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Environmental Futures

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Abstract

Critical thinking about environmental futures has a distinguished lineage. From Thomas More and William Morris to Ebenezer Howard and Peter Kropotkin, alternative environmental futures replete with geographical concerns regarding scale, place and nature-society interactions have long been imagined, articulated and critiqued. Since the 1970s, expositions of environmental futures in geography have become dominated by increasingly sophisticated modelling of environmental change. These models tend to assume a level of continuity and universality of trends that are based on scientific analyses of natural rather than social systems. In response, attempts have been made to capture the potential for societal innovation and discontinuity to shape environmental futures through more creative and participatory processes. Whatever their assumptions, articulations of environmental futures function as potential guides for decision making in the present, visualising alternative possibilities for human and non-human interactions.

Environmental Futures

Geographers from Alexander von Humbolt onwards have played leading roles in developing scientific methods of observation, data collection, and deriving and testing hypotheses that have proved effective in increasing understanding of environments past and present. However, key questions preoccupying contemporary society also relate to what our past and current actions might mean for future environments and generations. Explicit attention to environmental futures is therefore becoming an increasingly familiar practice in research and policy making. Thinking critically about environmental futures is not, however, a recent phenomenon. There is a long and diverse history of literary, artistic and scientific work that provides the foundations for current thinking about environmental futures. While based on different drivers and motivations, adopting divergent methods and approaches, and culminating in distinct and not necessarily comparable outputs, the broad field of environmental futures research nonetheless encompass core geographical concerns of including matters of scale and place and most fundamentally of nature-society interactions.

Much of the historic literary work in the field of environmental futures is focused on all-encompassing visions or blueprints of sustainable societies, often gathered together under a banner of the 'utopian tradition'. The utopian tradition can be traced back to Plato, through the political philosophies of Thomas More (*Utopia*, 1516), to William Morris (*News from Nowhere*, 1891) and on to the work of anarchist geographer Peter Kropotkin (*The Conquest of Bread*, 1892 and *Fields, Factories and Workshops*, 1904) and planning visionary

Ebenezer Howard (*Garden Cities of Tomorrow*, 1902). At the same time, dystopian visions of future environments have also been prominent features of politico-literary texts, as seen in the work of Aldous Huxley (*Brave New World*, 1932) and George Orwell (*Nineteen Eighty-Four* 1949) and increasingly through contemporary science fiction novels, films and computer gaming. These visions, both utopian and dystopian have been widely critiqued and categorized according to the proposed solutions for society's ills, be that extended state control or anarchy, private or public ownership and the degree of democracy and equality. Visions explicitly concentrating on environmental futures emphasize matters of resource use and consumption, typically focusing on problems of scarcity and the search for some attainment of 'the good life'. Yet solutions remain diverse, some focusing on sufficiency and limiting consumption based on basic needs, others placing great faith in technological progress to enable continued production and consumption of goods and services.

Envisioning environmental futures is not just the preserve of utopian/dystopian literary authors. Quotidian processes of land use planning, for example, frequently embody the creation of plans for how neighbourhoods, cities, regions and nations might evolve in the future. Yet these plans often depict near-term futures (around ten years in most cases), and are constrained by pragmatic resource limitations and the realpolitik of policy making. Yet, as Marius de Gues (1999) argues, imaginative visions for future societies as produced by the utopian authors may work usefully together with planning - at local, national, regional and global scales - as a means to provoke discussion about longer-term developments, providing alternative ideas, perspectives and questions about decisions to be made and resources to be allocated.

Modeling global environmental futures: trends, forecasting and scientization

In April 1968 the Club of Rome, an international think-tank, commissioned a team of system scientists from the Massachusetts Institute of Technology (MIT) to model possible future environmental scenarios based on five factors seen as limiting growth: population; agricultural production; natural resources; industrial production and pollution. The model predicted global economic collapse and ultimately population decline by 2030 if trends in production and consumption were to continue. Other scenarios identified possibilities for economic growth, but only if systems of governance were developed that both regulated resource consumption and invested in technologies to control humanity's ecological footprint. The research was published in 1972 as "*Limits to Growth*", and while heavily critiqued for its assumptions and limited data, it had international impact selling more than 12 million copies in more than 30 languages. It was followed in the same year by "*A Blueprint for Survival*" by Edward Goldsmith and colleagues. This document set out a manifesto for addressing the challenges identified in "*Limits to Growth*" and included supporting signatures from 36 experts from biology, chemistry, genetics, natural history, and medicine as well as two British geographers, Dr. S. Eyre from Leeds University and Prof. G. Melvyn Howe from Strathclyde University. Central to the authors' vision for a survivable future were radical shifts in the ways society, as experienced within western industrial countries at the time, would function. The vision was to create stability through decentralised, self-governing and self-sufficient communities where diversity rather than uniformity could be fostered. While technology was perceived to play a role in this stabilized future it would only do so when the full cost of its development and use was proven to be less than the benefits it provided. Likewise, the Blueprint focused on the recognition of what

was termed ‘real value’ rather than economic value, with an emphasis on quality rather than quantity in design, and a reclamation of value for skilled craftsmanship and the arts. However, how such transitions to the stable, survivable society envisaged by Goldsmith and colleagues were to be enacted were not outlined.

Many of the concerns of the Club of Rome regarding an impoverished environmental future, biodiversity loss, environmental pollution, and unsustainable consumption, remain concerns for global environmental governance institutions in the 21st century. Indeed, little progress has been made in redirecting the trajectory of trends identified by the MIT scientists back in the late 1960s. There has been significant progress, however, in terms of the computing capability of the programmes used to model possible environmental futures, the quality and quantity of data to underpin those models and the transnational collaboration between experts to refine both data and modeling attributes. A frontier activity in this regard is the global emissions scenarios of the Intergovernmental Panel on Climate Change (IPCC). The IPCC was established to assess scientific, technical and socio-economic information relevant to the understanding of humanly induced climate change, potential impacts of climate change and options for mitigation and adaptation. In 1992, the IPCC released the first global scenarios to provide estimates for the full suite of greenhouse gases (GHG), but by 1996 an even broader set of emission scenarios were developed. The new scenarios included improved emission baselines and updated information on economic restructuring globally, incorporating rates and trends in technological change and expanding the diversity of the economic-development pathways considered. Modeling these broader parameters indicated that different social, economic and technological developments strongly influence emissions trends, thereby providing significant insights into the interlinkages between environmental quality and development. Following the rules and procedures of the IPCC, multidisciplinary core writing teams, including geographers, draft reports which are then sent to international experts and member governments of the IPCC. For example, more than 2400 experts were formally invited to review the 2007 IPCC Synthesis Report and reviewers included geographers Dr. Thomas Spencer from Cambridge University, UK and Dr. Georg Kaser, Institut für Geographie at the University of Innsbruck, Austria.

During the following decade, other international organisations followed the IPCC in its environmental futures activities. The World Water Commission produced their ‘World Water Vision’, while agricultural scenarios were developed by the International Assessment of Agricultural Science and Technology for Development, and scenarios of global ecosystems services resulted from the work of the Millennium Ecosystem Assessment. Meanwhile, transectoral environmental scenarios have also been produced by both the Organisation for Economic Co-operation and Development (OECD) and the United Nations Environment Programme (UNEP). The analysis for the OECD Environmental Outlook combines economic and environmental modeling frameworks developed at the OECD and the Netherlands Environmental Assessment Agency (PBL). Specifically, a global dynamic computable general equilibrium model “ENV-Linkages” is used to describe how economic activities are linked between sectors and across regions. It also links economic activity to environmental pressures, specifically to emissions of GHG. These links are then projected several decades into the future, in an attempt to illuminate potential impacts of environmental policies. Outputs from ENV-Linkages are combined with the IMAGE (Integrated Model to Assess the Global Environment) models run by PBL. A dynamic integrated assessment framework to model global change, IMAGE is underpinned by modeling of global land allocation, subject

to production of food, feed, timber and water, and projects emissions, mapped onto a grid of the world. IMAGE has been used for other key global environmental assessments such as the Global Environmental Outlook (GEO) by UNEP. In contrast to the OECD approach, GEO aims to be a more consultative, participatory process focused on building capacity for conducting integrated assessments reporting on the state, trends and outlooks of the environment. Based on integrated assessment and reporting approaches developed by a team of authors, including geographer Dr. Jill Jäger, the UNEP GEO approach also aims to make its reports scientifically credible and policy relevant, supporting multi-stakeholder networking and intra and inter-regional cooperation to identify and assess key priority environmental issues at the regional levels. To this end a worldwide network of partners has been developed which allows governments and other stakeholders to nominate experts to the process, advisory groups to provide guidance on scientific and policy issues, and a comprehensive peer review process.

However, while there have been increased efforts to ensure greater interdisciplinary input into models of environmental futures, academics including geographers David Demeritt and Michael Hulme, have demonstrated that they remain predominantly informed by natural rather than the social science research (Hulme and Mahoney 2010). As well as marginalising attention to important social components of global environmental change, this has also meant less critical attention to the philosophical and methodological aspects of prediction and forecasting. That there remains gender and spatial bias in terms of the inputs to many of these models also suggests that the visions of environmental futures portrayed are both narrowly conceived and highly bounded; there are what Richard Powell (2007) calls geographies of science even in the modeling of big data with respect to global environmental change. Equally, as with the Club of Rome, such modeling provides little assistance in terms of imagining how society might develop governing pathways to manage and construct less destructive environmental futures.

From forecasting to backcasting: the participatory turn in environmental futures research

Within much standard environmental modeling work, natural phenomena are assumed to behave in the same way, whenever and wherever they occur. This assumption extends also to natural processes that represent a departure from long-term average conditions, and to non-linear processes, such as a collapse of the thermohaline circulation (Rahmstorf 2000). However, it is argued that this assumption of continuity cannot extend to the social sciences where innovation and discontinuity have been identified as key features in the development of social systems. While many significant social structures, processes and norms may remain relatively stable for periods of time, it is also the case that they can and do evolve, either suddenly or gradually, as a familiar outcome of economic and social activity. So, in contrast to the forecasting approaches adopted by the IPCC, OECD and UNEP reports where past trends and current 'rules' are iterated into the future, a body of work collectively called backcasting has evolved that explicitly adopts a normative scenario building approach (Dreborg 1996). The process is shaped around the question, "where do we want to go and what actions do we need to take in order to get there?" Essentially, backcasting assumes that futures can be created. This is its relative strength when compared with forecasting approaches although there are also dangers of overstating the capacity of actors to influence the future and clearly not all actors have equal influence in terms of shaping

change. In response to these concerns, a third way between forecasting and backcasting has been framed as exploratory scenario building. In this context a range of underlying socio-economic conditions are used to generate alternative futures as a means of mapping 'possibility spaces'. Within this exploratory framing, the future is imagined through the development of multiple alternative states in which social agents can respond according to their own interests albeit with limited control. It is the emphasis on the importance of adaptation that is a defining feature within this arena of environmental futures work.

Of particular importance in many of the backcasting activities are the interlinked features of expanded participation, innovation and creativity. Including diverse interests and expertise and explicitly focusing on a future that is far enough away to free participants from the constraints of everyday living, but close enough to imagine themselves or their children inhabiting, is thought to offer more opportunities for combining knowledge, stimulating creative thinking and developing innovative visions. Such transdisciplinarity in these normative environmental futures exercises is seen as essential to address the complexity of environmental challenges now and into the future. Backcasting scenarios are not theoretically based or empirically validated models, but heuristic tools to enable experts and others to engage in a collective process of deliberation. For example, the generated scenarios are frequently accompanied by a narrative, and sometimes even visualised, storylines elucidating the imagined futures. As such their value is seen to lie predominantly in their capacity to bring together disparate actors and agencies in a common process of envisaging desirable as well as possible futures; creating spaces for sustainability learning (Davies, Doyle and Pape 2012). The development of scenarios is thus a process through which imagined futures can be revealed, ordered and analysed although uneven patterns of power and participation in those visions remain.

Collective visioning experiments have been undertaken by different environmental sectors from energy and city planning, to water resource management and sustainable consumption and at different scales, from the household scale to national planning fora. The Netherlands in particular has adopted backcasting as a feature of its strategic environmental decision making with visioning applied within the main Dutch research organisation for agriculture and rural areas. Elsewhere experiments with participatory backcasting for supporting sustainable environmental futures have been undertaken in Sweden, Germany, New Zealand and Canada.

Environmental futures: themes and roles

It is clear that thinking about environmental futures has a diverse lineage and continues to be practiced in many ways. Environmental futures activities can be constructed by individual visionaries or transdisciplinary collectives and can address different scales, from the modelling of global futures produced by the IPCC to the small-scale utopian ecological communities crafted by Peter Kropotkin. Such imagining occurs both in terms of near environmental futures, the ten year development plan within a local government district for example, as well as in terms of the far futures of science fiction, way beyond the lifespan of current populations. While literary visions of environmental futures have tended to be characterised as utopian or dystopian, the scientization of thinking through environmental futures sought to create positive rather than normative fields of possibility for environmental futures. Yet, even these increasingly sophisticated scenarios based on

complex models map only certain dimensions of those futures, for example predicting weather patterns or rainfall frequency and intensity based on lessons from the past and the present to estimate future patterns. How those altered environmental futures might affect the ways in which people live across the globe and under what governing arrangements is not addressed. Yet, environmental change scenarios involve much more than the scientifically based models that underpin them. Scenarios, whether they are developed by the IPCC or any other organisation involve processes of selection and negotiation between different interests and stakeholders. For as Michael Hulme and Seraje Dessai (2008) outline, fundamental choices are made about the types of models used, the ways in which uncertainty is assessed and communicated, and the development pathways and emissions scenarios to be focused on. So, while there is widespread scepticism of the utopian grand plans of individual visionaries or the singular blueprint of the future proposed by elite groups such as the Club of Rome, even the most scientifically robust vision of environmental futures are constructed following debate and contestation. Recognising such characteristics does not diminish the usefulness of scenarios, as heuristic, motivational and informative tools for design, planning and policy development. Environmental futures experiments of all kinds provide spaces to debate important questions about the kinds of environments we might wish to inhabit in the future. While clearly multidisciplinary endeavours, the fundamental attention to nature-society interactions at the very roots of imagining environmental futures means that geographers (both human and physical) have a key role to play within them.

SEE ALSO: Big Data; Environmental change and social learning; Environmentalism; Global Climate Change; Global Climate Models; Global Environmental Change; Imaginative geographies; Participatory modeling; Spatial modeling; Sustainability science.

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