Chapter 22
Participation

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Abstract Participation is a core element of transdisciplinary research. A look at the different project descriptions reveals that participation is more prominent in the first and the third phase of the research process. Also, the intensity and the specific meaning of participation differ substantially between the projects. Transdisciplinary research could benefit from more reflexivity on questions such as who is empowered by participation, or on which criteria are used to decide who is in and who is out.

Keywords: Constructivism · Empowerment · Epistemology · Politics · Stakeholders

22.1 Introduction

The literature about public participation is largely dominated by case studies relating to technology assessment, risk analysis and the formation of science and technology policy. Participation theory is underdeveloped and evaluations of participation methods are often 'limited to ad hoc suggestions and criticisms about advantages and disadvantages of the various techniques, and the lack of a clear framework for criticism makes it difficult to compare and contrast their relative merits' (Rowe and Frewer, 2000; also see Rowe and Frewer, 2005 for the concept of 'public participation'). The present paper seeks to avoid such cataloguing of recipes distilled from the chapters in the present book. Instead, findings in a number of chapters will be laced with remarks on, and critical analysis of, the contexts and the concepts of participation that gives a broader perspective. I begin by situating the theme in an historical perspective focusing on the emergence and shifts of meaning of some associated concepts. Thereafter participation in the three 'phases' of transdisciplinary projects are discussed. Towards the end some findings from scholarship

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in science and technology studies (STS) are brought in, and a couple of issues are raised for further research.

22.2 Interdisciplinarity as a Prelude

In the late 1980s, in various countries, a series of new research fields emerged. These were prompted by societal problems and pressure from user groups. Among such fields appeared the following: peace and conflict research, development studies (related to development aid to what were then called underdeveloped countries), systems ecology, human ecology, work life research, women's studies, research into higher education, social work research, nursing care research and police research. In some cases social movements provided the motivation – anti-imperialist, peace and environmental movements, women's liberation and labour movements. In other cases it was a combination of welfare state concerns and professional occupational groups that provided external relevance pressures and participated in the establishment of new academic teaching programmes and areas of scientific expertise.

Occupational groups such as social workers, midwives, nurses, and police, sought increased status and professional legitimacy through 'scientification' of their knowledge, which often rested on tacit know-how and personal command of practical skills. Scientification brought with it codification of certain parts of their knowledge, theoretical concepts and new standards of public certification. Social and cognitive legitimation strategies were used to argue the case for participation in academic knowledge production. Social legitimation strategies referred to specific societal problems that had to be addressed, while cognitive legitimation strategies often started out by pointing to a lack of scientific knowledge in relevant areas.

Considerable effort was devoted to integrating workplace tacit knowledge into research projects, influencing the formation of new concepts. In nursing care research for example, it was pointed out that while medical expertise included a lot of important knowledge about the human body, diseases and the like, academic medicine failed to address the aspects of 'caring' for patients. Concepts like empathy and coping were therefore given new theoretical connotations corresponding to the goals of patient care in the ward. In social work and life work research the concept of 'action research' became prominent in order to denote the process wherein researchers interacted with target groups of people (e.g. workers in the workplace) as a part of their field work; whereby data was accumulated and societal problems were translated into researchable scientific problems to be tackled by a discipline such as sociology. Inspiration for the development of new concepts also derived from interaction with user groups and the latter's representations or images of experienced reality. Furthermore, interaction between researchers and user groups also occurred during the validation of research results.

Later, when the new fields took on a life of their own and began to function as new disciplines or interdisciplinary specialities, the links between researchers and user groups became more routine, which meant that professional representatives of the user groups took over as the ombudspersons for user group interaction with research

projects. In areas where social movements were strong a similar process occurred in the form of participation by professional activists belonging to one or other non-governmental organisation (NGO). In particular, the role of social movements in the setting of standards and regulating the design of new technologies, deserves study (Eyerman and Jamison, 1989; Hård and Jamison, 2005).

22.3 Entry of the Prefix 'Trans' and Related Concepts

It is interesting to note how in the first wave of discussions the terms interdisciplinarity and action research attended the co-production of new social and cognitive orders. Primacy was still given to the relative autonomy and sovereignty of academic disciplines, in as far as the terms inter- and multidisciplinarity had the question of interaction between members of different academic tribes (existing disciplines) as its centrepiece. Later the term transdisciplinarity became more prevalent, signalling the goal of transcending disciplinary boundaries as such. Of course Alvin Weinberg had already used the term trans-science back in the early 1970s, but then it was as part of his cognitive strategy to uphold boundaries around real science. Trans-science was taken to refer to an arena outside science proper where science based knowledge is employed in the public arena for advice in decision making and policy (Weinberg, 1972).

The discussions in the 1990s by contrast, in the context of neo-liberal, market oriented thinking that replaced welfare state and social movement oriented thinking, gave a new twist to the idea of participation. Now it was meant to highlight research or knowledge production in the actual context of application, so-called Mode 2 (Gibbons et al., 1994) as distinct from research in an academic setting (Mode 1). The new discourse emphasised the crossing, not only of boundaries between disciplines, but perhaps more so, the move beyond disciplines. Thence transcendence or 'transdisciplinarity' becomes an appropriate term (Elzinga, 2004). There is also talk of a 'new social contract for science' (Lubchenko, 1997; Gibbons, 1999). We should be careful however not to exaggerate the differences vis-a-vis the late 1960s. Nor, for that matter, should it be compared with the struggle of engineering in the early part of the 20th century, to become a recognised university based mode of higher educational training (with its own academic doctor's hat) and knowledge production; even though user groups and practitioners of various types participated in its establishment. Often, when they are introduced, new terms have ideological connotations.

In political discourses on democracy terms like 'citizen participation' in community change and 'participatory democracy' appeared in the late 1960s. Among others they entered into the discussion of: technology assessment (TA); risk assessment; science and technology policy in the mid-1970s; and OECD reports, where 20 years later the concept of 'governance' was in vogue. David Dickson, writing in 1984, noted how in the U.S. there had been a struggle about who should define the substantive content of participation. A chapter in his book, The New Politics of

Science, is devoted to delineating the tensions between technocracy and democratic control (Dickson, 1984). The technocratic approach is based on the imposition of solutions to problems relating to the social impact of science through consensus by experts. Public participation might be encouraged, but only in the process of reaching consensus about solutions usually expressed in technical terms. This was the 'rational' top–down approach, ignoring questions regarding the basic political structures through which solutions were to be put into effect. In contrast, a bottom–up democratic approach stressed the importance of procedures as much as goals, arguing that the rationality of solutions offered by experts is often illusory, and the best protection against this is a form of participation that simultaneously calls for a redistribution of political powers as well as the insight of technical expertise. It was an approach that had developed under the influence of the environmental movement and the morass of the Vietnam War, whence grassroots democracy was revitalised.

By the late 1970s the surge of the protest movements had subsided and the technocratic approach dominated once more, partly refined so as to include 'participation' in processes where the economic, political and scientific elites controlled the structure of the decision making agenda, e.g. by deciding which kinds of public participation would be admitted at what stage, laying down boundary conditions for participation, and determining what kinds of arguments would be considered by decision makers. Thereby, the substantive content of participation was narrowed and skewed towards legitimating established power politics. The political challenge to the technocratic approach had been successfully contained and the meaning of participation transformed and tamed to fit the power elite. Part of the Mode 2 discussion that emerged in the 1990s fits well into this mould.

On a more critical note some scholars involved in research into public policy have introduced further terms, such as 'mandated science' (Salter, 1988) and 'regulatory science' (Jasanoff, 1990) that came into our vocabulary in the early 1990s. These terms derived from studies relating to the interaction of research and policy in the area of environmental protection. It was found that differences in institutional and cultural dimensions of knowledge production and validation were significant and had to be taken into account. Salter was looking at procedures and the setting of standards for acceptable toxic levels in the work place environment, or in neighbourhoods adjacent to pollution prone industrial enterprises. She argued that in mandated science, policy considerations are closely integrated at every step in the production and use of knowledge. Secondary activities, such as evaluation, screening and meta-analysis, play an important role in such research. There is a significant component of knowledge synthesis.

Jasanoff has been particularly concerned with comparison of different countries' ways of managing risk related to modern biotechnologies. She, among others, pointed out how 'research science' (as distinct from 'regulatory science') places greater value on papers published in journals for academic peers, while science conducted for policy is rarely innovative and may not be subject to peer review. In as far as prediction enters into the picture, the transdisciplinary researcher is often asked to assign an estimate of the risk attached to different options when it comes to policy decisions or measures. Reporting channels may often be reports to public

agencies or user groups. A characteristic of transdisciplinary research then, is that its results tend to have a dual audience – other researchers as well as practitioners and user groups in society at large.

Related terms that are still used today are post-normal science (Funtowicz and Ravetz, 1992; Chapter 23) and post-academic science (Ziman, 1996). The emphasis here is on the transcendance of academic disciplinary areas and the entry of external practitioner or user group participation in the validation of research results and their adaptation for implementation in policy and decision making in society at large. Thence we also have the terms 'extended peer communities' (Funtowicz and Ravetz, 1992) and 'regulatory peer review' (Jasanoff, 1990). The latter refers to peer review being imported into user oriented bureaucracies or agencies. The former involves entry of outside users into academic based societal relevance (and quality) review processes. Affiliated with these moves one can find new ideals of democracy in a knowledge society. Extended peer review refers to more and more groups being drawn into the process of evaluating the research results and reworking them, resulting in recommendations for political action to mitigate identified risks or threats (e.g. emission of greenhouse gases in global climate change scenarios). In this context experts' affiliation with one or other of the stakeholders (industry, groups of environmental activists, owners of forests, game hunters in an alpine forest area, etc.) may introduce a bias in the extended peer review process, something that may be compensated by consciously introducing a demand for transparency and articulation of different interests – in a word, 'reflexivity'.

The literature concerning the theory of participation identifies two main approaches: a liberal functionalist or pluralist one; and a theory of direct participation. The former emphasises group representation while the latter gives priority to individual citizen involvement as 'amateurs' who are supposed to become progressively more knowledgeable in the participation process. Both views, however, converge around a number of criteria, e.g. the participant should be independent, involved in the research process as early as possible, and be given resources to effectively influence decision making. There should be a clear task differentiation, structured decision making, transparency for all concerned and cost-effectiveness (Laird, 1993; Rowe and Frewer, 2000). However, greater clarity concerning these points is by itself not enough to induce a deeper reflexivity. For this we also need awareness of some basic structural and institutional dynamics of science-in-society.

As Peter Weingart (1999) has argued the two sides, science and politics, operate along different institutional codes or logics. The Mode 1/Mode 2 dichotomy fails to take this into account, and it tends to blur boundaries, losing sight of the paradoxical nature of the science–politics relationship. The greater the number of societal problems that become subject to scientification, the larger the number of areas in which science based controversies may figure, a process that is attended by a simultaneous diminishing of the authority of scientific expertise. Increased scientification under such circumstances, therefore, simultaneously leads to more, not less, politicisation. In order to sustain their authority, scientists, institutionally, tend to cling to the old linear model of 'truth speaks to power', while policy makers do the same by relying on existing advisory arrangements. Thus one gets an entrenchment of the traditional norms, values and perspectives, or 'logics' in both spheres, an

intricate dialectic of paradoxes that needs to be taken into account when calling for greater reflexivity.

22.4 A Constructivist View

A constructivist view of scientific knowledge production takes as its point of departure the fact that scientific models of issues such as climate change do not by themselves always produce final outputs of interest to policy users. Therefore, one wants to look more closely at the further process of judgement and evaluation whereby decoupled modelling is introduced in order to reach a final output that will serve as the input-advice in the policy making arena. The strength of user group participation in such settings makes a difference in the context of implementation. A further point is that observational data against which a model (e.g. climate model) is tested or validated are themselves not free from theoretical commitments and assumptions (Jasanoff and Wynne, 1998).

With the foregoing in mind I now turn to the project descriptions in this volume. A guiding idea in the Handbook is that there are three distinguishable phases in projects: (a) problem identification and structuring, (b) probing aspects of a problem, concept and hypothesis formation, and analysis (problem analysis), (c) implementation, whence results from a project are integrated in a real world setting (bringing results to fruition). The activities classed here in three different categories tend to mesh in actual research projects, but the division into three phases is a convenient analytical device. I will use this framework to structure the discussion of the projects. This should however not be confused with the structure of the handbook: I will discuss participation in (a)–(c) independently of whether a project appears in Part 1, 2 or 3 of the handbook. A look at the different project descriptions reveals that, more often than not, participation figures are more prominent in the first and third phases, while focus on internal interaction, or collaboration between members of different disciplinary tribes, is greater in the second phase. Of course, such interaction is also very important in the first phase in order to establish rapport and develop a shared understanding of the object of study. Thus Baccini and Oswald refer to the need for researchers from different disciplines to sort out their 'cultural differences' early, before a more sophisticated conceptual framework can be developed. A common language has to be developed.

22.5 Participation in Problem Identification and Structuring

In the science studies literature one finds similar observations, sometimes expressed in terms of establishing a suitable 'boundary object'. This may at first hinge on a metaphor that is later transformed into a bridging concept, such as the redefinition of what is meant by 'mobility' (Chapter 6). In the project on mobility in a model city, external participants, at the outset, were planners from two model cities. Interests of the urban population and local government were taken into account by defining the 'societal' or 'practitioner' problem, with their help. This project highlights that the identification

and definition of a societal problem are not enough. Such a problem may not be immediately amenable to research but has to be translated into a researchable problem or 'research problem'. This means that the problem must be conceptually transformed and incorporated into a scientific discourse where it stimulates researchers to play with different models. The transformed problem, i.e. the research problem, becomes the shared research object that forms the starting point. It is not essential that everyone concerned has exactly the same perception of the problem or leading concept. The role of the model as a boundary object is to be partly open, leaving room for interpretative flexibility, so that various researchers can meaningfully refer to it, have different disciplinary angles on it, but still collaborate around it. The model serves as an integrative object along the boundaries of different disciplines, socially and cognitively. It also permits the researchers to avoid monodisciplinary reductionism (a point emphasised in several of the project descriptions), i.e. the tendency to promote a single interpretation of a term or concept as the only correct one.

Schwaninger et al. deal with the societal problem of citizen behaviour relating to environmentally benign practices – solid waste separation in particular. Municipal authorities were consulted to obtain information regarding possible enabling and constraining effects of different types of incentive structures that were modelled with an eye to finding appropriate policy alternatives. An implementation feedback to the municipal authorities and other interested parties was envisaged, but in practice it apparently fell outside the scope of the project (Chapter 13).

Hubert et al. deal with developing a grazing menu for sheep and other livestock in the Mediterranean rangeland in southern France. Stakeholders include livestock farmers, foresters and local political and administrative authorities (Chapter 7).

The authors devote considerable attention to the process by which the societal problem became translated into a research problem. The farmers' knowledge, reflecting their daily lives, was tapped and systematised from various angles. Scientific concepts and tools were used to construct new 'objects' to constitute the problem qua eco-systemic research problem. The authors nicely trace the dialectical tacking motion from the immediately concrete farmers' perceptions and know-how to the scientifically reflected new 'objects' (in a new research discourse) and back again to the farming context, now with more appropriate suggestions for science based interventions. In a sense one sees here, without reduction, a rethinking of practitioner knowledge with the help of transdisciplinary research, focusing on the issue of a complex interconnected system of animal production and environmental maintenance. The farmers and shepherds thus have a central position in the partnership with researchers during the phases of issue identification, problem (re-)definition and structuring, influencing the setting of parameters for modelling a 'menu' for livestock meals. It is noted that modelling can also stimulate alternatives and probe further possibilities for change at a more general level.

In the climate change modelling project described by Held and Edenhofer (Chapter 12) the stakeholders are major global actors, governments, multinational corporations, global NGOs and especially the EC. This is primarily a project of analysis. A novel feature is its incorporation of future technological change as an endogenous factor in the analysis, and also the way conservationist and

non-conservationist values are factored into the modelling in terms of a maximum allowable threshold value of global mean surface temperature change in the future (2°C). Thus the potential user group input is indirect (virtual participation), in part matched by direct informal consultation with representatives of two German federal governmental ministries (economic and environment), German energy suppliers and Greenpeace, in order to iteratively obtain acceptable options. In this case, the threshold value of the global temperature is a boundary constraint in the selection of realistic but relevant options for policy – relevant in the sense that the aim is for political realism.

In the regional forest and wildlife management project (Chapter 20), stakeholders were brought together (27 stakeholders representing forest owners, hunters and game wardens, foresters, nature conservationists, road planners and tourist officers) at the outset and continued to play a role as partners in a collaborative inquiry to generate science based knowledge about herbivore impact on forest ecosystems. In this case the researchers not only assembled data and a variety of mental models, but also went on to mediate in a process of negotiation with an eye to resolving a conflict. The 'synthesis model' again served as a boundary object in which different stakeholders could identify some of their own interests and input and therefore develop a sense of ownership regarding the bridging model.

Another important element the authors point out is the development of trust between researchers and users as a precondition for enrolling participants and networking. It is an ingredient that also appears to be important in many of the other projects, for facilitating interaction among researchers, and between the researchers and stakeholders and user groups (e.g. Chapter 17 concerning nomadic communities).

22.6 Participation in Learning and Analysis

The core of the project described by Hindenlang et al. (Chapter 20) consisted of a dialogue amongst practitioners and between researchers and practitioners. The process as described compares well with what scholars of scientific controversies (controversy studies) have found out about the evolution and dynamics of a public controversy and its termination (Beauchamp, 1987; McMullin, 1987; also see Nelkin 1995, Martin and Richards, 1995). These scholars sometimes distinguish between epistemic (i.e. knowledge related) and non-epistemic factors in a controversy. The latter refer to personality traits of those involved, institutional pressures, political influences, stakeholder interest and the like. Whereas positivist approaches to controversies focus on agreement reached on the basis of rational discussion and argument, regarding all non-epistemic factors as irrational 'noise', constructivist studies of controversies indicate that such rational termination of conflicts may never be reached, but that 'closure' of a controversy may still occur. When this happens it may be due to external intervention by courts or the adoption of procedural rules.

However, there is also 'negotiation closure' – settlement by intentionally arranged and morally unobjectionable resolution – acceptable to the principals in the controversy even if no party's ideal is reached. In participation theory the method is referred to as 'negotiated rule making' (Fiorino, 1990; Laird, 1993). In the case described by Hindenlang et al. researchers contributed to such a process by obtaining factual information, doing conceptual analysis, developing a common framework of principles, exposing inadequacies and unexpected consequences of various courses of action, raising examples and counter-examples to arrive at a set of acceptable measurable indicators to be used in forest and wildlife management.

The project described by Schelling et al. (Chapter 17) involves a broad range of stakeholder interests at various levels: local, regional, national and international. Stakeholders in Chad were continually consulted as resource persons in scientific studies devoted to developing health indicators and designing a single united human and veterinary medical and health delivery system. The cultural dimension is prominent, since treatment seeking behaviour on the part of nomadic men, women and families were found to be 'strongly influenced by cultural norms'. Thus socio-geographical surveys of ecological, economic and political dimensions of user groups' livelihoods were important. But user groups also had direct input into data and concept formation: interviewees alerted researchers that a vaccine used against anthrax was contaminated. The laboratory examination confirmed the concerns of the livestock owners. Here local knowledge was important for setting researchers on the right track. Participation implied a certain degree of empowerment of the nomadic communities involved.

Walter et al. (Chapter 14) describe a project that applies an interesting methodology for systematic interaction between researchers and stakeholder groups in all three phases. The importance of structure is emphasised as a precondition for flexibility. A significant anchor for participation is the project's co-constitution as a joint academic & cantonal authority endeavour – there was a co-determination of ownership of the problem from the outset. The links between a series of research groups focusing on an analytically differentiated set of facets on the one hand, and stakeholder groups involved in different sectors (e.g. agriculture, silviculture, textile industry, and regional political or administrative activities) on the other hand, allowed for continual reciprocity and a mutual learning curve on both sides. This mode of organising interaction provides a stable socio-epistemological baseline for deconstructing the societal problem analytically into different facets that may thereafter be reconfigured in a model to suggest various scenarios for landscape transformation.

The systemic model that evolved evidently served as a boundary object between the researchers and stakeholder groups, facilitating scenario construction of interest to both sides – users being encouraged to provide not only input for validation purposes but also, when needed, to reconfigure their own thinking about the problem prior to the implementation phase. One interesting outcome mentioned is a political decision relating to the future of tourism.

Rip's Chapter 9 contains a programme declaration for social science supported technology assessment focusing on nanotechnology. It is guided by a recognition of the societal mismatch whereby in practice the bulk of material and cultural resources

mostly appear on the side of technology drivers, while exercises in anticipatory intelligence on the part of citizens who will be impacted (as potential beneficiaries and/or victims) by new and emerging technologies is minimal or sometimes non-existent. A summary review of Foresight practices as well as Technology Assessment readily confirms the situation that Rip and his colleagues seek to overcome with their programme for Constructive Technology Assessment (CTA). Their approach is one that is organised around citizen participation in conjunction with a social science based understanding of the dynamics and potential impacts of science and technology.

One of the practical goals of Rip's programme is to use CTA expertise to offer nanoscientists and technologists – as well as other actors, including NGOs – a 'support system' for reflection and strategy articulation. The chapter thus homes in on the important question of 'reflexivity' and on clarifying and counteracting the structural bias whereby actors constantly project linear futures defined by their own intentions and – one might add – tunnel vision (compare Weingart's point above). In the programme, CTA projects relating to technological trajectories are overlayed with studies of cross-cutting aspects like risks, images, ethics and governance, in other words a combination of technical, social, political and cultural aspects or dimensions. Workshops involving researchers and stakeholders of various categories will be used to consider socio-technical scenarios of possible futures to stimulate multi-actor deliberations and mutual learning. The implementation phase still lies ahead. It will be interesting to see what comes out of it; considering the elusively futuristic and abstruse character of the impact of nanotechnology, a new technology that seems to present exceptionally tricky challenges for 'participation', requiring, for example, recognition and identification of sources of nanotoxicity (Royal Society and The Royal Academy of Engineering, 2004; Service, 2005).

22.7 Participation in the Implementation Phase

Having hitherto concentrated on the first two phases of the projects reviewed, let me now come back to the role of participation in the implementation phase. As already indicated this aspect is more pronounced when the goal is to develop a forest and wildlife management strategy (Chapter 20) or community based action involving barefoot veterinaries and midwives in nomadic communities without immediate access to village based infrastructures for health and veterinary services (Chapter 17) In the latter case (four) national stakeholder workshops helped articulate community demands and prepare the way for new types of medical and veterinary extension services. In the former, communication and negotiation-interaction formed part of a series of (10 one-day) meetings that gradually led to the shaping of a management tool. Two evaluations helped trim the process and give it public visibility. Researchers in both cases reported their findings and experiences in scientific journals, as well as in reports to government and practitioners.

In the climate modelling case (Chapter 12) members of the public at large were not included in the participation process. Information on the options was primarily

aimed at influencing established opinion leaders in economic and environmental spheres, with an eye to influencing current debates for the future of the Kyoto process, especially via the European Commission, a key actor on the global arena.

The CITY: *mobil* project (Chapter 6) seems to have ended up in an intermediate position. Discussion of the ecology of transportation and traffic genesis analysis using cost-benefit scenarios was highly relevant and interesting to scientific peers. At the same time a condensed outcome was fed back to societal practitioners in the form of a guide or handbook – a catalogue of strategic measures. It was hoped that practitioners would feel inclined to use these measures as instruments to help clarify policy options for decreasing the numbers of cars, improving the performance of the public transport system, promoting cycling, and in developing new planning tools for connecting the city's transportation planning and budget planning. Success here ultimately depends on the city authorities' ability to overcome barriers that maintain and continually reinforce the culture of sectoral differentiation of key functions and responsibilities in a city. To be effective in this situation transdisciplinarity has to allow trans-sectoral cooperation and integration by the users and official participating partners. With its primary focus on the development of a knowledge base for a new approach to urban mobility, enrolment of external partners to the cause seems to have become a secondary consideration.

22.8 The Need to Problematise the Concept of Participation and Introduce 'Reflexivity'

Members of the public and users may be invited to participate in research and deliberation for many reasons: to begin a process of cultural and institutional change; to observe and collect data; to complement expertise; to make or implement decisions; to attempt to 'educate' citizens about science; to gauge public opinion for the purpose of market research; to overcome public mistrust, stifle objections or defuse critique (for a review of some of the functions of public participation or engagement with science and technology, see Irwin, 1995, 2001, 2004; Sclove, 1998 emphasises the democratic imperative).

In order to dig deeper it is useful to take up a theme that is very much at the heart of participation, viz., 'public understanding of science' (PUS), a subject that has received much attention by science studies scholars during the past 20 years. In this literature it is now stated as common knowledge that the traditional mode of PUS is a science centred one. Therefore, it is referred to as the deficit model, and highlights its concern with scientific illiteracy and knowledge gaps on the part of the public. Since communication is not seen as a question of dialogue but rather as a uni-directional flow where scientists speak to the public, it is also called the linear model of science information (as distinct from an interactive model involving two-way communication). In such an idiom researchers are assumed to be the possessors of rational and expert knowledge. Participation then becomes a matter of the public, or practitioners, receiving and appreciating scientific knowledge in their

daily concerns. If there is any problem it is perceived as the participants' misunderstanding and use of technical knowledge. Thus 'public', 'society', 'practitioner', or 'user' tends to be problematised while science is taken at face value. In the minds of scientists, users are seen as passive receivers of their goods.

In the wake of scientific controversies and a fear of science's loss of authority in society there emerged an interest in moving to a more interactive model of communication with the public (Levidow and Marris, 2001; symptomatic of this move is a recent EC journal special thematic issue on 'science dialogues' – European Commission, 2005). Research in STS since about the mid-1980s has contributed to this trend by helping to turn the question around, signalling the need to investigate how people actually define and experience 'science'. It has been found that, in the cultural appropriation of scientific concepts and new technologies, different meanings are attached to scientific information, since citizens or users differ in the way they incorporate science into their everyday life-worlds. Attention has also been directed to the way in which particular scientific constructions disseminated to the public incorporate closed models of social relationships. These reflect dominant power relationships in society at large and therefore should be subject to critical scrutiny and negotiation on the part of the receiver (Wynne, 1995). A constructivist perspective on PUS and the science-policy interface thus seeks to problematise science as well as the public and users (see Jasanoff and Wynne, 1998 for detailed review).

Furthermore, it has been found that researchers tend to view 'users' or layperson participants in science and technology in ways that help sustain the privileged position of the expert, protecting them from public scrutiny of the way commitments, rules of inference or methods of standardisation may contain a structural bias. Certain stakeholders are privileged, particularly those who possess material and cultural resources to act and change conditions in society. This question has been discussed, in the case of genetically modified foods (GM-food), in connection with the use of focus groups and layperson participation in deliberations regarding different policy options. Results from interviews may reflect what the researchers imagine the participants (the laypersons, consumers, environmental activists) believe rather than the participants' actual feelings. (Callon, 1999; Nowotny et al., 2001; Maranta et al., 2003). Focus groups and workshops moreover involve a process of collaborative learning whereby laypersons may appropriate the technically oriented, expert centred perspective of the researcher, leading to engagement in the latter's strategy. When outcomes from such consensus seeking consultative exercises contradict the interests of strong economic lobbies and political elites, the government may still decide to ignore the advice, as happened in the GM nation debate in the UK when the public refused to believe in the benefits of GM food technology (see European Commission, 2005, p. 25 in an article under the heading 'Two-way communication', an interview with Steve Miller at University College London).

The foregoing suggests that the conflict in the 1970s between the approaches of technocracy and democratic control is being replayed in new ways. In a strategy of containment of public dissent the word 'participation' takes on a patronising meaning. Its rhetoric hides the technocratic approach while steering clear of the alternative, the 'democratic control' approach as outlined by Dickson (1984, see

above). Levidow and Marris (2001), in particular, have noted how the language of participation is mobilised to refurbish the old linear model, shifting the construal of the public as 'ignorant' to one of the public as 'distrustful'. Instead of disseminating information to overcome ignorance it is now a matter of defusing discontent. If the aim really is to 'relegitimise decision-making, government will need to 'unlearn' many institutional assumptions and to redefine the problem at stake. Rather than seeking ways to change the public, it is necessary to change the institutions responsible for promoting innovation and regulating risks. In particular they need to change their preconceptions of science, technology and public concerns. In such a process, public concerns offer a useful starting point and social resource for organisational learning' (Levidow and Marris, 2001, p. 357). Here we are back to what Dickson was talking about more than 20 years ago.

22.9 Who is Empowered by Participation?

The question in the subheading is a double one (Elzinga, 2000). Firstly, it is important to distinguish between effective participation and symbolic or token participation. The former leads to empowerment while the latter involves would-be participants going through the motions of being consulted without really having any bearing on the problem definition, analysis, or ultimate implementation of the results. Laypersons, or NGOs representing them, may also enter researchers' (simulation) models as virtual participants who determine boundary conditions, in which case they do make a difference. At other times they figure as imaginary 'users' in the minds of researchers when the latter discuss user consultations. Secondly, there is the question of who gets invited to participate and who simply gets left out. What criteria are used to define and target user groups as relevant participants, and who does the defining and targeting? Who gets empowered by transdisciplinary research and, the other side of the same coin, who gets marginalised?

Unfortunately, most of the project descriptions lack a degree of reflexivity; they do not provide sufficient information on this particular aspect of participation processes to warrant a cross-referential discussion. Baccini and Oswald implicitly touch upon the subject when they refer to 'generating cooperative majorities for shared target qualities' (Chapter 5) using participatory workshops. The question that arises is how do these 'cooperative majorities' differ from non-cooperative groups. Do they have specific stakes and do they possess superior material and cultural resources to make them worthy of inclusion while more marginal groups are excluded?

The issue of inclusion/exclusion mechanisms in participatory processes has captured the attention of philosophers, historians, sociologists and political scientists who point to a trend associated with globalisation. It is a trend where local governance and choice available to actors at the microlevel in local arenas, concern arrays of options that are predetermined by forces and structures beyond their control. A sense of individual participation is cultivated in a culture of individualism, with promises of radical freedom of self constitution of one's appearance, one's body, lifestyle, or local affairs, while decisive decisions concerning one's livelihood are

made in centres where elites concentrate their power. The possibility of radically changing one's own situation and life condition presupposes access to material and cultural resources that many people do not possess. As Zygmunt Bauman (2001) argues, it may well be that we are living in an increasingly polarised society, where some have an opportunity to practice meaningful freedoms and some do not; new mechanisms of inclusion and exclusion prevail when it comes to defining who is a relevant participant and who is not.

22.10 Conclusion

In this chapter project descriptions have been used to highlight salient features of the notion of participation. This has been done by looking at the historical context in which the discussion of interdisciplinarity began in the late 1960s and early 1970s. Twenty-five years later this became transdisciplinarity. It is noted that participation enters into transdisciplinary research projects in varying degrees, depending on the focus and goals of each project, and on the particular phase one looks at.

Apart from some general lessons for improving dialogue – the building of mutual trust, commitment, clear delimitation of expected tasks, transparency, and reflexivity – there are also project-specific features that are contingent on the context: the way a project is initiated, who the stakeholders are and what roles they (can) play. A distinction may also be made between real physical and virtual participation of external users or practitioners. A further distinction is made between effective and token or symbolic participation. We are asked to be more sensitive to power relations that prevail in transdisciplinary endeavours, taking into account skews in material and cultural resources available to different actors.

By asking who gets empowered, and what potential users get left out, we plead for a greater degree of reflexivity and at the same time point to a problem that calls for further deliberation, research and innovative social experimentation.

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