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PEST or Panacea? Science, Democracy, and the Promise of Public Participation

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Abstract: This paper explores what is entailed by the emerging UK consensus on the need for increased public engagement in science and technology, or PEST as we call it. Common to otherwise incompatible instrumental and de-ontological arguments for PEST is an associated claim that increased public engagement will also somehow make for 'better' science and science-based policy. We distinguish two different ways in which PEST might make such a substantive contribution, which we term 'normative steering' and 'epistemic checking'. Achieving those different aims involves engaging with different publics in different ways to different ends. Accordingly, we review a number of recent experiments in PEST to assess the practical challenges in delivering on its various substantive promises. The paper concludes with some wider reflections on whether public engagement *in science* is actually the best way of resolving the democratic dilemmas to which PEST is addressed.

In our technological age, the sciences occupy an increasingly contested and contradictory position in politics and policy. Whether it is cancer or climate change, the sciences are absolutely central to many of the signature problems of our time. In the case of stratospheric ozone depletion, to take just one example, science is at once the means for knowing there is a problem at all and the source of potential solutions to it. At the same time, however, science, in the form of CFCs, is also the ultimate cause of the problem in the first place. Ulrich Beck is far from alone in detecting something of a paradox here. In the face of global environmental changes that seem to make them

"more and more necessary," the sciences are "at the same time, less and less sufficient for the socially binding definition of truth" (Beck, 1992b: 156).

Beck sees this dilemma as a defining feature of an emergent risk society marked by far-reaching reflexivity and public debate. It is a dilemma that is keenly felt in the UK. In the wake of the BSE scandal, policy makers are no longer as confident in the ability of sound science alone to adjudicate between competing calls to action. From natural resource management to medicine, public engagement has become something of a mantra across a wide sweep of policy fields that were once the exclusive preserve of scientific experts. Echoing the recommendations of the House of Lords (2000) report on Science and Society, no less of a figure than Tony Blair (2002) insisted on the need for "a robust engaging dialogue with the public" in his speech to the Royal Society.

It would be easy to dismiss this embrace of dialogue as empty rhetoric. Indeed, in that very same speech, Blair (2002) warned of anti-GM "protestors and pressure groups who used emotion to drive out reason". Nevertheless there has been an unmistakable shift in the science policy culture in the UK. There was the *GM Nation?* public consultation, for example or the millions of pounds committed in the HM Treasury's Science and Innovation Framework (2004: para 7.21) "to build the capacity of citizens, the science community and policy makers to engage in the dialogue necessary to establish and maintain public confidence … in science and technology."

In this paper we want to think through just what might be involved in such calls for public engagement in science and technology, or PEST as we will call it. This rhetoric of participation, dialogue, and engagement is now ubiquitous across a variety of policy fields. For instance 'Together We Can' is "the [UK] government's action plan to get citizens and public bodies working together to make life better" (CLG, 2005). Launched in 2005 by the Department for Communities and Local Government[1] , its language of "people and government working together" is very similar to the sort of talk you hear from PEST proponents. But traditionally at least, we have tended to think about science

[1] Since rebranded as simply 'Communities and Local Government', as if the state-civil society divide could be overcome with a swish new logo and letter-headed stationery.

as something to which ordinary people are not qualified to contribute, unlike say neighborhood policing or local government, where there is a right, or even a duty, to do so.

Thus, we begin by first asking why, in the case of science in particular, we might want to see more public participation. As we will show there are number of quite distinct, and often incommensurable, rationales for PEST, ranging from the instrumental to the de-ontological. One point of common ground among otherwise antithetical rationales for PEST is the widespread but often vaguely formulated claim that public participation somehow makes for 'better' science and science-based policy. In the second part of the paper, we go on to clarify what those substantive contributions might be. While duly acknowledging both the slipperiness of the distinction and the hostility of many PEST advocates to it, we nevertheless identify in rationalizations of PEST two broad kinds of substantive contribution of public participation to science and science-based policy-- normative and epistemic. Drawing on a variety of concrete examples, we then identify various problems with PEST actually delivering on those substantive contributions. Finally we close by asking whether public engagement *in science* is the best way of resolving the decision-making dilemma identified by Beck.

Why Encourage Public Engagement in Science & Technology?

One reason for the widespread embrace of PEST by social and political theorists (e.g. Fischer 2000), public interest groups (Wilsdon and Wilson 2004), scientists (Rees 2006), and policymakers (DIUS 2008b) to name just of few, is that PEST promises different things to these different audiences. The diversity of its appeals is not necessarily a function of bad faith or misrepresentation. Both as a body of practice and as a democratic and policy-making ideal, PEST is clearly diverse. Recent years have witnessed an explosion in experiments with different forms of public participation in science and science-based policy, designed with often quite different purposes in mind. There is now a rapidly growing body of research offering technical evaluations of the fitness of PEST designs for such different purposes (e.g. Rowe and Frewer 2004; Chilvers

2009). While recognizing the importance of such work, our purpose here is simply to articulate the different rationales for PEST

There are a number of distinct reasons for the current enthusiasm for increasing public participation in and engagement with science. For example, in the face of India's emerging Biotech industry, the UK government is very concerned about falling enrollments in science subjects. With India and China churning out so many more science graduates each year, how is Britain to compete in the global knowledge economy? In that policy context, the concern with public participation in science is partly about producing scientific labour to feed innovation and thus national competitiveness (eg. DIUS 2008a).

There is another, slightly different way in which more public participation is needed to fuel scientific progress. Drug trials depend on people volunteering to participate in experimental research. Beyond the lurid headlines about "Human Guinea Pigs" (**figure 1**) lurks a serious point about what Nikolas Rose (2006) has called "biological citizenship". Delivering on the promises of genomic medicine depends on the participation of human subjects willing to offer themselves up as objects of medical research (Morris and Balmer 2006). Historically, such volunteers have tended to be disproportionately white, middle class people, often university students, whose healthy bodies make them ideal for Type 1 clinical trials. Further improvements in medical research and thus health care depend on securing participation from a more diverse and demographically representative sample of the population (Boynton et al. 2004).

While the biomedical industry is enjoining a biological citizenry to volunteer their bodies for clinical research (Holden and Demeritt 2008), much of the current vogue for PEST hankers after something more than just your flesh, or even your heart. Its aim is your assent as a citizen. The recent Innovation Nation white paper identifies "public acceptance of science and technology" as an obstacle that "had negatively affected the UK competitive position" (DIUS 2008a: 92).

Both in policy discourse and in social theory there is an emerging sense that science now depends on the public for what many are calling its "license to practice"

(e.g. House of Lords, 2000: para 5.2; Klug 2001). Securing that license is the aim for many PEST efforts. According to the UK government's Council for Science and Technology (CST 2005: para 11), public engagement offers "a more efficient means of developing broadly acceptable policies for issues where the problem of public consent is real, and which cannot readily be sidestepped by a quick fix or political sleight of hand". It should be clear what a departure this marks from the closed and technocratic traditions of science-based policymaking in which public opposition was attributed to public ignorance and a deficit of scientific knowledge (Wynne 1995; Sturgis and Allum 2004). The CST (2005: para 6) now acknowledges that "public concerns can rarely be reduced simply to scientific issues".

In this context, dialogue and public engagement are imagined as ways of building trust in and consensus about science and technology. As Alan Irwin (2006) has observed, there is an important tension within official talk about public engagement. The CST report (2005: para 7), for instance, now acknowledges the diversity of public concerns about science, but insists that dialogue must "engage with people who have no strong pre-existing interest" rather than "special interest groups" with well developed and opposing views. There is little acknowledgement here either of how deeply entrenched views can be or how public dialogue might "create further grounds for criticism and concern" (Irwin 2006: 306) rather than political consensus. Instead, dialogue is naively conceived as a mechanism for "increasing … public acceptance of specific policy decisions" (CST 2005, para 15). Rather than altering the trajectory of scientific development, dialogue is a way for realizing it, by closing down, rather than opening up, political debate.

Of course that is not always the case, and it is important to avoid caricaturing what is still quite a fluid policy discourse. For instance, the Horizon Scanning Centre and Foresight Programmes within the Government's Office of Science and Innovation are precisely about anticipating and opening up public debate at an early stage in the scientific and regulatory process. Thus the Horizon Scanning Centre recently commissioned a report entitled, 'Robo-rights: Utopian dream or rise of the machines?' examining the social and ethical implications of developments in artificial intelligence (Ispsos-Mori, 2006). It recommended kick-starting

public debate about whether intelligent robots might merit rights or legal standing, prompting a somewhat derisive piece in the *Guardian* (Randerson 2007).

The concern of the Horizon Scanning Centre with opening up public debate is probably not the dominant one, at least in policy circles. The more instrumental vision of PEST comes through very clearly in Tony Blair's 2002 speech to the Royal Society. Having acknowledged the need for "openness, transparency, and honesty" about science and scientific uncertainty, he goes on to explain:

> The fundamental distinction is between a process where science tells us the facts and we make a judgement; and a process where a priori judgements effectively constrain scientific research. (Blair, 2002)

In this context, it should be clear that the call for "robust and engaging dialogue with the public" is more about governing the public and "re-establish[ing] trust and confidence" than it is about governing science (Blair, 2002).

So if one rationale for public engagement is instrumental, a second is de-ontological. For many academic theorists, public participation fulfills a fundamental democratic imperative (eg Dryzek, 2000; Fischer 2000) . As the Royal Commission on Environmental Pollution (RCEP 1998: 102) put it, "Those directly affected by an environmental matter should always have an accepted right to make their views known before a decision is taken."

But that principled argument for engagement has caught ministers' ears because it is associated with a third, more practical rationale. Indeed, as the RCEP (1998: 102) goes on to say in the very next sentence:

> Giving them [the public] that opportunity [to participate] is also likely to improve the quality of decisions; drawing on a wider pool of knowledge and understanding (lay as well as professional) can give warning of obstacles which, unless removed or avoided, would impede effective implementation of a particular decision.

The RCEP is far from alone in eliding de-ontological arguments for participation with instrumental and substantive ones about 'better decisions'. In advocating deliberative and inclusive processes of technology assessment, Jacquie Burgess and Jason Chilvers (2006: 718) recently argued that they also promise "more robust decisions", while Fischer (2003) points

to the substantive contributions of public participation in opening up the narrow technical rationality of expert issue framings to the wider "socio-cultural rationality" of the public. In a somewhat similar vein, Funtowicz and Ravetz (1993) argue that extended peer review, involving stakeholders as well as scientists in "the evaluation of the scientific inputs to decision making" (740), promises not only to "democratize science" (739) but also improve its "quality", which in our post-normal time now "depends on the participation of people other than the technically qualified researchers" (744). We'll return to this vision of science as fundamentally undemocratic at the end of our paper. But first we to unpack how public participation might be said to improve the quality of science and science-based policy

What does PEST contribute to science and science-based policy?

There is a fundamental ambiguity to many of the claims about the substantive contributions of public participation made by PEST enthusiasts. Put all too simplistically, the issue is whether public participation promises to make an epistemic, factual contribution to science and science-based policy or whether its purpose is to provide the political values to steer their development. Arguably this is much too stark a distinction. Much of the impetus for increasing public participation in risk assessment and other science-based policy comes from the realization of just how difficult it is to distinguish scientific assessment of the facts alone from the political questions of which facts matter and what to do about them. PEST represents something of an official recognition of the arguments of science studies scholars. They have argued that even in the 'hardest' reaches of basic science, methods of testing, standards of proof, and ideas of experimental control embody tacit and value-laden assumptions about society and its norms, preferences, and tolerability of risk (e.g Wynne 1996; Irwin 1995). But proponents of PEST have not always been especially clear about whether its contributions to addressing that difficulty lie in clarifying and then assessing the values of science and science-based policy or aiding in the substantive discovery of new information, or both.

To explore this ambiguity, we want to return for a moment to Ulrich Beck. As we have already noted, this ambiguity exists in the claims of many other PEST proponents, but we

focus here on Beck in particular, both because his theory of reflexive modernization is influential in its own right and because it starkly illustrates the wider ambiguity about the contributions of PEST. Beck (1992a: 119) writes:

> The public sphere, in co-operation with a kind of 'public science' would be charged as a second centre of 'discursive checking' of scientific laboratory results.

While superficially attractive, this vision of public engagement begs some important questions. What kind of "'discursive checking' does Beck hope the public will perform in his "upper house"?

There are two quite different ways of reading this vision of 'discursive checking', which Demeritt (2006) has called $Beck_1$ and $Beck_2$.

PEST as normative steering

Let us deal first with $Beck_2$. In $Beck_2$, the public upper house fulfills a largely normative function (**Figure 2**). Its job, according to Beck (1992a: 199), is to apply the normative "standard 'How do we wish to live?' to scientific plans." In this role, the public or political sphere is responsible for regulating the techno-scientific innovation undertaken in the lower house of science. For instance, the 1948 Nuremberg Code (GPO, 1949) formally established the "voluntary consent of the human subject" as the first and "essential" principle of clinical research on human subjects. The $Beck_2$ vision of PEST as normative steering depends on already established distinctions between the scientific work of discovery and the political work of agreeing on the values to regulate the development and application of that knowledge. Conventionally this normative steering has come after the fact (**Figure 2a**), in the form of restrictions on the socially acceptable use of technology, but increasingly there are calls for 'upstream' public engagement in science itself (**Figure 2b**).

Upstream public engagement was popularized in an influential pamphlet from the London think-tank Demos, (Wildson and Willis, 2004). It called for engagement with the public to be moved 'upstream' into the heart of the scientific research process where research agendas can be shaped and steered, rather than , as has been more typical of

'downstream' public consultations, waiting until after the invention of new technologies before worrying about how to regulate them. Although the folks at Demos make some noises about upstream engagement making an epistemic contribution to science by helping to clarify "the values, visions and assumptions that usually lie hidden [i]n the theatre of science and technology" (Wilsdon and Wilson 2004: 24), this is largely rhetorical flourish. What they are much more concerned with is involving the public in the governance of science. Their vision for public participation is normative, not epistemic. It is about steering the direction science goes and deciding what goods science should serve, not judging good science or the truth of its epistemic claims.

PEST as normative steering does not dissolve the distinctions between science and politics. Rather upstream engagement helps make the institutional boundaries between them more porous while at the same time preserving the epistemic distinction between facts and values. This is a reformist, rather than a radical agenda, and it is one that is already coming to fruition, in the form of ethical review by research ethics committees (Dyer 2004; Dyer and Demeritt 2009), various 'nanodialogues' (Macnaghten et al. 2005; Rogers-Hayden and Pidgeon 2007) and other participatory technology assessments (Burgess and Chilvers 2006), and public involvement in priority setting for health research (NICE 2008; NRC 1998), to name just a few. As part of its 10-year strategy for science and innovation, the UK government is now committed to "enabl[ing] debate to take place 'upstream' in the scientific and technological development process, and not 'downstream' where technologies are waiting to be exploited but may be held back by public scepticism brought about through poor engagement and dialogue on issues of concern" (HM Treasury 2004: 105). Insofar as the promise here is that PEST as normative steering ultimately makes for more publicly acceptable science, claims about its substantive contributions to improving the quality of science and science-based policy are not too different from the instrumental rationale for PEST popular with ministers.[2]

[2] Indeed a number of critics have complained that PEST's emancipatory potential to open up the governance of science has been lost in its predominant translation to policy as an instrument for managing public responses to technology (Irwin 2006; Macnaghten et al. 2005).

Two problems, at once of principle and of practice, plague the ideal of PEST as normative steering. The first is about democratic accountability and authorization. How can the public license the decisions taken by PEST participants acting in its name but, unlike elected officials, not directly accountable to it through the ballot box? In its response to the CST (2005) report, the UK government enthusiastically endorsed the CST recommendation that the purpose of public dialogues on science "is not to determine but to inform policy… Government must retain responsibility for decision-making." In practice, however, the institutional imperative for PEST is often precisely to create enough distance between elected officials and controversial regulatory decisions to allow for blame avoidance and political deniability.

Take research with so-called chimera, or hybridized human-animal, embryos, for example. Citing public concerns raised during initial public consultations, the government's White Paper *Review of Human Fertilisation and Embryology Act* (DoH 2006) proposed to ban such research, prompting a storm of protest from patient groups and scientists (House of Commons 2007). The ink on the White Paper was barely dry before the Human Fertilization and Embryology Authority (HFEA), the government body responsible under the 1990 Human Fertilisation and Embryology Act for regulating such research, received two applications for licenses to conduct cytoplasmic hybrid embryo research. HFEA (2007a) responded by launching its own public consultation exercise "on the ethical and social implications of creating human/animal embryos in research". The HFEA consultation revisited the very same question of "whether the law should permit the creation of human-animal hybrid or chimera embryos for research purposes" discussed previously in the consultations over the government's White Paper (DoH 2005: para 9.35), which, against the advice offered by the HFEA (2005), had proposed outlawing such research. But the HFEA's eight lay and six professional members took a different view. In October 2007 HFEA (2007b) decided to allow such research and cited the results of its own public consultation as part of the justification for its "decision of how the HFEA should approach the licensing of human - animal hybrids and chimera research [which] is so novel in legal, scientific and ethical terms." Parliament,

meanwhile, was still debating revisions to the draft bill, which only received royal assent in November 2008, prompting a further round of consultation over its regulatory implementation, including modifications to the procedures for and scope of HFEA licencing of chimera embryo research (DoH 2009). Rather than confronting this problem of political accountability, PEST can serve to exacerbate it by adding a new layer of unelected and therefore unaccountable representatives from the lay public to already unelected and weakly accountable regulatory bodies like the HFEA. Indeed, as Rothstein (2007) notes, it is precisely among such unelected and weakly accountable arms of the regulatory state where the uptake of PEST has been greatest.

The second closely related problem with PEST as normative steering is about representation. How should PEST participants be chosen to ensure that their normative judgments reflect those of the wider public they serve and represent? (Brown 2006). It is difficult to scale up from small scale deliberative fora, such as the dozen discussion groups whose 104 participants were recruited (by market researchers) on behalf of the HFEA to deliberate on chimera embryo research, to larger scale national decisions about whether and how to license such research. One of the criticisms often made about the *GM Nation?* public consultations was that participants were not representative, either demographically or in terms of their hostility towards GM, of the public at large (Rowe et al, 2005). One persistent complaint about PEST exercises is that they fail to represent the views of the 'silent majority' (Irwin 2006; Rothstein 2007). This was echoed in the recommendation of the CST (2005, para 13) that PEST exercises should seek "to engage with people who have no strong pre-existing interest in the area and so … avoid capture by any special interest groups".

There is a particular model of the public at work here in these visions of PEST as normative steering. The general public is imagined as a disinterested public, very different from stakeholders with interests in specific areas of science and science-based policy. That experience makes stakeholders both knowledgeable about and concerned with the issues at hand. The general public, by contrast, lacks those interests and is thus

disinterested in this double sense both of ignorant and indifferent. As Lezauan and Soneryd (2007: 294) note:

> the unengaged, the quiet citizens, are the most *useful* of publics, because they are the one authoritative source of representative opinions, and the only constituency weightless enough to be moved by the kinds of consultation exercises and deliberative process that governments and their consultants dream up.

One increasingly common way that the UK government has sought to engage with and represent this disinterested general public in science and science-based policy is through broadening the membership of expert committees to include so-called lay members. Government advisory bodies as diverse as Defra's Advisory Committee for Hazardous Substances, the Residential Property Tribunal Service, Judicial Appointments Commission, the parole boards for England and Wales and for Scotland, and the Department of Health's Advisory Committee on Clinical Excellence Awards, now all now include members appointed specifically to serve as 'lay members', rather than as technical experts or representatives of particular stakeholder or professional groups. This proliferation has often proceeded without much explicit justification (House of Commons 2001). The *Phillips Inquiry into BSE* (Phillips et al 2000: vol 1, para 1290), recommended that "A lay member can play a valuable role on an expert committee". This line was quoted approvingly by the Government in its official response to Phillips (DEFRA, 2001: finding 138) and in the *Code of Practice for Scientific Advisory Committees* (OST, 2001: fn4, p3), which was formulated at its specific recommendation. None of these reports, however, specifies exactly what that 'valuable role' is or how it might be best achieved.

This idea of lay membership is most advanced in medical science and health care. Recent research into the Research Ethics Committees (RECs) charged with approving all clinical research conducted in the NHS points to the institutional obstacles lay members face in making meaningful contributions to the deliberations of such expert bodies (Dyer 2006).[3] The Department of Health's Governance Arrangements for

[3] The following discussion of RECs is based on the study of Dyer (2006), which was conducted between May 2002 and February 2004 and involved a survey of all 218 Local RECs operating in the NHS at the time and a subsequent an in-depth phase of observing the deliberations of 19 different committees followed

NHS Research Ethics Committees (GAfRAC, 2001: para 6.7) now require at least one third of the membership of all RECs to be "lay members", who "must be persons who are not, and never have been, either health or social care professionals, and who have never been involved in carrying out research involving human participants, their tissue or data". Despite all that detail, the GAfRAC (2001) fails to specify any particular roles or contributions to be made by such lay members, unlike those of expert members who "shall be chosen to ensure that the REC has the following expertise" including statistics, pharmacology, clinical practice, and research methodology (para 6.4).

Without any official guidance on this point, REC members offered three broad rationales for lay participation when interviewed. First, there was the idea that lay members are representatives of their local community. However, the GAfRAC (2001: para 6.8) stipulates that REC members, "despite being drawn from groups identified with particular interests or responsibilities in connection with health and social care issues", are not supposed to serve "in any way [as] the representatives of those groups." This idea of lay members as community representatives was further undermined by other problems of democratic representation and accountability. Lay members were selected by the committee itself from applications solicited "through public advertisement in the press and/or… via local professional and other networks" (GAfRAC, 2001: para 5.3), rather than through some process that would enable local communities to hold RECs or their lay members accountable for decisions taken on their behalf. Survey evidence showed that serving lay members also failed to be demographically representative of their local communities. Relative to the population at large, lay members were disproportionately old, white, and middle class. The 'open' recruitment process had been introduced as a means of extending the lay membership beyond consultant wives and hospital chaplains. However, given the time and other demands made on members--the ability and time to read the hundreds of pages of research protocols, application forms, and other paperwork that RECs pour over at their monthly

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by 49 interviews with committee members to discuss the ethical review process and substance of committee deliberations.

meetings, which often last hours during the working day-- it should come as no surprise that the typical lay member remains a civically minded retired professional.

The second rationale for lay membership was the idea that lay members could serve as 'proxy patients', able to inject a sense of what being a research subject would be like into the committee's deliberations over the ethical acceptability of any particular research proposal. In practice, however, it turned out that because they spent their days working on the wards with actual patients, doctors and other medical professionals often had a much better understanding of patient experiences than serving lay members. Far from disqualifying them, those professional interests sometimes made doctors *better* representatives of patient concerns and interests than lay members whose disinterestedness deprived them of the knowledge of patient needs and experiences needed to act effectively on their behalf.

The third rationale was the idea that as an outsider, the lay member would be able to ask the 'stupid' questions that expose fundamental assumptions that may go unquestioned by experts. This challenge role is central both to Fischer's (2003) faith in the "sociocultural rationality" of the public and the hopes of Macnaghten et al (2005: 11) that public engagement provides a mechanism for:

> Rendering scientific cultures more self-aware of their own taken-for-granted expectations, visions, and imaginations of the ultimate ends of knowledge, and rendering these more articulated, and thus more socially accountable and resilient.

In actual practice, however, lay membership per se did not prove effective at such normative steering. Rather than challenging the proceedings, 'stupid' questions from lay members often just irritated the other committee concerned with getting through the paperwork in time to get home for dinner. In any event, through the experience of REC service, lay members soon went native, picking up a basic medical knowledge about double blind clinical trials and other technical matters. At the same time, there was also the argument that outside of their own narrow basis of specialization 'expert' members were in fact also lay persons, and thus just as qualified as those appointed specifically as 'lay members' to provide an extra-disciplinary and independent perspective.

But finally the most important reason why 'stupid' questions asked from a 'lay' perspective proved so inconsequential was because they were inconsistent with the Department of Health's formal Governance Arrangements for NHS Research Ethics Committees (GAfRAC, 2001). The GAfRAC sets the terms under which committees operate and make their decisions. Whatever their ethical views about proposed research, RECs could only object if they framed their objections in terms allowable under the GAfRAC. As result substantive concerns about the scientific value, harm, or the 'yuk' factor involved in particularly unpleasant research proposals are instead often translated into demands for revisions to patient information sheets and informed consent paperwork, which more clearly falls into their purview. While lay members now sit on all RECs in the NHS, there is no scope for their engagement in the ethical review process to shift the predominant framings of what is acceptable medical research as set out in the GAfREC. Rather than opening up the ethical, legal, and societal implications of medical research to wider public engagement and normative steering, lay membership of RECs serves more of an instrumental function by legitimating the norms embodied in the GAfREC.

PEST as epistemic checking

As we have already noted, there is another, much more radical way to understand the substantive contributions of public engagement in science (**Figure 3**). $Beck_1$, as we have termed it, sees the role for public participation in epistemic terms. Beck writes:

> Only a strong competent public debate, 'armed' with scientific arguments, is capable of separating the scientific wheat from the chaff (1992a: 119).

Here, Beck implies that the role for public participation is a truth determining one. In this context, 'discursive checking' does just what it says on the tin. The role for the public is to double-check the factual claims made by the lower house of science. This amounts to a conventionalist theory of truth, in which, after (Rorty 1991, 23), science is understood as a form of solidarity and rather than a method of objective inquiry, and "'truth' is simply a

compliment paid to the beliefs we think so well justified that for the moment further justification is not needed." In such a world, scientific debate flows seamlessly into political debate. Indeed, the difference between them fades away altogether as epistemological and institutional divides between science and politics, facts and values, are dissolved within an enlarged and invigorated public sphere (**Figure 3a**).

Beck, of course, is far from alone here in arguing that the boundaries between science and politics have been irreparably breached. This is a central theme for a generation of academic science studies (Demeritt 2006). Its symmetry principle explained scientific facts as sociological feats of consensus building. In so doing, it undermined the exclusive authority once given to experts in science-based decision making. Academic science studies provides the intellectual foundation for expanding public participation in science and science-based policy to assure their legitimacy. Indeed many of the key UK government reports calling for such a shift in science policy were in fact directly influenced by leading British science studies scholars.[4]

The participatory turn of recent UK science policy has prompted something of a backlash, albeit one rather less intemperate than the so-called Science Wars of the United States. To their critics, the problem with academic science studies and calls for public engagement is that they undermine the epistemic grounds for identifying scientific truth. Writing in *Nature*, Lord Taverne (2004: 271), chair of the lobby group Sense about Science, insists, "[S]cience… is not a democratic activity. You do not decide by referendum whether the Earth goes round the Sun". The problem with extending public participation in science is that it makes controversies over matters of scientific fact difficult to resolve, because there is no epistemic foundation for distinguishing warranted claims from mere opinion: debate can always be extended by dissenters, however ignorant, ill-informed, or duplicitous their claims.

[4] For instance Brian Wynne was Special Adviser to the House of Lords Science and Technology Select Committee (2000) Inquiry into Science and Society, while his Lancaster colleague Robin Grove-White sat on the Agriculture and Environment Biotechnology Committee that commissioned and ran the *GM Nation?* consultations and Andrew Stirling from the Science Policy Research Unit at Sussex sits on Defra's Science Advisory Council.

Harry Collins and Robert Evans (2002) call this the 'problem of extension', and climate change provides a good example of the difficulties it creates. Notwithstanding the robust scientific consensus to the contrary (Oreskes, 2004), a host of conservative think tanks and industry-funded political action committees have spent millions in a slick public relations campaign to deny the risks posed by rising concentrations of greenhouse gases from fossil fuel consumption (McCright and Dunlap, 2000; Jacque et al 2008). Pointing specifically to such special interest organized skepticism, Collins and Evans (2002: 280) ask:

> do we never want to say that the tobacco industry has for years falsified … epidemiological studies out of a concern for selling more cigarettes? Do we want to say, rather, that this was just [their] point of view and that the only fight there is to be had with them is a political fight, not a scientific fight?

To solve this problem of extension, Collins and Evans offer a more carefully differentiated definition of expertise, emphasizing experience rather than formal scientific qualifications, as the basis for warranting knowledge claims (**figure 3b)**. Their approach to expertise provides a basis for some public involvement in epistemic checking of scientific claims by valorizing the knowledge of uncertified specialists from among what had been previously regarded as a uniformly unqualified lay public. At the same time Collins and Evans also insist that a having PhD in one specialist area does not qualify you as an expert in others. As a result the line in **Figure 3b** demarcating an expert-scientific realm from a public-political one is jagged to take in "the odd-shaped pockets of expertise found among the lay public" (251) and exclude scientists not possessing the particular expertise necessary to answer the scientific question at hand. As they explain:

> It seems, then, important to retain a notion … of ….expertise … to adjudicate between competing knowledge-claims …. The wide society still has a role to play in forming a view about the socially acceptable use of such knowledge and what to do while such knowledge remains contested, but this contribution lies in the political sphere. Lay people as lay people… have nothing to contribute to the scientific content of debate.

Their idea of uncertified expertise provides a formal justification for the claim, now widespread in many areas of science and science-based policy, that "public

engagement can be essential for 'getting the science right'" (Stern and Fineberg 1996: 6, quoted in Dietz and Stern 2008: 50). For instance, in 2001 the Department of Health launched the expert patient programme to tap the "knowledge and experience held by the patient [which] has for too long been an untapped resource" (DoH 2001: 5). Admittedly, much of the attraction for the NHS is that more self-reliant patients are likely to be less expensive ones:

> today's patients with chronic diseases need not be mere recipients of care… By ensuring that knowledge of their condition is developed to a point where they are empowered to take some responsibility for its management and work in partnership with their health and social care providers, patients can be given greater control over their lives. Self-management programmes can be specifically designed to reduce the severity of symptoms and improve confidence, resourcefulness and self-efficacy. (DoH 2001: 5)

But beyond the Foucaultian overtones of self-reliant subject formation, there is a formal recognition here that doctors no longer possess an epistemic monopoly: patients have their own substantive expertise of disease etiology and the efficacy of its care by virtue of their embodied experience of illness.

There is now increasing recognition across a range of scientific fields, from conservation biology and resource management to chemical risk assessment and epidemiology, of the potential epistemic contributions from 'traditional' ecological knowledge (e.g. Berkes et al. 2000) and the 'street science' (Corburn 2005) of various uncertified local experts. There are two broad ways in which their participation can contribute substantively to conventional scientific knowledge. First, there is a potential for uncertified experts to become sources of scientific data and contribute to empirical discovery. For instance, in the absence of reliable data about the fluctuating historical distributions of herring in Prince William Sound, Huntingdon (2000) surveyed local fishing groups so as to build up a picture of fish stocks over time and assess the relative influence of natural fluctuations as against damage from the Exxon Valdez spill on current population levels. Gilchrist et al. (2005) used a similar approach to measure populations of endangered bird species by tapping the expertise of birdwatchers, while

Cohen (1997) found that the local knowledge of native peoples and other natural resource users in the Mackenzie Basin of northern Canada was more sensitive at detecting subtle climate changes and their impacts on regional ecologies than the rather diffuse instrument networks of conventional science relied upon by the Mackenzie Basin Impacts Study. Though the spatial imaginary of so-called 'traditional ecological knowledge' typically locates it in less developed parts of the world, in both the US and Europe there have been efforts to enroll the expertise of amateur naturalists in measuring wildlife populations through programmes such as the Great Backyard Bird Count (Ellis and Waterton 2004; Greenwood 2007).

Aside from the technical difficulties of using unfamiliar (to scientists) social science methods, such as questionnaires, focus groups, and participatory mapping, scientists face more serious challenges integrating such traditional ecological knowledge with more conventional scientific data. Typically, the information provided is qualitative, even impressionistic, and representative of relatively restricted spatio-temporal scales. Millington (2007) found it difficult to square the broad-brush statements and sketch maps of likely land use/ cover changes in Spain made by farmers and other knowledgeable stakeholders, with the much more finely resolved data derived from remote sensing and aerial photogrammetry (**Figure 4**). In principle, at least, this kind of scale issue is not insurmountable. Scientific research designs frequently differ among themselves over such issues, and there are a variety of methods, from Bayesian approaches to uncertainty to Delphi and consensus building methods, for reconciling them.

Second, uncertified experts might become involved in validating scientific knowledge claims through their participation in what Funtowicz and Ravetz (1992) call extended peer review. As the web 2.0 model of wikipedia suggests, there is considerable potential here in the wisdom of crowds. Yearley (2006), for instance, found public interest groups and other stakeholders in Sheffield more than able, when asked in focus group work, to draw on their local knowledge of traffic patterns and exposure to raise legitimate questions about the analytical assumptions built into the models

used by city officials to manage air pollution risk. Such participatory methods of modeling and model validation are now increasingly common (e.g. Voinow and Gaddis 2008; Beall and Zeoli 2008).

Efforts to apply the idea of extended peer review are beset by various practical difficulties. As philosophers and sociologists of science have both shown (Demeritt 1996), empirical tests of scientific theories are never unambiguous. Of course this difficulty applies to normal science as much as any post-normal one involving extended peer review. While some members of the public may have local knowledge relevant to the sort of epistemic checking of science imagined by $Beck_1$, that experiential knowledge is not quite the same as understanding the underlying theoretical frameworks their experience is being used to test or the appropriate methods for doing so.

Millington's (2007) experiments with participatory modeling in the EU Special Protection Area 56 of central Spain were beset by both problems. Although the local farmers he interviewed possessed a deep understanding of the landscape and the economic and ecological processes that have shaped its development, they did not make very effective judges of the validity of his scientific model of land use/cover change processes. First, farmers tended to focus on their attention on the pixels representing the immediate vicinity of their farms, a fine scale beneath the effective resolution of his model, rather than on its depiction of broader, landscape-scale processes of fire, vegetation succession, spatial connectivity and habitat fragmentation whose dynamics he was trying to capture. Planners with the local municipalities and regional government tended to be more attuned to these issues by virtue of their professional training. But they too struggled to understand the scientific distinction between a model scenario, specifying various boundary and initial conditions for model variables, and the underlying model structure representing the interaction of those variables through time. Accordingly they had little to say about the model structure Millington was trying to test. Their responses to his model turned largely upon their beliefs about the likelihood of particular scenarios of future socio-economic change

rather than on the validity of his model's representation of the underlying landscape dynamics shaping the evolution of future land use/cover changes under such a scenario.

A rather different difficulty with bias and vested interests in extended peer review is highlighted by Griffin's (2009) study of the European Commission's Regional Fisheries Advisory Councils. Though they also advise the Commission on fisheries policy, they have become a major forum for debate over the scientific stock assessments that inform those policies. In this context one of the persistent points of technical dispute is over the appropriateness of random spatial sampling as a method for assessing Cod stocks. Fishermen complain that scientists are not looking where the fish are, whereas scientists complain that it is not valid to extrapolate North Sea populations from biased samples. Fishing interests are clearly knowledgeable if uncertified, experts in the matter of judging fish stock levels and so should, according to Collins and Evans (2002), have a place in deliberating about the validity of methods for doing so. The difficulty is that the vested interests that give such stakeholders experience- and hence expertise—also lead to charges of bias and to doubts about the validity of their factual claims. As one scientist complained:

> Essentially what the fishermen are asking the scientists to do is to extrapolate from dense areas of cod population where they fish to the rest of the sea. Which would be the equivalent of saying there are 8 million people in London, therefore there are 4 billion people in the UK! ... And of course the fishermen say, well the scientists don't use the latest fishing technology. Well, no they don't, they use the same ones year on year, which shows the relative changes in abundance in the same areas, year on year on year. So you get a picture of the sea over time. And, you know, it's going to be different. And it might be wrong to some extent. But it's the most *scientifically* robust way of doing it (First Secretary UK Permanent Representation to the EU (quoted in Griffin 2009).

The ideas of extended peer review and PEST as epistemic checking are beset by fundamental questions about which members of the public are qualified to judge and why. As many readers will instantly recognize, this problem is hardly unique to extended peer review. Though conventional scientific peer review is supposed to be both independent and expert, it often falls short in practice. At least, however, the criteria

are clear—impartiality and expertise—even if how they are defined and applied to any particular case is often more contentious.

The criteria for participating in an extended peer review are rather less clear. Funtowicz and Ravetz (1992:744) call for "all the stakeholders in an issue" to be involved, but their subsequent discussion of extended peer review suggests two different ways of demarcating who is, and is not, to participate. On the one hand they suggest that "Public agreement and participation, deriving essentially from value commitments, will be decisive for the assessment of risks and the setting of policy" (751) for post normal problems "where facts are uncertain, values in dispute, stakes high and decisions urgent" (744). The reason for "the inclusion of an ever-growing set of legitimate participants in the process of quality assurance of the scientific inputs" (752) could be de-ontological, responding to some democratic imperative, or instrumental, seeking legitimation. Either way it follows that membership of the extended peer community involved in review is based on political status, as in $Beck_2$ ideas of normative steering, rather than any substantive knowledge or experience. On the other hand, Funtowicz and Ravetz (1992: 753) also insist:

> The extension of the peer community is then not merely an ethical or political act; it can positively enrich the processes of scientific investigation. Knowledge of local conditions may determine which data are strong and relevant, and can also help to define the policy problems. Such local, personal knowledge does not come naturally to the subject-specialism experts whose training and employment predispose them to adopt abstract, generalized conceptions of genuineness of problems and relevance of information. Those whose lives and livelihood depend on the solution of the problems will have a keen awareness of how the general principles are realized in their 'back yards'. They will also have extended facts', including anecdotes, informal surveys, and official information published by unofficial means. It may be argued that they lack theoretical knowledge and are biased by self-interest; but it can equally well be argued that the experts lack practical knowledge and have their own unselfconscious forms of bias.

If extended peer review is designed to make this kind of epistemic contribution by drawing on "local personal knowledge", then it follows that participation must be

restricted to those members of the public actually possessing the revelant knowledge. Funtowicz and Ravetz (1992) fail to provide any such demarcation criteria. By contrast, Collins and Evans (2002; 2007) define membership in terms of experience-based expertise, whether formally certified with advanced degrees or not. Their critics complain that their ideas about uncertified expertise ignore the politics of demarcation and the fact that framing the questions to ask of experts is itself always political (Jasanoff 2003; Wynne 2003).

This is an important objection, but like much of the debate about PEST it is focused on the politics involved in science and scientific knowledge. Since the Scientific Revolution of the seventeenth century the credibility of science has rested upon distinguishing sharply between a realm of subjective political interest and an objective realm of science (Poovey 1998). By insisting that science is always value-laden and political, recent science studies has sought to undermine such distinctions and the epistemic privilege accorded to science over other ways of knowing. Both the very strong, truth-determining form of PEST as epistemic checking and the more modest claims about the potential epistemic contributions to science to be made by various uncertified experts take off from that skepticism about the epistemic monopoly of scientific experts. But with their focus on the epistemic warrant of science and the substantive contributions of PEST to improving the quality of science and science-based policy, PEST proponents have not considered the wider question of whether and why science should be so central to our politics.

Conclusion

Behind the emerging UK consensus on the need for greater public engagement in science and technology lie some very different conceptions of what PEST entails and of the proper relationships between science and democracy. Common to otherwise incompatible instrumental and de-ontological arguments for PEST is an associated claim that increased public engagement will also somehow make for 'better' science and science-based policy. Such claims have helped give PEST traction in policy circles, but they are often vague and poorly formulated, and will disappoint if they consequently lead to unrealistic expectations and inappropriate public engagements.

PEST is no cure-all but neither should its promises be dismissed out of hand. In this paper we have distinguished two different ways in which PEST might make substantive contributions to science and science-based policy, which we term normative steering and epistemic checking. Achieving those different aims involves engaging with different publics in different ways to different ends. However, without greater clarity about the purpose(s) of PEST, the tendency will be both for it to be oversold and for PEST designs to be ill-suited to the specific contexts and contributions for which they are invoked.

Accordingly, we also reviewed a number of recent experiments in PEST to assess the practical challenges in delivering on its various substantive contributions. The idea of normative steering promises a more publicly acceptable science and science-based policy. But in the absence of clear mechanisms of democratic accountability and control, PEST as normative steering can exacerbate problems of public acceptance and alienation in two distinct, but related ways: first, by adding another unaccountable and unrepresentative process of authorization for science and science-based policy atop already unelected and weakly accountable regulatory bodies (like RECs and the HFEA); second, by warranting its normative steering through appeals to a disinterested public, often too ignorant and indifferent to the issues at hand to assist effectively.

Whereas political status is key to identifying the publics to be engaged in normative steering, the idea of PEST as epistemic checking is different. In its very strongest form, it dissolves any epistemic or political distinction between scientists and citizens into a vastly expanded public debate. In this brave new world the specific need for *public* engagement with science is no longer so clear, since science carries no special epistemic status and truth is a matter of convention, determined through persuasion, popularity, and power. For many this radical version of PEST as epistemic checking strays too close to relativism. It denies any foundation for warranting belief and preventing the extension of debate by dissenters, however ignorant, ill-informed, or duplicitous their claims. Accordingly, the more common version of PEST as epistemic checking retains the traditional epistemic warrant granted to scientific experts, but opens up their claims to checking by, and contributions from, knowledgeable (if uncertified) experts from among the lay public. Enrolling that lay

knowledge is fraught with practical difficulties, however. It involves social research methods of engagement and elicitation unfamiliar to natural scientists and raises difficult questions about demarcating which publics might be engaged in epistemic checking, how and why. Often the very interests that make some members of the public knowledgeable enough to make epistemic contributions also tend to undermine the wider credibility of those contributions.

Traditionally, the authority and legitimacy of science have depended precisely upon appearing both knowledgeable and neutral. Increasingly however, that appearance no longer holds. The assumption of many PEST proponents is that science is undemocratic. The charge of being closed and undemocratic holds more firmly for science-based policy making, where the political appeal of science has come from its utility in closing down policy debate, than it does for science proper. Indeed, even if science has not always lived up to its own high ideals, its commitment to Mertonian (1973) values of reasonableness, disinterestedness, and impartial deliberation provided an important model for the development of liberal democracy and the operation of its public sphere (e.g. Ezrahi, 1990; Shapin and Schaffer, 1985). Nevertheless, PEST proponents insist that we need public engagement to open up science and democratize it, although, as we have shown, quite how and why are often undertheorized. Normative steering is not simply a different solution to epistemic checking; it also addresses a different concern about science and science-based policy: democratic control rather than validity. PEST can, in some circumstances, offer some help on both these counts, but it is no panacea.

Nor is PEST the best way of addressing the more general challenge identified by Beck (1992b: 156). If science is now “more and more necessary” and yet "at the same time, less and less sufficient” to resolving pressing public questions about climate change and whether we should be tinkering with life or sharing our world with chimera embryos, the democratic deficit we must overcome is not in our science, but in our politics. Rather than looking for new mechanisms to engage alientated publics in science, we would probably do better to seek ways of re-engaging them in our political institutions.

One of the difficulties with speaking of this as if it were a matter of public engagement *in* science is that it feeds into a pernicious misunderstanding of the challenge we face in forging a world in common. Whether it is genetic engineering or climate change, the challenge is typically neither an absence of facts (which might be resolved through more or better scientific research) nor public control over that science. Rather it is about competing values and finding ways of reconciling them to common programmes of action. Those are not scientific questions; they are political ones and will not be resolved by PEST and the industry of facilitators, focus group operators, and public relations experts to which it has given rise.

But politics is hard work and in the face of seemingly irreconcilable differences the temptation is to look to science for evidence to close off (or more often merely defer) difficult debates over political 'matters of concern' (Latour, 2004). Thus one of David Cameron's first moves on taking over the Conservative Party was to pose with photogenic millionaire and Ecologist editor Zac Goldsmith to announce his party's strategy on climate change. He pledged to appoint an expert panel "to take the politics out of the issue" and draft policy to "constrain future governments in the face of the natural tendency to put short-term electoral considerations above the long-term interests of the country and the planet" (Cameron 2005). Instead of resolving political differences, this instrumental use of science usually leads to their extension by forestalling the kind of open deliberation necessary to forge consensus about those long-term interests.

Compare this approach to the inaugural promise of Barack Obama (2009) to "restore science to its rightful place". His appointment of Nobel laureate Steve Chu as energy secretary and campaign pledge to "restore integrity to American science policy" undoubtedly signal a new attitude to science in the White House after eight years in which the Bush administration regularly "suppressed research that conflicts with its political agenda" (Obama n.d.; cf. Mooney 2005), but the core of Obama's inaugural address, like his campaign message, was about political renewal. Obama (2009) called for us all to put "an end to the petty grievances and false promises, the recriminations and worn-out dogmas that for far too long have strangled our politics". Although PEST has its uses, neither normative steering nor

epistemic checking ultimately provides an answer to this cosmopolitical challenge of forging a world in common.

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(a)

(b)

Figure 1. One way that public participation in science is important is through the role of 'biological citizens' as experimental subjects for drugs trials and other forms of medical research. (a) A 2005 advert seeking volunteers for medical research trials, hung on buses popular with students of the National University of Singapore; (b) By volunteering for research subjects transform themselves into objects of medical research, at no small risk to themselves. The act of informed consent preserves the sanctity of the human otherwise troubled by its status as a 'guinea pig'.

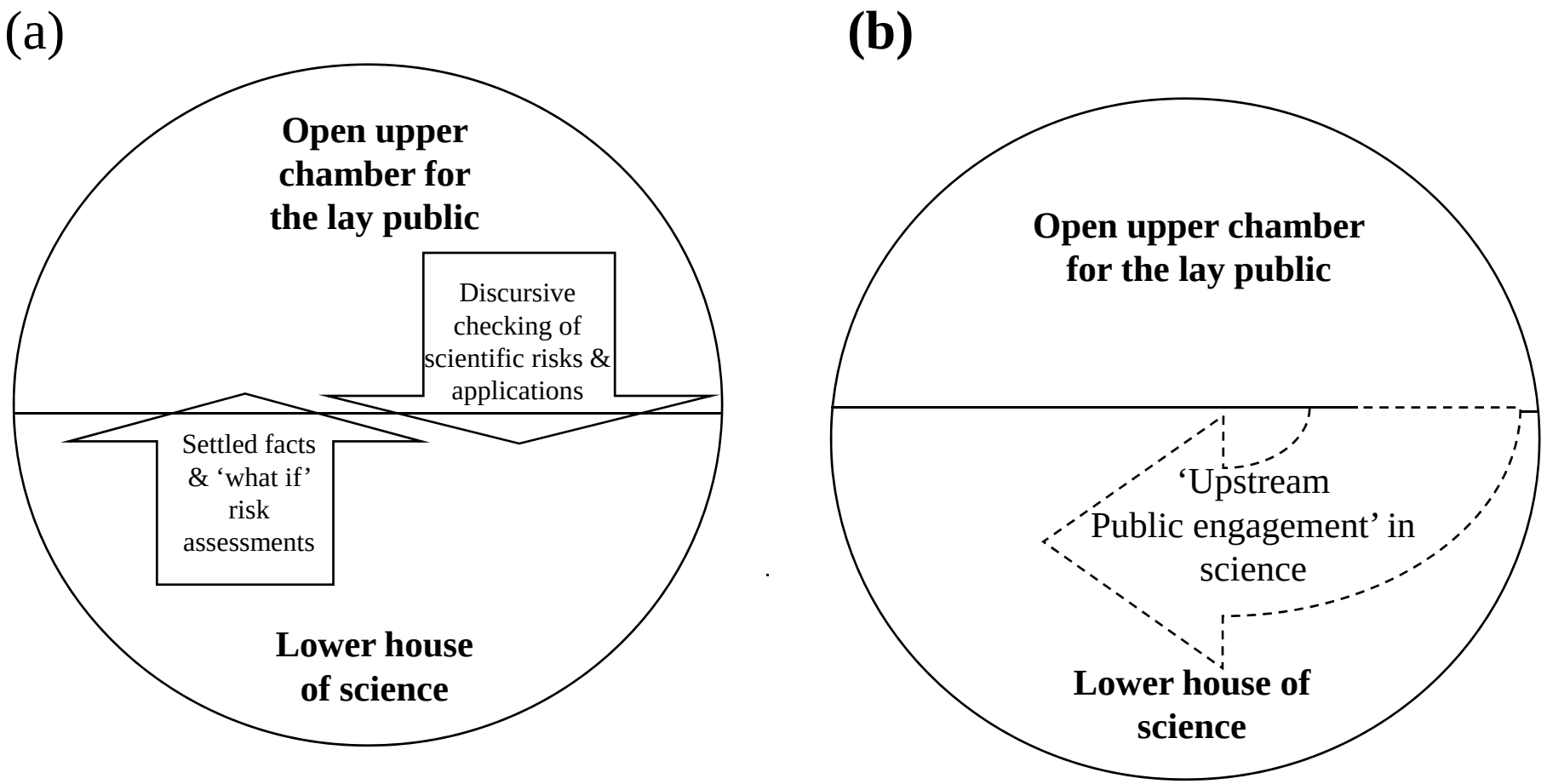


Figure 2. Beck$_2$ vision of Beck's (1992a) vision of 'discursive checking' of science: 'normative steering'. The upper public or political sphere is responsible for responding to and regulating the scientific facts and technical innovations generated by the lower house of science. (a) Conventionally this normative steering comes after the fact, in the form of restrictions on the socially acceptable use of technology. (b) Moving public engagement farther 'upstream' into the research process is intended to provide more effective normative steering of science and scientific research, blurring the institutional boundaries between science and politics while preserving the metaphysical distinction between facts and values.

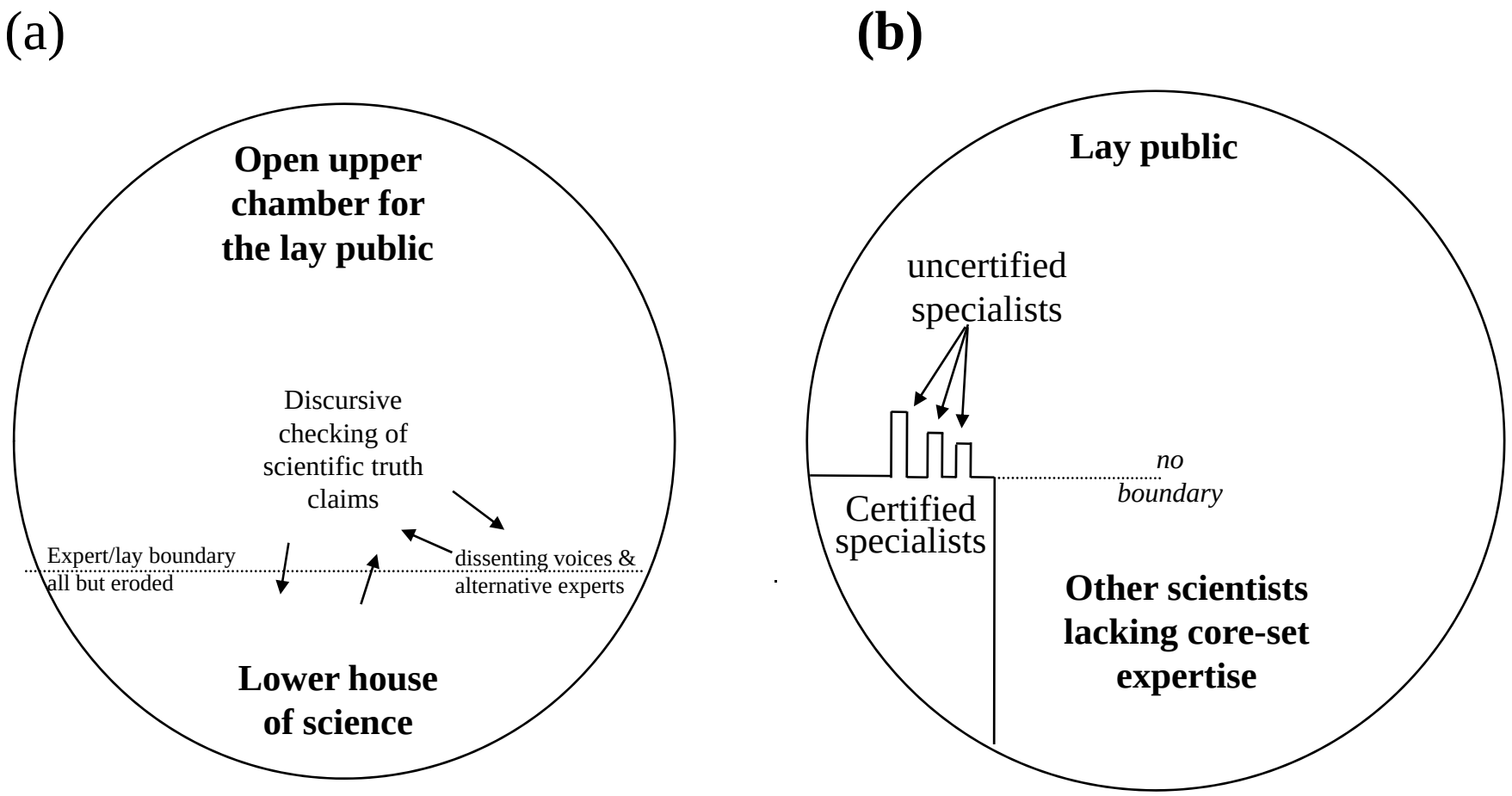
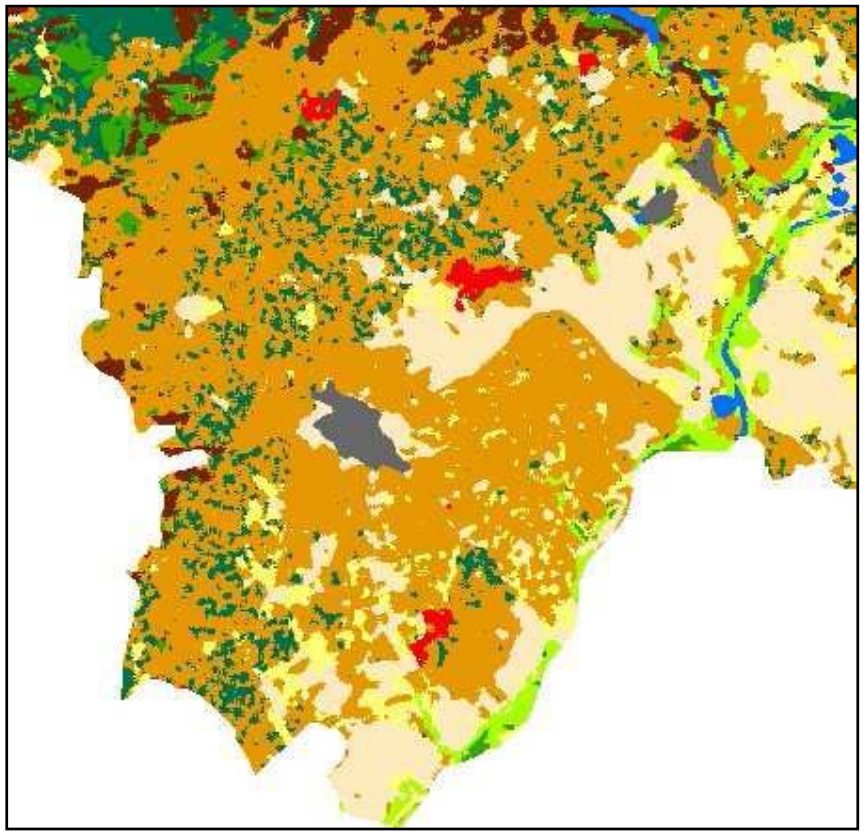


Figure 3. Beck$_1$ vision of Beck's (1992a) vision of 'discursive checking' of science: 'epistemic checking' of science.(a) In the very strongest versions, the expert/lay boundary is all but eroded, as truth becomes a matter of convention and scientific experts lose their special epistemic warrant. (b) Collins and Evans (2002) preserve the epistemic authority conventionally granted to experts, by refining its basis in experience. They thus grant epistemic warrant to some uncertified specialists from among the lay public while at the same time denying it to credentialed scientists who are become just like ordinary members of the lay public if they lacking experience in the matters at hand.

(a)



(b)

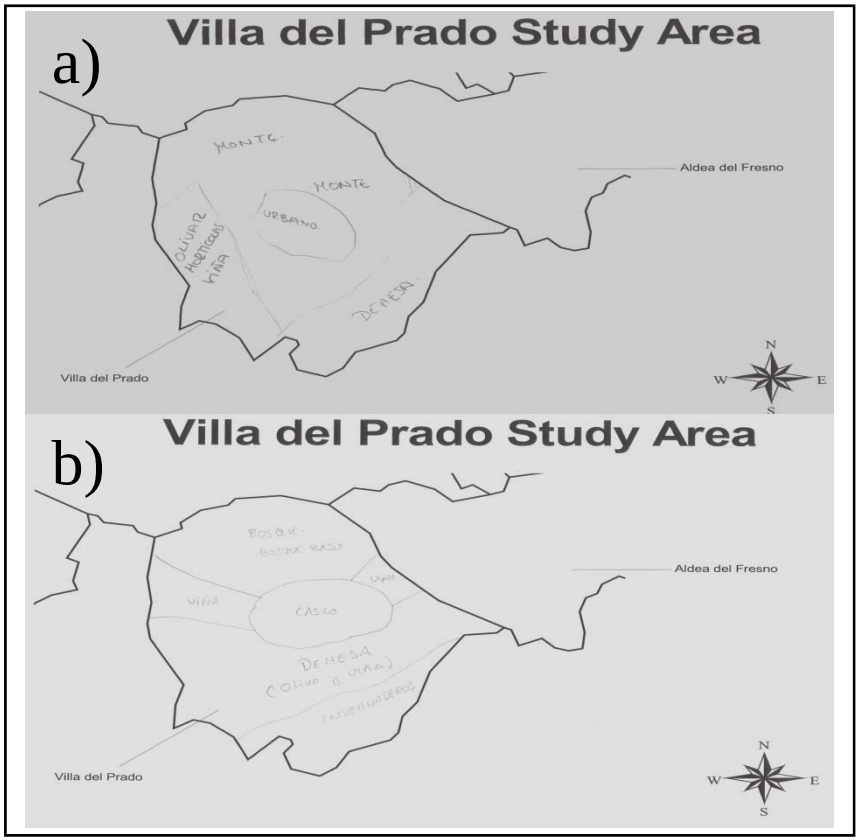


Figure 4. Incorporating effective lay participation in land use cover change modelling is complicated by mismatches in comprehensiveness and scale between the data available from remote sensing and from qualitative methods such as interviews and participatory sketch mapping as well as by differing understandings of what model outputs represented and how they should be evaluated. (a) Millington's (2007) simulation of landcover in Villa del Prado Spain for 2026 under a scenario of declining agricultural profitability due to increased competition and reduced Common Agricultural Policy subsidies. Scrubland (brown) predominates (b) Sketch maps of two interviewees' expectations of LUCC in Villa del Prado by 2026. Despite their broad spatial scale, these maps corresponded well with this scenario, leading interviewees to conclude that this scenario was the 'right' one, rather than considering the adequacy of the model's representation of spatial connectivity or landscape dynamics.