Editorial: A sociological reflection on the complexities of climate change research

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Abstract: This *International Journal of Water* presents European and Australian research into the New Water Paradigm as an ecologically integrative approach to climate change. The editorial outlines the political economic context of the climate crisis and the discourses that shape public responses. It suggests that the current international framing of climate policy by business and governments acts as a 'methodological forcing' on the science. It registers the call of some members of the Intergovernmental Panel on Climate Change (IPCC) for more holistic environmental assessments. And it notes the inverse relation between global 'analytical scale' and personal responsibility for enacting climate solutions.

Keywords: climate crisis; political economy; transdisciplinary research; dualism or complexity; methodological forcings; science for people; scale or responsibility.

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1 Political economy and the climate debate

This issue of *International Journal of Water* addresses connections between solar energy, soil, water, vegetation, air, climate – and people. The contributors are scholars and practitioners from hydrology, atmospheric physics, plant physiology, farming, urban design, socio-political analysis and philosophy. Each paper deals with an aspect of the water cycle and its role in Earth cooling – and the collection is designed to break down

the old 'two cultures' mindset of science vs. the humanities. The research also stands aside from the dualistic controversy over climate change. This noisy 'debate' so called is an overly simplified and politicised exchange, which has tended either to focus narrowly on the effects of increased atmospheric CO_2 or to deny the reality of global warming altogether. The present authors question neither the warming phenomenon, nor the role of human activities in destabilising climate. Rather, they urge that more sophisticated scientific models be used for developing assessments and solutions. They argue for attention to the climatic effects of landscape entropy and attention to climatic controls exerted by forest stands and water bodies. Landscapes are understood here, not merely as passive sinks for CO_2 emissions, but as agents of a life-affirming equilibrium in Earth temperatures.

Climate science is likely to remain a sterile contest between 'believers' and 'sceptics' until its complexities are acknowledged, researched and communicated. But, it is not only climate modellers who are conflicted, citizens around the world are divided over how best to respond to the crisis. In the lead up to the December 2009 conference of the United Nations Framework Convention on Climate Change (UNFCCC) in Copenhagen, political commentator Nicola Bullard identified three competing public discourses – business-as-usual, catastrophism, and climate justice (Bullard, 2009). The business-as-usual mindset is found mainly among transnationals and governments of wealthy G8 nations – a class that interprets ecological breakdown as a new market opportunity. By contrast, the language of catastrophism is often invoked by environmentalists and by leaders of vulnerable small island states. The third discourse, climate justice, marks the international movement for an alternative kind of globalisation. It argues that ecological sustainability cannot be achieved without social justice, and is supported at an official level by several South American countries (Salleh, 2008).

Currently, the terms of UNFCCC negotiations are set by a powerful global business lobby with its focus on financial benefits to be had from climate adaptation or mitigation, by technology transfer or carbon trading. Needless to say, environmentalists object to the translation of ecological problems into economic solutions. After the failure of COP15 to reach an international policy consensus, many activists took up an invitation from President Evo Morales of Bolivia to attend a People's World Conference on Climate Change and Mother Earth Rights at Cochabamba (Morales, 2010). The plan was to formulate fresh grassroots recommendations for consideration at the next UNFCCC round. Predictably perhaps, and despite extensive UN lobbying, recommendations from the People's Declaration (CMPCC, 2010) would not be assimilated into policy documents prepared for COP16 at Cancun in December 2010.

An indirect, but encouraging outcome of the climate crisis is that it has galvanised ordinary people across nations and classes with a sense of themselves as global ecological citizens. Concern over the impending breakdown of Earth life-support systems is also drawing thoughtful responses from a variety of disciplines in academia. Bhaskar et al. (2010) put the business-as-usual orientation of UNFCCC under the microscope; and analyse the discourse as a form of ecological modernisation (Hajer, 1996). Ecological modernisation confuses science and economics – as if there was commensurability between units of measurement used in the two kinds of knowledge. The 'natural capital' school of Hawken et al. (1999) is a case in point. The subsumption of nature to human priorities is a deeply enduring feature of eurocentric culture; but it is quite misguided to think that imputing a dollar value to units of CO_2 can alter environmental functions in any way.

Another false 'bridge' between economics and ecology is technological innovation. The UNFCCC serves as a 'broker' for industrial leaders hoping to export manufactured devices for climate adaptation to poor nations (GEF, 2010). Entrepreneurs may profit by selling 'solar renewables' to consumers looking for environmentally responsible products, see for example, Beyond Zero Emissions (2010). However, marketed solutions offer a contradictory response to global warming, in that product manufacture and distribution involves ever more earthly extractions, water use and gaseous emissions. A cradle-to-grave account of thermodynamic costs generated in making such products shows that technological fixes do not resolve but simply displace ecological costs – shifting the deficit from one region of nature to another, and from one human generation to another (Illich, 1977; York and Rosa, 2003).

Most importantly, in relation to the integrative response to climate instability adopted by authors in this *IJW* issue, the reliance on market solutions deflects attention from climatic adjustments that occur spontaneously in nature. That is to say, the language of economics is unable to engage with long-evolved dissipative processes – the cyclic interplay of sunshine, water, soil and plants. When the economistic emphasis on 'counting' merges with science, it results in reductionism. Typically, by economic reasoning, a factor deemed measurable and thus open to pricing – like a unit of CO_2 or unit of water – is abstracted from its materially regenerative context as part of a web of interactive functions in the biosphere. For this reason, it is sometimes claimed that the real managers of land and climate are plants, not humans. In any event, scientists who deal with macro-measurement of variables like CO_2 on a global scale could be well served by a closer study of how ecosystemic energy is balanced by complex self-managing dissipative structures (Prigogine, 1981).

2 Methodological forcings?

The three discourses on climate – business-as-usual, catastrophism and climate justice – each point to different kinds of human political response with different consequences for the environment. For example, Bullard notes that when business-as-usual and climate catastrophists come together, the emphasis on hardware or end-of-pipe solutions results in "dangerous last-grasp strategies such as geo-engineering, nuclear and carbon markets". Reinforcing this perception, Rommetveit et al. scholars of science and technology studies point out that:

> "With increasing political, commercial and public pressures building up around climate science, the danger is increasing that hasty scientific conclusions feed into policy processes demanding fast and safe answers. Policy makers and scientists may jump to premature conclusions leading to locked-in situations where society is committed to solutions that are neither sustainable, nor scientifically, nor economically viable." (Rommetveit et al., 2010, p.156)

In fact, many scientists engaged in the UNFCCC process are themselves uneasy about these pressures. A survey carried out by Anne Henderson-Sellers (2008), former Director of the World Climate Research Programme in Geneva, lists a number of reservations expressed by leading authors of the Fourth Assessment Report of the IPCC (2007). Several of these scientific misgivings are answered by papers in this *IJW* issue:

- the need for complexity in modelling

- the need for a fuller understanding of the carbon cycle
- the need to recognise links between land-use change and greenhouse emissions
- the need to rectify geographic unevenness in existing climate data
- the need to include measures of the hydrological cycle
- the need to bring social and economic sciences to the analysis of climate.

A capacity for thinking through physical complexity is indispensable for moving beyond the reductionist, single issue and carbon-based response to climate change. The measure of CO_2 is not a singular phenomenon – the carbon cycle and the water cycle are mutually interlinked. Likewise, CO_2 emissions are interconnected with environmental imposts such as run-off from paved urban areas or toxic chemical releases from factories. Agro-industrial meat production results not only in methane emissions, but also in exorbitant water use, vegetation loss and soil compaction. Cash crop development projects from rosebuds to biofuels – ideas exported by the EU or USA to the 'two-thirds world' – clear fell tree cover, dry out land and set regional warming in train, by breaking down the local evaporation–precipitation cycle.

It is time to round out the study of climate with more holistic ecological research, but sociological and cultural analysis is prescient as well. Science, itself, is a culture, and one that is becoming increasingly embedded in the culture of business-as-usual. This subtle shift from 20th century notions of socially neutral science and the ideal of 'objectivity' is revealed when Rommetveit et al. (2010) ask: What happens to the practice of science when climate is turned into an object of management by international agencies? How objective is the treatment of local ecosystems in all their idiographic uniqueness, once the political decision is made to go for global as distinct from regional assessments? Are 'methodological forcings' now introduced?

Can data gathered in differently functioning ecosystems be treated additively? Does the prioritisation of computer modelling over careful, on the ground empirical observation, create further methodological forcings? Computer simulation may work for industrial processes where humans are in charge of inputs, but the dynamic couplings and oscillations of nature's metabolism may well be far too complex for easy prediction. Current international climate assessments are based on abstract, decontextualised, global averages, but as social scientists suggest, this methodology appears to be tailored to serve a top-down social engineering agenda.

3 Science for people

Any top-down process is undemocratic. But additionally, in the context of climate change, the richness of scientific findings is compromised if people with a diversity of skill sets and observations are excluded from the activity of knowledge building. For example, once it is appreciated how the carbon and hydrological cycles are interlocking, and regulated by plants as 'heat valves', it makes sense to bring the hands-on land management expertise of farmers or indigenous forest dwellers such as studied by Vandana Shiva (1989) into deliberations over climate mitigation. Ideally, the composition of committees like the IPCC would be balanced in class, race and gender

membership (Salleh, 2009a, 2009b). A too narrow social base will foreclose a panel's terms of reference, choice of methodologies, and attitudes to uncertainty and risk.

The construction of scientific knowledge never takes place in a social vacuum, as Kuhn (1961) explained decades ago. Scientific facts and models are determined consensually, as informed researchers argue and decide among themselves what is plausible and what is not. Yet today, science as a democratic enterprise can be distorted by corporate and government interference. This is evidenced in the manipulation of academic research funds, in pressures on government regulatory committees, and in the censorship of investigatory journalists. The 'debate' over climate change is taking place in this kind of 'social pressure cooker' context and it is important that people be aware of that, as they rely on the integrity of scientists and on the capacity of state agencies to protect them from the risks of modernisation.

If ecological complexity can play havoc with predictive models, social interests can undermine them too. Thus, the practice of environmental risk management is fraught with difficulty and all the more so, because it involves balancing multiple physical and social variables and time scales at once. Where the scientific uncertainty is considerable, scientists sometimes protect themselves in advance against incrimination for failed risk analysis, by engaging community members as co-authors. Similarly, governments, these days, secure accountability by inviting the broadest possible public constituency to participate in policy deliberation. However, uncertainty and accountability problems are magnified in the case of the IPCC, because its mandate is to judge variables on a global scale – and politically speaking, this globe is not 'a level playing field'.

Reflecting on this dilemma as it affects climate, Sheila Jasanoff calls for new institutions to enable the interaction of scientists and citizens:

> "... the very fact that judgement has been integrated across so many fields leaves climate science vulnerable to charges of group think and inappropriate concealment of uncertainties ... Though intergovernmental in name, the IPCC is subject to none of the legal or political requirements that constrain, but also legitimate, national expert committees ... IPCC performs a mix of functions – part scientific assessment, part policy advice, and part diplomacy – that demand external, as well as internal accountability." (Jasanoff, 2010, p.696)

Jasanoff's point is well made, for most concerned citizens assume that the IPCC is conducting 'pure science' – not acting out a confusing blend of political roles "part scientific assessment, part policy advice, and part diplomacy". It is hard to imagine how research into the complexities of climate can flourish under such circumstances.

4 Scale, complexity, responsibility

Outside the IPCC, natural scientific complexities become compounded by the sociological complexities of human institutional responses to the climate crisis. In sociological terms, global warming is the collateral damage from a business-driven industrial growth trajectory with ever-increasing demand for natural resources, cheap labour and consumers. With the globalisation of economic production and intensification of free trade, nation states begin to cede powers to supranational institutions like the WTO and UNFCCC. One political consequence of this gradual shift to international governance is that people lose control over their everyday conditions of existence. The democratic ideal is disconnected from community. At the same time, the capitalist

division of labour, trained specialisations and abstract expertise, along with the growth of urban consumer lifestyles, all disconnect people from a direct sensuous understanding of how material nature works and how their very own bodies are a material part of that nature.

Commenting on the consequences of 'modernisation', Toulmin writes:

> "There is a ... contrast between our local knowledge of the patterns we find in concrete events, and the universal, abstract understanding ... The substance of everyday experience refers always to a 'where and when': a 'here and now' or a 'there and then'. General theoretical abstractions, by contrast, claim to apply *always* and *everywhere* – and so ... hold good *nowhere-in-particular*." (Toulmin, 2003, pp.15, 16)

If findings apply 'no-where-in-particular', then do the risks of scientific uncertainty also apply 'no-where-in-particular'? In other words, is there an inverse relation between scale and the capacity for responsible science? And how do scientific results applicable to 'no-where-in-particular' translate into responsible social policy? How do people struggling to protect their health, livelihood, community, and habitat, make good use of scientific results that apply 'no-where-in-particular'?

Then again, what does it mean to talk of 'acceptable risks' in an international context? Are acceptable risks simply those that can be displaced on to other humans in other environments? As Ana Isla points out, the livelihood of subsistence dwellers in forests of the global South is sacrificed when pollution from wealthy industrial nations is offset by carbon sinks (Isla, 2009). This occurs under the UNFCCC Clean Development Mechanism (CDM), and according to climate justice activists, ecological debts of this kind are inherent to programmes for Reducing Emissions from Deforestation and Degradation (REDD). A sociologically reflexive and indeed non-racist UNFCCC policy would ensure that wealthy states deal with their own CO_2 footprint on their own territory. The climate paradigm put forward in this special *IJW* issue demonstrates how this is possible by restoring dissipative structures to ecosystem integrity.

As distinct from the politically convenient gaze of "no-where-in-particular", a democratic approach to climate change will look at things from the ground-up. It will apply the principle of subsidiarity and respect the localised experience and knowledge of those who labour everyday to maintain living processes – as farmers, mothers, gatherers and fishers do (Via Campesina, 2010). Strong sustainability means empowering environmentally committed local communities, and this is the focus of the alternative globalisation movement (ETC Group, 2009; Regenvanu, 2010). While the discourse of business-as-usual advances the climate crisis as a chance to sell more 'stuff' in Annie Leonard's words (2009), climate justice advocates see this crisis as a chance for people to recover their capacities for reconnecting with nature and re-inventing ways of eco-sufficient provisioning.

5 In this IJW issue

This collection opens with an informal essay by Juraj Kohutiar and Michal Kravcik – 'Water for an integrative climate paradigm'. They explain how cultural perceptions of water developed historically, and eventually compromised the Earth's circular feedback systems among water, land, plants and climate. The authors, trained as hydrologists, have pioneered what they call the New Water Paradigm (NWP); today, they are civil society

activists in the People and Water NGO (2009), based in Kosice, Slovakia. Kravcik was awarded a Goldman Environmental Prize for initiatives in the protection of catchments. Subsequently, this work to restore local water cycles evolved into projects for grassroots education and employment, community development and cultural identity. On the question of global warming, Kohutiar and Kravcik point out that water evaporation is the single most important cause of energy movement and temperature control in the biosphere.

> "By the logic of the New Water Paradigm (NWP), it is deforestation, industrial agriculture, and urbanisation that determine climate by draining land, so that more solar energy re-enters the atmosphere as sensible heat, rather than latent heat of evaporation. Human made 'hot plates' lead to irregular precipitation and other climate destabilisation effects, but these can be mitigated through rainwater conservation and re-vegetation. This integrative paradigm combines the management of climate, water, biodiversity, and land, with implications for agriculture, forestry, engineering, urban design and regional planning."

Holding on to water is essential to recovery of the climate, and the micro-physics of this process is demonstrated by biological scientists from the University of Southern Bohemia, Mendel University, the Czech Life Sciences University in Prague, and the ENKI research organisation. In 'Solar energy dissipation and temperature control by water and plants', co-authors Jan Pokorný, Jakub Brom, Jan Čermák, Petra Hesslerova, Hanna Huryna, Nadia Nadezhdina and Alžběta Rejšková present data from the Trebon region of the Czech Republic, using a variety of remote-sensing techniques including satellite and thermovision images.

> "Ecosystems use solar energy for self-organisation and cool themselves by exporting entropy to the atmosphere as heat. These energy transformations are achieved through evapotranspiration, with plants as 'heat valves' ... While global warming is commonly attributed to atmospheric CO_2, the research shows water vapour has a concentration two orders of magnitude higher than other greenhouse gases. It is critical that landscape management protects the hydrological cycle with its capacity for dissipation of incoming solar energy."

The centrality of climate cooling through evaporative processes is taken up next by Marco Schmidt, an architect and planner from the Watergy research group at the Technical University of Berlin. The paper 'Ecological design for climate mitigation in contemporary urban living' discusses climate responsive urban demonstration projects in Berlin and surrounds – water harvesting or green roofs and facades – and shows how the NWP can be applied to mitigate the development of 'hot plates' in built-up and over-engineered environments.

> "Evaporation is the most important hydrological function on Earth because it provides rain. As deforestation and urbanisation reduce plant cover and evapotranspiration, ever more short-wave solar radiation is converted to long-wave thermal emissions and sensible heat. Higher surface temperatures set up heat island effects, contributing to local, and ultimately, global climate change. Rainwater harvesting is therefore a key mitigation strategy against increased temperatures and drought."

In 'Losing fertile matter to the sea: How landscape entropy affects climate', Wilhelm Ripl, a limnologist from the Technical University of Berlin, describes research on the River Stor basin in North Germany. Human interference with landscape vegetation cover causes erosion of fertile carbon matter to the sea or as polluting depositions in

freshwater lakes. The effect is entropic – a running down of the natural order of energy transformations by which climate is regulated.

> "Under natural conditions order is created by interactions between water, temperature, chemical gradients, ground surface, and organisms. However, in the 'developed' landscape, order is replaced by randomness ... Applying the Energy-Transport-Reaction Model to the River Stor Catchment in Germany, the paper shows how dissipative structures balance terrestrial and aquatic ecosystems, returning short water cycles to the atmosphere. This ecosystem integrity benefits food production as well as climate."

Anastassia Makarieva and Victor Gorshkov, theoretical physicists from the Petersburg Nuclear Physics Institute in Russia, likewise emphasise the role of evaporation in Earth cooling. Their paper 'The Biotic Pump: Condensation, atmospheric dynamics, and climate' challenges commonly held scientific assumptions about air circulation. The thesis both affirms the agency of plant life and describes a natural process that counter-balances aspects of the landscape entropy described by Ripl.

> "The intense condensation associated with high evaporation from natural forest maintains regions of low atmospheric pressure on land. This causes moist air to flow from the ocean on to land, compensating for continental water loss through river runoff. Conversely, deforestation induces desiccation by reversing this moisture flow ... forest preservation is a sound strategy for both water security and for protecting a continental landmass against climate extremes like floods, droughts, hurricanes, and tornadoes."

In 'Re-coupling the carbon and water cycles by Natural Sequence Farming', landscape manager Duane Norris and farmer Peter Andrews discuss recent, intuitively derived, understandings of the hydrological system that once operated on the Australian continent. Andrews has devised the technique of Natural Sequence Farming to restore this unique hydrology. In his view, agro-industrial farming 'mines carbon' from the soil, whereas the purpose of NSF is to enhance natural soil fertility by getting water and carbon cycles back into sync.

> "Early settlement of the continent by people with European cultural assumptions disrupted established interactions of water, soil, and plants resulting in lost fertility. Moreover, agricultural practices such as clearing, burning, ploughing, draining, and irrigation, have implications for global warming. Soils hold twice as much carbon as the atmosphere, and three times as much as vegetation. But carbon in exposed soil oxidises releasing CO_2 into the atmosphere."

Using the NSF approach, Australian farmers are well placed to become proactive agents in the mitigation of unstable climate patterns and there is hope yet, for the threatened Murray River basin. In a short paper entitled 'The principles of Natural Sequence Farming', John Williams, former Chief of the Land and Water Division at the Australian CSIRO, now Natural Resources Commissioner for New South Wales, summarises the multiple benefits to be had from application of NSF practices.

> "The paper outlines the 4 fundamental principles of Natural Sequence Farming. It explains historical changes in the Australian landscape affecting vegetation, drainage, and morphology, including the typical perched water flows. NSF management techniques are analysed as structural and non-structural and in the opinion of the CSIRO Expert Panel, both produce manifold benefits in terms of – erosive water velocities; aquifer recharge; soil structure; erosion, compaction, and pasture productivity, to name a few."

If the effects of mal-development are seen everywhere in Australia, so too in Africa, inappropriate economic models transferred from Europe have taken an ecological toll. In this context, Petra Hesslerova and Jan Pokorný from the Czech research organisation ENKI document the effects of land clearing in the Mau Forest region of Central Kenya. Their paper 'Forest clearing, water loss, and land surface heating as development costs' compares Landsat satellite images for 1986, 2000 and 2009, demonstrating the environmentally disastrous fall in evapotranspiration and corresponding rise in ground surface temperatures over this period.

> "… extensive deforestation over the past 20 years has caused changes in climate and hydrology. The analyses are based on processing of Landsat satellite images. Field observations during the 'dry' rainy season in October 2008, and testimonies of local people and scientists, confirm the decline of precipitation, low water level in lakes and discharge of rivers."

If economic development models are typically eurocentric, UNFCCC climate policy is no less so. This failure of sociological awareness is exposed by James Goodman and Ellen Roberts in their paper 'Is the United Nations' REDD scheme conservation colonialism by default?' The authors, respectively, political scientist from the University of Technology, Sydney, and activist from Friends of the Earth, Melbourne, comment on the Reducing Emissions from Deforestation and Degradation scheme supported by both Australian and Indonesian governments, with unwelcome costs passed on to Kalimantan subsistence communities.

> "It is envisaged that reductions in deforestation will generate a stock of UN recognised carbon credits for Indonesia. The Australian government hopes to offset 50% of its own emissions by buying up international carbon credits, and has a direct interest in securing access to these exceptionally cheap Indonesian credits. Local organisations in Indonesia oppose this type of aid, and the offset schemes it promotes, which they say benefits high-emitting industrialised countries and promotes corporate interests over their livelihoods."

In 'The New Water Paradigm, human capabilities and strong sustainability', Justus Lodemann and Rafael Ziegler from the Social-Ecological Research Group of the University of Greifswald in Germany join forces with Pavol Varga, from the Slovak NGO People and Water. The essay draws on environmental ethics and politics, in particular, the popular capabilities approach. The authors observe that the modernist idea of water engineering – the 'hydraulic mission' – abstracted water from its many landscape functions, treating it as a single variable to be measured and controlled. This destructive 'one-dimensional' water paradigm is contrasted with the NWP.

> "The analysis suggests that the NWP should enhance the capacity of ecosystems to cope with stress, a key objective of sustainability; and it should promote social goals associated with strong sustainability by meeting basic capabilities. Nevertheless, effective implementation of sustainability using the NWP will depend upon political commitment and social participation."

The collection closes with four reviews of books about water and sustainable solutions by authors from Australia – the driest continent on Earth. Diane Bell discusses historian Michael Cathcart's *The Water Dreamers*, a study of misguided attitudes to progress exported from 'the old world' to *terra australis.* Frank Stilwell appraises *Positive Development* by architect and sustainability planner Janis Birkeland. Holly Creenaune reviews Christopher Daniel's compendium of solutions for a

water-stressed community – *Adelaide: Water of a City*. Ron Nicholls reflects on the anthology by Emily Potter et al., *Fresh Water*, a study of innovative indigenous thinking about water.

6 Coming to our senses

The authors in this *IJW* express concern over the impasse in climate policy evidenced by the narrow emphasis on CO_2 in IPCC models, and they are not alone in this. Editors of the *International Journal of Climatology* claim that:

> "... landscape variations may have important local, regional and potentially global climatic implications. In some cases, the climate response to land use and land-cover change may even exceed the contribution from increasing greenhouse gases." (Dirmeyer et al., 2010)

Meanwhile, a comprehensive literature review from *Current Opinion in Environmental Sustainability* states:

> "... policy makers remain overwhelmingly focused on CO_2 reductions and continue to ignore other anthropogenic modifiers of climate systems. To date, climate models such as those used for the 4AR of the IPCC have failed to adequately capture the full range of human-influenced climate forcings impacting on the climate system ..."
>
> "It is critical to adopt a broader perspective ... [by examining] global and regional climate approaches which recognise the climate regulation function that forests and woodlands play through moderating regional climate variability, resisting abrupt change to existing climate regimes, as well as underpinning the hydrological cycle." (McAlpine et al., 2010)

A major obstacle to this integrative paradigm is the lack of articulation between existing instruments of international governance such as the Kyoto Protocol, Convention on Biological Diversity and Millennium Development Goals.

Getting the science right is certainly a necessary condition of planetary survival, but it is not a sufficient condition. The political economic, social and cultural antecedents of climate change cannot be ignored. Given the social complexities that criss-cross the global warming phenomenon, taking action to reduce climate instability will mean coming to terms with

- the respective roles of business-as-usual and the climate justice movement
- the reliance on reductionist scientific models by governments and agencies
- the modernist faith in technological solutions for ecological problems
- the externalisation of risk by displacement on to those without a political voice
- the lack of class, race and sex-gender reflexivity among decision-makers.

One of the biggest challenges, and the media will be critical here, is moving beyond the feelgood macho clash between sceptics and believers. It is time to replace the politics of competition with a politics of communication.

The present authors offer a clear direction for defusing the either/or stalemate of climate politics. Each paper substantiates the centrality of an intact ecosystem, and the

work of water and plants in regulating climate; and this perception is triangulated through several disciplinary lenses. Some of the researchers make use of highly sophisticated industrial technologies to verify their claims – and they are all too aware of the contradictory tension that exists between this and their ultimate environmental objectives. Other contributors, like Michal Kravcik, have gained knowledge in the field, and in calling together his Kosice community to take action for climate, he appeals to common sense:

> "... some 58,000 square kilometres of paved urban paradise drains rainwater into the sea, leaving heat at a loose end in the atmosphere and causing chaos ... It would not be a paved road to hell, if we harvested rainwater in city parks and green areas, and let the water evaporate. And what's more, more water in the country means more vegetation, and more vegetation means more photosynthesis plus more consumed CO_2 from the air into vegetation ..."
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> "If we remove water, vegetation disappears, weakening the processes of photosynthesis, and leaving unconsumed CO_2 in the air." (Kravcik, 2010)

Environmentally aware climate activists agree, arguing that an end to land clearing could immediately reduce global warming by 20%. And in light of the New Water Paradigm – this carries renewed salience. Forest reserves not only absorb CO_2 from the atmosphere as 'carbon sinks' in IPCC language; by the NWP, plants act as 'heat valves' regulating temperatures through atmospheric evaporation. This capacity reveals nature to be an active agent of climate control, an 'independent variable' that is being overlooked in equations of the dominant discourse. A sound hydrological cycle, therefore, is the first premise of a coherent climate policy. As a political commitment, it is neither expensive nor risky to achieve. And, as the Slovak experience shows, restoring catchments creates green jobs; it is community building, identity affirming and healthy human work.

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