

Open Research Online

The Open University's repository of research publications and other research outputs

Navigating through an 'ecological desert and a sociological hell': a cyber-systemic governance approach for the Anthropocene

Journal Item

How to cite:

Ison, R. L. and Schlindwein, S. (2015). Navigating through an 'ecological desert and a sociological hell': a cyber-systemic governance approach for the Anthropocene. *Kybernetes*, 44(6/7) pp. 891–902.

For guidance on citations see [FAQs](#).

© 2015 Emerald Group Publishing Limited

Version: Accepted Manuscript

Link(s) to article on publisher's website:
<http://dx.doi.org/doi:10.1108/K-01-2015-0007>

Copyright and Moral Rights for the articles on this site are retained by the individual authors and/or other copyright owners. For more information on Open Research Online's data [policy](#) on reuse of materials please consult the policies page.

oro.open.ac.uk

Navigating through an ‘ecological desert and a sociological hell’: a cyber-systemic governance approach for the Anthropocene

Abstract

Purpose – The governance of the relationship between humans and the biophysical world has been based on a paradigm characterized by dualistic thinking and scientism. This has led us to the Anthropocene. The purpose of this paper is to reframe human-biosphere governance in terms of “cyber-systemics”, a neologism that is useful, we argue, not only for breaking out of this dualistic paradigm in human-environmental governance but also of the dualism associated with the use of systems and cybernetics.

Design/methodology/approach – In this paper we draw on our own research praxis to exemplify how the intellectual lineages of cybernetics and systems have been mutually influencing our doings, and how new forms of governance practices that explore different framing choices might contribute to building innovative governance approaches attuned to the problematique of the Anthropocene, for instance through institutional designs for cyber-systemic governance.

Findings – The growing popularity of the Anthropocene as a particular framing for our circumstances, if it is to be transformative and thus relevant demands critique if it is to help change the trajectory of human-life on Earth. We offer arguments and a rationale for adopting a cyber-systemic perspective as a means to avoid the dangers in pursuing the current trajectory of our relationship with the biophysical world, as for example climate change. The essay frames an invitation for a systemic inquiry into forms of governance more suited to the contemporary circumstances of humans in their relationships with the biophysical world.

Research limitations/implications – The research essay challenges many taken-for-granted epistemological assumptions within the cybernetics and systems intellectual communities. A case for radical change is mounted; the means to effect this change, other than through changes in discourse remain unclear though it is apparent that changes to praxis and institutional forms and arrangements will be central.

Practical implications – Cybersystemic capabilities need to be developed; this requires investment and new institutions that are conducive to cybersystemic understandings and praxis.

Social implications – The lack of thriving communities of practice of cybersystemics significantly reduces the choices we humans have in shaping our future.

Originality/value – Understanding the global environmental crisis as an emergent outcome of current commitments to dualistic governance choices demands a reframing of much of what humans have done, Re-investment in cybersystemics offers a moral and practical response.

Keywords: cyber-systemic, governance, systemic inquiry, socio-ecological systems

Article classification: conceptual paper

Problematique

The prevailing paradigm in the governance of the relationship between humans and the biophysical world is characterized by joint commitments to scientism and dualistic thinking. As a consequence humans not only have become divorced from their biophysical environment but their relationship with it has been characterized by systematic control attempts, like top-down management regulations, rather than by systemic learning-based approaches. Ultimately this has led us to the Anthropocene, the new geological epoch in planetary history which refers to the current age of complex global changes in which humans take an active part (Isendahl, 2010), becoming a driving force in the planetary system (Steffen et al., 2011). Congruent with these global changes, there is increasing evidence from many contexts that current ‘governance systems’ are failing citizens and, too often, are not fit for contemporary circumstances (Chapman, 2002; Ringen, 2009a,b; Ringen, 2014; Ison, 2010a,b; Kelly, 2014).

The ontology of the contemporary planetary environmental crisis of this new geological epoch is, however, far more complex than other crises in geological and human history, since human agency has launched an irreversible transformation of the thermodynamic regime of the planet. Living in the Anthropocene, regardless of whether it is an adequate framing choice (in the sense of Schön and Rein, 1994), means that we are collectively in a period new to human history, one that calls for critically reflexive engagement with our past thinking, practices, institutions, patterns of investment and governance, not least because the problems that will arise in this epoch will steadily become more severe, unpredictable, complex and of a magnitude hitherto unseen (Steffen et al, 2011).

In this paper we focus on governance as understood and researched through the Systemic Governance Research Program based at Monash University (Ison et al, 2013; 2014a). When governance is reframed, and understood as enacting cyber-systemic processes towards the maintenance of a given quality of the relationships between humans and the biosphere, then it can be seen to be failing on many fronts. Examples of governance situations where this occurs are the governance of biodiversity, water catchments and of land use change, since in these situations governance normally has been focused on the management of isolable features of the biophysical world (for instance in practices of natural resources management based on quantitative approaches) instead of fostering learning processes to improve the relational dynamic between humans and the biosphere. The consequences of the disruption of a conservative relational dynamic between humans and the biosphere can be felt in many different circumstances, as for example in the loss of confidence, almost universal now across the globe, that rivers are safe places for swimming by children. Importantly this is not a loss of amenity, but a diminution of the quality of being human, paradoxically in mankind's geological time!

However, momentum is now growing to address the limitations of the prevailing governance paradigm in the face of a worsening global environmental crisis that threatens water and food security as well as accelerates the loss of many vital ecosystems services. Further, this crisis might have unprecedented social consequences triggering dramatic effects like unemployment, migration, outbreak of diseases, affecting the social and productive structure of whole regions. Ultimately such issues that human societies have to tackle in the emerging Anthropocene epoch can be conceptualized as building a 'wicked situation' (in the sense of Rittel & Weber, 1973), demanding alternative governance mechanisms within an overall cyber-systemic governance framework.

This 'problematique' raises significant questions for praxis towards a planetary stewardship:

- (i) what form of praxis might best contribute to a governance paradigm shift in these circumstances, considering that we may also lack conceptual, institutional and practical tools to maintain or improve the relationship humans-biosphere?
- (ii) what constraints and possibilities does a conception of cyber-systemic governance offer to praxis innovations which realise new perspectives that generate an effective break with dualistic thinking and acting in the governance of socio-ecological systems, thus changing human behaviour towards the biosphere?
- (iii) how could a cyber-systemic governance framework mediate learning processes toward social learning [1] as an approach to the governance of socio-ecological systems in the Anthropocene?

As Boyd & Zeman (2007, p. 1225) note "a deeper cyber-systemic understanding of just how people are all parts of one mutually educating and mutually surviving Earth-life system changes the value of everything". This understanding brings with it the possibility of building new framings for how we think and act, allowing us to engage in design processes or innovative practices that are more fit-for-purpose, if systemic governance is to emerge and be

effective (e.g. Bason 2014). This paper is an attempt to critically reflect on why a paradigmatic shift in the way humans govern the biosphere is necessary if future generations have not to live in “an ecological desert and a sociological hell” (Danowsky & Viveiros de Castro, 2014).

The emerging Anthropocene: taking responsibility in doing cyber-systemics

In the unfolding discourse of the Anthropocene, a considerable effort has been made to discuss the conceptual and historical aspects behind the choice of the name of this emerging geological time (Steffen et al., 2011; Malm & Hornborg, 2014), although the term has yet to be accepted formally. Up to now however much less emphasis has been given to the ethical entailments of this framing choice or to the discussion of how the consequences of the Anthropocene framing for human societies and for the biosphere should be engaged with. As discussed by Danowsky & Viveiros de Castro (2014) according to some espoused ideologies nothing dramatic will happen in the “good Anthropocene”, and Nature will simply be re-encoded by the capitalistic machine as an issue of resource management, within a “best practices” framework. For others like Malm & Hornburg (2014) “it is disturbing that the acknowledged impact of social forces on the biosphere should be couched in terms of a narrative dominated by a natural [deterministic] science [approach]”. This might result in what could be called the “naturalization” of Anthropocene thinking, hindering not only the necessary reflexivity towards current governance practices, but also being inimical to action. Therefore we claim that a paradigmatic shift to cyber-systemic governance framings can contribute to transformations in understandings and practices that better enable us to govern the Anthropocene.

But with this paradigmatic shift some epistemological confusion is perhaps to be expected. As an example, the very common confusion within the academic literature over the concept *system* and whether *system* is an epistemological device, a way of knowing about the world and thus a choice to be made in context sensitive ways, or an ontological claim, that is, a claim that systems are ‘real’ and thus describable objectively, extends to the concepts of ecosystem (for more details we refer to Ison, 2011) and of environment. One of the great traps we have created for ourselves is to see the environment as something in and of itself, instead of seeing it arising in a relational dynamic when we distinguish a system (or a foreground from a background). This is a good example of what Wenger (1998, p. 58) has called reification “to refer to the process of giving form to our experience by producing objects that congeal this experience into “thingness””. Reification has become a pervasive practice, and Ison et al. (2015) draw attention to the act of reifying, or creating a ‘thing’, as a practice that we do all the time without understanding and being aware of the implications of this practice for what we do in the world. As with the concepts of systems and ecosystem, the concept of environment has come to be reified as something existing independently of those who make the boundary judgments that distinguish it as a system of interest. This understanding has had and will continue to have profound implications in our praxis in the world unless the cyber-systemic implications are more widely appreciated, especially the responsibility we hold for bringing forth our world (von Foerster, 1981; von Foerster & Poerksen, 2003; Ison, 2010b; 2011). One such implication is how reifying practices might constrain systemic governance, and thus innovation and change.

Figure 1, adapted from Ison (2010b, p. 27), is an heuristic model designed for mediating a conversation about some of the different influences that have shaped contemporary cyber-systemic approaches and the lineages from which they have emerged. During their development in the last 50-60 years these contemporary cybernetics and systems approaches (cyber-systemic approaches) have become isolated lineages, despite sharing some common foundational understandings. These lineages have been conserved within particular communities of practice, favoured also by particular academic practices and institutional arrangements. This heuristic can be used to facilitate a conversation about these isolated lineages, a reason why we see cyber-systemics as a useful neologism for breaking out of the dualism [2] associated with the use of systems and cybernetics concepts, manifest even in social and organizational separations such as different professional societies, as has been claimed by Ison & Blackmore (2014). This

neologism has been coined by Gary Boyd for whom “cybersystemics” is the name for the science of historically and evolutionarily emergent levels of cybersystems (Boyd & Zeman, 2007).

Using the term cyber-systemics offers a reframing (Schön & Rein, 1994) that, if the past excesses of reification are avoided, has potential to move the conversation of a divided community with different epistemological commitments into a meta-conversation in which differences are articulated and understood at the same time as what is held in common is celebrated and rearticulated in terms of the needs and challenges of the contemporary world, desperately in need of new forms of thinking and acting (Ison, 2011). Therefore our use of cybersystemics is an invitation to “recreate the feast” – the conversation – imagined by Boyd before his death, so that the opportunities provided by the diverse cyber-systemic lineages might re-emerge with vigour into contemporary society. Cyber-systemic concepts such as feedback, recursion, circularity, variety, autopoiesis and structural coupling offer opportunities to create the circumstances where policy makers might begin to conceptualise socio-biophysical systems as coupled systems drawing attention to what relations might best be conserved over time (Ison, 2011).

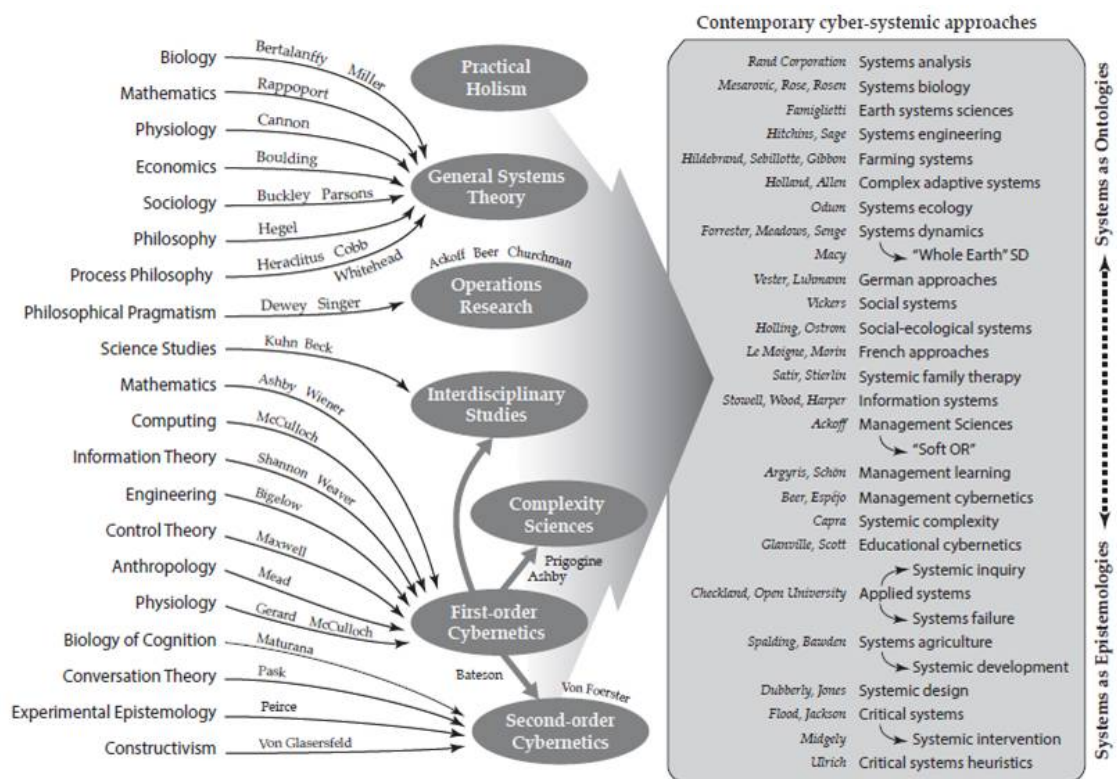


Figure 1. A heuristic model of some of the different influences that have shaped contemporary cybersystemic approaches and the lineages from which they have emerged. This Figure is best read from right to left in the first instance. Down the right-hand side are a set of contemporary cybersystemic approaches which are written about, put into practice and sometimes taught. Some names of people (practitioners) are added who are particularly associated with approaches. The approaches are also organised from top to bottom in terms of what can be perceived to be common commitments, or tendencies, of a majority of practitioners within the given approaches to seeing systems as entities (ontologies) or heuristic devices (epistemologies) (Source: adapted from Ison 2010b).[3]

From communities of discourse to communities of practice in cybersystemics

Although most discourses on environmental governance are dominated by technological, economic and biophysical framings (informed by an instrumental rationality) some attempts at introducing cyber-systemic understandings into environmental discourse go back to the 1970s with the Club of Rome's report "The Limits to Growth". Its approach was based on Systems Dynamics modelling of world resources and despite the fact that "The Limits to Growth" was effective at the level of discourse, it has done little to transform praxis. Or to put it into other words, all too rarely has this discourse been capable of operating at the epistemological level or capable of informing transformative governance practices, as it is all too evident when we look at the current state of our biophysical world. It can be argued that existing institutional arrangements with their entrenched practices based on systematic and dualistic thinking have contributed to a large extent to this result.

Furthermore, if we draw on Wenger's definition of communities of practice as "groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly" (<<http://wenger-trayner.com/theory/>> accessed September 16, 2014) we necessarily come to the conclusion that communities of practice (CoP) in this field of cyber-systemic governance are almost non-existent. This is a theme that will be taken up in 2015 in Berlin under the rubric of "Governing the Anthropocene: the greatest challenge for systems thinking in practice?"[4]. There are also important questions that emerge in policy circles between the ways in which a 'discourse coalition' is now understood (Hajer, 1995; 2009) and how a CoP might be understood in Wengerian terms (Wenger, 1998; Blackmore, 2010; Ison et al., 2014b). If the Anthropocene is used as the most appropriate framing choice for our current circumstances then an imperative follows – a critically reflexive praxis is needed that can make contemporary modes of enacting democracy and/or authoritarian governance (as in China) effective. This entails being capable of dismantling and reinventing the institutions of governance.

Crafting and designing institutions for cyber-systemic governance

Current governance practices effecting the relationship between humans and the biophysical world are based on the conservation of a 'technical and instrumental rationality' that prevents any substantive governance innovation. Examples can be seen in the case of water governance where framings introduced in the 1970s and 1980s, such as Integrated Catchment Management (ICM) and Integrated Water Resources Management (IWRM), despite the use of the term 'integrated,' conserved praxes that were at best systematic, and rarely systemic; in essence rivers were still framed as hydrological or biophysical entities, later ecological but until the present never as structurally coupled social-biophysical systems (Ison and Wallis 2015). Innovation failure includes also a failure of the institutions that mediate our understandings and practices and thus the modality or the quality of our relationship with the biophysical world. However, in the Anthropocene society will have to rethink completely the myriad socio-legal institutions that it uses to regulate this relationship (Kotzé, 2014), not least of which is the commitment to equilibrial dynamics, rather than non-equilibrial dynamics, at the heart of neo-classical and neo-liberal economics.

It seems to be beyond dispute that our future perspectives on Earth will depend to a great extent on our abilities to respond to the many challenges that the Anthropocene framing presents. The growing awareness of these challenges raises the question of how we understand our governance institutions and our institutionalizing practices, which need to be critically reappraised. However, in many situations the changes proposed so far are not fundamentally different from current institutionalized practices and they might be subject to the same constraints. For example, Biermann (2014) claims that the Anthropocene requires an effective institutional framework for global cooperation, because, for him, countries become more interdependent as a result of local environmental degradation leading to trans-regional or global crises. But having in mind the known attempts (and their failures) of building global climate governance institutions it is questionable if such international institutional arrangements of

global governance through UN-type institutions, as proposed by Biermann et al. (2012), can indeed be a more effective way in mediating the relationship between humans and the biosphere. Instead they may help to conserve disruptive relational dynamics whose consequences we already know, and which are even the ultimate cause of this new geological epoch which we need to learn how to deal with.

Therefore the praxis of crafting innovative institutions needs to be taken into account as a way to create the circumstances to understand and act differently in the way we govern ourselves and our relationship with the biophysical world. As outlined in Ison (2011) the current trajectory of development of ecosystems services institutions poses significant social risk when understood through a cyber-systemic lens. This is also exemplified by the major financial flows through the current economic system based on financial institutions that have no, or deleterious, relationships with the biophysical world. Furthermore some of the claims about the need of institutional changes are based on regulatory interventions (Biermann et al., 2012; Kotzé, 2014) revealing not only how deeply entrenched (and unaware) is the power of the control paradigm and its assumptions, but also how challenging it will be to carry out a paradigmatic shift to cyber-systemic governance.

We join those arguing the need to move towards systemic design in public-policy-making (Bason 2014). Crafting, a form of design, is the work of 'making skilfully' but unless what is made is understood in terms of what it mediates, facilitates, or offers affordances to, then crafting remains a praxis devoid of purpose and the potential for the transformation of experience (Ison et al., 2013). Institutions are inventions we make which establish norms, rules of the game, regulations, polices, etc. They are pervasive in our societies, often operating without awareness of those who are affected by them (Ison, 2011). An institution can also be reframed as a social technology particularly when procedures and rules designed to standardise behaviour are reified or institutionalised. But institutional transformation towards cyber-systemic governance regimes is more than crafting the new. Crafting also requires innovation in understandings and practice of those who do crafting, as well as clearing the situation of old, constraining institutions and appreciating extant institutional complexity (Wallis & Ison, 2011; Ison et al., 2013, 2015).

Drawing on the conclusion of Thompson and Warburton (1985) that institutional innovation is central to transform complex issues like those of 'wicked situations', contemporary cyber-systemic approaches might constitute the conceptual foundation of purposeful institutional change to effect transformation towards innovative systemic, governance trajectories in the social-biophysical systems of concern. However, there is limited evidence that understandings about 'wicked problems' as well as about cyber-systemic approaches have been incorporated into institutional innovations; for example will they inform the design and operationalization of the new UN Sustainable Development Goals now being institutionalised to replace the Millennium Development Goals (Ison et al., 2014a; 2015)? Attempts to move beyond the dominant framings of GDP as a measure of standard of living towards human wellbeing, or liveability or, as in Bhutan, happiness are a few examples of attempts at institutional innovation. The great challenge facing cyber-systemicists is reimagining and then changing our own professional and scholarly institutions to enhance both the narrative and praxis elements of what we collectively have in common. Cooperation in this venture is warranted so as to build a new wave of institutional development around our scholarship and praxis and to facilitate more investment in cybersystemic capabilities.

Towards doing cyber-systemic governance: governing the Anthropocene?

As has been mentioned earlier there is a lack of clarity and even confusion in the literature and in the policy community in relation to terminology and underpinning epistemology of emerging holistic conceptualizations and models which include socio-ecological systems, social-ecological systems, or coupled human-environment systems. Clarifying these conceptions and teasing out the policy and practice, especially governance implications, is an urgent imperative. Cyber-

systemic concepts offer opportunities for policy makers to begin to conceptualize socio-biophysical systems in more promising non-dualistic ways. For example, water catchments or watersheds could be conceptualized as structurally coupled socio-biophysical systems thus drawing attention to what relations might best be conserved over time, and what mediating functions are, or could be, carried out by current institutions or institutions still to be invented.

It seems not exaggerated to assume that normally there is a lack of awareness about the epistemological basis of governance mechanism choices in place. Further it is necessary to understand that cyber-systemic concepts of governance operate at multiple levels from projects to government ministries and involves crafting institutions and associated praxes that perceive, interpret and respond to feedback processes so that actions can be taken that affect the quality of the relationship between social and biophysical systems. Governance, or more aptly, governing, is thus in our terms also a form of praxis (Ison et al., 2013). A good example to illustrate this situation can be taken from Biermann (2014). For him, the Anthropocene has to be understood as a global political phenomenon, and he presents the notion of 'Earth System' governance as a response and a reaction in the social sciences to face the challenges of this geological epoch (for more details the interested reader is referred to Biermann et al., 2012 and Biermann, 2014, as well as to the references within these papers). Biermann (2014) explains that 'Earth System' governance is about the societal steering (in a cybernetic sense?) of human activities with regard to the long-term stability of geobiophysical systems, but, unfortunately, the underpinning epistemology seems to be more related to current systematic governance mechanisms.

As we have discussed the act of being aware of framing governance choices are central to systemic governance. On the other hand, those who unknowingly frame situations as 'tame' and employ, non-reflexively, the traditional governance mechanisms, engage in systematic rather than systemic governance (Ison et al., 2013). But purposeful framing-choice praxis has yet to be institutionalised into governance activities. This raises the question of how framing processes might be designed so as to contribute to systemic governance innovation.

Ultimately 'wicked situations' such as water managing and climate change are problems of relationship – of human beings with the biosphere. However, in terms of conceptualizing and enacting governance practices out of this relationship we can notice a generalized institutional failure: almost always systems approaches have not taken hold in policy and governance circles; i.e., cyber-systemic explanations and hence practices are not valued in this context yet. As a result together with institutionalized reification practices, we simply blame "the environment" as the source of concern when confronted with pressing environmental problems. See, for instance, what is currently happening in California. Despite the claim that it is necessary "to act differently" to face the severe drought, the recent first mandatory water restrictions and the regulations to implement the governor's order (Megerian et al., 2015) still are based on a command-and-control approach. The 2014-2015 severe water shortage in some parts of Brazil (as in the large metropolitan area of São Paulo) is a good example of a failure to institutionalize cyber-systemic integrative and adaptive governance practices, since the effect of powerful feedback processes among land use planning, population growth and climate dynamics on water availability for human consumption have simply been ignored (or not valued) over decades. In this particular situation (as probably in many others around the world), current policies and governance practices are based on the assumption (if not in the belief) that social and ecological systems are isolated, not coupled systems. Water governance has been based on simple linear cause-effect thinking within an overall simplistic resource management framework, and worse that future climate – and thereby water availability – will deterministically be nothing else other than the simple continuation of the past, i.e., the trajectory and dynamics will not change.

Final remarks

The acceptance of the emergence of the Anthropocene as the result of the irreversible impacts of human activities on Earth has profound moral implications and shows that almost always

technological progress is not followed by moral progress. For Kotzé (2014) the future of life on Earth will depend on our ability to respond to the many challenges that the Anthropocene presents, and to these many challenging contemporary issues understandings from the field of cyber-systemics offer opportunity and hope. It offers the opportunity to critique current forms of environmental governance, since from a cyber-systemic perspective there seems to be many dangers in pursuing the current trajectory of our relationship with the biophysical world, as for example climate change. Therefore, it is necessary to take a “design turn” towards more cyber-systemic governance of social-biophysical systems, understanding “how underlying cyber-systemic processes generate our experienced world” (Boyd & Zeman, 2007) to inform the design of transformative practices. As has been pointed out, such a “design turn” will open up new opportunities for engaging in innovative design practices in public policy and governance arrangements, allowing human beings to take responsibility for the futures they can now “design” (Ison, 2010b).

The history of the relationship of human beings with their biophysical world, increasingly in modern times, has been shaped by systematic control attempts rather than by approaches towards ‘symviability’ (Boyd & Zeman, 2007). Therefore, new forms of inquiring are necessary in order to understand and contribute to building governance approaches that are more cyber-systemic and adaptive. As has been claimed by Ison et al. (2013), from the perspective of systemic governance, dualistic thinking is unhelpful, and new forms of governance practices that explore framing choices that act as a duality need to be pursued. Although not widely adopted yet, some attempts and initiatives in this direction are beginning to emerge, including institutional innovation as has been reported in Wallis & Ison (2011), Rogers et al. (2013), Chaffin et al. (2014) and Freitag et al. (2014).

It remains unclear however how many of the arguments of this paper should be enacted. Therefore, the issues we have discussed frame an invitation for a systemic inquiry into forms of governance more suited to the contemporary circumstances of humans in their relationships with the biophysical world. Also to the need of developing socio-environmental technologies in ways that do not constrain innovations and change but enable the socio-ecological transformations that are sought. The inquiry purpose is to invent ways of acting in theory-informed ways (i.e., praxis) that gives rise to systemic and adaptive governance at levels ranging from the international to the program or project. In other words, the more general purpose of such a systemic inquiry is to contribute to building innovative governance approaches (for instance through institutional design for cyber-systemic governance) that are more systemic and adaptive. Furthermore, such an inquiry might also contribute to an improved, holistic understanding of socio-ecological systems and how to transform them by fostering new understandings and practices.

This is an invitation to avoid the adoption of simplistic understandings of governance reducing it to the application of techno-scientific knowledge and solutions particularly in times of rapid global change and uncertainty. As outlined by Sonnenfeld & Mol (2011), socio-environmental theory (and governance) needs to adapt itself, reviewing its schemes and theories in order ‘to reflect the new social, economic and political architecture underlying both causes and solutions for today’s environmental challenges’. This includes also the design of new institutional arrangements to facilitate cyber-systemics as a basis for social learning based approaches to the governance of socio-ecological systems. The ‘new world (dis)order’ (Sonnenfeld & Mol, 2011) calls for innovative paradigmatic shifts in the way we govern ourselves and our relationship with the biophysical world. Furthermore, if the Anthropocene undeniably also offers us a certain perspective “of the end of the world”, of a radical shift of the material conditions for our existence as a species on Earth, then the enactment of a cyber-systemic approach in the governance of the relationship between humans and the biosphere might give us some hope and relief from the (metaphysical) anguish that the Anthropocene is provoking.

References

- Bason, C. (Ed.) (2014), *Design for Policy*, Gower, Aldershot.
- Biermann, F. (2014), "The Anthropocene: a governance perspective", *The Anthropocene Review*, Vol. 1 No. 1, pp. 57-61.
- Biermann, F., Abbott, K., Andresen, S., Bäckstrand, K., Bernstein, S., Betsill, M.M., Bulkeley, H., Cashore, B., Clapp, J., Folke, C., Gupta, J., Haas, P.M., Jordan, A., Kanie, N., Klavánková-Oravská, T., Lebel, L., Liverman, D., Meadowcroft, J., Mitchell, R.B., Newell, P., Oberthür, S., Olsson, L., Pattberg, P., Sánchez-Rodríguez, R., Schroeder, H., Underdal, A., Camargo Vieira, S., Vogel, C., Young, O.R., Brock, A. and Zondervan, R. (2012), "Navigating the Anthropocene: improving Earth System Governance", *Science*, Vol. 335, pp. 1306-1307.
- Blackmore, C.P. ed. (2010), *Social Learning Systems and Communities of Practice*, Springer & The Open University, London.
- Boyd, G. and Zeman, V. (2007), "Designing cybersystemically for symviability", *Kybernetes*, Vol. 36 No. 9/10, pp. 1255-1265.
- Chaffin, B.C., Gosnell, H. and Cosens, B.A. (2014), "A decade of adaptive governance scholarship: synthesis and future directions", *Ecology and Society*, Vol. 19 No. 3, 56.
- Chapman, J. (2002), *System Failure. Why governments must learn to think differently*, DEMOS, London.
- Danowski, D. and Viveiros de Castro, D. (2014), *Há mundo por vir? Ensaio sobre os medos e os fins*, Cultura e Bárbarie: Instituto Sociambiental, Florianópolis.
- Freitag, S., Biggs, and Breen, C. (2014), "The spread and maturation of strategic adaptive management within and beyond South African national parks", *Ecology and Society*, Vol. 19 No. 3, 25.
- Hajer, M. (1995), *The Politics of Environmental Discourse, Ecological Modernization and the Policy Process*, Oxford University Press, Oxford.
- Hajer, M. (2009), *Policy Making in the Age of Mediatization*, Oxford University Press, Oxford.
- Isendahl, C. (2010), "The Anthropocene forces us to reconsider adaptationist models of human-environment interactions", *Environmental Science & Technology*, Vol. 44 No. 16, p.6007
- Ison, R.L. (2010a), "Governance that works. Why public service reform needs systems thinking", in Davis, M. and Lyons, M. (Ed.), *More Than Luck. Ideas Australia Needs Now*, CPD, Sydney, pp. 215-228
- Ison, R. L. (2010b), *Systems practice: how to act in a climate-change world*, Springer, London.
- Ison, R.L. (2011), "Cybersystemic conviviality: addressing the conundrum of ecosystems services", *Cybernetics and Human Knowing*, Vol. 18 No. 1-2, pp. 135-141.
- Ison, R.L, Blackmore, C.P. and Iaquinto, B. (2013), "Towards systemic and adaptive governance: exploring the revealing and concealing aspects of contemporary social-learning metaphors", *Ecological Economics*, Vol. 87, pp.34-42.
- Ison, R.L. and Blackmore, C. (2014), "Designing and developing a reflexive learning system for managing systemic change", *Systems*, Vol. 2 No. 2, pp. 119-136.
- Ison, R.L., Grant, A. and Bawden, R.B. (2014a), "Scenario praxis for systemic and adaptive governance: A critical framework", *Environment & Planning C: Government & Policy* Vol. 32 No. 4, pp. 623 – 640.
- Ison, R.L., Blackmore, C.P., Collins, K., Holwell, S. and Iaquinto, B. (2014b), "Insights into operationalizing communities of practice from SSM-based inquiry processes", *Systemic Practice & Action Research*, Vol. 27, No. 2, pp. 91-113.
- Ison, R.L. and Wallis, P. (2015), "Mechanisms for inclusive governance", in Karar, E. and Naidoo, D. (Ed.), *Water Governance for the 21st Century*, Chapter 6 (in press).
- Ison, R.L., Collins, K.B and Wallis, P.J. (2015) "Institutionalising social learning: towards systemic and adaptive governance", *Environmental Science & Policy* (in press).
- Kelly, P. (2014), *Triumph and Demise. The Broken Promise of a Labor Generation*, Melbourne University Press, Melbourne

- Kotzé, L.J. (2014), "Human rights and the environment in the Anthropocene", *The Anthropocene Review*, Vol. 1 No. 3, pp. 252-275.
- Malm, A. and Hornburg, A. (2014), "The geology of mankind? A critique of the Anthropocene narrative", *The Anthropocene Review*, Vol. 1 No.1, pp. 62-69.
- Megerian, C., Stevens, M. and Boxall, B. (2015), "Brown orders California's first mandatory water restrictions: 'It's a different world'", available at: <http://www.latimes.com/local/lanow/la-me-ln-snowpack-20150331-story.html#page=1> (accessed 7 April 2015).
- Ringen, S. (2009a), "Stein Ringen – The economic consequences of Mr Brown", available at: <http://www.thersa.org/fellowship/journal/videos/stein-ringen-the-economic-consequences-of-mr-brown> (Accessed 8th January 2015)
- Ringen, S. (2009b), *The Economic Consequences of Mr Brown. How a Strong Government Was Defeated by a Weak System of Governance*, The Bardwell Press, UK.
- Ringen, S. (2014), "Is American democracy headed to extinction?", *The Washington Post*, 28 March (available at: http://www.washingtonpost.com/opinions/is-american-democracy-headed-to-extinction/2014/03/28/70e2c7f4-b69f-11e3-8cc3-d4bf596577eb_story.html)
- Rittel, H.W.J. and Weber, M.M. (1973), "Dilemmas in a general theory of planning", *Policy Science*, Vol. 4 No. 2, pp. 155-169.
- Rogers, K.H., Luton, R., Biggs, H., Biggs, R., Blignaut, S., Choles, A.G., Palmer, C.G. and Tangwe, P. (2013), "Fostering complexity thinking in action research for change in social-ecological systems", *Ecology and Society*, Vol. 18 No. 2, 31
- Schön, D. and Rein, M. (1994), *Frame reflection: toward the resolution of intractable policy controversies*, Basic Books, New York.
- Sonnenfeld, D.A. and Mol, A.P.J. (2011), "Editorial: social theory and the environment in the new world (dis)order", *Global Environmental Change*, Vol. 21 No. 3, pp. 771-775.
- Steffen, W., Grinevald, J., Crutzen, P. and McNeill, J. (2011), "The Anthropocene: conceptual and historical perspectives", *Philosophical Transactions of the Royal Society A*, Vol. 369, p. 842-867.
- Thompson, M. and Warburton, M. (1985), "Decision making under contradictory certainties: how to save the Himalayas when you can't find out what is wrong with them", *Journal of Applied Systems Analysis*, Vol.12, pp. 3-34.
- von Foerster, H. (1981), *Observing Systems*, Intersystems Publications, Seaside.
- von Foerster, H. and Pörksen, B. (2003), *Wahrheit ist die Erfindung eines Lügners. Gespräche für Skeptiker*, Carl-Auer-Systeme Verlag, Heidelberg.
- Wallis, P.J. and Ison, R.L. (2011), "Appreciating institutional complexity in water governance dynamics: a case from the Murray-Darling Basin, Australia", *Water Resources Management*, Vol. 25 No. 15, pp. 4081-4097.
- Wenger, E. (1998), *Communities of practice. Learning, meaning, and identity*, Cambridge University Press, New York.

Notes

[1] Social learning is understood as a duality comprising concerted action by multiple stakeholders in complex and uncertain situations as well as a governance mechanism which can be deployed i.e., it comprises entity and process just as with an orchestra (Ison et al., 2013)

[2] Dualism is a term used to describe antagonistic or negating opposites, e.g. mind/matter, objective/subjective. Two concepts form a dualism when they belong to the same logical level and are viewed as opposites. Dualistic thinking or either/or thinking is a product of this orthodox logic. However, when two concepts belong to two different logical levels and one emerges from the other, showing complementary behaviours, they constitute a duality, e.g. predator-prey, control-autonomy (adapted from The Open University (1998), *T860*)

Environmental decision making. A system approach. Block 2, Exploring the context of environmental issues and formulating problems and opportunities, The Open University, Milton Keynes, p. 40).

[3] As noted by Ison (2010b) this heuristic is not designed to map all of the possible lineages – but to foster a conversation about what these might be.

[4] The 2015 ISSS Conference in the first week of August 2015 will be run under this title; see <http://iss.org/world/node/608> (accessed 8th January 2015)