necessitates global solutions of GM food production, or by virtue of their supposed properties GM foods engender risk that could be globalized (e.g. pesticide-resistant weeds). In any case, risk at the global level occupies a highly contested and highly politicised space that provides no easy answers for those involved. As a result of heightened global risk, contemporary relations between the different stakeholders are being formed beyond the boundaries of the nation state. The public GMO controversy between Monsanto and Greenpeace already mentioned illustrates how multinational corporations and international social movements engage in debate at the global level.

To conclude, in Europe discussions on future biotechnological development have never been limited to who will make the biggest profit. Equal importance has been given to questions of which kinds of social and ethical values will guide the future progress of biotechnology.

## **The demand for a new EU policy approach to biotechnology**

Key EU policy-makers today are increasingly facing the big challenges of biotechnological progress. The specific characteristics of biotech development and biotech risk often demand the introduction of new policy approaches and instruments. EU policy-makers are coping with a 'multi-level governance structure in biotechnology' (Dolata 2002, 61) and the question arises of whether the EU has ever had a single policy on biotechnology. According to the assessments of some analysts, some EU institutions (European Commission, Council of Europe) should be more sympathetic to the industry's arguments concerning further progress in biotechnology fields. Unlike these EU institutions, the European Parliament

should rather represent the interests of citizens and consumers. The debates surrounding the European Commission's Directive on the Regulation of GMOs in EU countries very well illustrate the conflict of interest between the European Parliament and the Council of Europe. The European Parliament presented this Directive as a 'victory' for GMO-sensitive stakeholders by forcing more control and information for the benefit of consumers and for reducing risk. The Council of Europe interpreted the Directive as a victory for those stakeholders who have a positive attitude to GMOs and as a document that blocks any attempt to ban GMOs altogether (for more, see: Borras 2003).

EU policy regulation of the biotechnology field currently covers a broad spectrum of topics: patenting of biotechnological inventions; authorisation of pharmaceutical products; contained use of genetically modified micro-organisms; and the release and marketing of products consisting of or derived from GMOs, including food, feed, seeds etc. Although this wide regulatory policy framework has gradually evolved over the last three and half decades, a broader change in R&D policy styles (to begin to use the language of inclusion and not the language of exclusion) did not emerge before the end of the 1990s.

Before this turning point at the end of the 1990s, EU R&D policy-makers showed a lower level of interest in encouraging a more active role of citizens. Last but not least, the European Commission has long been criticised for its technocratic approach to policy-making (see, for example: Haller 1999). According to Martin Bauer and George Gaskell, biotechnology was seen as a promising area of research characterised by self-regulation and little public attention in the first period of the common EU biotech policy (1973–1978) (Bauer & Gaskell, 2002). In the second period (1978–1990), as biotechnological techniques began to be applied in different fields, biotechnology was primarily seen as a tool to enhance the competitiveness of EU countries in world markets. NGOs started to voice criticism against the unforeseeable development of biogenetic engineering. In the third period (1990–1996), the EU began to implement directives on biotechnology more intensively. The actions of NGOs were still more oriented to regional and national issues than to global issues connected with advances in the biotechnology field.

The real change did not occur before the end of the 1990s. For example, the public revolt against GM food at the end of the 1990s is still regarded as one of the most important turning points in the thinking and behaviour of EU science policy-makers about the new social role of citizenship in science (see Mali 2004). As already stated, after the first imports of Monsanto Roundup Ready Soya and Ciba Geigy GM maize into Europe, consumer and environmental organisations raised a broad debate on labelling, claiming that imports should be banned until it became possible to trace GM soya and maize. Many other events have also inspired a change in views. The first cloning of sheep sparked off hot public discussions on the ethical and social implications of biotechnological development.

It has often been said that the growing pressure of the interests of ordinary people as consumers led to a change in the R&D policy discourse. In fact, the recent development of biotechnology is directly related to individuals as consumers. Modern societies are consumer societies where the desires of consumers are increasingly articulated. In modern consumer societies, an additional change occurs. As consumers of cultural symbols and signs, as well as material products, people are now looking beyond national boundaries (see Faulks 2003).

We can agree that it is becoming ever more problematic for modern consumer societies to keep the practices of citizenship apart from those of consumption. Although citizens in their role as consumers are also limited in many ways concerning their influence on scientific and technological matters, their importance has grown due to globalisation processes. These changes are well reflected in the many sorts of revolts by ordinary people against the use of GMO food and crops.

As already mentioned, GMO scandals reshaped the EU's R&D policy approach to biotechnological development. The boycott of GMO products was conducted by consumers—i.e. via economic activity not political activity. In a time of global consumers, the role of national governments as policy regulators of biotechnological development appears to be shrinking.

There were many other events at the end of the 1990s that led to a change in R&D policy discourse in Europe. For example, after the emergence of BSE a fierce debate on health and safety relating to modern farm-

ing erupted across Europe. After such affairs and events the EU's R&D policy began to be released from its previous positivistic ideology. In old-fashioned positivism experts emerged as the most reliable guarantors of the acceptance of rational decisions on R&D policy.

Clearly, public opinion was becoming sensitive to the unexpected and sometimes negative consequences of advances in science and technology even before the upsurge of modern biotechnology. Ordinary people have reacted not only to risk as such, but even more so to the often unacceptable behaviour of science and policy institutions. Brian Wynne says that in Western democracies the main factor in converting localised public concern into widespread public protest against nuclear power in the 1970s was not just the escalation of risk but, more fundamentally, the inadequate way in which the expert discourse represented the public and its concerns (Wynne 2001).

## **The rise of public participation in R&D policy-making structures**

The enhanced interest of ordinary people in biotech risks has contributed to the downfall of the old-fashioned positivistic R&D policy discourse. In this regard, some authors have drawn some interesting historical parallels. Mark Elam says that the latest development of biogenetic engineering which requires new forms of communication between science and the public in many ways mirrors the dilemmas of the seventeenth century pattern of science communication (see Elam 2004). Like the first scientific experimentalists in the seventeenth century, today's genetic engineers are also in a position where they cannot hope to successfully disseminate their research by simply drawing on their ready-made authority. They must legitimate their scientific work in the broader public arena.

The modern public arena is often defined as a new agora. The shift from the traditional concept of the autonomy of science to a regime of greater social accountability presupposes that science ought to turn to this new public arena. Alternatively, as the authors of the book *Re-thinking Science* put it, '(...) to remain effective in the twenty-first century, science

must rely on both its public and private forms, as they emerge and diffuse in the agora' (Nowotny, Scott & Gibbons 2001, 204).

At the practical level, including citizens in policy-making processes results in many dilemmas. Let us mention only one of them.

On the one hand, the repercussions of modern scientific and technological development concern practically everybody in contemporary society. In the emerging knowledge-based societies, the new generic sciences (biotechnology, information sciences, nanotechnology) are all sciences with ambitions stretching well beyond the boundaries of traditional laboratory environments and extending deep into the social environment. The public space of new generic sciences is becoming a contested area in which a multitude of actors are involved. Ordinary people are very sceptical about various advances in biotechnology: therapeutic cloning, xenotransplantation etc. If the public does not have trust in science or if it is poorly informed, this represents a closed option for the scientists researching in these areas. In the changing situation it is expected that the public will also have the right to influence decisions which might directly affect their personal lives, health, safety and well-being.

On the other hand, the new generic sciences are becoming part of trends leading—to use the well-known term coined by Derek de Solla Price—to 'big science'. A good example of such trends is the Human Genome Project. The goal of this big international project was to map and sequence the entire human genome (see Gottweis 2005; Huijjer 2003). The Human Genome Project lies at the heart of the new scientific-technological field of genomics, which has focused on the characterisation and sequencing of the genome, and the analysis of the relationship between gene activity and cell function. The project has not only emerged as a formal transnational project producing DNA information. Advances in this research field will also have a significant impact on medical practice and the economy. As many critics argue, 'traditional' governments and governmental institutions with a focus on top-down governance continue to play a crucial role in the support and regulation of genomics research and they are deeply concerned about a continuation of these policy instruments. The general fear is that the interest of the broader public is not being taken into account in such a large-scale socio-technical project.



In spite of the above mentioned difficulties, all mechanisms for boosting public dialogue on science and technology which have already been implemented in practice are very important. They have contributed to reducing the public's distrust in science, abolishing distorted communication between scientists, politicians and laymen, socially legitimising public concerns about biotech risk etc. (see Weingart 2001). In individual countries of Western Europe there is already a long tradition of citizens' participation in R&D policy-making. The practical forms of their participation ranges between two extreme poles: from those that elicit input in the form of opinions (e.g. public opinion surveys and focus groups) to those that elicit judgements and decisions from which actual policy might be derived (e.g. consensus conferences, citizens' juries). Each of these forms has its own characteristics and there is not always a significant connection between them. For this reason, experts dealing with this topic agree that the scope and definition of citizens' participation in R&D policy-making structures is still full of theoretical controversies (see, for example: Futrell 2003; Rowe & Frewer 2004; Salomon 2001).

Irrespective of all theoretical controversies, we can identify different forms of scientific citizenship. Citizens have been involved in science and technology policy decisions in a number of ways.

- (1) Public opinion surveys clarify the basis of agreement and disagreement and identify values that underline the opinions of citizens. They cannot set any clear direction for policy-makers. As such, they are best regarded as an exploratory procedure for complementing other participatory procedures.
- (2) Forms of participation such as public hearings should also not be an end in themselves, but rather a means to arrive at more advanced forms of involvement. Irwin and Michael described the following case: in November 1997, the UK Minister of Science announced his intention to hold a public consultation exercise on bioscience issues (Irwin & Michael 2003, 58–62). The exercise's main purpose was to identify and explore the public's hopes and concerns and to feed these into the policy process.
- (3) More developed forms of participation should be strategies based on the science court concept. They have taken a number of forms but have

generally been conceived as a forum for face-to-face, structured discussions in which the public, government officials and scientists clarify technical and political disagreements (see Futrell 2003). They usually seek to guide a decision-making process for which the form of the 'end solution' has already been defined.

- (4) Consensus conferences, despite their name, usually spark off debate between experts and citizens on new subjects where regulation does not currently exist. The consensus conferences were a relatively widespread form of public debate on GMOs in Denmark in the 1980s. Denmark was the only country where a consensus conference on human genome mapping was organised prior to the start of the Human Genome Project. In addition, public risk and ethical discourse of the effects of biotechnology began in Denmark earlier than in other European countries. Consensus conferences are a staged assessment activity in which a group of lay people are given the opportunity to question selected experts and prepare a 'citizen's assessment' document. As such, consensus conferences can be seen as one of the various deliberative instruments allowing the 'public' to take part in scientific decision-making (Jamison & Lassen 2004). Although the advocates of consensus conferences would like to broaden the issues for citizens' participation in science and technology and to include the planning phase, consensus conferences often come too late—after a project has already been launched.

## The public and R&D decision-making processes in newcomer EU countries

We have noted that biotech risk is moving beyond national borders. Notwithstanding, it is difficult to expect that public assessments about it could be harmonised across various countries. In this sense, there are still differences between EU member states concerning the perception of biotech risk. However, these differences in opinions are apparently decreasing.

According to the latest Eurobarometer survey, risk perception in relation to biotechnology is even higher among citizens in newcomer EU

states than in the old EU member states (see, for example: Europeans, Science and Technology 2005). The share of people who think that GMOs pose a risk is higher in the newcomer EU states (more than 54% in every single new EU member state) than in the old EU member states such as the Netherlands, the United Kingdom, Sweden, Finland and Denmark. One reason can be found in the activities of the leading EU R&D policy institutions. As already said, they are changing into important social and legal regulators of biotechnology in Europe. The national factor is becoming ever less important. Last but not least, the candidate countries were obliged to harmonise their national GMO laws with the European Commission's directives before joining the EU in 2004. As we know, the 'acquis communautaire' was accepted without contradiction by the new EU entrants.

The processes of 'Europeanisation' did not stop at the level of legal standards.

The new 'philosophy' is apparently influencing the opinions of citizens in the new EU member countries as well. In recent times, the European Commission's Action Plan on Science and Society as part of general endeavours to create a new European Research Area has been one of the efforts to revive the concept of scientific citizenship. This action plan proposes 38 different instruments to be undertaken jointly with EU member states, regional authorities, scientists, policy-makers, businesses and other stakeholders in civil society. The core efforts are directed at the following goals: (1) promoting a scientific and education culture; (2) bringing science policies closer to citizens; and (3) putting responsible science at the heart of policy-making (Science and Society Action Plan 2002).

Does this action plan mean that the EU authorities have departed from its technocratic 'philosophy'? Before the end of the 1990s the EU authorities were permanently criticised for their rigid technocratic position. In my view, the Science and Society Action Plan still expresses some sort of duality in the EU's R&D policy approach:

- On the one hand, there has been an increasing emphasis on democratic consequences as a result of the awareness that social legitimacy and even financial support for some fields of science strongly depend on political and scientific sensitivity to citizens' concerns, their wishes

for a more accountable and transparent science and technology policy. Finally, EU citizens should have democratic rights to be involved in different forms of decision-making structures. Citizenship has become one of the most important political ideas of our time.

- On the other hand, it seems that the EU's R&D policy approach is still strongly characterised by technocratic discourse (if I not taking into account Brussels' bureaucratic approach). Strategic activities are still strongly centred around expert groups, where the voices of citizens are not sufficiently heard. But, to be fair, the 'philosophy' of the Science and Society Action Plan is far away from the classical 'deficit' communication model. The deficit communication model is based on the assumption that only the 'rational' discourse of science is important. It is sufficient that this 'rational' discourse is transmitted from a specialist context to a popular one (Irwin & Wynne 1996). Massimiano Bucchi uses a different term here where he talks instead of a 'deficit' about the 'diffusionist' communication model (Bucchi 2004, 108).

Unfortunately, while the European Commission has adopted a clear approach to institutional communication with citizens and to policy design, not all processes in EU member states are executed with the same intensity. It seems that the motivation of citizens in new EU member states to participate in the science and technology decision-making process is still an Achilles heel for this part of world. Let us look again at the latest Eurobarometer survey. Here, citizens from all EU member states also evaluated the relevance of their personal involvement in decisions about science and technology. Although various aspects (the level of information of European citizens about new scientific discoveries and inventions, the image of science and technology in the eyes of Europeans, citizens' support for scientific research, etc.) were taken into account in these pan-European surveys, the biggest difference between the Eastern and Western parts of Europe was clearly observed in the readiness of citizens to take on a more active role in R&D policy.<sup>1</sup>

A significant proportion of citizens from the former communist countries, which joined the EU in 2004, express the opinion that a personal involvement in R&D policy decision-making is irrelevant to them.

60% of citizens in Lithuania, 60% in Estonia, 56% in the Czech Republic, 55% in Latvia, 52% in Hungary and 51% in Slovakia agree with the statement that such involvement is not actually important. Only 26% of citizens in the Netherlands, 28% each in Sweden, Luxembourg and France and 31% in the United Kingdom agree that it is not important. The data show that public opinion in those groups of countries which in the past have given more space to public science-society controversies and for mechanisms leading to citizens' broader participation in science decision-making processes, is much more inclined to the participation of ordinary people in matters of science and technology. These countries include some Scandinavian countries, the Netherlands, France and Luxembourg.

The relatively low motivation of citizens in the eastern part of Europe to participate in the science and technology decision-making process probably indicates a less developed modern political culture. It is also true that only comprehensive comparative studies would allow any firmer conclusions on this topic. In this sense, the tentative assessment of some reasons for the less active role of citizens in science, which will be briefly discussed below, must be understood in a very modest way. The heritage of the past still plays a role. In the old communist regimes, the endeavours of ordinary people to be more active in broader social affairs was not encouraged by the political nomenclature. On the contrary, every form of a citizen's engagement in civil social movements was ideologically condemned and persecuted. In addition, the political nomenclature saw public worries about the risk of scientific and technological development as irrational and hostile resistance to the progress of communist society. What was then demanded from people was unconditional support of the official ideology of the communist party. Critical public opinion was not only ignored for being irrelevant, but it was even considered as a threat to the official ideology. With some exceptions, public trust in different social institutions such as science, technology etc. was never measured.

The heritage of the past still has some influence on the public's behaviour today. The lack of reciprocal trust between different social actors (the existence of the so-called 'credibility gap') has sometimes also been indicated in recent times. Given that citizens were not allowed to be active in public life for many decades, it is no surprise that even today

many of them accept it as the norm to avoid matters in the public domain. This is especially the case where the issues involved are characterised by complexity and non-transparency as is often the case in modern scientific and technological development.

Several other factors hinder the activation of new 'scientific citizenship'. Let us briefly examine two of them.

- (1) The role of NGOs as mediators of interest between political authorities (state) and citizens (public) is still quite underdeveloped in this part of the world. Although there is a great need to have horizontal links for interest mediation and to include public concern in scientific and technological matters, the inflexible forms of communication in these societies prevent a more active role of NGOs. Let us take the case of Slovenia: public commitment concerning biotechnology in Slovenia is restricted to the activity of an NGO called Umanotera. The aim of actions taken in the last three years by Umanotera (the organisation was established in 2002) was to proclaim Slovenia a GM-free zone and to put pressure on politics to accept EU legislation in this area. Unfortunately, the broader ethical aspect of development in the field of biogenetics is poorly covered by this association. Moreover, there is always the chance that NGOs will disappear from the public scene after a short period of activity.
- (2) Politicians and scientists insist too strongly on the old-fashioned elitist model in which expert advice acts as the supreme and authoritative source for R&D policy decisions. The elitist model assumes that all that is needed is for the government to 'top up the tank' with the accurate reporting of scientific discoveries, and that much public distrust will thus evaporate. Political actors do not feel a duty to stimulate and protect citizens' initiatives and to ensure that the voices of citizens be heard even in matters of science and technology. Some Western European countries pursue the opposite course. For example, in the United Kingdom a number of significant strategic documents from state institutions call for increased public participation at national and local levels. Although there has recently been a lot of talk about including various stakeholders in the national innovation strategy in

Slovenia, a place for the citizens in this is, unfortunately, nowhere to be seen. The ideas developed in the EU Science and Society Action Plan are generally not accepted in the National Strategy of Scientific and Technological Development in 2006–2010. The whole document expresses the hegemony of scientific or narrow economic interests of the business sector. But not one statement in the document calls for a more active role of the public, despite the fact that the challenges of the risk assessment and risk management of future scientific and technological development require following the philosophy of inclusion. It could be said that the document, instead of promoting the role of active citizenship, rather defines citizens as an object of planned scientific action. To conclude, the voices of citizens are weak and scientists, politicians and industrialists do not feel that public discussion can make any constructive contributions to the S&T development strategy.

## Conclusion

At the end of the discussion I would like to say that I agree with those who claim that the necessary demand for restoring citizens' engagement in R&D policy-making structures must not become a new form of orthodoxy. We cannot simplify matters. The prevalence of one interest or view at the expense of another interest or view should be prevented. In this sense, expert points of view should retain their importance when formulating R&D policy decisions. Sheila Jasanoff says that the expert advice of scientists must be understood as more complex processes of negotiation, reconstruction and boundary work between scientific and lay discourse (see Jasanoff 1990). This also holds for the EU's social regulation of biotechnology where different instruments have been shaped and designed with the explicit intention to enhance citizens' participation in biotech risk governance.

Some analysts say that the EU's R&D policy approach represents a unique attempt in the modern world to move in the direction of a multiple citizenship model based on a participatory and cosmopolitan understanding of democracy. Here, the idea of citizenship should not only assume the

extension of responsibilities and rights beyond national borders but should also take on a new form of 'participatory democracy' (Faulks 2003; Held 1995). Contrary to liberal and republican models of democracy (concerning science and technology policy the role of citizens is restricted to approving decisions on science and technology matters made by political representatives), the participatory model of democracy requires citizens' opinions, values and concerns to be expressed and heard. R&D policy decisions are not made once and for all by the political representatives of society. They are permanently subjected to the interaction between politics, science and the public. To borrow wording from the authors of the Mode 2 concept of society (Nowotny, Scott & Gibbons 2001), we no longer speak of the 'weak contextualisation' of scientific communications or 'middle-range contextualisation' (the communication patterns are largely determined by institutions or representatives of institutions) but about the creation of a new agora. An agora as a public arena in which many elements of the Mode 2 society come together in novel ways.

## Note

- <sup>1</sup> It is clear that interpretations of data taken from public opinion surveys are far from straightforward. In the context of the 'Public Understanding of Science', several different methodological perspectives have been developed. Large-scale public opinion surveys are not always the best methodological approaches for measuring the capacity of ordinary people to grasp the events and implications of science as they affect their everyday lives. Alan Irwin and Brian Wynne argue that cognitive psychological or constructivist qualitative approaches are better than large-scale quantitative surveys (Irwin & Wynne 1996). Here, it is not my goal to become involved in methodological issues of the public understanding of science. What I would like to say is that, irrespective of all theoretical, epistemological and methodological problems connected with the public understanding of science, the Eurobarometer survey does provide some interesting insights into the attitudes of 'average' European citizens regarding science and technology.



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