

## GOVERNANCE IN SCIENCE & TECHNOLOGY

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**Abstract:** Our purpose is to discuss certain issues of contemporary political theory (focusing on governance and policy networks) together with some themes recently explored in the field of science and technology studies (related to the social construction of knowledge and the divide between experts and lay people). First, we sketch the development of the concept of democratic governance in the European Union and its consequences to the democratization of expertise, which could contribute to tie up sustainable relationships between science and society. Second, we examine three different configurations of relationships between experts and lay people, which demonstrate three different conceptions of the expected embracement of science with society. Third, we explore the notion of policy networks as venues where coordinated collective action constructs the policy outcomes corresponding to the knowledge-based society.

### Governance and Expertise

During the first half of the twentieth century, John Dewey in his 1927 book *The Public and Its Problems* was posing an important ‘democracy question’ (Fischer, 2000): How could modern citizens participate in political decision-making which is dominated by complex technosciences and so it depends on the knowledge of experts? In this way, Dewey was touching on a paradox of democracy which on the one side expands during modernity but on the other side it does so in parallel with the growth of power of large corporate and governmental organizations directed by managerial and technical expertise.<sup>1</sup>

Similarly, at the end of the twentieth century, the Commission of the European Union (EU) was starting to discuss the problem of governance because of the following

reasons: a growing awareness of societal complexity; an increasing difficulty for effective policy-making; challenges of credibility and legitimacy that governments and other regulatory institutions were confronting; and an emergence of new modes of governance (Lebessis & Paterson, 1997). In fact, the European Commission (EC) was speaking about the need to bring government closer to citizens in order to be able to better receive and understand societal concerns and to develop more openness, transparency and accountability. This need for administrative re-organization<sup>2</sup> was originating from the observed tension between the functional approach followed by governments and the increasing complexity of modern societies (Lebessis & Paterson, 1997). The functional models of administration usually adopted by national governments were based on an invariable differentiation of competencies and constituting centralized top-down modes of policy-making. Apparently, they are challenged by the dominant characteristics of modern societies, which are exhibiting diversity, complexity, interdependence and uncertainty.

But there is a second important reason motivating the EC concern with the issue of governance. This is related to the often-heard criticism of the existing ‘democratic deficit’ in Europe. By this it is meant that, because of a perceived increase in detailed regulation coming from the EC, European institutions appear to malfunction since they are lacking adequate popular accountability grounded on national or local conditions. As a result, under the existing EU institutional system, the criticism of the ‘democratic deficit’ denounces that it is political actors such as experts, lobbies, bureaucrats, non-elected executives, etc., those who gain significant power, although they are not politically responsible and not directly associated with the citizens.

Therefore, pushed by the need to move from a rigid and top-down approach to regulation towards a flexible and inclusive model of ‘shared’ administration, during the last fifteen years, many scholars and policy-makers have started to rethink the concept of governance. In these new elaborations, governance has been used to refer to a shift of power and intervention capacities from state executives and technical experts towards all stakeholders, whether public, private or social, who are fully involved in the process of the formulation, implementation, dissemination and evaluation of policies. This is a way to manage public affairs between such an extended variety of actors provided that the involved protagonists express their own interests and responsibilities and that they prefer to be engaged in interdependent and interactive forms of policy-making based on cooperation or conflict in order to solve societal problems or create new societal opportunities.<sup>3</sup>

For instance, in their recommendations for the Commission, Lebessis & Paterson (1997) have put forward the following five principles as essential characteristics of the kind of governance needed to be adopted by Europe: participation, multi-disciplinarity, contextualized implementation, reflexivity and network-ness of actors. Consequently, it was in July 2001 that the EC published its long-announced White Paper on Governance (CEC, 2001). Now, openness, participation, accountability, effectiveness and coherence become the five main principles underpinning good governance<sup>4</sup> at all levels – global, European, national, regional and local (p. 10). And in this way, “the European agenda must come to be understood as more relevant by civil society” (Lebessis & Paterson, 1999, p. 4).

A particularly hot issue in the context of the European White Paper of Governance is that of the role of knowledge<sup>5</sup> in the policy process. For that purpose, the EC set up a working group on the democratization of expertise (Liberatore, 2001) aiming to examine how to use and develop expertise in order to improve the quality of policy-making while at the same time the democratic principles and aspirations of European governance might be assured. In particular, this working group of the Commission has recommended the following five action lines<sup>6</sup> to be taken so that a proper democratization of expertise might be attained:

- A more complete understanding of how expertise is used at the EU level.
- Establishing guidelines for the selection and use of expertise for policy-making.
- Ensuring access, improving participation and facilitating interaction between experts, policy-makers and citizens through a more transparent and accountable policy-making and informed public debate.
- Broadening and integrating expertise in order to become ‘socially robust’ (for example, through extended peer reviews, gender impact assessments, etc.).
- Greater integration between risk assessment and risk management.

At this point, we need to discuss how expertise is usually defined in policy studies. Arguing with Claudio Radaelli (2002), it is more convincing to associate experts less with specific intentional or behavioral features of the actors and more with the structure in which the actors are enacted and operate. In this sense, expertise usually comes from a multiplicity of structures or domains of epistemic, bureaucratic and technocratic policy-making, such as (cf., Liberatore, 2001; Radaelli, 2002):

- communities of scientists, ad hoc or ‘independent’ experts, consultancies and scientific advisory committees;
- ‘stakeholders’ or various ‘holders’ who possess some quality of resource that entitles them to participate in a governance arrangement (Schmitter, 2002, pp. 62-63);
- ‘in-house’ experts, ‘fonctionnaires’ of the EC or other European agencies, including expertise developed through the research policy of the EC, or working within national ministries, diplomats, etc.

Independently of its type, expertise becomes problematic in at least two aspects, representation and knowledge (Radaelli, 2002). As Radaelli argues (pp. 198-199), when expertise is represented in a process of public policy, what is in action is a different notion of representation than, say, when a person or an organization is entitled to represent a certain political, social or economic entity. In fact, what is claimed to be represented in the former case is just knowledge as a highly valued resource in the policy-making process. But the concept of knowledge is qualitatively different from that of a political, social or economic identity, which would be expected to participate or to be represented in the former case. This is what Radaelli calls the ‘anthropomorphic’ view of knowledge, i.e., the tendency to define knowledge in relation to certain actors (e.g., experts or knowledge-holders or ‘guardians’ in Schmitter’s terminology). But then, the crucial question to answer is: What makes knowledge a more critical resource in policy-making than, say, money or votes and gives advantages to knowledge ‘guardians’? According to Radaelli, it is what he calls the ‘cognitive structure’ of the policy process the factor which attributes such a prestige to experts. As Radaelli argues, the ‘cognitive structure’ is a social and

cultural construct, which “provides interpretation, representations of political events, learning opportunities and ‘lenses’ that give focus to interests and behavioural codes” (p. 202). This is why Radaelli suggests that to democratize expertise should involve multiple strategies in different dimensions, including civic education, the media and culture.<sup>7</sup>

## **Experts and Citizens**

In light of certain developments that were elaborated in the field of Science & Technology Studies (STS) and in particularly following the taxonomy of Michel Callon (1999), we are going now to explore three possible modes or models of public participation in techno-scientific processes. In each of them, experts and lay people are configured and mutually articulated in a distinctive way, which reflects on the practical form of the adopted democratic governance. Thus, each model contributes to the shaping of its own conception of techno-scientific citizenship.

### *The Enlightenment Model*

This is the simplest and most widespread – but also most challenged – model of techno-scientific governance, based on the assumption that techno-scientific experts are the only ones who really grasp issues of science and technology, while lay people are illiterate and ignorant on these matters, unless they are educated or ‘enlightened’ by the former (Irwin, 1995, pp. 9-36). The underlying assumption is that scientific knowledge is always universal, objective and value-free, while the knowledge of lay people might be shaped by irrational beliefs and superstitions. Therefore, knowledge holders have to teach the public without needing to learn anything from it, which justifies another name for this model, the ‘public education model,’ as used by Michel Callon (1999).

In addition, this model has become known as the ‘deficit model’ (Wynne, 1991) in order to stress the alleged deficiency of the public on matters of knowledge in comparison with the experts’ sufficiency. As such this is a survey approach to the public understanding of science (Durant *et al.*, 1989), since the public’s level of possession of scientific knowledge could be measured through surveys (in order to be correlated with the public’s interests and attitudes towards science and technology).

Furthermore, in this model the only possible mode of communication between science and society is an one-way (or top-down) flow, in which scientists might disseminate knowledge through education, popularization and the media to a silent and passive society which would never have the chance to respond back or to react in any way. This is the so-called “canonical account of the communicational relationships between science and the public” (Shapin, 1990, p. 991) that is assumed to be absolutely under control of the scientific community (Hilgartner, 1990).

Therefore, from the point of view of the discussion in the previous section, the Enlightenment model cannot be considered a proper governance model because it amounts to a model of complete demarcation and insulation between science and society. Although science is an autonomous institution, it is subjected to control by the public authorities and also influenced by the market (as in adaptations to

innovation projects – Callon, 1999, p. 83). The public cannot participate in knowledge production but it is represented by the State, which “speaks for (or claims the right legitimately to speak for) the public and to voice public interest in the conduct of science” (Shapin, 1990, p. 1004). At the underpinning of this model is the existence of relations of trust<sup>8</sup> between experts and lay people (Callon, 1999, p. 83). The State is assuring the legitimacy of the political decisions taken in such an arrangement since it is the public administration which sets the goals, legitimates them over the representativeness of those who speak in the name of the citizens and mobilizes the resources of the techno-scientific expertise in order to meet these goals (Callon, 1999, p. 84).

### *The Public Debate Model*

This model attempts to open up the sealed divide between science and society assumed by the previous model and to allow richer relations between techno-scientific experts and lay people. These relations are now based on public debates and exchanges of opinions, which might serve to inform both sides and, in particular, they might “enhance the abstract and inhuman knowledge of the scientists” (Callon, 1999, pp. 84-89). Two presuppositions (resulting as concrete developments both in ‘real life’ experiences and elaborations of social and cultural theories) have led to the adoption of this model: (1) the acceptance of various ‘publics’ in society, which possess their own knowledges, and (2) the complementarity between these publics’ knowledges.

The simplistic conception of an undifferentiated public (consisting of citizens or consumers with different knowledge competences) tends to be replaced by the more realistic perspective of a number of differentiated publics, defined by their locality, age, sex, professional activities or any other conditions of life. Thus, ‘lay local publics’ are now regarded as constituencies that do possess their own knowledges and skills – relevant for their own purposes – reflecting their own local social and cultural conditions (Michael, 1998).

Scholars in STS and the ethnography of science and technology argue nowadays that both scientific knowledge and lay knowledge are mainly local knowledges.<sup>9</sup> Consequently, for instance, as science produced in laboratories is inherently incomplete (and sometimes even controversial) to account for the complexity and the uncertainty of the ‘real world,’ what is needed is enrichment by open interaction, discussion, consultation and deliberation with other local knowledges and cultures. In particular cases, the only way that such enrichment can be materialized is through “procedures aimed at broadening the circle of actors addressing the issue of technoscience and its applications” (Callon, 1999, p. 86). Examples of these procedures are plenty: referenda, inquiries and public hearings, public opinion surveys, negotiated rule making, focus groups, consensus conferences, citizens juries and panels, local information committees, citizen and public advisory committees, etc. (Rowe & Frewer, 2000). Similarly, there are different models and experiences of participatory policy analysis and policy-making with respect to science and technology, such as constructive technological assessment (Rip, 1999), participatory technology assessment (EUROpTA, 2000) and other modes of participatory research (Fischer, 2000).

From the point of view of political and social theory, the public debate model embodies the idea of deliberative democracy, which has raised significant interest during the last three decades thanks to the writings of Habermas, Rawls, Elster, Cohen, Bohman and many other scholars. Recently, social studies of science and technology have sought the relation between knowledge and enfranchisement in deliberative models of democracy.<sup>10</sup> For instance, Mark Elam and Margareta Bertilsson (2002, pp. 14-15) claim that deliberative democracy is “a science friendly model of democracy and one which scientists can embrace because, not only does it help make science more democratic, but also democracy more scientific.” Focusing on deliberation as a source of continuous education and training (Manin, 1987; Benhabib, 1994), Elam and Bertilsson argue that deliberative democracy offers to science “a new pedagogic model supporting interactive learning between science and the public” and also something like “political laboratories for carrying out controlled experiments in scientific democracy.” Of course, the many criticisms often addressed to the mainstream approach to deliberative democracy cannot be easily dismissed and those emphasizing the role of discursive argumentation have a very important role to play in relation to the elucidation of the content of techno-scientific democracy.<sup>11</sup> Finally, one should add that in order to overcome the limitations of deliberative politics, Chantal Mouffe (1999, 2000) has elaborated the conception of a radical or ‘agonistic pluralist’ democracy, which might also accommodate various forms of enfranchising scientific activism (Young, 2001).<sup>12</sup>

### *The Model of Hybrid Collectives*

This is the model of the ‘co-production of knowledge’ (Callon, 1999, pp. 89-93) between science and society: After outreaching their relative insulation in the Enlightenment model and negotiating their deliberations inside public debates, experts and lay people are becoming more closely entangled with each other, more mutually interdependent and more determined for a mature engagement in a collective research enterprise. A further outcome of this process of knowledge co-production is collective learning, since the attained shared understanding is mutually reinforcing throughout the process. Thus, this is a process which is regulated by a genuine collective governance mode<sup>13</sup> (in the sense given in the first section): Different forms of knowledge, like universal and local knowledge, are not only open and inclusive to each other and interactively negotiating their combinations but also their hybridization is necessary to get forward in the management of risk-complexity-uncertainty or the implementation of knowledge-based policies.

By the development and elaboration of new statements, new instruments, new techniques and new skills (Callon, 1994, p. 412), this process of knowledge co-production results a simultaneous reconfiguration (Knorr-Cetina, 1992) of both orders (or ‘economies’), the social (identities) and the natural (scientific knowledge), in which the involved actors are embedded, and which generate the irreversible varieties of the social, cultural and techno-scientific stances. Again, this reconfiguration of the orders of things contrasts the consolidation into ironbound hierarchies of the Enlightenment model or the discursive reaffirmation of existing power relations in the public debate model.

The co-production of knowledge is illustrated by specific arrangements of involvement and engagement of ‘concerned groups,’ which usually take the form of



heterogeneous networks. Michel Callon (1994) has called these networks ‘hybrid collectives’ or ‘heterogeneous collectives.’ Good examples of these hybrid collectives are the networks of patient organizations, which become increasingly visible within the domains of health and medicine (Callon, 1999; Rabeharisoa & Callon, 1999; Rabeharisoa, 2002). Originating from the old ‘self-help’ movement, patient organizations increasingly keep on being concerned and involved with scientific and clinical research on their diseases, on which some of them even proceed to contribute substantially even to its funding (Rabeharisoa & Callon, 1999). As they are actively intervening into research activities and directly participating into debates concerning the very constitution of the research, patient organizations are dedicated into the co-production, orientation and evaluation of the knowledge of their concern. But they do so by networking themselves into a hybrid collective, a heterogeneous assemblage over which a large number of other networks or social worlds intersect and interfere.<sup>14</sup> For instance, for patients suffering from a serious genetic deficiency, “genes are no longer external realities which impose their merciless logic on human beings reduced to little more than the consequence of a biological determinism; they are collectively integrated, domesticated, shared and manipulated” (Callon, 1999, p. 92).

## **Policy Networks**

Networks are met everywhere in the present landscape of science and culture and the word ‘network’ has become a fashionable catchword. As Kenis and Schneider have already claimed for more than a decade ago: “The term network is on the way to becoming the new paradigm for the ‘architecture of complexity’ (compared to hierarchy as the old architectural paradigm of complexity: see Simon)” (Kenis & Schneider, 1991, p. 25). Within such an extended spectrum of uses and occurrences of networks,<sup>15</sup> perhaps it is very difficult and even meaningless to try to find a common denominator in a formal definition of this concept. But, at least for our purposes, a generic or ‘cognitively shared’ (among so many domains) understanding of networks could be described in terms of two entities: actors and relations. This means that in a network, a set of nodes or actors (individual, aggregate or mixed) are related or linked to each other under specific more or less stable mechanisms which are defining a non-hierarchical set of relationships among the actors.

Now, if one tries to conceptualize ‘actors’ and ‘relationships’ in a concrete context, then one realizes that there are so many selections of these terms, which yield different notions of networks. In particular, in the context of policy studies, there is a variety of definitions of ‘policy networks’ according to the attributed sense to the basic terms. For instance, typical actors in a policy network might be either public (like the state, governmental or other public institutions, citizens, etc.) or private (like the market, corporations, interest groups, consumers, etc.) or even mixed-hybridized forms of the former (like modern science the way it is envisaged by Callon [1994]).

The situation becomes even more complicated<sup>16</sup> when one tries to theorize in a general or generic setting the relationships that could possibly tie these actors in a policy network. The dominant view in the literature of policy studies is to assume that policy actors carry certain interests and possess certain resources. Therefore, it is argued, the actors are linked together (i.e., they develop their relationships of interdependence or seclusion) when they proceed to mediate their interests and

exchange their resources. But this mechanism should not be understood in the sense that the actors' interests and resources (i.e., identities and competences) exist before the actors start to constitute a network: the very idea of the 'relational' perspective is that a network both defines and is defined by its links. After saying this, the question is how in a policy network the actors are managing their relationships. There are two different 'schools' of policy-making answering this question (cf., Börzel, 1997, p. 3), although not in mutually exclusive ways, since there exist hybrid conceptualizations between these two theoretical responses (Mayntz, 1993):

- According to the 'interest intermediation school' (Marsh & Rhodes, 1992), there is a generic meso-level mechanism of developing relationships in a policy network independently of who the actors are. This goes as follows: depending on whether the involved actors have common or competing interests and what exactly their interests are, they decide with whom, how and for what purpose to exchange their resources. Thus, the actors are taking certain political decisions, formulating, implementing or changing certain policies by their bargains (where they are trying to optimize their profits) or their negotiations (where they are trying to reconfigure their identities).
- According to the 'governance school' (Kenis & Schneider, 1991), which is restricted to apply only for public-private interactions of public policy, a policy network between public and private actors is a specific form of governance. Therefore, as we have already seen in the first section, such a policy network is developing the relationships between the involved policy actors following an 'integrative logic' of a non-hierarchical coordination, which is contrasted with both the state hierarchy or market deregulation.<sup>17</sup>

However, whatever the theoretical articulation of the actors and their relationships might be, the theoretical basis and, thus, the explanatory power of policy networks appears to be rather ambivalent by many policy scholars. For instance, Keith Dowding (1995) severely doubts whether the concept of policy networks has ever operated as an explanatory factor, i.e., as an independent variable, and, thus, influenced policy outcomes, although many times policy networks tend to be conceptualized as including dependent variables for other systemic changes as, for instance, the behavior of individual institutions or organizations. This is why Dowding claims that policy networks at present appear more useful as heuristic devices, i.e., as metaphors. Emphasizing that policy networks just reflect patterns of interaction and resource exchange between agents, he restricts their explanatory value of most of the existing theories of policy networks only at the level of the characteristics of the components within the networks (e.g., the intentions of the agents) but he is reluctant to accept any explanatory value at the network-structural level. In fact, Dowding would expect such network level explanations to be provided only by a formal social networks analysis. However, he argues that even this perspective has a limited potential because the quality of the existing relevant data is too poor for predictions: "collecting such high quality data requires us to know the answers to the questions we are posing. Such answers are themselves open to competing interpretations even for those involved in the events" (Dowding, 1995, p. 158).

Nevertheless, despite all these limitations and "critiques of the very possibility of rational policy-formation because of the socially constructed nature of knowledge"



(*ibid.*, p. 147), there are some cases in which policy networks appear to possess greater dynamism and predictive capacity. Especially, these are cases purporting to offer a theory of policy-making on issues of science and technology. Advocacy coalitions and epistemic communities are two such examples that we intend to present in what follows. As these techno-scientific policy networks are illustrating certain specific constellations of actors, including both public and private actors, experts and involved citizens, in which some types of policy learning are exhibited, they have an important interest for our analysis of governance in science and technology.

### *Advocacy Coalitions in Policy Processes*

The Advocacy Coalition Framework (Sabatier, 1998; Sabatier & Jenkins-Smith, 1993) in policy-making processes originates from the recognition that typically there exist multiple and conflicting views of policy issues and correspondingly the advocates of different conceptions coalesce in separate groups in order to advance their own interests, possibly by aligning themselves with influential policy and knowledge experts. According to Paul Sabatier (in Sabatier & Jenkins-Smith, 1998, p. 16), an advocacy coalition is constituted when the following four conditions are fully understood: (1) the slow time – about a decade – for policy changes to be implemented; (2) the need to concentrate on a policy network; (3) the focus on an intergovernmental framework; and (4) the importance of the conceptualization of public policies as belief systems.

Thus, advocacy coalitions are defined by their inherent belief systems, which consist of a core of shared beliefs about the followed policy process plus some more specific ideas and other perceptions derived from the former stable and persistent core. But, as the latter ideas are less fixed, they become more easily negotiable with contending conceptions and they permit opposed groups to bargain with each other. The crucial outcome of such interactions is that advocacy coalitions become quite prone to learn from each other in their effort to resolve the conflicts that they are confronting. From this point of view, advocacy coalitions are policy networks in which the influence of the network is not derived from the power endowments of individual actors, as the mainstream theories of policy networks would expect to be the case. On the contrary, the formation of influence at the aggregate level is an emergent property, since it is produced by a genuine network effect, enacted by this process of ‘policy oriented learning,’ which is characteristic of advocacy coalitions.

### *Epistemic Communities*

The literature on epistemic communities (Haas, 1990, 1992; Adler & Haas, 1992) presents another interesting conceptualization of a policy network, which has arisen in the field of foreign policy and international relations in the context of international policy coordination of such issues as GATT, the environment, food aid, the world economy, banking regulation, etc. Peter Haas (1992, p. 3) defines epistemic communities as “a network of professionals with recognized expertise and competence in a particular domain and an authoritative claim to policy-relevant knowledge within that domain or issue-area” who “have (1) a shared set of normative and principled beliefs ... (2) shared causal beliefs ... (3) shared notions of validity ... and (4) a common policy enterprise.”

Therefore, as knowledge is supplied by a network of experts to authoritative policy-makers, it becomes the key variable defining an epistemic community. This knowledge plays a double role. On the one hand, policy actors use it in order to legitimize their actions by resorting to the scientific authority. On the other hand, knowledge is a useful policy resource informing the actors about the means to cope with uncertainty, through which their interests are shaped, but also providing them coherent positions for bargaining. Note that this knowledge is not just a property of individual actors: it is the content of the shared thinking of the whole epistemic community through which the identity of the community is defined. For instance, although in all international policy arenas the final decisions are made through negotiations between the involved states, there are non-state actors (as scientific experts or other providers of technical advice), who acquire power through their access to and their participation into the production of the relevant knowledge, which is framing the process. Again, as this shared knowledge is an emergent property, it is the structural conditions of epistemic communities the factor which leads to policy convergence and not the behavioral features of the self-interested states-actors, which are responsible for the power bargaining games that the negotiating states might want to play with each other.

## Notes

1. However, Dewey (1927) possessed an answer to resolve the ‘democracy question.’ His answer was based on a clear division of labor between citizens and experts and an enhancement of the quality of public debate, discussion and persuasion. Citizens should set a democratic agenda of engagement with problems and troubles raised by technical expertise: “It is not necessary that the many should have the knowledge and skill to carry on the needed investigations; what is required is that they have the ability to judge of the bearing of the knowledge supplied by others upon common concerns.” Experts should interpret complex issues in order to facilitate citizen learning and empowerment: “But their expertness is not shown in framing and executing policies, but in discovering and making known the facts upon which the former depend.”
2. According to Philippe Schmitter (2002, p. 54), “governance only emerges as an attractive alternative when there are manifest *state failures* and/or *market failures*.” The former are created when something goes wrong with “calling upon the government, backed by the hierarchical authority of the *state*, to impose a solution” and the latter when the problem arises from “relying upon firms to allocate resources by *market* competition and, thereby, generate a voluntary, mutually satisfactory outcome.”
3. This is close to Jan Kooiman’s definition of ‘socio-political’ or ‘interactive’ governance: “*All those interactive arrangements in which public as well as private actors participate aimed at solving societal problems, or creating societal opportunities, attending to the institutions within which these governance activities take place, and the stimulation of normative debates on the principles underlying all governance activities*” (Kooiman, 2002, p. 73).
4. As Barrie Axford and Richard Huggins (1999) have remarked, the new European governance model “elevates governance *beyond*, rather *above* the state.” In this setting, the created open policy communities and networks and the borderless economic space provide the dynamics for a more “poly-centric and non-hierarchical” form of governance (Jachtenfuchs, 1995). As Hix (1998, p. 40) notes, “with no clear hierarchy of power and competence anywhere in the process, this is ‘governance without government’ (Rosenau & Czempiel, 1992).”

5. Another important EC contribution is the Science and Society Action Plan (CEC, 2002), which aims to strengthen European democratic governance in a knowledge-based society and economy.
6. In parallel, the working group of the Commission has set the following seven main aims of the above mentioned action lines: (1) access to, and transparency of, the process of the development, selection and use of expertise for policy-making; (2) accountability to citizens and those who provide and use expertise; (3) effectiveness in providing expertise; (4) early warning and foresight; (5) independence and integrity; (6) plurality; (7) quality (Liberatore, 2001).
7. Besides all these, the fact is that the democratization of expertise entails finding solutions to some thorny issues and even committing certain compromises or trade-offs. From the point of view of policy-making, Radaelli (2002, p. 203) describes the decisions, which have to be taken in terms of a trilemma among three poles: political legitimacy, policy effectiveness and scientific accuracy. Radaelli argues that all the elements of this trilemma are problematic although they should not be considered always as antithetic. Finally, as the working group of the Commission has suggested, democratizing expertise necessitates some potential trade-offs such as between legitimacy and efficiency, simplification and participation (Liberatore, 2001, p. 7) and between democracy and time (Radaelli, 2002, p. 204).
8. However, as Michel Callon (1999, p. 83) clarifies, sometimes mistrust might appear because of the unintended consequences of scientists' actions, their controversies and mainly because of the ignorant lay people's illiteracy, which makes them vulnerable to irrationality and obscurantism.
9. This is the basis of the so-called 'critical or interpretationist' (Michael, 2002) perspective of the public understanding of science, which describes and follows the dynamics of the encounters of different cultures between experts and lay people (Wynne, 1995, 1996).
10. John Durant (1999, p. 317) has outlined the 'democratic turn' in the public understanding of science as follows: "The ideals of equality between scientists and non-scientists and of informed public debate as the preconditions for forging socially sustainable public policies need to be translated into new processes of deliberative democracy."
11. In a criticism of the 'deliberative turn' for its liberal constitutionalism, John Dryzek (1990, 2000) advocates 'discursive democracy' as a critical, pluralistic and reflexive component of deliberative democracy. Accordingly, C.A. Willard's (1996) 'policy epistemics' are drawn upon the 'field of argument,' i.e., on dynamic trans-border differences in communication and upon the ways these differences are transformed to disputes. Thus, decision-making can be understood in terms of enduring negotiations over normative spaces defined through the 'argumentation of controversies' (Joss, 1998; Cambrosio & Limoges, 1991).
12. Echoing the provocative thesis of Carl Schmitt that democracy always entails relations of inclusion-exclusion in the very definition and constitution of a demos, Chantal Mouffe wonders whether any attempt to realize a universal equality in the political realm without taking into account existing distinctions in other realms might be doomed to a complete devaluation of political equality and of politics itself (2000, p. 41). Thus, Chantal argues (using Derridean terminology): "the very conditions of possibility of the exercise of democracy constitute simultaneously the conditions of impossibility of democratic legitimacy as envisaged by deliberative democracy. Consensus in a liberal-democratic society is – and will always be – the expression of a hegemony and the crystallization of power relations" (pp. 48-49). Therefore, contrary to the model of deliberative democracy, Mouffe envisages politics through a model of radical or 'agonistic pluralist' democracy, the prime aim of which is to transform 'antagonism' into 'agonism,' i.e., "not to eliminate passions nor to relegate them to the private sphere in order to render rational consensus possible, but to mobilize those passions towards the promotion of democratic designs" (1999, pp. 755-756). This is why she considers that "modern democracy's specificity lies in the recognition and legitimation of conflict and the refusal to suppress it by imposing an authoritarian order" (p. 756). For her, the only type of consensus compatible with

radical democracy is bound to be a ‘conflictual consensus.’ As Mouffe expresses it, “pluralist politics should be envisaged as a ‘mixed-game,’ i.e., in part collaborative and in part conflictual and not as a wholly co-operative game as most liberal pluralists would have it” (*ibid.*). According to Elam and Bertilsson (2002), these conceptions of radical democracy have important consequences for the political shaping of a ‘radical scientific citizen’ and they contribute to the construction of an ‘alternative public understanding of science.’ Elam and Bertilsson argue that activist and radical scientific citizens should be “fully prepared to participate in demonstrations and direct action ... witness to current wrongs and injustices in scientific affairs ... assuming a moral stance in defense of general ethico-political principles (like scientific democracy)” (pp. 20-21). In this way, activist scientific citizens oppose to the perpetuation of scientific injustices by publicly communicating them and demonstrating them for all to see (Young, 2001). One has to remark that this is not an ‘anti-scientific’ activity but an effort “to tell the truth before a larger public” (Barry, 1999).

13. As Elam and Bertilsson put it: “Here the focus would shift from the advantages of deliberative democracy for producing ‘governance virtue’ and the legitimation of innovative actions alone, to its potential for generating significant ‘cognitive virtue’ (Pellizzoni) and ‘the conditions whereby actors can widen their own limited and fallible perspectives by drawing on each other’s knowledge, experience and capabilities’ (Smith & Wales)” (Elam & Bertilsson, 2002, p. 17).
14. Michel Callon (1999) argues that the elements of hybrid collectives are networks themselves which are drawn together to confront or interact with each other through representatives, the ‘obligatory points of passage’ in the language of the Actor-Network Theory. These heterogeneous entities that constitute the local elements of a hybrid collective are designated as ‘intermediaries’ (Callon, 1994, p. 414) and they represent the ‘boundary objects’ of Star and Griesemer (1989).
15. Besides many occurrences they have in science and engineering (for instance, neural, ‘complex,’ self-organized, informational, environmental, transportation and telecommunication networks, etc.), networks are also often met in social science (e.g., social networks, scientometric networks, etc.), in economics and organization theories (e.g., networks of innovation, networks in between markets and hierarchies, learning networks, etc.) and in political science (where belong the ‘policy networks’ that we intend to discuss in the next section).
16. For instance, van Waarden (1992) classifies policy networks along seven dimensions (according to: actors, function, structure, institutionalization, conventions of interaction, distribution of power, strategies of public administration). He then lists eleven types of networks (statist, captured statist, clientelist, pressure pluralist, possessing parentela relations, iron triangles, issue networks, sectoral corporatist, macro-corporatist, state corporatist and sponsored pluralist) and by cataloguing them according to the seven dimensions he obtains 37 types of policy networks.
17. As David Marsh (1998, p. 8) argues: “Hierarchy is a mode of governance characterized by a very close structural coupling between the public and private level, with central coordination, and thus control, being exercised by government. In contrast, markets as a form of governance involve no structural coupling and outcomes result from the market-driven interplay between a plurality of autonomous agents drawn from the public and the private spheres; there is no central coordination. In contrast, policy networks involve a loose structural coupling; interaction within networks between autonomous actors produces a negotiated consensus which provides the basis for coordination.”

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