

POLITICS ON THE MOVE: THE DEMOCRATIC CONTROL OF THE DESIGN OF SUSTAINABLE TECHNOLOGIES

This article examines how "design rationality" could help remediate the controversy over environmental degradation. Drawing on the case of designing sustainable forms of traffic management, it argues that this will only be effective to a limited degree. "Policy conversation" does indeed take place but within a coalition of actions that pushes a particular set of solutions. This facilitates due procedure but erodes political legitimacy, thus potentially reproducing an intractable controversy. The article suggests a five-phase model of democratic control as an alternative.

Introduction

"We are all greens now," leaders of government, business, and industry could be heard saying in the early 1990s. Environmental politics, so the statement seems to imply, has become a quasi techno-administrative matter of negotiating general agreements on the implementation of ecologically sound measures. Implicit in this message is the suggestion that the antagonistic and highly political debates that preceded the green consensus of the 1992 Earth Summit are something of the past: the time has come for serious and concerted policy-making. Although it seems fair to argue that only few would disagree nowadays that the "ecological crisis" urgently requires serious political attention, a controversial trajectory is still to come. Ecology may have become accepted as an essential variable of prudent decision making but the political conflict has by no means disappeared. It has merely changed character: it has become discursive. The new environmental conflict is one in which actors seek to dominate the definition of what it means to be green. In this process we can observe the formation of new discourse-coalitions that dominate the process of interpreting the meaning of the ecological crisis and the formulation of the appropriate response.^[1]

To be sure, the Brundtland report and Rio deserve to remain to be seen as milestones in the history of environmental politics. After all, the publication of the Brundtland report in 1987 and the 1992 Earth Summit at Rio de Janeiro signify the global endorsement of sustainable development as a new way of conceptualising the relationship between society and nature. It completes a process that I have elsewhere called discourse structuration (Hajer, 1995a:chap. 3). It is meant to signify that there is now a broad consensus on the vocabulary to be used in conceptualizing solutions for the environmental problematic. But that is just the first step in a process of reframing. A discourse also needs to solidify in new institutional practices according to the prescriptions of the particular new way of seeing. It is this phase of discourse institutionalization that characterizes the present environmental conflict. In the mid-1990s the politics of sustainable development have become a matter of how this notion congeals, how the language of sustainability solidifies in new technologies, new fiscal regimes, new socio-cultural practices. Politics, then, is about dominating this process of translation.

The new environmental conflict, as such, most certainly features the sort of policy controversies that Schon and Rein (1994) see as derived from conflicts of underlying metacultural frames. In principle, it is therefore the sort of controversy that should be remediated by the application of the rules of "design rationality" as proposed by Schon and Rein. Yet it seems questionable whether the conflict over the translation and congealment of sustainable development qualifies as a process for which design rationality offers us the sort of pragmatic possibility for resolution. First, design rationality seems too much oriented to finding the single best solution. This presumes that such a solution can be found in the precise examination of the object (i.e., the nature of the environmental crisis). However, the environmental crisis is a discourse that is as much a statement on the changing self-image of society (who are we? how are we doing?) as it is a discourse on the changing nature of the environment (Hajer, 1995b). Recourse to rational argument will not always help remediate such conflicts. This article suggests that the institutional challenge of environmental politics is more encompassing than are optimum policy design strategies alone. It calls for the reinvention of political choice. The challenge facing liberal democracy is not the adjustment of policy-making procedures but the reconceptualization of the political institutions and, in particular, the relationship between the realm of experts and society.

A second problem with the idea of design rationality relates to the assumption that the designer team can take up the central position in decision making that is required to make the concept work. Especially in the field of decision making on environmental and technological development we can identify a process of displacement of political decision making away from the politico-administrative center to various spheres of "subpolitics" (Beck, 1992). In that case, the important choices are made before or after a development becomes an "issue" for policymakers. Subpolitics seems to inhibit the realization of the policy conversations that Schon and Rein have in mind. There are of course many ways in which the freedom and power of policymakers is restricted, but we here focus on one particularly prominent aspect of it--the extent to which policymakers can actually be seen to dominate the process of translation and congealment of the discourse in terms of which the design process has to take place. Policymakers and politicians have lost their central role in the process of defining both problems and solutions and cannot regain their position by taking up a more reflective stand vis-a-vis their subject matter or, in the words of Schon and Rein, their material. Intractable policy controversies in the environmental domain call for interventions that are oriented on the facilitation of bringing into the open the political choices that are now being made in concealed subpolitical processes. Drawing on the case of mobility and traffic management the paper illustrates the character of the present "displacement of politics" (Beck, 1992). Using material from that case this paper addresses possible alternative institutional arrangements, arguing for a change in the conception of politics from a point-oriented "politics of decision" towards a "discursive politics of transformation."

The Institutional Challenge of Sustainable Development

In the aftermath of Rio the notion of sustainable development has become the general orientation for environmental politics. Sustainable development is important, especially since it integrates the North-South divide in the analysis of the production of ecological degradation. Yet this notion, that seeks to combine the need for care for nature and the environment with a sustained orientation towards growth and development, is of course not unproblematic. In essence, it remains a

modernist discourse that promises the best of both worlds: it suggests that we can reconfigure the project of capitalist industrialism so as to combine the sustained creation of wealth with the care for nature and quality of life. This is neither inconceivable nor always true. In some spheres sustainable development most certainly seems a realm of possibility (as in the case of the better provision of drinking water, installation of sewage facilities and reliable electricity, which can be predicted to stimulate investment and improve the life changes of future generations), yet it is problematic in others (if sustaining growth continues to take the form of a global imitation of the American way of life). Furthermore, since Rio, it has become the leitmotiv for environmental action at nearly all levels, including some local strategies for improved quality of life. Sustainable development has its backgrounds in the global debate and thus does not provide directly applicable guidance for action (Ekins, 1992; Hajer, 1995a). In other words, sustainable development should also be seen as a stage at which an interpretive struggle is to be fought: whether a given project fulfills the goals of sustainable development can never be determined with recourse to the "theory." What sustainable development means is essentially a political decision. Hence what is needed is a way to democratically govern this process of interpretation in a given polity.

Since the global endorsement of the Brundtland report the politics of sustainable development have entered a different phase. In the first phase of discourse structuration the looseness of the concept was instrumental to create the global consensus and for the structuration of the discourse. But precisely those qualities may backfire now that the notion has to guide the process of institutional change. The question is whether the theory of design rationality can help. Schon and Rein argue a familiar case. The prevailing traditions in policy analysis fail to take seriously the way in which cultural variables often hinder the resolution of policy controversies. Since mainstream traditions conceive of individual cultural values as constant and static "deeply held values," they perceive such multi-cultural controversies to be intractable. Schon and Rein come in from an alternative, interpretive angle and seek to illuminate how problems, problem holders and analysts mutually construct one another. This is akin to the way in which symbolical interactionism revolutionized the perspective on the power of the individual versus the existing social institutions or structures in the realm of sociological theory. They now suggest that power of policy-makers can be greatly improved through certain procedural innovations.

The consensus around sustainable development most certainly conceals many of the sort of inter-cultural problems they have in mind. How such differing cultural patterns might obstruct the decision making has been shown by cultural theorists, among others. Different cultures imply "contradictory certainties," which frustrate the process of consensus formation. Not only do actors in such cases disagree on what the problem "really" is, they also hold their own specific views as to what sort of institutional arrangement might help remediate the environmental problems (cf. Schwarz and Thompson, 1990).

Nobody stands above such cultural preferences. The model proposed by Schon and Rein, for instance, shows their confidence in the possibilities to resolve some of the pressing problems of our times through a more subtle maneuvering of policymakers. It is the latter who have to create the institutional preconditions for situated frame reflection or policy conversation, in the course of which policies and interests are continuously adjusted so as to create the sort of policies (and [perceptions of] interests) that match social expectations. Design rationality is an approach that

seeks to overcome some of the problems of more mainstream approaches to policy analysis by emphasizing the way in which policymakers could become active in the creation of problem definitions. However, what happens if politics occurs without the policymaker being aware of it? What happens to the possibility for constructive policy conversation if a specific problem definition has already been linked to a specific technology that can serve as a set solution? The problem that occurs is that the policymaker then has to fight not merely thought constructs but a network of actors, institutions and technologies that have, for themselves, interpreted what sustainable development should be about. The policymaker, then, cannot freely readjust problem definitions or the preferences of problem holders and lacks power precisely where the often decisive initial commitments are being made.

This latter observation refers to what the German sociologist Ulrich Beck has called "subpolitics" (Beck, 1992). Beck emphasizes the inability of traditional political institutions to come to meaningful centralized decision making, especially where the fundamental issues implicated in decision making over environmental problems and highly technological processes are concerned. The essential decisions concerning the direction of societal modernization bypass centralized decision-making structures and take place in such formally nonpolitical realms as science, business or, indeed, the household. Experimental work in laboratories, the invention of new technologies, or the quasi-autonomous changes in cultural values and consumer behavior, make the traditional political realm into a spasmodic subsystem that seeks to control social developments but enters at a stage at which such developments have already generated considerable momentum. It still pretends to control social developments but in actual fact has become more and more dependent on symbolic measures that at least suggest a certain degree of control (see Torgerson, 1990).

It is important to emphasize that Beck does not conceive of subpolitics in purely negative terms. Subpolitics might be a massive threat to the traditional institutions of representative democracy, but it also signifies a potential for new political debates and for new ways of dealing with decision making on the intricate issues involved in the environmental and technological realms (Beck, 1993).

It is not difficult to see how the above can be applied to the present-day controversies in the environmental sphere. The notion of sustainable development plays an essential role in the reproduction or transformation of institutional approaches to environmental change. Yet it becomes increasingly clear that sustainable development generates all sorts of unintended subpolitical responses. Of course, sustainable development is, first and foremost, a case of "management by speech": the state actually exercises power to the degree that actors rethink their future projects in light of new governmental preferences. Yet sometimes certain actors may cut and run and create their own interpretations of sustainable development; these subsequently come to set the tone for innovations of other actors. What is more, it is very possible that certain networks of actors can actually dominate the way in which a notion like sustainable development becomes institutionalized in a societal sector; for instance, through the effective "enlistment" (cf. Callon and Latour, 1981; Latour, 1991) of certain technologies and institutions for a particular way of reconstructing environmentally harmful practices and by playing on certain ambivalences that can be found within governmental circles. In such cases decisions bypass the traditional political institutions. At the same time we have not yet found ways for how policy backtalk to take place in

the subpolitical realm. The case of the restructuring of traffic is a case in point.

The Politics of Sustainable Technologies: The Case of Traffic Management

What is characteristic of modern society is not so much the places we live, but the ever increasing scale and intensity of our mobility--both generational, or biographical, mobility and mobility on a smaller time scale (in terms of the traveling we do or the routes we take in our everyday lives; and the traveling that needs to be done by others in order to reproduce our ways of life). Indeed, it has been argued that mobility is the very essence of modernity (Lash and Urry, 1994). At the same time, mobility is a remarkable example of how industrial society endangers itself, not because it fails to live up to its promises but because of its own incredible success in the creation of freedom from being bound up in traditional arrangements. Yet the stunning success of industrial capitalism came with unintended side-effects which, in an age of "reflexive modernization," come to dominate our attention (Beck, 1992; Beck, Giddens, and Lash, 1994). The symbol of this "age of unintended side-effects" is undoubtedly the traffic jam: it is the meditative moment of modernity, as Beck has called it (Beck, 1993). The traffic jam is the result of the astonishing economic prosperity in the Western world, which manifests itself, above all, in an ever growing demand for all sorts of individual mobility.

Increasing mobility is thus to be seen as immanent in our age of high modernity. Here traffic is the everyday concretization of the unintended consequences: traffic congestion illustrates the need to come to structurally different ways of organizing mobility. It is not only a huge waste of money, time and energy, it also has detrimental effects on health and the environment. For instance, car traffic alone is responsible for 20 percent of the global CO₂ emissions, and traffic accidents almost routinely cause an astounding number of casualties and lasting disabilities (Grundmann, 1994).

There will be little dispute over the fact that the organization of mobility needs to be fundamentally rethought. Yet where does society search for solutions? In the context of this article it is important to keep in mind that there is not one standard solution to the issue of traffic management. In the face of the discourse structuration of sustainable development it is almost inevitable that this restructuring now comes to be centered around the idea of a sustainable mobility. Yet what should a sustainable form of traffic look like? Is it a matter of introducing "clean" technologies, or does it require a more fundamental reevaluation of, for instance, the organization of work in time and space, or of leisure-related traffic, and/or the orientations in town and country planning to reduce the social need for physical mobility? Defining a sustainable solution is not at all easy. If sustainable development requires sustained growth, then presumably the volume of traffic (of resources, goods and services) should be allowed to grow; yet, would this still be ecologically sound? What is more, is a reduction of mobility at all conceivable if increasing movement of signs, persons and goods, and the constant breaking out of established patterns is the cultural essence of modernity?

In all its conciseness, the above should indicate the scope of the interpretive space involved in

rethinking traffic/mobility. The point is that sustainable development does not provide straight answers. Policymakers more or less do what Schon and Rein prescribe: they call together experts and interest groups to help design a scenario for sustainable mobility. Yet, with this, they are merely one actor in a much more complex field. Empirical research illuminates a discursive struggle in which various actors active in the field of mobility seek to dominate the way in which the practical consequences of the social commitment to sustainability are to be conceived. Yet, interestingly, though perhaps not surprisingly, this institutionalization of sustainable development does not start in the policymaker's office (although that is certainly a part of the story).

We can discern specific discourse-coalitions that begin to dominate the way in which a sustainable form of mobility is conceived. These discourse-coalitions are of a completely different nature from those that dominated the environmental debates in the 1970s or early 1980s. Take the case of Germany (Weidner, 1995). Germany is internationally known for its innovative environmental policies, but at least as much for its national love of the automobile and its stubborn refusal to introduce a speed limit (it is perceived to be a fundamental freedom of the citizen: *Freie Fahrt für freie Bürger*). But recently, things have begun to change. We can identify a new discourse that argues against out-of-town shopping centers, that is opposed to the *autogerechte Stadt* (car-friendly city), and that promotes the extension of Park & Ride facilities and the construction of other transport transfer points. This may sound familiar, but the identity of the protagonists who sustain the argument to move away from the car as the center of mobility might come as a surprise. German car producers, such as BMW or Mercedes-Benz, actively promote a discourse which no longer focuses on "automobility" but centers on the presentation of "multimobility" schemes, sometimes even going so far as to rethink their products in terms of mobility services (connecting the car to other products such as trams, regional railroads or electronic traffic control, or disconnecting car-ownership from regular car-usage).[2]

Environmentalist NGOs, on the other hand, realize that they cannot simply say "no" to mobility and are aware that the car-centered technological infrastructure strongly inhibits a rapid move away from the car. Hence, they too argue their case in terms of multimobility, promoting the notion of "Umweltverbund" as an alternative to the hegemony of the car, and seeking sustainable traffic in a new "modal split" (public transport when possible, private when necessary; see *Politische Ökologie* 41, 1995). This multimobility discourse thus becomes the central orientation for a new organization of traffic.

The German case shows how the social legitimacy of the discourse of sustainable development now leads to a situation in which the major car producers promote the "ecologization" of society, including a car-free city.[3] This may seem to be a success story and a classic case of management by speech: the government makes sustainable development into the leitmotiv for action, and car producers take up the discourse, rethink their own corporate identities and design the new sustainable technologies required. In fact, however, the discourse on sustainable mobility threatens to become the vehicle for the introduction of a stunning technological project that focuses on the erection of comprehensive high tech "transport systems" that are supposed to reduce emissions, curb conventional traffic accidents and, above all, increase transport efficiency (eradicate traffic jams) and create systemic integration of different transport systems. Obviously, this scenario not only draws away massive sums of money, which are therefore no longer available for other ways of facilitating a continued mobility, but it also threatens to dominate the thinking about ways of remediating traffic related problems. This discourse-coalition "enlists"

actors and technologies: it stabilizes actor commitments and makes it increasingly difficult to conceive of and experiment with other scenarios for a sustainable form of mobility.

If we put the above in the context of the model of congealment of Leitbilder we see, first of all, that the Leitbild of sustainable development becomes the figurehead of a very specific configuration of actors and technologies. Large electronic systems of traffic management are presented as being the state-of-the-art technology in terms of sustainable development. It is not clear, however, whether this technology fits the societal image of what sustainable development is (to be) about. Likewise, policymakers (especially at the local municipal level) can be heard complaining about their lack of control over the developments. It comes out that this "electronic highway" is furthered under the "Eureka" project of the European Union and is based on collective research by car producers in six European Union countries (the so-called "Prometheus" project). Hence, there is a project of great political and economic power that promotes one particular interpretation of sustainable mobility. This technological system is never the object of integrated societal discussion. Instead, what one can observe is how elements of the system are introduced. BMW top models are now routinely equipped with the required satellite navigational systems. Intercity highways have traffic regulation facilities installed. Similarly, Siemens has now introduced a new "intelligent" system of integrated traffic lights in the northern parts of Munich.^[4] Whether or not this matches public understandings of what the "sustainable city" is to be about has obviously never been the subject of public debate. Donald Schon once identified transportation systems as "meta technologies" (Schon, 1971). Such technologies called for focused democratic control since they exert essential influence on technological and hence social change and public well-being. Yet, this is precisely what is now missing.

The Case for Institutional Innovation

This example demonstrates, first of all, that government is not absent. Both on the European Union level and that of the nation state, we can see how the administration is involved in the furthering of the technological schemes outlined above. It thus plays a role in the phase of discourse institutionalization. Typically innovation-oriented projects like Prometheus create a strong bond between the officials and technicians involved. Yet, while the group might internally have an agreed upon perception of problem and solution, it has difficulty in communicating its solutions to the outside world. It is also obvious that the policymakers involved in this project are part of a discourse coalition within which they may indeed stage a policy conversation. However, politicians, policymakers at the local level, environmental NGOs and citizens are initially kept out and are not seen as relevant actors for the phases during which technologies are composed. Indeed, what is absent is not the government as such--but politics.

The essential first phases of decision making concerned with the formulation of goals and the translation of goals into specific technical or technological solutions bypasses the formal political institutions--particularly those at the level at which people will eventually have to live with the consequences. Politics enters when the technologies of sustainable development have been defined, and the agenda has thus been set. Moreover, the solutions to environmental degradation in no way match the cultural backgrounds of at least some of the public concern about the "ecological crisis." The high-tech solutions actually bear some of the main characteristics of the

discourses that were criticized in the early phases of the modern environmental conflict. The domination of man by technology and the orientation on efficiency are obvious cases in point, as is the omission of a more broadly conceived reevaluation of mobility (e.g., separating the increase of physical mobility from the social value of cultural mobility).

The foregoing shows that design rationality might also be reaching its limits in the face of present developments in the environmental domain. When it comes to furthering a project as broad as sustainable development, one needs to create more space for an explicit discussion of the implicit future scenarios that hide in the prevailing patterns of problem resolution. The "ecological turn" in the modernization process is not simply about re-mediating environmental damage. It is much more about rethinking social arrangements, about a reassessment of the intentions and achievements of modernity--all of which deserve democratic debate. At the same time it should be clear that debate alone cannot remediate the problems of subpolitics: while the discussion goes on in one place, technological decisions might be made elsewhere. The real challenge therefore is to find ways to rethink democracy so as to regain influence on the design of solutions.

New institutional arrangements should create a prominent place for normative discussion about what sort of social ecology we really want. Environmental politics, after all, is about world making, not merely the curbing of emissions. In the remainder of this article I would like to suggest the creation of a parallel set of institutions as an effective way of bringing politics back in.

[The Politics of Technological Design](#)

In the classic construction of the political process we always worked with a decision-making pyramid. At the apex of the process of value allocation is a parliament of elected citizens that makes the binding decisions, legitimized by the theory of representative democracy. Administrators subsequently set about implementing these measures. Of course, parliamentary democracy is still an extremely valuable set of institutions. Yet the analysis of the displacement of politics to various subpolitical spheres indicates the need to think about additional institutional arrangements to facilitate the public control over the central decisions in the process of modernization. Based on the idea that the politics of sustainability now is about discourse institutionalization, I would suggest a five-phase model of vertical integration of politics in the development of sustainable technologies (see figure 1).

Clearly, this sort of scheme is beyond the scope of this article. The main point, however, is to enhance the continuity of reflexive debate regarding the introduction of central components of what should culminate in a strategy for sustainable development. The basic principle is that there are three different sorts of decisions and that each can be made in a more reflective way through the appropriate institutions. Each of the three elements of democracy in a high-tech society (at the right in the scheme) thus requires its own types of institutional arrangements. In the remainder of this article I will briefly discuss the five phases of the politics of sustainable technologies.

Direct Democracy

Direct democracy is introduced as a means to enhance the possibility for the public to choose a basic scenario for modernization. This serves the revitalization of democracy and the conscious creation of societal discourse coalitions: the idea here would be that the discussion over the various options/ scenarios as well as the actual vote will help create the basis for a more deliberate social interaction with the goals and means of modernization.

As an example of a new institution of direct democracy, I see the societal inquiry that I have described elsewhere (Hajer, 1995a:chap. 6). The idea is to create an institution that allows for policy-oriented debate on issues of great public concern. A societal inquiry would take place at public request. Ideally a societal inquiry should result in a discussion of different negotiated scenarios, for instance regarding the future organization of mobility. These scenarios should be discussed and compared in various ways that would eventually result in the endorsement of one particular scenario. This scenario is then to be the leitmotiv for public action as well as it should be the measuring stick to judge various subsequent plans and the projects of private actors.

Once a scenario has been agreed upon (which of necessity can only give a rough indication), the congealment of the leitmotiv enters a new phase. Now all sorts of concrete projects have to be conceived. This is necessarily a phase in which various experts (technicians, scientists, policymakers and the like) play a dominant role. As has been shown above, the problem in this phase is that it often results in the development of common commitments among these experts (or groups thereof). Hence, when it comes to political decision making, the options have been confined and the power of the elected representatives to influence the interpretation of the leitmotiv develops an almost "yes-no" character.

Alternatively, one would seek to enhance the interaction between actual design and political debate during the second phase in which particular socio-technical solutions are conceived. A promising innovation here could be technological citizenship (Frankenfeld, 1992). Technological citizenship calls attention to the discrepancy between formal spheres of jurisdiction, authority and impacts. It proposes the recognition of the reality of our technological polities, referring to the spheres of impact of given technologies. To facilitate technological citizenship it calls for the extension of the rights of citizenship (rights to know, to participate, rights to guarantees of informed consent, rights to the limitation of endangerment, see Frankenfeld, 1992: 465). Technological citizenship also refers to certain obligations, such as the duty to review the safety and well being in light of the knowledge one has available, the obligation to accept the will of a majority, and the obligation to "exercise technological civic literacy and technological civic virtue" (Frankenfeld, 1992: 473).

Technological citizenship thus calls for the recognition of a personal moral and techno-instrumental responsibility to monitor the interpretive process in which a leitmotiv materializes in specific socio-technical arrangements and to open up for discussion those choices that seem to require renewed debate. As such, technological citizenship calls for a strong civic discourse in which every individual internalizes his or her responsibility as a citizen and hence monitors his or her own work as scientist, engineer, policymaker, manager, and so on. Technological citizenship, then, is about identifying issues of public importance in one's own environment and assuming responsibility as a citizen (Laird, 1993; Zimmerman, 1994).

Technological citizenship would basically cut through formal organizations and would try to reconstitute the individual responsibility for technological decisions. Hence, it would also call for a social appreciation and legal entitlement for "whistle blowing" within organizations (Bovens, in press). For example, subpolitics implies that it should somehow be facilitated that individual employees raise awareness if a firm active in, e.g., genetic design is about to embark on new processes with questionable consequences for public well-being. Individuals and institutions should be given the duty to consider the public consequences in such cases. Institutional citizenship thus contains two different elements: (1) it gives individuals (and collective actors like firms or agencies) the legal duty to consider the public good in light of the debates in the public domain when they deal with subpolitical decisions; and (2) it gives individuals the fight to "blow the whistle" and would seek to protect them against possible consequences.

The first element here also refers back to the agreed-upon leitmotiv: actors have the duty to position their work within that broader, generally agreed-upon scenario for development. The second element is of course not without difficulties. Whistle blowing might be seen as a public service by the outside world, but it tends to have grave consequences in terms of career perspectives (Vintgen, 1994). Someone working on a temporary contract is not likely to raise issues that might put their continued employment in jeopardy.

Whistle blowing seems, in that regard, to be more of a last resort. Technological citizenship is more likely to be effective through a broad set of practices that seek to enhance the recognition of individual responsibility for monitoring the social consequences of actions and behaviors. Given the nature of this phase of the design process it will often be important to create the possibility for experts to engage in frame-reflective discourse among peers. Here is a role that could be taken up by specialized Internet newsgroups, where experts could build up their policy conversation, or in specific sections of professional journals. The point here would be that they would seek to combine the moral and the instrumental/technical side of the work in progress. Such a discussion might actually take off given the fact that the experts would have been given the duty to take these public aspects into consideration.

Technological citizenship is a much needed innovation for liberal democracy. Yet it should not be forgotten that the political reality seems to work in a different direction. "Official Secrets Acts," for example, are by no means an exception to the rule. Indeed, control seems to be more strict at the international level than at the level of the nation state (i.e., the rights and requirements of European Union officials). Conversely, given the nature of the various technological polities, technological citizenship can only materialize at a truly international level.

Representative Democracy

Representative democracy would keep its place at the apex of the political system. Once a set of truly competing socio-technological solutions have been devised, the elected representatives of parliament would decide which way to go. But politics is then by no means over. Once a socio-technological solution has been agreed upon in parliament, it will have to be implemented. Precisely in this phase what emerges is how a technology is integrated in existing social, ecological and technological environments.[5] Here again, technological citizenship is called for.

Experts will have to interpret the scenario that materializes and will have to act accordingly.

Finally, during the fifth phase of the model the public would have a say in evaluating a specific innovation. Was a given socio-technological intervention the appropriate translation of the scenario that was agreed upon in the first phase of technological design? Here the societal inquiry could address implementation failure or possible effects that were unintended and unforeseen when society agreed upon the policy earlier on. Societal inquiries are not to replace parliament in the sense that they would take politically binding decisions. Their influence should be seen as much more discursive: it is the debate that they produce that might give guidance to individual actors operating in concealed subpolitical practices. In this fifth phase the inquiry would cause readjustments in the never ending process of democratic governance of technology.

Concluding Remarks

In this article I have sought to contribute to the debate on the ways in which intractable policy controversies should be approached. Drawing on the case of environmental politics I have sought to show that the widespread occurrence of subpolitics seems to reduce the power of design rationality as proposed by Schon and Rein. Most certainly design rationality can increase the reflectiveness of policy-making but, as the case of traffic management indicates, there are certain political cleavages that would delimit the power of new decision-making rules. The problem with design rationality discussed in this paper concerns the learning between discourse-coalitions. Mutual learning has indeed taken place within the new coalition that seeks to devise and implement high-tech solutions to control the consequences of increased mobility. This coalition now dominates the thinking about the restructuring of traffic, while possible alternatives fail to materialize, and public debate on this "meta-technological development" fails to change the institutional mechanisms that would interfere with the process of the congealment of sustainable development. The article therefore suggests less of an orientation to the indoor processes of increasing rationality, and seeks to rejuvenate liberal democracy through the implementation of a new set of political institutions to allow for democratic governance of technological decision making.

Environmental discourse is one of the few remaining stages where modernity is being reflected upon. Environmental discourse seems to have a quasi-religious aspect to it that sustains the discussion of fundamental aspects of environmental issues concerning distributive justice, democracy, responsibility and the relationship of human beings, technology and nature. Yet, at the same time, we witness a scientification of what is an essentially social problem. Liberal democracy needs new institutions that allow for a coupling of these more fundamental questions to the developments in technological design. Designing is "world making" and deserves to be a public issue.

Notes

1. This article broadly draws on the discourse-theoretical argument that I have presented in Hajer (1995a). For a detailed description of the approach and the backgrounds of the concept of discourse

coalitions, see especially Chapter 2.

2. In the case of Mercedes all these services can be produced by subsidiaries of the Daimler-Benz conglomerate, such as AEG, Intertraffic or Daimler-Benz InterServices. Cf. Daimler-Benz, 1993, *Auch Morgen Mobil*, Daimler-Benz AG, Stuttgart.

3. Interestingly, the restructuring of traffic is promoted using all sorts of biological metaphors, which effectively suggests a certain naturalness of the new high-tech system of mobility. The 1995 BMW advertisement campaign was a case in point; it employed biological analogies to promote new high-tech schemes for traffic management.

4. The main idea is to monitor traffic so as to be able to adjust red and green intervals. Obviously, the underlying target is traffic management and reduction of urban air pollution (traffic in flow produces lower emissions than does 'stop-go' traffic). The problem is, however, that the standard time to allow pedestrians to cross the street had to be reduced, which has resulted in a need for additional provision of traffic islands where old-age pedestrians can seek refuge as the pedestrians' green turns red and the flow of traffic comes rolling on towards them.

5. Lash and Urry (1994) are among the few that define this as an element of technological design.

FIGURE 1 The Politics of Technological Design

Acceptance of a Leitbild	direct democracy
development of a socio-technical solution	technological citizenship
decision about adoption of solution	representative democracy
integration in social practices	technological citizenship
evaluation of its effects	direct democracy

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