# Editorial—
# Policy and Climate Change

Jean Boulton[1] & Eve Mitleton-Kelly[2]
1. Affiliation, UK
2. London School of Economics, UK

## An Overview of the Papers in this Edition

This special edition of E:CO resulted from a series of very successful seminars in the UK funded by ESRC (Economic and Social Research Council) and organized by Professor Eve Mitleton-Kelly, at the London School of Economics with five other universities (King's College London, Open University, Cranfield, Lancaster and Oxford Brookes). The purpose of the seminars was to explore what complexity thinking has to offer policy makers. Two of the seminars focussed on climate change and the papers in this special edition are based on talks given at the seminars on 24 March 2009 at the LSE and 10 June 2009 at Cranfield. (A video recording of the March seminar and all presentations are at www.lse.ac.uk/complexity. Further seminars in 2010 on climate change can also be found at that website.)

Four of the contributions—by Stephen Peake, Sir Alan Wilson, David Elliot and Jean Boulton—are reviewed papers. David's paper on sustainable energy systems takes an overview of policy issues for renewables, focusing on the mitigation options, and asks some interesting questions: should we think locally, regionally or globally? How can we store energy? Could renewables ever be enough? Stephen's paper explores how climate change policy develops in practice, using a framework based on complexity thinking developed by Johnson (2008). He is also keen to bring to our attention the assumptions, often implicit, that are made in creating policy; he reminds us that no account is taken of the probability of shifts in behavior which may result from policy implementation or increased information or actual changes in the environment. He emphasizes the existence of very substantial variations in predictions from models and the need to be flexible in developing and reviewing policy.

Sir Alan's paper looks at ways of modelling cities in the light of climate change with the intent of developing policy around urban development. He shows that, with the model-based analyses now available to us, future outcomes are path dependent and liable to abrupt change—phase transitions—at critical points. As he says, it is an interesting and important question as to whether developments can be 'nudged' towards beneficial outcomes at critical points as viewed from an energy-efficiency perspective.

As well as the reviewed papers, we are also privileged to include an interview with Lord Puttnam, Vice Chancellor of the UK's Open University and a think-piece, based on an interview, with Professor Brian Collins of Cranfield University; both Professor Collins and Lord Puttnam are advisers to the UK government and so have a good understanding of policy-making and implementation in practice. Both their examples focus on the need to develop policy systemically and holistically, with a view to surfacing and tackling explicitly conflicting goals; for example, between economic, environmental and social perspectives. There are concerns raised over the way rigid government structures can mitigate against this, and emphasis is given to the need for education to bring to our attention the inherent complexity of the world and to emphasise the dangers of over-simplification and the belief in clear outcomes with clear data.

Jean's paper, in the philosophy section, is more theoretical and reflective, and explores, more generally, what complexity thinking suggests for policy development. It gives a good overview of the basic tenets of complexity theory and connects this with the earlier worldviews.

We have also chosen, as the classic paper, one by Thorstein Veblen, written in 1898, '*Why is Economics not an Evolutionary Sci-*

*ence'*. In it he argues that it is irrational to imagine the economy will reach equilibrium and accord with the laws of physics; the only rational position is to assume that the economy evolves. This is very clearly in accord with the themes of complexity thinking, and it is both refreshing and depressing to realize such ideas were surfacing so long ago and did not gain traction.

## Climate Change Policy—
## A Complex Problem
### An Editorial Perspective by Dr Jean Boulton

Why *is* climate change policy of such interest for complexity thinkers? Or, perhaps a better question is to ask why complexity thinking is so important for policy makers? Climate change policy is non-trivial for many reasons. First, to tackle climate change is to tackle economic growth—or at least growth in consumerism, based, as it is, on goods made from often finite resources, needing energy for manufacture and transport. Even a discourse on the faintest possibility of limiting growth is highly political and one that most politicians and corporate leaders are unwilling to entertain.

Secondly, the topic is alive with issues of social justice, as climate change will impact the developing world to a far greater extent than the developed world; so if we are to mitigate against climate change, are we to do so at the expense of the poor and the powerless? Thirdly, it is highly complex and interconnected. Understanding, for example, the impact of melting ice, the release of gases trapped in the permafrost, the way currents may change in the oceans—and how these all interrelate—is difficult enough. But then we have to consider the impact on human behavior of emerging policies and the impact of the way the media report such issues—not to mention the impact of actual changes to the weather. Climate change denial is once again gathering momentum, fuelled in part by the coldest winter for thirty years in Europe and in part by questions over the validity of some data in key reports and from key institutions. How can such changes in attitude be incorporated into policy? How can we anticipate how different governments will respond? These are complex and fundamentally unanswerable questions, so how can policy weave a way through such complexity and, equally, take account of the behaviors of those with vested interests in the status quo and with vested interests in remaining in power?

Fourthly, there is the issue of scale. Climate change is global and thus cuts across any existing form of global governance. How can we find a way to deal with the way water is used when rivers flow across national boundaries? How can we truly understand the impact that deforestation in South America may have on flooding in Bangladesh? And, as humans, we seem to find it very difficult to take seriously future threats when short-term data is inevitably ambiguous. How can we take in, emotionally and psychologically, that a particularly cold winter in Europe is indicative of global warming, even if we understand the science of climate change and so understand it cognitively? How can we really internalize that our use of the car today is truly connected to future irreversible and highly dangerous shifts? How can we make sense of and act on the fact that the medium-term impact of greenhouse gases, given the time lag, is already set? And how will long-term policy ever be set when it potentially affects short-term economic prosperity—not in the interests of those who wield power, be they financiers, politicians or corporate giants.

So what has complexity thinking to offer? One of the great difficulties in answering this question is that the question itself is framed within a reductive, Newtonian, machine paradigm. We want complexity thinking to give us answers and solid ways forwards because we believe that optimal solutions and predictable outcomes exist. Part of what complexity thinking has to offer is that is gives ample evidence that the future, whilst not being random, indeed being path-dependent, is nevertheless not predictable. There are often turning points where the future may evolve in more than one direction; the future is a complex product of the past, mitigated by chance and by choices; where different decisions in seemingly different spheres interact and mutually affect each

other. So, whilst we might not like the picture it presents, complexity thinking emphasizes inter-connectedness and dynamic change and emphasizes the limits to predictability and indeed to knowledge. And there is an argument to say that if we accept the reality of this, we may indeed do a better job of developing policy and creating processes.

This is not a recipe for giving up. Rather, it is recognition that policy is, to some degree, provisional and is very likely to need to be modified in light of unexpected outcomes, of unforeseen events. We should regard policy as live, as requiring constant attention, as intrinsically complex. And we should set up organizational structures and processes that facilitate policy development across interconnected issues and allow for regular review and development in light of unintended consequences and changing contexts. Finally, we must address the issues of scale. How can we establish governance processes, with teeth, that are global, while allowing local flexibility, and at the same time address the long term? How can we mitigate against economic and political short-termism? We may need to tackle some of those tacit 'policies' that have become accepted as the norm—such as limited liability for companies, which creates a particular attitude to risk: a preponderance of public limited companies rather than private ownership, which creates short-termism: and, of course, re-consider the appropriate level of financial regulation.

When considering such sweeping changes to the status quo, it can seem difficult to remember that such norms were at one time quite different. In particular, the view that a largely unregulated market is the best approach, has really taken hold. John Gray (1998), Emeritus Professor of European Thought at the London School of Economics, in his 2009 foreword to '*False Dawn: the delusions of global capitalism',* talks of this neo-liberal view that market forces lead to the 'best' outcome as a utopia. Veblen (1898) picked up the same theme in his criticism of Adam Smith's recourse to 'natural law'. Gray believes, as part of this utopian perspective, we tend to ignore history, and to imagine a *'breathless continuation of the present'.* He calls it, borrowing Fukuyama's (1992) phrase, 'the end of history'.

This utopian view creates a number of difficulties; it makes it difficult to learn from the past; it makes it difficult to consider that new policies and worldviews are possible. If we are doing the best, making progress, it is easy to ignore or deny climate change, to imagine that 'all will be well'. Diamond's (2005) treatise on 'Collapse' shows how often societies that collapsed failed to take seriously the signs of their demise.

That well-known complexity theorist Mark Twain said '*history does not repeat itself, but it does often rhyme':* a reminder that we ignore the lessons of history at our peril.

### References

Diamond, J. (2005). *Collapse,* ISBN 0713992867.

Fukuyama (1992). *The End of History and the Last Man,* ISBN 0029109752.

Gray, J. (1998). False Dawn: The Delusions of Global Capitalism, ISBN13 9781847081322.

Veblen, T. (1898). "Why is economics not an evolutionary science," *The Quarterly Journal of Economics*, July 1898.

## Some Reflections on Complexity Theory, Policy and Climate Change
### Editorial Comments from Professor Eve Mitleton-Kelly

What the papers in this special edition show is that we have reached a critical point which will force us to *explore the space of possibilities* (this and all other complexity principles mentioned in this editorial can be found in Mitleton-Kelly, 2003) and find new ways of living, travelling, different sources of energy, new forms of agriculture and urban development. In complexity terms the global human social ecosystem is being pushed *far-from-equilibrium* (Nicolis & Prigogine, 1989; Nicolis, 1989; Prigogine & Stengers 1985) in the sense that it is being pushed away from its existing norms of behavior, thinking, relating and working. When a complex system is pushed away from its norms, it may be forced towards a critical point where choices will have to be made. This is a point of innovation when several possible options are explored until one (or more) possible new paths are found and 'new order' emerges. This is the theory, and the papers show some

of these options. What policy makers need to recognise is the fact that we have reached this critical point; they either have to take deliberate action to both mitigate and adapt[1] to climate change or these changes will be forced upon us by significant climatic changes that will result in persistent drought, flooding through heavy rainfall as well as sea level rise, deforestation, desertification, crop failures, and insufficient energy generation. In addition we are likely to see conflict due to water shortages as well as shortages of other key resources.

The sheer multiplicity of factors to be taken into account when trying to address climate change, often results in either paralysis in the decision making process or denial, because complexity is seen as an insurmountable or intractable problem. But a complex problem only appears intractable when addressed in a linear or simplistic way. On the other hand, if complexity theory is seen as a means of explaining and understanding the behavior of complex systems, then we have a way forward. Understanding the characteristics of complex behavior means that we can work with those characteristics rather than against them.

One of the ways to approach climate change as a complex problem is to acknowledge that there is no single solution, but that many will have to be explored. Also that it cannot be addressed top-down through Government action alone. What complexity theory and practice demonstrate is that action needs to be taken at several levels simultaneously: individual, community, regional, country and groups of countries (e.g., the EU, the various 'G' groups, etc.). To do this Governments and policy makers do need to create *enabling environments* that will facilitate engagement and involvement, which will lead to action at the individual, community and regional levels. Such environments will need to facilitate and

not block self-organization (in the sense that a group of people take action and responsibility themselves without external direction). The Transition Town movement is one such example, when local communities support each other to drastically reduce their carbon emissions to mitigate the effects of climate change, while at the same time increase resilience to mitigate the effects of peak oil.

Another example is a cluster of self organized initiatives, taken by communities in West African States in the ECOWAS group (Economic Community of West African States). These initiatives have two things in common: (i) they are local, either to a Member State or a community; and (ii) they *involve* local people and communities. The initiatives very briefly were: (a) addressing massive illiteracy (e.g., 70% in Sierra Leone) through public education, by actively using the community's 'distributed intelligence'; (b) the Mali Rice Initiative to decrease dependence on food imports; (c) Sierra Leone's Counter-Deforestation measures which include the involvement of community schools and traditional rulers; and (d) Peace Building, based on distributed intelligence & local contributions.

The value of identifying these initiatives is not in copying them; as 'best practice' cannot be copied effectively. The value lies in the inspiration they provide and in learning why they were successful or why they failed. Copying does not work because what is usually copied is 'what' and 'how' something was done. But transferring the 'what' and the 'how' to a totally different context, means that the initial conditions are different and consequently the outcome is also likely to be different. By contrast, understanding 'why it worked in that context' and 'what would have stopped it working in that context', are much more useful. From this understanding we can derive underlying principles, which are transferable. It is this deeper understanding, which can then lead to successful adaptation of local initiatives into a new and different context.

Furthermore, if this information is made widely available to other communities, the benefits will multiply through learning. Success has a re-enforcing effect through

1. From Wikipedia: Climate change mitigations are measures or actions to decrease the intensity of radiative forcing in order to reduce global warming. Mitigation is distinguished from adaptation, which involves acting to minimize the effects of global warming. Most often, mitigations involve reductions in the concentrations of greenhouse gases, either by reducing their sources or by increasing their sinks.

*positive feedback*, the better it works the more others are inclined to try out similar initiatives; and the more is known about why they worked, the next iteration will be improved, and so on. The whole thing creates a positive environment of 'can do', which counters the consistent negative messages generated by the possibility of imminent crises.

These communities are actively and locally '*exploring the space of possibilities*'; when a complex system (a group, community, organization or country) is facing a crisis, and when past solutions are no longer effective, it searches for new options, new solutions and creative alternatives to addressing the problem. Not all the options will work, but some will be effective and successful. By making these successful attempts widely known, it will help reduce the number of unsuccessful attempts.

Furthermore, when a new idea is being tried, both the idea and the people involved, evolve and change in the process. When the change is reciprocal and all those involved influence and change each other, then the process becomes *coevolutionary*. When change is only in one direction, e.g., when individuals or a group change in response to changes in their environment, then this is *adaptation.* However, when adaptation in time affects the environment and changes it, then both the adapting entity and its environment have influenced each other and changed in the process. This reciprocal coevolutionary process is very powerful; that is why it is not always necessary to make major top-down interventions in order to bring about significant change; while creating an enabling environment which facilitates self-organization, exploration of the space of possibilities and coevolution, is far more effective, when it encourages multiple local and simultaneous experiments. One advantage of a local experiment is that it is relatively safe in the sense that if it fails it has not affected the entire system or in this case a country or even the whole planet.

All these initiatives will however have *emergent* outcomes which may be either desirable or undesirable. This is where learning and awareness of the unfolding process is important and where policy makers have a particular role. In seeing the bigger picture and quickly identifying potentially undesirable emergent outcomes. This however means that they are aware of complexity theory and emergence. Such awareness is growing. Several UK Government Departments are exploring the theory and a round table of five Governments (Brazil, Canada, Netherlands, Singapore, UK) was set up recently to look at emergence and resilience from a complexity theory perspective. Furthermore, China is taking learning and complexity very seriously and forty senior civil servants from different parts of China, have recently taken a course in organizational learning and complexity in an attempt to understand how to create learning organizations (enabling environments that facilitate learning) using the principles of complexity. What these examples show is that policy makers are taking an active interest in understanding complexity theory, but more is necessary if the complex problem which is climate change is to be addressed effectively.

On the other hand policy makers are inclined towards 'group think' and tend to favour a few well-tried options. For instance, the UK Government is at present favouring wind and wave generation and is, not putting enough resources into researching and actively developing alternative forms of power generation. The potential danger is that we may become 'locked in' to a position, which is reinforced through *positive feedback* processes until it becomes extremely difficult and costly to change.

This danger could again be reduced if policy makers were aware of these dynamic complex processes as they unfold. The message of this reflection is threefold: (i) to address a complex problem it is not enough to act top-down, action needs to be taken at multiple levels at the same time; (ii) this necessitates active engagement of individuals, communities, and local governments; (iii) an effective way to ensure such participation is to create an enabling environment which facilitates local experiments, and a process for sharing the learning from these experiments, whether successful or not. In addition, policy makers do need to understand how complex behavior arises through

interaction with non-linear, emergent and unpredictable outcomes; the dynamics of self-organization, exploration of the space of possibilities, coevolution and path dependence; and that a single solution cannot be enough to address a multi-dimensional complex problem, which is coevolving with every action and decision taken to address it. Climate change can be addressed effectively if the problem is recognized correctly and addressed appropriately and in time.

## References

Mitleton-Kelly, E. (2003). "Ten principles of complexity and enabling infrastructures," in *Complex Systems & Evolutionary Perspectives of Organizations: The Application of Complexity Theory to Organizations,* ISBN 0080439578, pp. 23-50.

Nicolis, G. and Prigogine I. (1989). *Exploring Complexity,* ISBN 0716718596.

Nicolis, G. (1994). "Physics of far-from-equilibrium systems and self-organization," in P. Davies (ed.), *The New Physics*, ISBN 0521438314.

Prigogine, I. and Stengers, I. (1985). *Order Out of Chaos,* ISBN 0553340824.