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Embedding an Ecosystems Approach? The Utilisation of Ecological Knowledge in Decision-Making

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THE POSSIBLE EXPERTS: HOW EPISTEMIC COMMUNITIES NEGOTIATE BARRIERS TO KNOWLEDGE USE IN ECOSYSTEMS SERVICES POLICY¹

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Abstract *The increased saliency of how to value ecosystems services has driven up the demand for policy-relevant knowledge. It is clear that epistemic communities' advice can show-up in policy outcomes, yet little systematic analysis exists prescribing how this can actually be achieved. This article draws on four decades of knowledge utilisation research to propose four types of 'possible expert' that might be influential on ecosystems services. The first section reports the broad findings of a literature review on knowledge use in public policy, and outlines the four-fold conceptualisation pioneered by Carol Weiss that defines the literature. Section two systematises the field by placing these four modes of knowledge use within an explanatory typology of policy learning. With how, when and why experts and their knowledge are likely to show-up in policy outcomes established, the article then proposes the boundaries of the possible in how the ecosystems services epistemic community might navigate the challenges associated with each learning mode. Four possible experts emerge. The expert with: political antenna and epistemic humility; the ability to speak locally and early to the hearts and minds of citizens; a willingness to advocate policy, and, finally, an enhanced institutional awareness and peripheral policy vision. The article concludes with a brief discussion of the utility of the analysis.*

Keywords ecosystems services; evidence based policymaking; epistemic communities; expert advice; knowledge utilisation; policy learning

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Introduction

In 2001, the United Nations (UN) marked World Environment Day by launching the Millennium Ecosystem Assessment (MEA) with then Secretary General Kofi Annan's memorable exhortation that we be 'good stewards of the earth we inherited' (UN, 2001). As a worldwide scientific enterprise to map the health of the planet and the gaps in the knowledge, the MEA established arguably the largest global interdisciplinary epistemic community (Haas, 1992) on ecosystems services and placed experts at the forefront of translating Annan's aspiration into policy reality. The salience of policy-relevant knowledge on the environment in general and ecosystems in particular has encouraged experts to reflect on their understanding of the ways in which evidence informs policymaking, and the different strategies they might deploy to negotiate knowledge-policy interface (Fazey et al, 2012; Meyer, 1996; Pielke, 2010; Owens, Petts and Bulkeley, 2006; Weiss, 1998). This article reviews the literature on knowledge utilisation to explore what lessons can be drawn from the research in this field. Specifically, it reflects on the state of knowledge utilisation and evidence-based policymaking (EBPM) across a wide variety of policy sectors and issues. This approach assumes that valuing ecosystems is not an exceptional problem with unique features. Like many issues characterized by uncertainty and complexity, knowledge around ecosystems services is comprised of normative beliefs, cause-and-effect claims, agreed methodological standards and policy aspirations (Haas, 1992). The urgency of the problem certainly makes the search for ways in which experts can get their evidence into policy especially pertinent. But this urgency is not unique – as illustrated by studies from the health, social care, criminal justice and nuclear sectors, to name a few.

The literature reveals a consensus around the 'varieties of use' argument (Nutley, Walter and Davies, 2007; Weiss, 1979). Decision-makers need knowledge – especially in complex issues associated with environmental protection and sustainable development – but,

how and when decision-makers use it is varied and contingent. And so, it makes sense to think of knowledge utilisation as a *varied process* as opposed to an endpoint (see Cowell and Lennon in this issue for a wider critique of the so-called linear model).

For researchers and scholars producing policy-relevant knowledge, this varied reality can be frustrating. Evidence, they worry, is being used in the wrong way if at all (Beam, 1996; Weiss, 1979). It would be easy to argue that those engaged in knowledge production can do very little about the barrage of barriers they encounter. But, this is too defeatist and partly rooted in a misunderstanding about what it means to contribute to policy. In their classic study on *Useable Knowledge*, Lindblom and Cohen (1979) argue that experts often become engaged in a mistaken pursuit of authoritativeness – erroneously equating influence with the direct and immediate translation of their knowledge into policy. Experts’ knowledge does ensure they occupy a special role in policymaking. Rather research tells us that in the real world of policymaking the impact of this knowledge must be mediated by other actors and structures. After over four decades of research, a good deal is known about how policymakers learn from experts in different contexts, and the conditions that give rise to that use. How can experts in ecosystems services engage and adapt positively and creatively to these different contexts of use? What skills might they need?

This article applies a typology of four learning types to the reviewed literature on knowledge utilisation in order to explore the variety of ‘possible experts’ that might flourish in different contexts. It is argued that experts should explore the form of knowledge they produce and how they present it; how they relate to society; the tactics they adopt in politicised advisory games, and finally, their role in relation to other authoritative structures – for example courts and policy programmes. The article is organised as follows. The first section reports the broad findings of a literature review on knowledge use in public policy, and outlines the four-fold conceptualisation pioneered by Carol Weiss that structures the

literature. Section two systematises the field by placing these four modes of knowledge use within an explanatory typology of policy learning. This emphasis on learning reflects the dynamic nature of knowledge use where decision-makers' policy beliefs are updated, challenged and, on occasion, changed. Examples from the literature are used to explicate the causal mechanisms; actors' modes of interactions, and micro-foundations of decision-makers' attention to experts found in each mode of knowledge use. The aim here is to establish the boundaries of the probable – i.e. to outline what the literature tells us about how, when and why experts and their knowledge are likely to show-up in policy outcomes. The third section builds on these findings to establish the boundaries of the possible in how the preeminent epistemic community of experts working in ecosystems services might navigate the challenges associated with each learning mode. In short, what qualities might the ideal 'possible expert' in the ecosystems services epistemic community usefully cultivate in the four scenarios? The article concludes with a brief discussion of the utility of the analysis.

Section 1 Four Types of Knowledge Utilisation

Knowledge utilisation and the role of experts have been examined in many different ways in public policy. The sustained empirical study of the uses of knowledge and evaluation goes back over four decades and flourished in particular in the 1970s and 1980s. During this 'golden age' (Henry and Mark, 2003) much research energy was dedicated to surveying experts and users to uncover the extent of, and routes to, influence (for example, Caplan, Morrison and Stambaugh, 1975; Weiss, 1979; Weiss and Bucuvalas, 1977). This tradition has been given a new lease of life by the evidence-based policymaking (EBPM) literature (Nutley, Walter and Davies, 2007) and research on policy formulation and appraisal (Dunlop, Maggetti, Radaelli and Russel, 2012; Turnpenny et al, 2010; Turnpenny et al, in this issue).

The first step in systematising the field is to map the literature by conducting a bibliographic search. Using a variety of search options in the ISI social science citation index (SSCI) some 1351 articles and book chapters were identified from the main sub-fields of political and environmental science². After sifting these down to 171, a further 57 sources were added that are concerned with knowledge use, expertise and evidence based policymaking but are absent from the index. The result was 228 studies covering over 40 policy fields and issue areas. The full bibliography can be found in the [online annex](#).

This empirical variation is not however mirrored conceptually. In contrast to the landscape of policy analysis in general, and specific subjects such as policy learning, the study of knowledge utilisation is analytically well-organised. Scholars researching how and when evidence shows up in policy speak the same conceptual language. Specifically, they continue to speak in the terms invented by Carol Weiss (and various collaborators) where ‘enlightenment’ is instrumental, conceptual, symbolic-political (1979)³ or, most recently, imposed (Weiss, Murphy-Graham and Birkeland, 2005)⁴.

First, knowledge can be used *instrumentally*. The most direct form of use, decision-makers operating in instrumental mode use knowledge to inform decision-making and improve policy action – building and terminating policy programmes on the basis of what the evidence says. While such ‘intended use by intended users’ (Patton et al, 1977) is the prescriptive baseline to which experts producing policy knowledge commonly aspire (see

² Four searches in the ISI Social Science citation index were conducted on 20-24 April 2013 with the following criteria: (i) Topic=(evidence-based AND policy OR evidence-based AND public policy); (ii) Topic=(knowledge utilisation AND policy); (iii) Topic=(knowledge usage AND policy); and (iv) Topic=(expert advice AND policy). This was then refined by subject areas: Public Administration OR Government Law OR Environmental Sciences Ecology. This produced an initial sample of 1351. 1171 articles and book chapters were rejected from this sample through an abstract sift. Paper were rejected that focussed on developing countries; knowledge utilisation between non-state actors beyond the political sphere; those which used evidence, expert and knowledge use in a purely descriptive way; and those which reviewed the literature without offering either an empirical study, prescriptive conclusions, or conceptual content. Of the remaining 180 sources a further 9 duplicates were rejected. This left us with the 171 articles and chapters that could be explored, 57 were added as the result of a hand search (N=228). These 228 references can be accessed in an online appendix found at [XXX INSERT HYPERLINK](#)

³³ To be clear, Weiss identifies seven types of knowledge use which are commonly compressed into the three listed here.

⁴ To give a sense of the scale of the impact of Weiss’ categorisation, her 1979 article in *Public Administration Review* alone is cited by N=307 in the ISI Web of Science and her 1987 book (with Bucuvalas) *Using Social Research in Public Policy Making* N=245. Google scholar put these at N=1062 and N=649 respectively (accessed 24 April 2013).

Preskill and Caracelli, 1997 for a survey of US evaluators), policy design is rarely justified in evidential terms alone (Weiss, Murphy-Graham and Birkeland, 2005: 13). Whether experts like it or not, decision-makers have a plurality of audiences to whom they must attend and appeal. Even when they are in a position to privilege expert voices, decision-makers may not be endowed with the resources (both economic and technical) necessary to translate evidence into action (Howlett, 2008).

But, all is not lost. More commonly, knowledge is used *conceptually* to ‘enlighten’ (Greene, 1988; Weiss, 1979). Though decision-makers may neither slavishly nor directly follow expert direction, the fact that evidence about a policy programme or issue is ‘out there’ can combine with other ideas to condition the wider policy environment. Use in this mode is indirect and temporally contingent, where ideas come of age over time.

In contrast to received wisdoms which form and enlighten over time, the third use of knowledge is for legitimisation. In this *political or symbolic* mode, evidence is used to deliver pre-existing preferences (Boswell, 2008; Weiss, 1986). While selective use, or cherry picking, of evidence is common here, it can also simply be used to strengthen a policy stance that has most support.

Recently, a fourth mode has been identified by Weiss and her colleagues. In their study of the effects of the Drug Abuse Resistance Evaluation (DARE) in the United States (US), the *imposed* use of knowledge was discerned (Weiss, Murphy-Graham and Birkeland, 2005). To boost local accountability, the US Department of Education (DoE) required districts to adopt drug education programmes that met its ‘Principles of Effectiveness’. Evaluations of DARE repeatedly found that this programme failed to meet its objectives, resulting in widespread negative publicity and DARE being denied a place on the DoE’s approved programme list. As a result, districts either abandoned or scaled back their involvement in DARE. While the

negative evaluations of DARE played a central role in its marginalisation, this is a story of imposed rather than instrumental use. The causal factor at work here was structural – the rule that a prescribed form of evidential justification be made for their programme choices. This condition left districts with the choice to either offer their own evaluations of DARE, or turn to the pre-approved list. The weight of evidence against DARE, limited local analytical capacity and federal mandate combined to make the adoption of an approved list programme the only viable option.

Of course, a fifth category, that of *non-use* of evidence, must also be acknowledged. The UK National Ecosystems Services (NEA) report notes the undervaluation of ecosystems services in conventional analysis and policymaking (NEA, 2011: 13). However this need not be equated with non-use. While the null hypothesis of-use is analytically possible, it is empirically improbable and therefore arguably unnecessary. Where decision-makers' ignorance of evidence is wilful we are not witnessing non-use but rather rejection. Where ignorance is unwitting – often the product of information overload and scarce decision-making attention – what may be categorised as non-use may actually be better understood as pending, deferred or delayed knowledge use.

Section 2 Systematising Knowledge Utilisation as Policy Learning

With these four modes outlined, the second step is to systematise the field. Three elements are explicated: the causal assumptions, political implications and micro-foundations of decision-makers' attention that underpin them⁵. Only once this has been done, can the pathologies that occur in each mode be explained and lessons drawn for the 'possible expert'

⁵ It should be noted that recent attempts to take Weiss's modes of knowledge use to a deeper analytical level have been set to one side in this discussion. While they too focus on the causal pathways that underpin knowledge use, the schema developed by Henry and Mark (2003) and Mark and Henry (2004) is far more wide-ranging than what is on offer here. Specifically, the aim here is to zoom-in on the learning dimension of expert influence, while Henry and Mark treat learning as just one of many processes through which evidence can exert influence.

that might emerge to avoid or overcome them. Following a recent explanatory typology of policy learning founded on conceptions of knowledge utilisation (Dunlop, 2009; Dunlop and Radaelli, 2013), it is argued that Weiss's four categories are the result of variation in two key dimensions of knowledge-dense policy problems.

The first concerns the level of *problem tractability* associated with the issue (see for example Hisschemöller and Hoppe, 2001). Where technical uncertainty is radical, decision-makers need authoritative advice – in the form of epistemic communities (Dunlop, 2009, 2010a, 2012; Haas, 1992). However, where uncertainty is low or has been reduced, issues become open to contestation by citizens and special interests. Epistemic uncertainty seems particularly pertinent to the valuation of ecosystems where knowledge is often developing rapidly and paradigms not always fully formed.

The second contextual dimension concerns the *certification of actors*. This concerns the extent to which a group of experts exists to advise policymakers on the issue at hand. These experts will hold consensual knowledge and their 'performances and claims' to expertise will have been validated by the state (McAdam, Tarrow and Tilly, 2001; 121). In relation to the environment, institutional fora are often the classic place where certified actors are found – most notably the Intergovernmental Panel on Climate Change (IPCC). It should be noted, certified actors may or may not be the subject of a formal delegation of power (certainly policy advice is more commonly produced by ad hoc advisory committees than formal epistemic agencies). Knowledge use is not limited to such highly structured formal environments however. Epistemic authority can be diffuse where no single certified group exists and expertise is localised or plural.

Taken together, epistemic uncertainty and authority provide the basic conditions for the models of learning that underpin the four knowledge use types championed by Weiss (see

Figure 1). These four are differentiated by the causal mechanisms they imply; actors' modes of interaction; and the types of decision-maker attention that mediate experts' influence (see Table 1). By outlining these ideal types and illustrating them empirically the boundaries of the probable can be established – the worlds of knowledge use that experts are most likely to face.

FIGURE 1: CONCEPTUALISING KNOWLEDGE MODES AS POLICY LEARNING

		PROBLEM TRACTABILITY	
		LOW	HIGH
CERTIFICATION OF ACTORS	LOW	<p>Reflexive Learning CONCEPTUAL KNOWLEDGE USE</p>	<p>Learning through Bargaining POLITICAL / SYMBOLIC KNOWLEDGE USE</p>
	HIGH	<p>Epistemic Learning INSTRUMENTAL KNOWLEDGE USE</p>	<p>Learning in the Shadow of Hierarchy IMPOSED KNOWLEDGE USE</p>

Source: adapted from figure 1 (Dunlop and Radaelli, 2013)

(1) *Epistemic learning* takes place where knowledge is created and communicated by a certified set of experts with the aim of directly increasing problem tractability and improving policy outcomes. Here knowledge use is instrumental and decision-makers' attention is 'directed' – voluntarily tied to a narrow stimulus or group in order to understand complex phenomena (Kaplan and Berman, 2010). Specifically, these are closed and specialised epistemic communities which assume the role of socially legitimate teachers to decision-makers. In its purest form, epistemic learning and instrumental use can result in expert involvement in preference formation. For example, in Peter M. Haas' ground-breaking study of the United Nations

Environment Plan (UNEP) he identifies an epistemic community of academics and environmentalists which came to define the international approach to the environmental management of the Mediterranean Sea (1990). In this ideal typical example, the mode of interaction was cooperative but necessarily asymmetrical, with decision-makers effectively being taught by the experts.

But, the UNEP case is far from representative. As noted earlier, this is the atypical form of knowledge use, and empirical studies of such successful cases are thin on the ground. This has not led to a limited literature however. On the contrary, the majority of papers on knowledge use concern the instrumental mode – or more accurately the barriers to it and techniques that may increase success in affecting a direct link between expert inputs and decision-making outputs. For scholars (who are themselves experts), it is the ideal type to which evidence-based policymaking should aspire. Remedies come in two categories. First, there are reforms that might be made to bureaucratic architectures – for example, most recently arguments have been made that policy evaluation be systematically embedded in policymaking (Oxman et al, 2010; Sowden and Raine, 2008) as impact assessment has been in many countries. In addition, the role of institutionalised evidence champions has also been noted – see for example, Dunlop (2010b) on the importance of Chief Scientific Advisers (CSAs) on biofuels in the UK. Indeed, the importance of knowledge brokers is a recurrent theme in studies of how decision-makers search and access knowledge (Hird, 2009; Landry et al, 2003; Ritter, 2009; Sheard, 2010).

The second (longer) list of palliatives concerns what experts themselves can do. In short, experts need to ensure their work is ‘useable’ (Lindblom and Cohen, 1979). This means using accessible communication strategies that fit the context (Howlett, 2009; Jewell and Bero, 2008; Yetley, 2007). Many scholars link

communication to the content of what is being communicated and specifically, the technique used to produce that content. Systematic reviews that allow the summation of a large amount of information (both qualitative and quantitative) in response to a specific question are foregrounded as powerful tools (for example, Fox, 2005; Moreira, 2007; Ritter et al, 2007) (assuming they are kept up-to-date [Petrosino et al, 2001]). Randomised control trials (RCTs) are similarly promoted as offering clear-cut evidence of ‘what works’ (Stoker, 2010; Stoker and John, 2009). Although such enthusiasm may be tempered by evidence that decision-makers – even North America where the experimental method is most common – are not always aware of RCT data (Bedard and Ouimet, 2012). Moreover, they raise the stakes in ways that can make them sites of considerable contestation (Dunlop, 2013). Finally on techniques that enhance evidence usability, ‘return on investment’ techniques that aim to quantify or monetise the costs and benefits of action are thought to boost instrumental use (see Jewell and Bero, 2008 for a survey of policymakers; Hamblin and Shearer 2009 on cost forecasting in Medicaid).

What these methods have in common is their assumption that experts increase their chances of direct effect when they can align their research to the policy context. Co-production of research questions with decision-makers is one means of gaining clarity about the policy boundaries *before* systematic reviews or RCTs are designed. But, this is also about timing (see Collins et al, 2006 on waste management in Cardiff and Elliott and Popay, 2000 on local NHS policymaking). A recurrent theme in the literature is that experts must seek out and jump through ‘windows of opportunity’ (Doran et al, 2010; Hughes, 2007; Ward et al, 2012) when the salience of evidence peaks. Of course, all of this assumes much about experts’ proximity to the policy world and their ability to read it.

(2) *Reflexive learning* maps onto knowledge use in its conceptual form. In reflexive settings, knowledge use is open-ended – the result of deliberation by a multiplicity of social actors – making outcomes difficult to predict. In this mode uncertainty is at its greatest – uncertainty about the issue and who should learn from whom. The result is learning through horizontal social networks where knowledge is used to deepen discussion, challenge and recreate received wisdom. This is learning in the Habermasian mode where decision-makers’ attention is diffuse and policy learning occurs over time through communication, percolation, collective puzzling and persuasion.

Interaction here is cooperative and symmetric. In its purest form, deliberation is force-free where a multiplicity of voices can be heard and preferences open to persuasion. The epistemic hierarchy of the instrumental mode is replaced here by a range of knowledge types – substantive; value-based; experiential – associated with complexity (Sanderson, 2002, 2009)⁶. In its ideal type, ‘what works?’ is not merely a technical question, it is also a matter of social legitimacy – interpretations that underpin policies must resonate with the wider public who will be reconstructed by them (Freiberg and Carson, 2010). Such post-positivism is evident in the empirical studies where claims are challenged by lay actors and expertise (re)distributed. For example, the role of the voluntary sector in bringing experiential knowledge to the policy process is a recurring theme (see for example, Laforest and Orsini, 2005) as is the emphasis on the benefits of localised approaches to evidence which reject top-down centralised models (Ferlie et al, 2009 on UK health policy). Jarvis, Berkeley

⁶ See Little (2012) for a discussion of the compatibility of deliberative tools to address complex or wicked issues.

and Broughton (2012) place similar emphasis on the role of local communities in urban regeneration.

- (3) The third category concerns *learning through bargaining* – where knowledge use is political or symbolic. As with reflexive type, actor certification is low, but so is the uncertainty associated with the issue. This problem tractability ensures that the many actors in this area are powering rather than puzzling around the issue with interaction guided by a strategic rather than communicative rationality. Thus, the field is open to politicians, bureaucrats and organised interests to commission and select evidence from a plurality of ‘knowers’ most suited to develop and justify their policy preferences. As noted earlier, evidential misuse⁷ can be a feature of strategic learning situations, but is not the only one (Weiss, 1979: 36).

Interaction here is polyarchic where interest-based and political actors form coalitions based on resource interdependencies to advance pre-formed policy preferences. The literature review reveals that in this competitive environment, it makes sense to think in terms of policy-based evidence making (Boswell, 2008; Hughes, 2007). Policies are the result of partisan mutual adjustment with evidence used to drive home bargains. The absence of new regulations restricting food marketing to young people is a classic example of a compromise between governments and the powerful food industry (Hawkes, 2007). Experts and evidence in this case was cherry picked to back a political compromise. Similar evidence exists of selective attention to evidence in areas where the substantive cause-effect mechanisms are understood but are less important than the pay-offs at stake – for example in

⁷ See Patton (1997) on the problematic nature of the idea of misuse.

tobacco control policy (Hastie and Kothari, 2009); energy (Torriti, 2010) and alcohol regulation (Baggott, 2010).

Even in the most technical of areas, it can be difficult to ring-fence experts and evidence from selective attribution. Take for example the case of health care in the US. The once technocratic issue of comparative effectiveness has become engulfed in the wider partisan struggle to define the policy on universal health care reform. Here, experts with opposing views are pitted against each other by political parties and the insurance industry (Gerber and Patashnik, 2010). The resulting stand-off can only be resolved by political compromise and bargaining. A similar example where political actors inject conflict into expertise is provided by Dunlop (2013) in their study of how the National Farmers Union (NFU) and rival scientists dismantled evidence on the management of bovine tuberculosis (BTB) despite it being the bedrock of an international scientific consensus.

(4) Finally, there is a context marked not by a plurality of actors bargaining or deliberating but rather by hierarchical mechanisms strong enough to force knowledge use. *Learning in the shadow of hierarchy* captures the imposed use uncovered in the DARE case. It is worth pausing to make the case for imposed use as a category of the same order as our three established modes of use. Imposed use concerns situations where research is structured into institutional rules or mandated in some way. Here, the power of a formal institution (the US DoE), and its rules, was the central causal mechanism in coercing how and when experts and their knowledge mattered. The literature review reveals that pre-eminent paradigms underpinning institutions, existing policy tools and programmes and legal requirements all impose particular ways of using knowledge.

Butler’s (2009) study of alcohol regulation in the Republic of Ireland (RoI) is particularly instructive. Here, the prevailing neo-liberal policy climate created a context in which the state eschewed direct intervention in the functioning of the alcohol market. Thus, the market mediated and limited the influence of the scientific community armed with consensual knowledge on the positive impact of pricing interventions on alcohol abuse. As with the DARE study, this case highlights the asymmetric power relations that mark interactions between actors in hierarchical settings, and routinized nature of policymakers’ attention. Alcohol experts cannot engineer an escape from the conflicting neo-liberal ‘rules of the game’ and cannot hold the attention of policymakers whose attention is set to this default position. Rather, exogenous shocks are required to trigger a paradigm shift. Butler (2009) suggests that the economic recession triggered by the 2008 banking crisis could precipitate a move from hierarchy toward more epistemic learning in this case.

TABLE 1: BOUNDARIES OF THE PROBABLE: UNPACKING KNOWLEDGE USE AS POLICY LEARNING

Learning as ...	Epistemic	Reflexive	Bargaining	Hierarchical
Knowledge use as ...	Instrumental	Conceptual	Political / Symbolic	Imposed
Causal mechanism Knowledge use mediated by ...	Expert teaching	Deliberation	Resource competition	Institutional rules
Interaction of experts and policy actors as ...	Cooperative asymmetric	Cooperative symmetric	Competitive symmetric	Competitive asymmetric
Decision-makers’ attention as ...	Directed	Diffuse / Divided	Selective	Routinized

Section 3 Four Possible Experts of Policy Learning

Having established the probable worlds faced by experts aiming to get their knowledge into policy, this section moves on to the boundaries of the possible. By using the literature review to highlight the benefits and pathologies of each mode of knowledge use, the aim is to draw lessons for the ways in which experts in environmental and ecosystems services might facilitate policy learning (see Table 2). In short, what qualities might an ideal ‘possible expert’ acquire? Following the approach adopted thus far, each of the four modes is explained in turn.

TABLE 2: BOUNDARIES OF THE POSSIBLE: EXPLORING THE POSSIBLE EXPERTS

Learning as ...	Epistemic	Reflexive	Bargaining	Hierarchical
Knowledge use as ...	Instrumental	Conceptual	Political / Symbolic	Imposed
Benefits as ...	Clinching what works	Depth of debate and breadth of knowledge types	Wide range of evidence scanned	Lock-in evidence
Pathologies ...	Groupthink and stifled innovation	Uneven capacity leads to spurious consensus	Unstable outcomes and expert discrediting or withdrawal	Blocked learning and expert defeatism
The possible expert has ...	Political antenna and epistemic humility	The ability to speak locally and early to citizens’ hearts and minds	A willingness to advocate policy	An enhanced institutional awareness and peripheral policy vision

In terms of *instrumental use* in the epistemic mode of learning, a good deal is known about the benefits of using evidence of what works in policy design and reform. As discussed earlier, experts have at their disposal techniques that may ‘clinch’ an argument (Cartwright and Hardie, 2012). They also have the ability to extend the regulatory imagination about both what is probable and possible in the future. In relation to environmental policymaking, forward-looking techniques such as scenario planning (Volkery and Ribeiro, 2009) and horizon scanning (Sutherland and Freckleton, 2012) offer ways of demonstrating the interaction between ecological and socioeconomic models (see also the six storylines outlined in the UK NEA [2011: section 7, p. 45-48]).

However, epistemic forms of learning are vulnerable to ‘groupthink’ (Janis, 1972). Studies explore how narrow methodological choices can effectively bar important pieces of evidence created from different research traditions (see Milewa and Barry, 2005 on the primacy of quantitative methods). Policy overconfidence may result from such closed and narrow advisory relationships (see Curry, 2011 on the IPCC) where dissenting voices are shut-out. Glees’ (2005) analysis of groupthink in the UK intelligence community illustrates that while access to the epistemic community should be based on knowledge endowment often these communities act more as ‘invisible colleges’ (Crane, 1972). In that instance, those who pointed to the inadequacy of intelligence evidence and methods, both before and after 9/11, were ignored because they were not part of the narrow group of certified actors. The groupthink pathology is not simply problematic in policy terms, where certification is contested as a result, social trust in evidence based policymaking as a whole may be undermined.

Much space is devoted in the literature to the importance of simple, summative and accessible messages from experts to decision-makers (Brownson and Jones, 2009; Ritter,

2009; Sheaft et al, 2009). But, we must acknowledge the trade-offs such communication strategies may involve. To take an extreme case; the Southwood committee reporting on bovine spongiform encephalopathy (BSE) in the UK stands as an acute example of the misunderstandings such strategies can give rise to (Jensen, 2004). The countervailing risks can also distort the nature of knowledge supply. Smith's (2010) interviews of experts involved in health inequalities research in Scotland and England reveals that the need to be policy-relevant squeezes the space available for innovation. Davoudi (2006) provides an example in relation to knowledge construction on urban environments where he argues that chasing policy relevance has left areas such as strategic waste management planning under-researched.

The possible expert in the world of epistemic learning has political antenna and epistemic humility. For experts aiming to achieve instrumental use, the challenges of evidential presentation are considerable. Getting into the right institutional position is only one part of the battle; as the earlier discussion illustrates experts need softer skills – persuasion, resilience and policy guile. While the challenge of developing political antenna should not be understated, the changing incentives structures created by new audit requirements – for example in the UK, academics are required to demonstrate impact – may provide scholars and experts with more support to develop knowledge transfer skills. Navigating the policy world is not risk-free of course. Normative questions regarding independence, and the fact that policy boundaries can be gerrymandered by political actors, may leave experts exposed.

Given these risks presented by the advisory world, the integrity of the evidence produced must always be the expert's core concern; this raises a need for epistemic humility. As we saw from the many tips concerning how evidence is produced and packaged by experts, there is no shortage of advice on offer. Knowledge management tools such as

systematic reviews might offer a useful way ahead in environmental issues. A recent review of some 262 evaluation studies of European climate policies revealed a lack of systematic policy evaluation (Haug et al, 2010; Huitema et al, 2011). One could imagine how a Cochrane-style collaboration for ecosystems services could help elucidate the multi-dimensional nature of the associated policy problems. Of course, diversity in the quantity, accessibility and quality of ecological data presents particular challenges for the construction of systematic reviews (Pullin and Stewart, 2006) that may undermine explanatory scope (Boaz and Pawson, 2005). These accepted, the Campbell collaboration covering education, crime and social welfare suggests they are may not be insurmountable in multi-dimensional ecological issues. Moreover, the existence of a common conceptual framework developed by the UK ecosystem services epistemic community, first in the Millennium Ecosystem Assessment (MEA) and then the UK's NEA (NEA, 2011: 57), provides room for optimism about the prospects for collaboration.

A similar balance of caution and ambition is required in relation to RCTs and cost-benefit analyses (CBA) which promise to provide 'clinching' evidence to direct policy (Cartwright and Hardie, 2012). Experts working in ecosystems services must be mindful of the limits to translating 'rational' evidence into policy: the responsible teacher is willing to disappoint their pupils and highlight areas where evidence is partial or uncertain (Salafsky et al, 2001; Hockley in this issue). Certainly, the NEA illustrates epistemic realism as it makes clear where the knowledge is incomplete – for example on microbial diversity in soil and water or in how changes in ecosystems affect human well-being (2011: 23, 31). Even where there is an adequate evidence base, we know that transforming evidential indicators into actual policy is complex (Herzi and Dovers, 2009). Similarly, Willis' (2010) exploration of the utility of cost benefit analysis (CBA) suggests that sustainable development policy in the UK may be 'running ahead' of the evidence base (NEA, 2011: 49 echoes this point as does

Hockley in this issue). Analytical capacity issues may exacerbate problems in how these complex tools are used (if they are used at all – see Nilsson et al 2008), as will the fact that services are constantly changing and so require frequent recalibration and adjustment of the evidence base (NEA, 2011: 7).

Moving onto learning in the reflexive mode, a key benefit of the *conceptual use* of knowledge is thought to be the prevention of the groupthink associated with instrumental modes. Certainly, deliberation and epistemic inclusion allows a wide range of knowers to open hitherto closed black boxes. Disorganised decision-making can be more reliable, and less subject to political interference, than that of the epistemic mode (see Surowiecki, 2005 and Sunstein, 2006 on crowd wisdom) and result in transformative moments (Pallet and Chilvers, 2013). More knowers also make for ideational heterogeneity. In particular, approaching issues in a values-based manner appears to be a promising way to enhance the social legitimacy of outcomes. Value-talk is especially suitable for contested issues where the trade-offs between public and private interests are at their most controversial (see Pawson, Owen and Wong, 2010 on banning smoking in cars carrying children and Resnik, 2010 on trans-fat bans). Beyond values, inclusive and localised deliberation increase the opportunities to bring in grey and undervalued areas of the epistemic world – where uncoded and experiential knowledge, anecdotes and innuendo can expand the understanding of an issue (Bastian and Coveney, 2012; Elliot and Popay, 2000; Fazey et al, 2006; Griffin, 2009; Raymond et al, 2010; Wegner et al 2001; Wynne, 1996) and be subjected to scrutiny (Haines-Young and Potshin in this issue; Ritchie, 2011).

Society is not simply the engine of debate; it can also be the laboratory for testing risky policy ideas. Local settings emerge in the literature as critical to gathering support for

policy experimentation (see for example Collins et al, 2007 on health inequalities). User-engagement in knowledge production and policy testing is also increasingly evident in environmental issues (for example, Evans, 2006 on local environmental planning; McKenzie et al in this issue). Localised participation is a key aspiration voiced by ecosystems services experts in the NEA – where the ideal is to create mechanisms ‘open ... enough to facilitative dialogue and collaboration and allow necessary trade-offs to be understood and agreed when making decisions’ (2011: 5; see also Waylen and Young in this issue for a wider discussion of learning as co-production and McKenzie et al in this issue for a case study of the positive benefits this mode can generate).

And so, the reflexive learning that underpins conceptual knowledge use aspires to the redistribution of expertise. Yet, the implementation of this ideal is often problematic on the ground. The co-production of knowledge is challenging (Hivon et al, 2005) with the uneven capacity of participants presenting a key stumbling block. Deliberative forms of advisory politics do not mean that all participants have equal voice (Milewa, 2006 on the adoption of health technologies). For example, while participatory scenario planning on climate change futures in British Columbia did enhance citizens’ ‘buy in’, actual gaps in some participants’ comprehension of the subject’s nuances prevented empowerment (Robinson et al, 2011). Even where participants are cognisant of the issue at hand, where value conflicts are deep-rooted a ‘best argument’ and way forward may not be found (Pellizzoni, 2001). In such circumstances, nebulous or ‘vehicular ideas’ (McLennan, 2004) often appear to placate participants and close down debate. For Shulock (1999), these inequalities and incommensurabilities represent a dose of realism – we should limit our ambitions. Knowledge should percolate down to citizens at best serving an educative function which over time enhances democracy in a general sense.

There is also a risk that process may displace achieving practical, efficient and timely policy outcomes. Isett et al's (2007) study of mental health treatments illustrates the difficulty in achieving economies of scale and policy coherence where decision-making attention is diffuse and participation fluid. This experience is echoed in wider critiques of deliberative approaches to policy making in general where inclusive processes result in chaotic and impractical policy. As Sanderson warns, a practical rationality must underpin deliberations if policy improvement is to ultimately follow. Deweyian reflection and thoughtfulness must be harnessed into action, lest we risk paralysis by analysis.

The possible expert in the reflexive realm has the ability to speak locally and early to citizens' hearts and minds. Research on the role of expert evidence in criminal justice policy illustrates the significance of affect and emotion in how the public understand the policy challenges (Freiberg and Carson, 2010). Similarly on ecosystems services, people's understandings of what works is often informed by deep-rooted beliefs or experiences. Where evidence and cognitive authority is contested, ecosystems experts have much to gain from engaging citizens' hearts as well as their minds. Indeed, such a bottom-up strategy chimes with much of the ideology that underpins sustainable development concepts in general (Charron, 2012; Lawton, 2007; Naess, 2001), and ecosystems services – in particular cultural services concerning the value of landscapes.

For this dialogue to generate communicative rationality, it is best directed as close to citizens and in a timely way. Much could be learned, for example, from those scholars that advocate the idea of 'upstream' knowledge production and use – where citizens, scientists, policymakers and interest groups – are brought together at the earliest possible stages (Willis and Wilsdon, 2004). This early involvement allows for the development of intersubjective understandings. As the NEA report acknowledges, shared ownership of the concept of ecosystem services has yet to be achieved (2011: 40-45).

The proposition that the selective use of knowledge characteristic of the *political / symbolic* mode actually involves learning processes may, at first sight, appear counter-intuitive. But, while there is no certified ‘teacher’ here to enlighten powerful and resource-focussed political actors, the competitive processes do produce unintended learning. Actors scan the epistemic landscape for evidence useful to their cause – ensuring an audience, at least initially, for a wide range of views. While the result of this consumption can be misuse (in the eyes of experts) it can also be seen as the development of know-how related to a specific policy preference.

The pathologies associated with the political or symbolic use of knowledge concern the depth of learning and stability of the political compromises generated. Learning may be shallow – this is particularly the case where use is entirely symbolic. For example, Mesnil (2012) argues that political actors are wedded to an out-dated maximum sustainable yield (MSY) model to defend the EU’s Common Fisheries Policy (CFP) as being evidence based. Where policy preferences are driving epistemic interpretation the prospects for double-loop learning (Argyris and Schön, 1978), where the fundamental objectives of policy are scrutinised, are remote. Where excessive, such incrementalism may leave unquestioned assumptions at the heart of policy paving the way for policy disasters and fiascos. Learning through bargaining may also be distorted and knowledge compartmentalised. For example, we know from behavioural economics that where responses to incentives are shaped by selective attention actors may focus disproportionately on evidence associated with loss and negative consequences (Kahneman and Tversky, 1984).

This inertia does not equate with stability of outcomes however. Where knowledge is used selectively or research agendas skewed (see Widome et al, 2010 on the tobacco

industry's influence in this regard), policy agreements may be fragile and subject to regular destabilisation by concerted campaigns waged by rival groups (for example, see Doehler, 2012 on employment law in Germany or Nagel, 2006 on occupational health policy in Australia). The tendency in such contested settings can be for experts to become discredited or to withdraw altogether (see Dunlop and James, 2007), preferring to remain above the fray. But, this may simply exacerbate the problem.

The possible expert in bargaining situations is willing to use their expertise to advocate policy. This is perhaps a bold proposition given how little the literature provides on the boundaries of the possible for experts operating in contexts dominated by political conflict. Indeed, most prescriptions are limited to negative lessons – where experts should keep their distance from interests to preserve their cognitive authority. But this is too simplistic in two respects. First, evidence is used and needed by interests – whether experts approve or not. Indeed, political actors as ‘ready-made partisans’ (Weiss, 1979) can add much needed fuel to ideas. This is certainly the case in ecosystems services which are directly affected by production-related activities – food, fish, energy, water etc. Second, experts are often political actors. They have policy projects and normative beliefs to advance (Haas, 1992). Most obviously on ecosystems, experts want to advance the argument that services are currently undervalued (NEA, 2011: 7). Establishing the ‘proper’ value (NEA, 2011: 4 foreword) is as much a matter of bargaining as it is technical modelling. The ecosystems epistemic community will want a seat at this table. That these experts speak the language of value and economic impacts is an obvious advantage in securing a place.

Experts are also commonly involved in commercial activities (see Dunlop, 2007 on genetic modification) or interest groups (see Boezeman et al 2010 on ecological economics). This is particularly visible in the development of sustainable technologies where knowledge, product development and environmental advocacy are entwined (see for example first

generation biofuels, Dunlop, 2010b). Accepting the blurred boundaries between knowledge and interests may liberate experts helping them become more assertive and transparent about the policy-relevance of their knowledge. One caveat is required however. Experts may encounter capacity issues of their own when they engage with interest-based actors. Nannini's (2009) study of nursing illustrates the utility of providing experts with information about how to operate effectively in the world of interest groups and advocacy.

And so, that knowledge use is mediated by resource competition does not render experts impotent. In fact, the selective use of their knowledge and credentials makes them potentially powerful political actors. But, this potential can only be realised if they are willing to leave the sidelines and join the argument.

It may, at first glance, be intuitive to reject learning in the shadow of hierarchy as having few benefits for knowledge use and the role of experts. However, as the DARE study illustrates, hierarchy can serve to lock policy onto an evidential path and *impose knowledge*. Rules, frameworks and prevailing orthodoxies are in place for a reason. This is not the shadow of dark unaccountable forces, but rather the product of socially and politically certified decisions. Such institutions can offer an important counter-balance, and challenge function to the power of experts. The result, of course, may be the inconsistent use of epistemic authority. For example, in the case of the use of neuroimaging evidence courts in the US are unwilling to accept evidence to prove insanity yet are more lenient about its use in death penalty hearings (Moriarty, 2008).

The pathologies associated with this imposed mode of use focus around the blocks to innovation that can occur. Many of the studies associated with hierarchy lay bare the interaction effects that result as evidence encounters governance architectures and rules. The shadow cast by New Public Management (NPM) tools is singled out for particular attention. While evidence-based policymaking (EBPM) is often cited as one of the NPM family (Geyer,

2012; Newman, 2001), studies suggest that knowledge use in the epistemic mode prescribed by EBPM is frustrated by performance-related tools and funding mechanisms (Learmonth and Harding, 2006). For example, the drive to evidence targets and private finance initiatives (PFI) has been found to work against the epistemic rigour associated with EBPM (see Bhatta, 2002; Heinrich, 2007 on the former and Pollock, Price and Stewart, 2007 on the latter).

Policy mixes can mediate the manner in which evidence is used, locking experts into suboptimal roles. In her exploration of the interlinkages between international trade policy commitments and health, Blouin (2007) illustrates that following evidence of what works in one domain – trade – produced an inhospitable environment for evidence in the other – health.

Laws, technical tools and standards may stifle expert-inspired innovation. Even environmental legislation may lock-in unwelcome, contested or outmoded knowledge. Eales and Sheate (2011) argue that a weak conception of sustainability underpinning the Strategic Environmental Assessment (SEA) Directive 2001/42/EC has contributed to the SEA's poor performance, thus far. Similar pathologies have been attributed to the design of technical assessment procedures (see Hertin et al, 2009 on impact assessment) and the use of the precautionary principle – which in some instances has prevented the updating of evidence on harm.

The possible expert in the shadow of hierarchy has enhanced institutional awareness, an understanding of the veto players in that setting and well-developed peripheral vision for policy interlinkages. Awareness of the structure of the policy pyramid is central if they are to maximise their position within it. Faced with the pathologies of hierarchy, experts could easily become defeatist – expecting rules and institutions to dictate the role of knowledge. Yet, hierarchy need not be insurmountable. While alone they cannot engineer an escape from stable structures and their influence is heavily circumscribed by strong forces, experts can

adapt to work with rules, or take advantage of occasional forces powerful enough to cut through institutional rules.

On adaptation, examples of the entrepreneurial behaviour of experts in legal settings abound where rules are exploited to lever-in new evidence (for example Gavrielides, 2010 on the expert use of the 1988 UK Human Rights Act and Stutz, 2008 on public inquiries) and experts use their cognitive authority to define the law and enforce standards (Guidotti, 2006 on evidence-based medical dispute resolution). Given this, it may be in experts' best interests to be aware of the hierarchical forces that structure their issue area with a view to developing research across linked areas (Downe, Martin and Bovaird, 2012; Ryder, 2008). They should also look for the institutional gaps which experts might argue to be filled. The suggestion that UK ecosystem protection could be locked-in by international action on biomass is one such example of this possible expert's mindset (NEA, 2011: 38-39), as is the understanding of the protection offered by the EU's Common Fisheries Policy (CFP) and Rural Development Programme (2011: 25).

Being aware that some hierarchies may be rendered spurious is also a key asset. For example, in the case of the Common Agricultural Policy (CAP), some policy instruments have changed agricultural policy beyond the production paradigm without any alteration to the original Treaty. Grant (2010) tells us that as expert analysis laid bare the social problems and economic inefficiencies of the original instruments, the CAP's founding infrastructure has been delegitimised. Of course, that it has not been dismantled mean it could still be used – rhetorically at least – to slow or pause reform.

Conclusions

This article has outlined four probable worlds of policy learning that underpin how and when knowledge is used in policymaking. Then, drawing on a bibliographic search, it

outlined the benefits and pathologies associated with each utilisation type and identified key examples of best practice. The key aim here was to reflect on the potential relevance of these lessons for the ecosystems sector, and the qualities that the ideal ‘possible experts’ might cultivate.

The literature review reveals the enduring appeal of Weiss’s four-fold categorisation of knowledge use. The papers in this volume suggest that knowledge use and learning in ecosystems services at the moment is concentrated around the two categories on the left hand side of the typology – reflexive (Haines-Young and Potskin; McKenzie; Waylen and Young) and epistemic (Jordan and Russel; Hockley). This reflects that, currently, ecosystems services issues have low tractability and the extent to which socially certified actors exist depends upon which aspect of ecosystems services one is addressing.

The approach taken here will not satisfy everyone. Typologies obscure as well as illuminate. For example, by shining a light on the types of use and the learning mechanisms that underpin them, this analysis offered a stylised account which draws clear lines between types of knowledge use and learning. While we know that in reality more than one type of use can be found in a single case⁸, it is remarkable how well the literature reviewed could be dropped into the distinct boxes.

Moreover, the ways in which knowledge usage changes over time has been neglected here (though see Cowell and Lennon in this issue). Exploration of this temporal dimension of knowledge production and use represents a useful next step in research as learning around ecosystems services expands beyond expert teaching and social deliberation into the right side of the typology of the more competitive worlds of learning through bargaining and hierarchy; worlds where resource competition and institutional standards and rules underpin learning and knowledge use.

⁸ This is something acknowledged by those scholars who prefer the language of continuum rather than distinct categorization (see for example, Nutley et al 2007).

The review of the wide range of policy issues and sectors beyond ecosystems services offers cause for optimism. Perhaps most hopeful is the relative absence of studies of non-use where evidence is consciously eschewed or rejected. The review offers up an eclectic range of ideas and possible tips to spark creativity in this area of environmental policymaking, and emphasizes that experts can widen their view beyond their instrumental ideal type. Of course, the downside is one of coherence; a motley collection of ideas can only offer a patchwork of views rather than a tailored vision for the way ahead in ecosystems services. But, a more coherent view will be possible as work in this area continues.

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⁹ Please note, the 228 references that arise from the literature review (outlined in section 1) can be accessed in an online appendix found at [XXXX INSERT HYPERLINK](#)

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