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# Ecological conversations and systems thinking<sup>1</sup>

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## **Introduction**

Charles P. Snow building upon his 1950s critique of the separation of two cultures of science and humanities said later “If you are going to have a scientist in a position of isolated power, the only scientist amongst non-scientists, it is dangerous whoever he is” (Snow, 1962:118). Sir Charles went on to suggest that for intelligent and highly placed non-scientists to believe in a value-neutral, quasi-objective form of scientific support in political affairs is not only misleading but dangerous. His reflections clearly have resonance in contemporary debates on environmental issues.

Politics is integral to science. There is now plenty of scholarship and research to support this claim, but there remains little in the way of a conceptual framing or mediating literacy to guide more purposeful interaction between the two cultures. This paper offers a review of ideas from different traditions though centred on systems thinking. Together they may help towards developing a framework with appropriate creative space for dealing with political and scientific issues in an integral manner. The ideas build upon a compilation of readings and editorial contributions in *The Environmental Responsibility Reader* (Reynolds et. al., 2009a)

## **From environmental debates to ecological conversation**

Much of what constitutes informed policy making around environmental decision making centres on contested debates that merely reinforces an alienation of an environment comprising the natural world of life and life support in which humans are an integral part. A well crafted essay by Stephen Talbott (2004) illustrates the dilemma by illustrating two dominant contrasting perspectives on environment – radical preservationism and scientific management – and illustrates the impoverishment of both in terms of mystifying or technically alienating non-human nature. The two perspectives may derive from well-intentioned drivers of environmental responsibility. In the case of radical preservationism – a caring for non-human natural world, and for scientific management – generating an accountability towards harm or wrongdoing to non-human nature. The flourishing of planet Earth is dependent on the way in which our human social worlds integrate with the biophysical natural world. Our engagement with non-human nature, either directly

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or indirectly, circumscribes how we care for nature and bear accountability for our impacts on nature in the past, present and future.

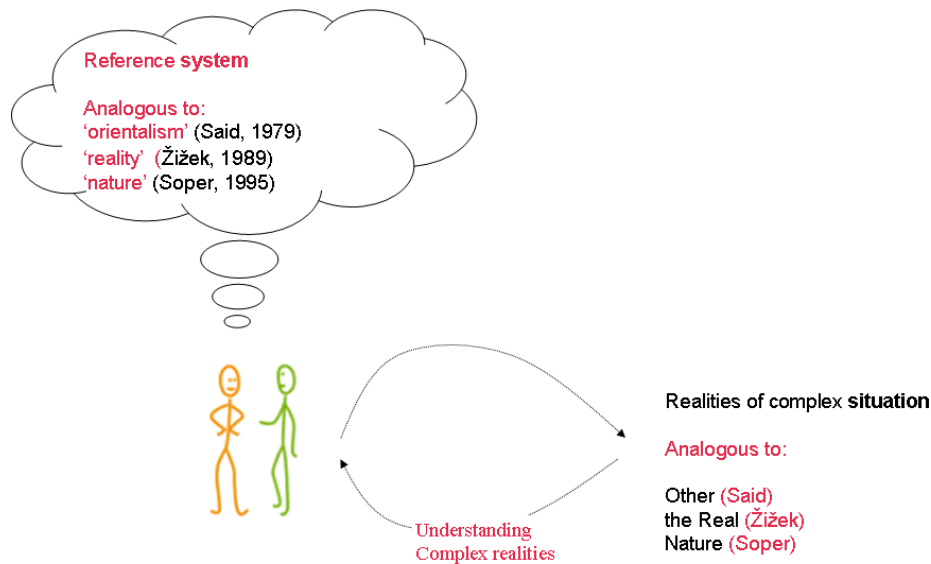
Talbott argues from an explicitly human-centred perspective, challenging us to explore the relationship with the ecological world – the Other - in terms of human conversation. The metaphor of conversation provides the means for identifying a more responsible and politically-informed engagement with environment. Similar expressions can be found in critiques of mainstream debates on environment in both the humanities camp and science camp. Andrew Light (2002) describes four key debates in environmental ethics that have shaped the way in which nature is valued. Whilst dialogues are important for creating respect for the non-human natural world, Light adds a note of caution regarding the need for a more relevant pragmatic language so as to inform policy design and action. Eric Higgs (2005) is similarly cautious about the language of science in ecological restoration initiatives. He argues for a distinction between the more focused scientific endeavours of restoration ecology and the wider conversations around ecological restoration in drawing out issues that matter.

In developing a framework for politically informed ecological conversations, three entities are required (i) the context or ‘objects’ of conversation – particularly, the interrelated socio-ecological issues that need surfacing; (ii) the agency of conversation – particularly people interacting and learning together; and (iii) ideas or tools for mediating conversation – particularly conceptual constructs that can help generate a continual sharing of understanding and practice. The remainder of this paper suggests a way of framing the interaction between these three entities. The framing itself is a conceptual task based upon traditions of systems thinking and systems practice.

### ***Framing understanding of contexts: systems thinking***

An extra-conceptual realm of context is sometimes demarcated from the more conceptual realm by a convention of reverence through use of upper-case initials. For example, Talbott himself uses the notion of the Other. Edward Said in exploring Western conceptions of non-western Islamic cultures famously distinguished between notions of the Other – representing unfamiliar cultures – with conceptual constructs of ‘orientalism’ (Said 1979) In a similar way, the psychoanalytical work of Slavoj Žižek demarcates actual realities - ‘the Real’ - from ideological constructs of ‘realities’ (Žižek 1989), and Kate Soper (Soper 1995) makes a distinction in appreciating how we construct environmental narratives, signalling a difference between the extra-discursive material realm of Nature compared with conceptual ‘nature’ narratives. The degree to which Nature, the Real or the Other occupy a wholly extra-discursive realm is debatable since the formulation of these dualistic pairs are themselves discursive expressions. The important point is to acknowledge a context that exists outside of any one reference system.

**[Figure 1 about here]**



**Figure 1 Framing complex situations of change and uncertainty**

Much of what is considered Nature is often codified as ‘systems’ – natural systems, ecosystems, ecological systems and/or environmental systems. *Systems thinking* is an active cognitive endeavour to conceptually frame reality. A key feature of framing Nature in terms of systems is the appreciation given to the multiple interrelationships and interdependencies that exist in the natural world

One of the first and most famous formal expressions of thinking about the natural world in terms of systems with interdependent parts was through the work of systems dynamics, as pioneered by Jay Forrester (b. 1918) who after a meeting with the influential Club of Rome drafted a systems dynamics model of the problems associated with the world – a model later referred to as ‘World1’. Under the influence of Forrester, a team of systems modellers from the Massachusetts Institute of Technology (MIT) who had been commissioned by the Club of Rome published their report *The Limits to Growth* (Meadows et al., 1972).

Although the book was widely read and discussed, most readers found the prescriptive ideas in *The Limits to Growth* hard to swallow. Economists were generally still of the opinion that ecological resources were not a limiting or constraining factor on economic development. Economists were quick to pick up on the shortcomings in the modelling scenarios (shortcomings that the authors had acknowledged anyway).

Twenty years after their original publication, several of the authors revised their scenarios in a new book, *Beyond the Limits* (Meadows et al., 1992). In giving greater acknowledgement to the potential of human *technological* inventiveness, the authors celebrated initiatives concerning the efficiency of resource use and provided a more optimistic note with regard to future technological innovations. However, their main argument – suggesting natural limits to *economic* growth – remained unchanged. Another significant development in the twentieth century that provided a framing of interdependencies in the tradition of thinking about systems was *chaos theory* and *complexity science*. Edward Lorenz (1917–2008) was a pioneer in this field and the

originator of the term ‘butterfly effect’ – his 1972 suggestion that very small changes in a natural system (e.g., butterfly wings flapping in Brazil) can have very large and unexpected consequences (tornados in Texas).

Fritjof Capra is a prominent contemporary writer in the same traditions of systems dynamics and chaos theory. Capra is a physicist; like other scientists, he draws inspiration from thinking about systems, and in particular thinking about living systems. He regards systems principally as interrelated entities constituting the ‘web of life’ (1996:1):

The more we study the major problems of our time, the more we come to realize that they cannot be understood in isolation. They are systemic problems, which means that they are interconnected and interdependent. For example, stabilizing world population will only be possible when poverty is reduced worldwide.

Systemic problems arise from the interrelationships and interdependencies of entities in a system. Thinking about complex issues associated with the environment in terms of systems provides a powerful framework for understanding and getting a grip on the issues. Capra equates systems thinking with ecological holistic thinking and its accompanying language and understanding, which he calls ecoliteracy. Developing ecoliteracy requires attention to concepts of interrelatedness and interdependence. Thus, returning to Talbott’s metaphor of having an effective ecological conversation, ecoliteracy may provide the lingua franca (or common language) for mediating conversation. In other words, understanding the principles of ecology can provide the conceptual devices that are necessary to flourish in a sustainable ecological world.

But some care is needed here. However good we may attribute our faculties for appreciating nature, there are limits. The philosopher of aesthetics Ronald Moore signals the dilemma in terms of a framing paradox: ‘On the one hand, frames seem to be an indispensable condition for the aesthetic experience of anything whatsoever, and on the other hand the aesthetic appreciation of natural environments seems to require the dissolving or penetrating of boundaries of all sorts’ (Moore, 2006, p. 249). He goes on to state (p.263):

In the end, the framing controversy is about the variety of limits on attention. Everyone admits that our sensory exposure to the world is limited and that our way of making sense of, or appreciating, the world to which we are exposed is also limited. Not only are the limits inevitable, they are basic conditions of the intelligibility of our sensory world.

Systems thinking is often invoked as an holistic approach towards assuring comprehensiveness. But this is only part of the story. One of the hallmarks of (critical) systems thinking is a recognition of the limits of holistic thinking (see Figure 2).

**[figure 2 about here]**



**Figure 2 Limiting understanding of interrelationships of climate change**

although systems thinking and ecological thinking are culturally important framing activities for alerting us to interrelationships and interdependencies, claims towards holism or being holistic can only be relative. Thus, Capra's ecological thinking is certainly *more* holistic than conventional scientific reductionist thinking.

### ***Framing practice and learning: systems practice***

Complexity scientists and chaos theorists provide an invaluable understanding of reality and living systems as interconnected wholes. Yet ultimately these are codified understandings of what 'is'; they can never be absolute, true representations. Moreover, moving from a powerful descriptive understanding of reality towards appropriate practice in that world requires shifting our framing device from an 'is' mode to an 'ought' mode. This is an ethical jump, requiring value judgements as much as judgements of 'fact'. Confusing the two leads to the 'naturalistic fallacy' - assuming that what is natural in the descriptive world is necessarily what is equivalent to what is good - a judgement in the normative world rather than the descriptive. In the practice of ascribing value to nature Luke Martell (1994) refers to this in terms of 'fetishizing the natural'. Judgements of fact (descriptions) are different from, though very much related to, value judgements (norms) - the latter being more associated with the realm of multiple perspectives.

C. West Churchman succinctly described systems practice as follows: "A systems approach begins when first you see the world through the eyes of another" (Churchman, 1968, p. 231). Whilst most 'systems approaches' tend to focus on the need to make proper representation of the interrelationships between entities deemed relevant to a situation. They often pay little attention to practical issues of *engaging* with different perspectives (Figure 3).

**[Figure 3 about here]**



Figure 3 Multiple perspectives on climate change

The ability to frame a perspective and also to reframe a perspective based on another viewpoint is a powerful tool that is peculiar to humans. There is an echo of Churchman's idea about seeing the world through the eyes of another in Talbott's concern about the biocentric preservationist perspective (2004, p. 52):

The well-intentioned exhortation to replace anthropocentrism with biocentrism, if pushed very far, becomes a curious contradiction. It appeals to the uniquely human – the detachment from our environment that allows us to try to see things from the Other's point of view – in order to deny any special place for humans within nature.

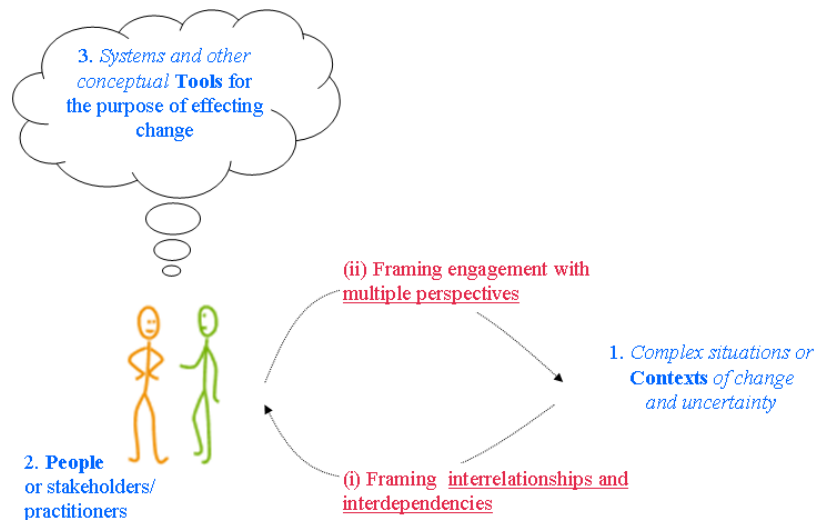
Talbott considers this capacity to be overtly anthropocentric, and one that legitimately distinguishes us from non-human nature whilst at the same time bestowing particular responsibilities on us: 'We are asked to make a philosophical and moral principle of the idea that we do not differ decisively from other orders of life – but this formulation of principle is itself surely one decisive thing we cannot ask of those other orders' (ibid.).

So making perspectives transparent and appreciating other perspectives, particularly those that may not share the same foundational worldview of science, religious commitment or whatever, is a key attribute of systems thinking, and key factor in reframing expert support for development practice (Reynolds, 2008a). In the context of carrying out an ecological conversation, or any other such way of describing our relationship with non-human nature, it confers a particular responsibility on us as humans. Humberto Maturana might describe Churchman's endeavour in terms of practising being epistemologically 'multiverse' (Maturana and Poerksen, 2004, p. 38), as distinct from assuming access to some ontological 'universe' (or even multiple ontological universes, as in the contemporary scientific meaning of multiverse). The focus moves away from an ontological idea that there is a single reality to be discovered, towards the acceptance that there may be many valid realities depending

on the criteria of validity and values applied - an epistemological concept inherent in contemporary systems thinking.

The idea can be conveyed in terms of social learning – providing a space for learning through practice: “It is the essential wisdom of the social learning tradition that practice and learning are construed as correlative processes, so that the one process necessarily implies the other” (Friedman, 1987 p.181). It may also be conveyed in terms of systems thinking in practice (Reynolds and Holwell, 2010. See Figure 4)

[Figure 4 about here]



**Figure 4 Systems thinking in practice: dealing with multiple perspectives**

## ***Systems thinking in practice and environmental responsibility***

The question arising from the previous two imperatives of systems thinking – dealing with holism and engaging with multiple perspectives – is how we might develop frameworks that deal responsibly with our inevitable limitations on being holistically comprehensive and epistemologically ‘multiverse’. Werner Ulrich, a student of West Churchman, deals with three systems concerns head-on (Ulrich, 2002). I have paraphrased these as follows:

- 1 dealing meaningfully with *holism*
- 2 engaging with *multiple perspectives*
- 3 framing reality from a *critical* perspective.

So a ‘systems approach’ to environmental responsibility is perhaps not quite the panacea that it so often mistakenly promises to be. Take, for example, the ‘ecosystem

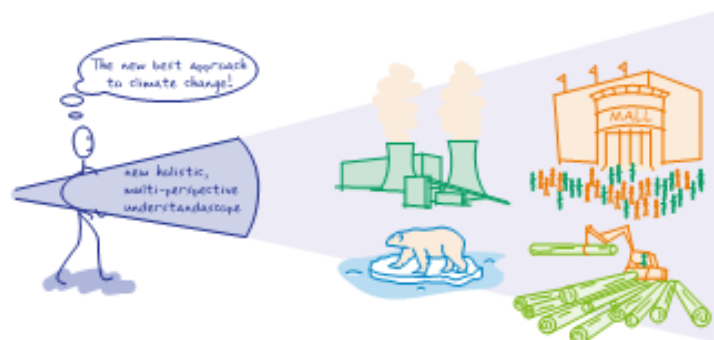


approach' as described by the United Nations Convention on Biological Diversity (2005):

The ecosystem approach is a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way. Application of the ecosystem approach will help to reach a balance of the three objectives of the Convention. It is based on the application of appropriate scientific methodologies focused on levels of biological organization which encompass the essential processes, functions and interactions among organisms and their environment. It recognizes that humans, with their cultural diversity, are an integral component of ecosystems.

Humans may be integral, but is something omitted by referring to them as component parts of ecosystems? Are they mere (object) entities, or rather (subject) agents with different, sometimes conflicting perspectives on the ecosystems? Reference to 'the' ecosystems approach suggests one viewpoint (Figure 5). Like Capra's ecoliteracy, it may be a valuable viewpoint in drawing out (some) interrelationships and interdependencies, but it ought not to mask the possibilities of other viewpoints. A more reliable perspective is one that recognises the limitations of systems thinking, or indeed any human thinking – as raised by commentators such as Ulrich and Moore.

[Figure 5 about here]



**Figure 5 'The' approach to climate change!**

In a paper outlining a critical systems approach to corporate responsibility, I have drawn on the traditions of Churchman and Ulrich to map out three distinct types of systems framing associated with three generic purposes (Reynolds, 2008b):

- 1 a framework for understanding (fwU)
- 2 a framework for practice (fwP)
- 3 a composite framework for responsibility (fwR).

These frameworks are described as follows (ibid. pp. 385–6):

A critical systems framework constitutes three distinct though interrelated (sub)frameworks: firstly, a framework for understanding (fwU) complex interrelationships and interdependencies; secondly, a framework for practice (fwP) when engaging with different perspectives; and thirdly, a composite framework for

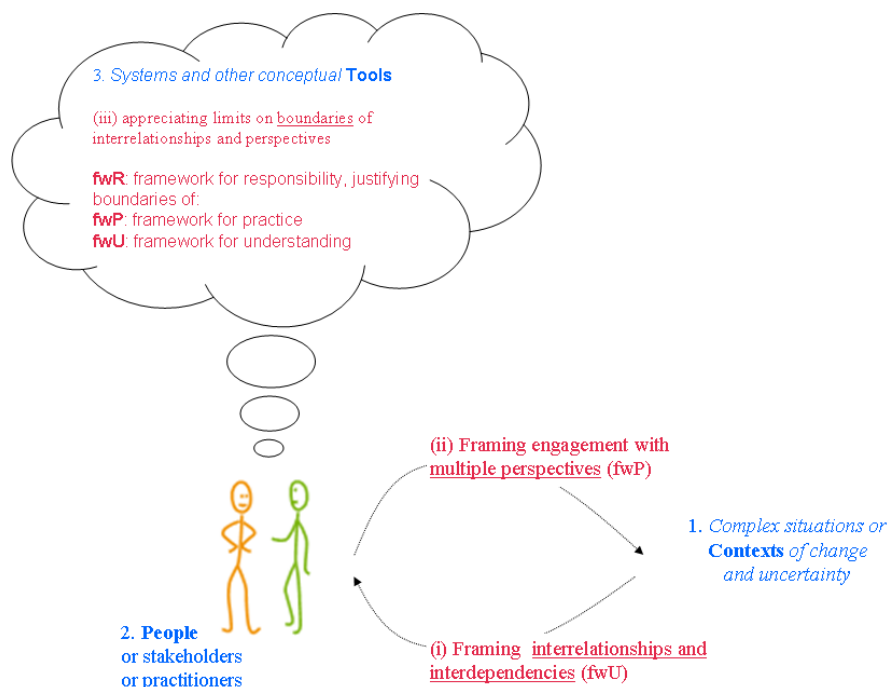
responsibility (fwR) in dealing ethically with inevitable limitations on being holistically ‘universe’ and pluralistically ‘multiverse’.

...

The three frameworks can be regarded as systems for addressing [corporate responsibility] dilemmas. The fwU provides a system for ‘getting real’ – translating complex realities into manageable systems. The fwP provides a system for ‘getting it right’ – enabling multiple perspectives to engage with constructing better systems. The fwR provides a system for ‘getting a grip’ – responsibly coming to terms with inevitable incomplete understanding and inadequate practice.

Figure 6 gives a representation of critical systems thinking (adapted from Ulrich and Reynolds, 2010 p.282)

[Figure 6 around here]



**Figure 6 Framing through responsible systems thinking in practice**

In sum, a framework for understanding (fwU) can help us to appreciate the holistic realities of interrelationships and interdependencies associated with the natural world. A framework for practice (fwP) can support constructive engagement with multiple and sometimes conflicting perspectives on the complexities of the natural world. A framework for responsibility (fwR) reminds us of the limitations of any fwU and fwP, and keeps our attention focused on continually improving our framing constructs to best suit the demands of environmental responsibility at any one time and in any one place.

## ***Towards creating political space in ecological conversations***

The air of doom and gloom often prevalent in discussion on environmental crises time and again prompts despair, fear and cynicism which can cloud more creative forms of engagement in being more politically responsible in our conversations. Being politically responsible in a creative and inventive manner requires creative space for socio-ecological flourishing. Creative conversational space requires not just political space, but also ecological space and learning space – all three of which in turn require particular virtues (Reynolds et. al., 2009b).

*Ecological space* associated with a framework for understanding, is commonly measured in quantitative terms – for example, a measure of ‘area’ (hectares of land) in ecological footprint or ‘weight’ (tonnes of carbon dioxide) in carbon footprint. Scientific measurements provide one important type of framing, but other types of inventive framing might also be important in appreciating, re-evaluating and negotiating ecological space in more qualitative terms. Such space requires attention to ensuing changes in our obligations to the non-human natural world, which may in turn shape the development of new duties and rights. An important virtue here is environmental justice. Not justice in the familiar quantitative terms of providing the just distribution of environmental goods and bads, but rather in more qualitative terms, through appropriate framing devices that *do justice* to our ecological world. Such justice requires an appreciation and some understanding of the complexities of multiple interdependencies in the natural world, whilst keeping a simplicity of framing in order to communicate effectively with and about nature. The virtue of environmental justice in this sense warns against the extreme tendencies of, on the one hand, using over-simplistic models to understand the world (which often generates wilful ignorance of scientific information) and, on the other hand, being too despairing over the complexity of our ecological world. Nurturing purposeful simplicity through, for example, systems thinking, combined with respect in being both inclusive and pragmatic, provide good guiding principles for framing our ecological space.

*Learning space* associated with a framework for practice, as explored through ideas of social learning and communities of practice raise the question of what this space ought to look like if it is to enable questioning, and either the fostering of new principles and rules or the use of existing principles and rules in a creative manner for environmental responsibility. Appropriate interaction between our understandings and practices is required, taking heed of the change in values that may arise from the consequences of previous actions. New understandings and practices can arise through this kind of learning. Here, a dominant virtue might be identified as practical wisdom, a virtue that warns against, on the one hand, self-righteousness, and on the other hand apathy. Practical wisdom thrives in a space where questions are continually being asked of the right approach to environmental responsibility, and innovative experimentation is encouraged to improve responsible practice.

Finally *political space* associated with a framework for responsibility represents the spheres of social (civil society) and individual (private lives) in which ethical and political concerns can be contested. Ideas of ecological citizenship provide some signposting towards a more virtuous engagement with political space. Here humility might be seen as a particularly important virtue. Humility prompts the possibility of

other virtues appropriate for different circumstances in different institutional settings at different times, providing political space for exploring new values and new principles that might be necessary in emergent socio-political circumstances. Humility also warns against complacency and arrogance on one hand and cynicism on the other, which too often prevent meaningful ecological citizenship.

There are many other virtues associated with a systems thinking in practice approach to ecological conversation, and some are more relevant than others depending on the circumstances. In campaigning for environmental justice in authoritarian societies, for example, courage is perhaps seen as an equally important virtue. But virtues of environmental responsibility do not stand still. Like values and principles, they may change and develop in the course of our engagement with changing environmental issues.

## **Summary**

Politics is integral to science. What is now required is a different type of conversation in appreciation of this widely accepted notion. This paper attempts to map the contours. A conceptual framework and associated literacy for guiding purposeful interaction between contrasting cultures of science and humanities, as well as between professional experts and citizens, requires attention to three entities – context, people, and ideas – and three associated activities - framing understanding of contexts, framing practice with engaging contrasting perspectives, and framing responsibility in dealing with inevitable partiality of understanding and inevitable bias in privileging particular perspectives. This paper reviews some ideas from different traditions centred on systems thinking in practice, which together may help towards developing a framework with appropriate creative space for dealing with political and scientific issues in a more integral manner.

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