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ON THE LOCAL CONSTITUTION OF GLOBAL FUTURES

Science and democratic engagement in a decentred world

by Alan Irwin

This essay focuses on the relationship between public engagement with science and larger discussions of globalized and decentred democracy. In particular, it asks whether public engagement on very specific issues and in the form of carefully-planned exercises should be seen as a distraction (or irrelevance) with regard to the democratic process or else as an enhancement and invigoration of it. It will be argued that we cannot tackle these issues of engagement and democracy without considering the wider challenges of governing what are very often globalized, socio-culturally complex and generally-wicked problems. There is a tendency for engagement initiatives to operate at the regional or national levels. But what happens when the issues are presented as crossing borders and boundaries, and when the traditional centres of power seem sidelined by the expressed requirement for 'global' governance? Going further, issues of science and technology governance often involve a special concern with the future or, more specifically, the multiple futures suggested by science, technology and innovation and their relationship to our sense of the present. I will suggest that the heterogeneous practices of scientific governance represent both a challenge when it comes to issues such as climate change and global food security but also an important focus for STS scholarship. Finally, and in the spirit of more grounded conclusions, I suggest six 'red blooded' principles for public engagement which can at least get us started in addressing these issues.

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Introduction

In a Danish town on the Western Sjælland coast a group of residents gather for a 'citizen summit'.[1] The theme of climate adaptation may seem rather large, elusive and abstract. But the meeting's focus is very much on the specific consequences for the town in question. Kalundborg has already suffered flooding, but this could become much more serious. Should the local authority intervene or simply, and as the law suggests, leave it to individual property owners? And what kind of action would be most appropriate? Should dikes be built or would it be better to let nature take its course? Should the whole area be protected or resources concentrated in some way? In the end, the citizens support focusing efforts on protecting the town itself but also giving the municipality an active role in climate adaptation.

In London, Edinburgh and Aberystwyth, a two-stage workshop process is organized to explore public views about another future challenge: global food security. Altogether 44 members of the public take part in the discussions. On the agenda are consumers' right to a choice of foods, the responsibilities of industry for non-sustainable patterns of food consumption, the global food trade and the use of new technologies. GM foods feature prominently. More generally, the workshops raise issues of the power and responsibility of agriculture companies, the need to change Western patterns of food consumption, and the role of technologies in achieving greater sustainability. Participants express some surprise at the globalization of familiar food items, with particular astonishment that the frozen scampi they buy in the local supermarket may have been farmed in Scotland, shipped to Asia for shelling, and then returned to Scotland for processing. The product may be labeled as 'Scottish' but it has travelled many food miles to get from its original source to the dinner table.

These are just two examples of 'public engagement' in action, but there have been many others – particularly (but not exclusively) across Western Europe (see for example Hagendijk and Irwin, 2006: Mejlgaard et al, 2012). In 2007, one research project reported on case-studies from eight European nations – including Denmark, Sweden, Finland and Norway (Horst et al, 2007). The basic idea behind this kind of engagement exercise is that ordinary citizens should be able to express their views and in some way help guide (or at least inform) public policy. As in the Kalundborg case, this can take the form of a citizens' summit where a defined group of people comes together to discuss a particular topic or question. Public engagement can also take shape as a highly-structured series of workshops where people return to the same issue on more than one occasion. Sometimes, these activities are organized on a grand scale - as in the Dutch and British national consultations on genetically-modified foods (Horlick-Jones et al, 2007).

At the core of what has come to be defined as 'public engagement' there is generally an attempt to 'broaden' discussion, to identify new issues and to consult groups which might not otherwise be heard. Very often, the focus has been on concerns around scientific/technological change and on potentially-controversial developments: for example, GM food, stem cell research, energy and the environment. In the case of the London, Edinburgh and Aberystwyth workshops, the sponsor was a governmentally-funded research programme on global food security. The hope was that by listening to public views the research could be made more responsive, more accountable and more relevant to citizens' needs. In Kalundborg, the local authority was very specifically looking for advice, and to some degree backing, from residents.

Public engagement with science (or PES) is not a new phenomenon. Indeed, the body behind the Kalundborg citizen summit, the Danish Board of Technology (Teknologirådet), has been running such exercises for 30 years or so (Jensen, 2005). Especially in Europe, the idea of bringing 'science' and 'society' closer together has been expressed in many policy documents and political statements (Irwin, 2006: Mejlgaard et al, 2012). Stimulated by public controversies and concerns over the social and environmental consequences of GM foods, nanotechnology and nuclear power, PES has often been advocated as a way of bringing the larger publics into the discussion so that later conflicts can be avoided or at least a more trusting climate generated (House of Lords, 2000). Greater and earlier engagement might not have prevented critical reactions over GM foods or energy policy, but at least some of the public concerns about the future of food and agriculture or the acceptability of long-term threats might have been anticipated and (perhaps) some kind of action taken (for a larger discussion of 'anticipatory governance' see Barben et al, 2008). At this point also, I need to make it clear that 'public engagement with science' as I am very specifically discussing it here refers primarily to exercises organized by 'official' institutions such as (in the above examples) local government, research councils and national government. One can think of 'PES' in this sense as being constituted in the particular form of organized and invited events related to a specific policy body.[2] Later, I will come back to this institutional construction of PES with reference to 'wilder' forms of engagement activity (and the need for 'official' activities to be rather less 'tame').

Given both the promise of bringing science and citizens closer together and the already-established history, it is perhaps unsurprising that many words have been written about PES (see among many others Blok, 2007; Davies, 2013; Felt and Fochler, 2010; Jasanoff, 2003; Leach et al, 2005; Nishizawa, 2005; Wynne, 2006). To a large degree, these words have supported the broad principle of public engagement as a means of building mutual

1 This paper draws upon Irwin and Horst (2016).

2 Thanks to Maximillian Fochler for this definition.

understanding and trust between ordinary citizens and scientific institutions. However, many accounts of actual practice (ie of 'PES in action') reach negative conclusions. Certainly, one response to public engagement activities (among citizen groups but also social scientists) has been to view them in a rather critical light: as failing to address fundamental issues of economic and political power or else as being restricted in structure, intention and content (for a discussion see Irwin et al, 2013). It seems that attempts at public engagement readily lead to accusations of superficiality, inconsequentiality and legitimation.

More specifically, questions have been asked about the output from such activities – especially as this has taken shape in subsequent governmental responses. What actually happens after public engagement in terms of practical action? Is it not the case that such initiatives create the appearance of openness and democratic dialogue, but then can easily be set aside afterwards? After large-scale engagement exercises, such as the UK's 'GM Nation?' public consultation on the growth of genetically-modified foods in Britain, the reaction has often been disappointment that more was not achieved. Criticism often focuses on the marginality and fragility of engagement initiatives – and, consequently, their lack of transformative power (Hagendijk and Irwin, 2006). No matter how brave or worthy the intentions, what real hope is there for such small-scale, occasional and partial efforts?

In this essay, I do not aim to cover all the critical issues concerning public engagement with the social and environmental consequences of science and innovation. Instead, I will focus on one important dimension of the whole debate around public engagement, namely the relationship between PES and democracy. Put simply, should public engagement initiatives be seen as a distraction (or irrelevance) with regard to the democratic process or instead as an enhancement and invigoration of it? Certainly, one can ask whether engagement on very specific issues and in the form of carefully-planned exercises represents a compartmentalization of democracy or perhaps an undermining of more traditional democratic structures. The risk here is that citizens only get to express themselves within carefully-controlled exercises rather than connecting with larger questions of power and responsibility, rights and choice. Should we be impressed or worried when citizens find it easier to give their views on global food security (especially when such views are requested in a professional and carefully-designed fashion) than on the future of the banking system or the desirability of public spending cuts in response to the financial crisis? Perhaps more seriously, one is left to wonder why public engagement is organized around certain issues rather than others: nanotechnology but not the relationship between national debt and economic recovery, synthetic biology rather than European integration.

In opening up this discussion about the relationship between public engagement and democracy, I need to make three immediate points. First of all, and just to avoid later disappointment, I do not raise such issues in the expectation of finding simple and straightforward answers. Democracy is (famously) open to many definitions and the issues regarding environmental threats and the direction of technological innovation can be highly complex in this 'post-normal' age (Funtowicz and Ravetz, 1993). Nevertheless, I do believe it important to open up a discussion both about the democratic (or otherwise) implications of current initiatives in PES but also about societal engagement with scientific and environmental concerns more broadly. That at least is the intention here.

The second, and for me fundamental, point is that we cannot address these issues of engagement and democracy without considering the wider challenges of governing what are very often globalized, socio-culturally complex and potentially overwhelming issues. There is a tendency for engagement initiatives to operate at the regional or national levels. But what happens when the underlying problems are seen to cross borders and boundaries, and when the traditional centres of power (not least parliamentary systems and bureaucracies) are sidelined by the requirement for 'global' forms of governance (Lidskog et al, 2009; Sundström et al, 2010)? One can think of this in terms of there being multiple 'centres' for scientific governance (including national governments and parliaments, regional assemblies, international bodies, industrial organizations, scientific advisors, consumers across different countries, citizens as constructed not least by public engagement exercises, non-governmental organizations and the 'third sector' more generally). Or one can go even further by suggesting that the notion of a fixed 'centre' for governance and decision-making breaks down altogether as such processes operate within – and are constructed by - a world of networks, shifting alliances and 'ethno-epistemic assemblages' (Irwin and Michael, 2006). Putting this basic point about 'decentredness' differently, which is the relevant public when it comes to the consequences of climate change or the social and environmental dimensions of international food policy? Who has the ultimate power to decide about climate action and who in the end should be held accountable? My point is not that accountability has become irrelevant (on the contrary). Instead, the key point concerning a 'decentred' understanding is that the 'centres' (whether 'local' or 'global') are not simply given but must be constructed within particular contexts and particular moments.

My third point follows very closely from this observation of decentredness. Issues of science and technology governance often involve a special concern with the future or, more specifically, the multiple futures generated by talk of science, technology and innovation and their relationship to present experiences and practices (Adam and Groves, 2007; Brown and Michael, 2003; Felt et al, 2013; Jasanoff and Kim, 2009). Climate change is perhaps the paradigmatic case of this, with difficult decisions being demanded now about wicked problems which may develop in the future – but which also sit in the present as evidence of climate-related consequences accumulates. What is often presented as 'the future' appears to be happening in the present. As Holthaus (2015) puts it the 'nightmares are already

here'. In a similar way, the issue of global food security invites us to think about the future of agriculture but, and as the public workshops expressed, also about the real problems being experienced today in terms of access to nutritious food and the perceived dysfunctionalities in our production and supply systems. It is hard to get excited about the possibilities for new food technologies when one sees huge problems in terms of agricultural practices, food distribution and product marketing – problems which new technological 'solutions' do not seem to address or even acknowledge. Other areas of socio-technical development raise questions of the relationship between futures and the present in different ways: whether the vast possibilities being suggested for synthetic biology or else the threat that global innovation will leave individual nations and regions behind. In this discussion, therefore, we cannot ignore the democratic challenges of future-present relations. This means both how different ideas of the future can (or should) influence decisions taken today and also how societal experiences of the present profoundly influence our sense of what is to come.

In March 2014, *The Economist* published an essay with the provocative title: 'What's gone wrong with democracy?' Noting both the wide consequences of the 2007-8 financial crisis and the manner in which 'the Chinese Communist Party has broken the democratic world's monopoly on economic progress', *The Economist* argued that many of the political institutions of the West (not least in North America and Western Europe) have come to seem outdated and dysfunctional. Whether in terms of the current gridlock in US politics or the 2015 treatment of Greece's elected government by the 'Euro-elite', it is not hard to find evidence of democracy suffering from serious problems and also of democracy being put under serious pressure within globalized systems. In such circumstances, it might seem very odd (and possibly very dangerous) to even imagine that enhanced public engagement with issues like climate change or global food security could lead to better policy-making or that regional, national or global institutions could be capable of taking the necessary actions. The rest of this essay will consider these odd and dangerous thoughts.

Democratic thinking about PES

There are many ways of exploring the relationship between PES and wider discussions over the nature of democracy – and undoubtedly there are many questions to be asked. Thus, there is the abiding issue of who gets to engage in engagement activities – and whether participation can, or should, be in some way representative of the wider population. Especially in the UK, there is a tendency for official engagement exercises to turn into a form of consumer research as external consultants produce public opinion survey data alongside more 'qualitative' and exploratory workshops – and with the (usually governmental) sponsors of the exercise staying firmly at arm's length from the citizens themselves (Lezaun and Soneryd, 2007).

There are crucial questions too regarding the framing of the issues for debate – are policy-makers implicitly (or possibly deliberately) missing the point of citizen concerns in their frequent enthusiasm to construct these issues as primarily 'technical' in character (Welsh and Wynne, 2013)? To take one notable example, the British debate over GM was defined from the beginning as a discussion over the risks of commercially growing such crops in the UK. As was also found in the global food security discussions, however, public views tended not to focus on risk but rather on questions of need, of choice and of the influence exerted by cross-national industry. One important form of power within public consultation exercises relates precisely to the ability to shape the framework and focus of the discussion. Put differently, the capacity to decide what counts as an 'issue' (or a 'problem' or a 'matter of concern': Latour, 2004) can be the most important influence of all – including of course the power to decide what does not get presented as a matter for democratic reflection. This point also reminds us that whole areas of scientific and environmental innovation – especially as developed within private organizations – are typically excluded from active engagement and public consultation.

And there are certainly questions to be asked about the relationship between established institutions and processes of democracy, on the one hand, and PES activities, on the other. Should consultation processes like the one in Kalundborg be seen as a supplement to local government or as a threat to it? In this specific case, local officials seemed content with the expressed views of citizens. But what happens when such initiatives are seen to be 'captured' by particular organizations which are then labelled as 'interest groups' (and therefore excluded from the category of 'the public' – as if having clear views on an issue and acting together with others is an automatic disqualification from 'ordinary citizen' status)? And what is the role of existing government institutions when it comes to these questions? Do they have the competence to deal with such complex matters? Is their authority even clear when it comes to issues which may have a regional, national or even international significance?

As should already be apparent, there is no shortage of questions when it comes to considering the democratic implications of public engagement – and I have by no means presented all of them here. Very significantly for our discussion, these questions extend beyond the mechanics and structure of individual PES initiatives and into larger matters of the nature of contemporary democracy. Could it be (whether they know it or not) that the good citizens of Kalundborg or the invited participants in the London, Edinburgh and Aberystwyth food security workshops are actually part of a larger democratic movement? If that can even be imagined, then it is also necessary to consider where and how 'engaged citizens' should find voice alongside more familiar institutional forms such as political parties, voting systems and so-called 'public interest'

groups. If elected politicians see their role as representing specific regional publics (in the form of 'constituencies'), then how should they react to consultation exercises which claim to tell them 'what the public really thinks'?

One good place to enter this broader discussion is with the analysis of 'technical democracy' provided by Michel Callon and colleagues. For these authors, traditional representative democracy – which they term 'delegative democracy' – needs to be enriched by a new form of democratic engagement: 'dialogic democracy'.

> "when uncertainties about possible states of the world and the constitution of the collective are dominant, the procedures of delegative democracy are shown to be unable to take the measure of the overflows created by science and technology. Other procedures of consultation and mobilization must be devised; other modes of decision-making must be invented." (Callon et al, 2009: 225)

Developing some of the wider issues that have already been hinted at here, Callon, Lascoumes and Barthe present science and technology as overflowing existing frameworks of knowledge and governance. In line with Beck's account of the risk society (Beck 1992), controversial areas of science and technology are seen to be challenging current technical-social barriers. Is climate mitigation a technical or a social issue? Can the 'science' be separated from 'society' when it comes to an issue like global food security? In this situation, traditional distinctions between 'experts' and 'lay', 'science' and 'policy' disintegrate. This is not simply a theoretical matter, but has consequences for the institutions which seek to govern such areas. Where is the best place for the impacts of climate change to be addressed: parliament, scientific laboratories, global institutions, the supermarket? As Callon et al argue, new alliances and networks are emerging which question both existing assumptions about scientific advice and established forms of delegative democracy.

Unsurprisingly in this situation, policy-makers find themselves under pressure. If we think in terms of the British global food security engagement exercise, one of the greatest problems was how to keep citizen views within the institutionally-defined framework for consultation when the issues are potentially so broad and so diverse. The very term 'security' raises a whole set of questions about war and peace, the rise of new world powers, and the threat of terrorism – all of which threatened to 'overflow' this very specific PES exercise. Equally, it is not unusual for policy-makers to express frustration when public groups raise questions, issues and problems which are 'obviously' outside their remit and authority. Very often, such policy-makers struggle to recognize that this might not actually be a problem with public discussions but rather with the institutions and processes of government.

Callon and colleagues see particular possibilities in what they term 'hybrid forums': new forms of direct engagement in which a broader array of political and technical possibilities can find expression and new actors emerge. As Callon et al present these, hybrid forums offer 'an enrichment of delegative democracy, and not a threat to it.... They replace a conception of the public space made up of detached, transparent actors lacking existential substance with a "cluttered" public space in which individual wills are worked out and nourished by attachments that concerned groups have negotiated and discussed at length and in breadth.' (Callon et al 2009:262)

In keeping with many other social scientific commentaries, Callon et al are critical of the practice of consensus conferences in particular, including their 'traditional vision of the collective and the general will' (ibid: 173). One reason for such limitations is, of course, the very structured form of consensus conferences, including the fact that the citizens are intended to focus on the common good and represent the 'general' public rather than specific concerned groups (Horst, 2008; Horst, 2010; Horst and Irwin, 2010). Here we see a tension between a view of public engagement exercises as 'opening up' a range of networks, questions and questions and one which essentially treats such exercises as a means of 'closing down' complicated and potentially-controversial matters in the interests of the common good (Stirling, 2005; Sundqvist, 2014).

However, in arguing in favour of an 'enrichment' of democracy, Callon et al are at risk of under-estimating the larger shifts in scientific governance hinted at in this essay under the broad heading of 'decentredness'. In order for 'dialogical democracy' to take place there must be someone on the other end of the metaphorical line (ie someone – or some thing – to 'dialogue' with). But who is that when it comes to an issue such as global climate change or food security? The point is not to remove institutional responsibility, but instead to suggest that one political challenge for PES activities is precisely to identify – and as necessary co-create – the relevant 'centre'. My argument is that one cannot simply assume that the traditional institutions of 'delegative democracy' have matters under their control.

Taking this point about the 'dialogical centre' one step further, the notion of decentredness suggests both that the relevant centre is not simply given and that public engagement generally only makes sense when it is focused (or 'centred') in some way. This means that the centre for engagement cannot be taken for granted, but must instead be actively constructed. This is of course a persistent challenge for forms of public engagement which simply assume that the 'ownership' of the problem under discussion is beyond question. However, it also suggests an opportunity for more open forms of engagement to make deliberate decisions about the social, political and institutional focus (or 'centre') for their deliberations.

Challenging the futures in the present

At this point, we seem to have moved far from the rather modest examples with which this essay began. Whilst PES (at least in the 'official' form I have considered here) is generally presented in very specific and practical terms, the broad implication of this discussion is that such cases can have much larger significance for the relationship between science, risk and democracy. This means that, if we take Callon et al's analysis, PES activities have the potential to serve as places where 'the direction given to research and the modes of application of its results are discussed, uncertainties predominate, and everyone contributes information and knowledge that enrich the discussion.' (Callon et al 2009: 9). However, and as Callon and colleagues also suggest, this is a highly ambitious goal and many actual initiatives fall short in terms of both re-imagining the political possibilities and re-constituting the issues under discussion. As I have indicated, this is all the more true once we move beyond the notion of a 'dialogue' between relatively stable parties and acknowledge the more complex and cross-cutting character of contemporary governance processes. PES may offer a (partial) means of enriching the issues but who is even listening – and who has the power to make change – in the face of these simultaneously localized and globalized concerns?

It follows from the discussion so far that our understanding of 'engagement' must deal with a more complex – and more diverse – sense of the political and institutional possibilities. In particular, this suggests an awareness both of 'governance' as extending beyond national governments alone and of the larger networks and associations through which policy directions are set (Dean, 1999). In the case of science, risk and environmental issues, this is likely to encompass a range of governmental and non-governmental entities – including environmental organizations, scientific bodies and citizens acting in novel, and globally-oriented, ways. Just as with the 'hybrid forums' discussed by Callon et al, but moving to an even greater level of challenge as we consider changes in the nature of governance itself, decentredness can be presented both as a practical problem for existing modes of PES but also as a substantial opportunity. In a situation where scientific and environmental policies cannot be controlled by national governments acting alone, new threats but also new possibilities arise for democratic governance.

None of this suggests that national governments have become powerless or that local citizens can simply take control of the issues. Instead, a more balanced approach is required. Earlier, I referred to *The Economist*'s treatment of 'what has gone wrong with democracy'. The same article concluded: 'The trick is to harness the twin forces of globalism and localism, rather than trying to ignore or resist them.' (*The Economist*: 48). One does not need to share *The Economist*'s neo-liberal view of world politics in order to see the possibilities for a reinvigorated democracy. Nevertheless, we do need to be careful about putting too many expectations on what are currently only small-scale and politically marginal activities – especially when a good argument can be made that public engagement exercises are more typically used as a means of avoiding deeper institutional reflection than as a stimulus to such a potentially dangerous activity. Equally, arguments for enriching delegative democracy should be careful not to under-play more pervasive shifts in the nature of scientific governance or to assume that the traditional institutions of democracy can stretch to meet the new governance contexts.

Having made a (very) cautiously optimistic case, the clear challenges for public engagement in this decentred and future-oriented context cannot be ignored. Among these challenges, let me name three.

The first concerns the contextual and constructed character of 'global democracy'. Whilst 'localism' in the form of specific public engagement initiatives may have many merits, it is hard not to see a substantial gap – in terms of influence if not geographical space – between the public discussions in Kalundborg and those grander (but somehow less orderly) ceremonies which took place on just the other side of the island of Sjælland at the December 2009 Copenhagen climate change conference. Whilst efforts have certainly been made to connect local initiatives with such 'global' events (and as many of the demonstrators tried to express), the reinvigoration of democracy seems to have a very long way to go. Of course, this is more than a challenge of communication or simply making connections but instead raises profound questions about the very meaning of a 'global democracy' around such issues and concerns. However, in making this point it is important to stress - in line with the previous discussion of decentredness - that 'global democracy' is itself not a pre-defined object waiting to be 'discovered', but a matter for active and specific constitution. We should be as skeptical about the construction of certain problems as 'global' as we are about their definition in national or local terms (for an early discussion of the constructedness of the 'global', see Yearley 1996).

The second challenge takes us to the matter of socio-technical futures and their relationship to present engagement activities. Here we return to the opening up/closing down theme briefly introduced above (Stirling, 2005). My experience of public engagement exercises is that they are often at their best when expanding issues, raising foundational questions, and linking concerns which the policy-maker might view as quite separate. In this also, engagement can represent a partial antidote to the contemporary version of the Thatcherite 'there is no alternative' mantra (this time, 'there is no alternative to a particular vision of socio-technical progress'). However, the capacity of governance institutions to operate with the necessary level of multiplicity and ambiguity is often open to question – leading to frustration, critique and accusations of bad faith. Public engagement exercises may therefore have a particular capacity to open up alternative visions of the future and link them to the challenges of the present. Whether governance institutions are capable of dealing

with this enhanced sense of multiple possibilities remains open to question (Irwin and Horst, 2016). This point about future-present relations is of course open to much greater development. If we briefly return to the two illustrations offered at the start of this essay, then the Kalundborg case of climate adaptation represents a deliberate decision to focus on one socio-technical scenario within one geographically-defined context so as to produce very concrete and locally-relevant outputs. The global food security workshops (whatever the sponsor's original intention) ended up as a much larger exploration of future-present relations and possibilities. One size (or shape) does not have to fit all. But each represents a particular construction of future-present relations and each has at least the potential to indicate that (to put it in slogan form) 'the future could be otherwise'. For me, conveying this sense of possibility has to be a core purpose of public engagement.

The third, and closely linked, challenge relates to the still-absent discussion concerning the relationship between issues such as global warming or food security and societal development. In the end, scientific governance is about making choices with regard to the kind of societies we wish to create – and to live in. Whilst an issue like food policy or climate change raises questions about basic value decisions, about sustainable ways of living and about the very meaning of 'development', these questions seem to slip away amidst the specifics of international agreements, government policies and arguments over the scale of human and environmental threat. Once again, if public engagement activities could even get questions of basic socio-technical choices onto the political agenda, then they would have achieved a lot. Meanwhile, the institutional resistance to setting issues like climate change or food security within larger social, political and economic frameworks appears as strong as ever.

Returning to the relationship between 'official' public engagement exercises and democracy with which we began this essay, it seems safe to conclude both that there are possible ways in which specific public engagement exercises could invigorate democracy but also that such limited initiatives cannot carry the full burden of this on their own. Seen as part of a larger political strategy of opening up scientific and environmental governance to a broader range of ideas, interventions and future-present pathways, PES could play its part. Even very modest engagement exercises can suggest new possibilities and new ways of thinking – and in that sense can be an inspiration to larger political discussions. None of this, however, is possible without greater recognition of the social as well as technical character of environmental response and of the need to identify – and, crucially, act upon - some of the inherent weaknesses in contemporary policy-making forms.

Current approaches to public engagement are indeed limited. However, they do remind us that democracy is something to work at, argue over, revise and perform rather than simply make perfect (if ever that could be presented as a 'simple' task). Meanwhile, the lesson for STS scholars in particular is that we need to give as much serious attention to the heterogeneous practices, contextual constructions and competing frameworks of scientific governance as we have previously given to interpreting and exploring the diverse publics for science and innovation.

Conclusions written in blood

At this point, I wanted to stop. I really did. But a small chorus of critical colleagues and slightly-disappointed reviewers (thank you, one and all!) expressed their dissatisfaction with what they saw as excessive agnosticism, caution and tentativeness on my part. Too much cool-headedness and not enough red blood. Having been accused at various points in the past of being too applied (even 'compassionate') in my approach, I must confess that this accusation made me feel a little proud. However, I also have to admit that they have a point. That was indeed no way to say goodbye (at least to this essay).

So let me not finish quite so abruptly but instead, and as a kind of unrequested encore, consider six principles for public engagement which go some way towards addressing the broad democratic and governance challenges I have presented above. In case it isn't immediately obvious, these should not be taken as the final word. They are probably not very red-blooded either. But I hope they at least serve as a starting-point (and buy me a little peace).

My first principle is that public engagement with science needs to be seen as a challenge, disturbance or provocation to scientific governance and not simply an extension to it. Currently, the external critic's dismissal of public engagement exercises for not changing anything is often matched by institutional disappointment that 'we really didn't learn very much.' Rather than abandoning such exercises altogether, I would argue that they should not always be presented as 'tame' initiatives but rather as an attempt to bring in 'wilder' elements: opening up the taken-for-granted to fresh scrutiny and fixed visions of the future to multiple possibilities, 'reality-testing' embedded assumptions and questioning the (often implicit) questions. The 'taming' of engagement is not only a restriction on democracy. It also generally fails to deliver (beyond a fast-fading claim to official legitimation).

My second principle is that if public engagement is to have real meaning, it cannot solely be controlled by governmental institutions. I can admire the professional skill of many of those who design consultation exercises. And there is still place for the kind of focused exercise which took place in Kalundborg –provided the inevitable constraints are duly noted. But 'public' engagement must also be open to the 'public(s)' to construct and define in a plurality of imaginative ways. Rather than simply serving as the object of

consultation, the 'public' in 'public engagement' could in that way indicate a sense of wider ownership. This would also mean that rather than being focused on meeting the needs of the sponsor institution, the very question of to whom public views should be directed could become a matter for discussion. As I have tried to argue, when the issue is global food security, which is the appropriate 'centre' and in what terms should this be addressed? Such fundamental questions sit uneasily with current forms of institutional control over PES. At this point, wilder versions of public engagement become extremely important – whether innovative communication activities, cross-disciplinary encounters or various forms of socio-technical activism – and deserved to be recognized as such.

The third principle is that at least as much attention should be paid to the citizenship dimensions of public engagement as to the technical aspects. In many PES initiatives there seems to be an almost obsessive concern 'to get the facts right'. The background information provided to members of the publics must be accurate, impartial and unquestionable. Otherwise, the fear is that accusations of 'bias' will follow and the activity will be flawed from the beginning. But where is the equivalent discussion of the models of citizenship employed within such exercises and the 'biases' which are built into these? What assumptions about citizenship are being made when 'dialogue' takes this highly-structured form? What alternatives are available and what other models could be used? On this, there is often only institutional silence. My practical suggestion here is that words like 'democracy', 'justice' and 'choice' should be brought explicitly into public engagement exercises from the beginning.

The fourth principle is that public engagement cannot simply be defined as a local or national concern. I do not mean by this that each initiative needs to include a citizen from every European state nor that every participant needs to be burdened with speaking for the planet. In my experience, engaged publics often construct a distinctly bounded sense of identity (of how it is for 'us' or 'around here'). However, ideas of 'the global' are often close to the surface: whether the power of North American companies over European consumers, the vulnerability of particular communities to external economic pressures, the larger consequences of climate change or the perceived insensitivity of technological innovation to local settings. Sometimes, these global ideas are expressed as a self-imposed limitation: 'the people in Africa will have to speak for themselves'. Inevitably also they can take form as a generalized fear of 'the other'. But the role of 'the global' within 'local' discussions cannot simply be dismissed as an institutional inconvenience since the political boundaries are not drawn in that way. It may also give us some clues as to how international governance systems can be designed in more democratic terms or at least made more responsive and accountable.

The fifth principle is that talk of public engagement only makes sense in the wider context of socio-technical innovation. Whilst it is fine to point to the empowering potential of engagement, we also need to take a 'cool-headed' look (that expression again) at the political and economic forces for change. What are the key drivers behind synthetic biology, nanotechnology or digitalization and where does engagement sit amidst all the institutional enthusiasm for the blessed triangle of research, innovation and economic growth? One can become pessimistic about the possibilities for engagement in this setting (actually, that is hard to avoid). But engagement exercises do at least need to recognize this larger setting and have the capacity to explore it. Put more positively, public engagement - now defined as engagement by and for the people - can provide a means of 'getting to grips' with what can otherwise be a very slippery set of issues and problems. However, we need to be realistic about what is and is not open for change and also about what can be achieved by 'engagement' rather than other, perhaps more direct, forms of political action.

The sixth and, for now, final principle is that public engagement with science should have the central purpose of acknowledging and exploring multiple socio-technical futures and their relationship to public experiences of the present. This does not mean that each and every engagement activity has to deal extensively with multiplicity, plurality and an exhaustive range of alternative socio-technical futures. There is a time (and a context) to open and a time to close. But it is a fundamental point for me that even those exercises which do choose to focus on one particular model or socio-technical scenario should acknowledge that this is a choice and not an inevitability: the future could indeed be otherwise.

At this point, I suspect that there is still some disappointment amongst the small-but-perceptive critical chorus since there is still much more to say and do regarding the relationship between public engagement with science and contemporary democracy. I share that disappointment, but also see it as a challenge best tackled by a greater, and more diverse, range of voices. Seen in that way, critical disappointment may not be such a bad note on which to end.

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