Editorial

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The Anthropocene Review: Its significance, implications and the rationale for a new transdisciplinary journal

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Abstract

Human activities now play a major, integral and ever-increasing role in the functioning of the Earth System. This fact lies at the heart of the notion of the Anthropocene. Documenting, understanding and responding to the present and future challenges posed by the recent, dramatic changes in the relationship between humans and their environment thus becomes an imperative for human society. This editorial presents the rationale for engaging with the Anthropocene across a wide range of disciplines from engineering and environmental science to the social sciences and humanities. This essentially transdisciplinary engagement requires the establishment of a new journal, *The Anthropocene Review*, the scope of which is outlined in this editorial.

Keywords

Anthropocene, Earth System, Great Acceleration, human environmental impacts, Industrial Revolution

Since its introduction by Crutzen and Stoermer (2000), the term 'Anthropocene' has generated lively interest across a wide range of institutions and an impressive diversity of individual scholars and writers. Dating the start of the Anthropocene to around AD 1800, as originally proposed, has generated some ongoing controversy, but there is general consensus around the view that the key to its definition is the onset of processes through which human activities began to move crucial aspects of Earth System function well outside the preceding envelope of variability. Throughout the Holocene, and increasingly since the transition to farming, the human species has increased its

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imprint upon Earth, but it is only after the start of the Industrial Revolution that this imprint has evolved into a major force impacting many global biogeophysical cycles to the point of becoming a strong, integral and, in some respects, dominating force in the Earth System. In recent years especially, an unprecedented degree of global economic, cultural and political interconnectedness has also developed – the increasingly globalized human social system is thus also a key feature of the Anthropocene. While it may be premature to talk about an integrated human society, the ongoing dynamics point in this direction. Science can help lead this evolving global society towards greater awareness of its impacts, and guide it towards responsible, wise use of the resource systems upon which it depends. The capacity of systemic self-organization on a global scale also enables human society, at least in principle, to use Earth System knowledge for self-governance. Clearly, it is now necessary to understand the increasingly globalized social system as well as the biogeophysical phenomena that led to the original definition.

Such observations foreshadow the breadth of concerns subsumed under the Anthropocene heading and highlight the many ways in which *The Anthropocene Review* will be a radical departure from any of its predecessors in terms of scope and orientation. Existing journals with recent geological periods in their title, such as 'Holocene' or 'Quaternary' do, by their designation, broadly define their subject matter. Their concerns are primarily retrospective, which is not to say that by dealing with the past their concerns have no bearing on present and future environmental issues. It is important to reconstruct and understand the past not merely as the pages in a history book, or even as essential records of the Earth System under changed conditions of external forcing and internal dynamics. The past also contributes to a continuum of insight into processes and interactions that flows through the present to the future.

It is evident therefore that the justification for the Anthropocene (and for *The Anthropocene Review*) does not rest on the issue of exact equivalence to past epochs in a formal sense, but on the dramatic physical and biological changes caused by human activities. Reviewing the familiar and lengthy litany of human impacts and their growing, global significance (see e.g. McNeill, 2000; Steffen et al., 2004) is one important way of acknowledging the distinctive nature of the Anthropocene. An additional and complementary way of framing our concern with the Anthropocene is to try to seek out those characteristics of emerging human–environment relations that lend it distinction in substantive, conceptual, methodological and philosophical terms.

Prior to the formulation of the Anthropocene, the iconic precursors of our present concerns with Earth System integrity and human sustainability were mainly focused on one aspect of human–environment interactions, for example land-ethic based conservation (Leopold, 1949), pesticides (Carson, 1962), population (Ehrlich, 1968), the unplanned overexploitation of shared resources (Hardin, 1968), and model projections of global limits (Meadows et al., 1972). Now, we are dealing with complex systemic impacts, requiring a more comprehensive conceptual framework, as well as newly emerging research priorities. Perhaps we can begin to explore these by establishing some relatively non-controversial propositions:

- Anthropogenic climate change, in combination with a wide range of additional human impacts on the Earth System, forces us to acknowledge that human activities are now an integral part of the range of processes driving environmental change.
- This has the effect of breaking down the dichotomy between humans and nature at the functional level which, in turn, brings into question the appropriateness of much previous thinking and writing, about human–nature relations, since the human–nature dualism, as conventionally framed, no longer provides an adequate basis for assessing the functional dimensions of human–environment interactions.

- Although there must, inevitably, be a major focus on all those aspects of the Earth System that are seen to contribute to human life-support and welfare broadly defined, our concerns must go well beyond these and also deal with features of the changing Earth System in their own right. It would be unwise, for both pragmatic and moral reasons, to use a too narrowly anthropocentric perspective, especially in view of the many ways in which human actions have often had unintended consequences, though it is important not to oversensationalize. The Earth System has withstood a number of major vicissitudes, the most extreme of which resulted in major shifts to a new planetary state and, in the case of the big five mass extinctions, it took at least hundreds of thousands of years to recover. Some of these past changes have greatly exceeded the sum total of our current anthropogenic impacts, but it is clear that human influences, especially over the last six decades, are already leading to huge adjustments to the biosphere, and that the geological signature of our activities will persist into the future.
- Identifying and understanding those aspects essential for human life and well-being and all the interactions upon which they, and the functioning of the Earth System depend, pose unprecedented challenges for human society, not least because of the complexity of environmental systems (sensu Scheffer, 2009) as well as the complexity, size and range of actions of the human population. These features of the Anthropocene make it virtually impossible to establish simple, linear links between causes and effects.
- Humans have changed the Earth in both positive and negative ways. The key challenge for the future is to ensure that the negative changes do not outweigh the positive ones. Optimizing human influences within an ever- (and inevitably) changing Earth System of huge complexity has many dimensions – scientific, social, economic and ethical – that interact with and should help to steer decision-making towards more sustainable and equitable choices. The destructive side of this human capacity has become manifest in two world wars and countless other conflicts, and it is encapsulated in the technical ability to wage a global nuclear war. A constructive side of this capacity could manifest itself in efforts at geo-engineering or Earth management, though both pose daunting challenges.

These considerations point to the great breadth of concerns implicit in our engagement with the Anthropocene, whether or not it acquires formal, geological recognition. They also highlight the need for a journal that is truly transdisciplinary in scope. This implies more than a wide spread of diverse themes. It calls for a commitment to *communicate among* disciplines and conceptual frameworks in a way that creates mutual understanding without compromising professional quality. Articles should be accessible to all, and every attempt made, through the use of simple language, to overcome the difficulty of translating between the languages used by the members of different scientific communities.

The overall aim of the new journal therefore must be to communicate clearly, across a wide range of disciplines and interests, the causes, history, nature and implications of a world in which human activities are integral to the functioning of the Earth System.

The question of what time frame to adopt for the Anthropocene still requires consideration, for it inevitably impinges on the content of the journal. The original concept, as conceived by Crutzen and Stoermer (2000) sees the start of the Anthropocene coinciding with the early stages of the Industrial Revolution. By contrast, Ruddiman, who has recently summarised his findings in a comprehensive review (Ruddiman, 2013) outlines the evidence for atmospheric greenhouse gas increases in response to the early impacts of Old World farming from Neolithic times onwards. He makes a persuasive case for the importance of these increases in warming mean global temperatures long before the onset of industrialisation. His analysis also serves as an essential reminder

that many of the landscapes upon which global change is occurring have a long history of human modification. Ruddiman's review drives him towards a definition of the Anthropocene that differs strongly from that of Crutzen and Stoermer, which focuses on the growing scope and accelerating rate of change from early industrial times onwards. In this regard, human impacts in the wake of the Industrial Revolution go far beyond increased atmospheric CO_2 concentrations and their consequences. They include resource depletion and innumerable forms of environmental pollution, as well as the myriad other consequences, social, economic and political linked to the rapid growth of human populations and the spread of globalization.

Ruddiman, recognising the accelerating rates of change with industrialisation, suggests, towards the end of his review, an informally defined two-stage Anthropocene, pre-industrial and post-AD 1850. In fact, what may be observed is three broad stages, with a third stage post-dating what Steffen et al. (2007) call the Great Acceleration from around AD 1950 onwards. For the time being then, pending any formal definition of the Anthropocene, we might think in terms of these three stages, though we see a strong case for focusing above all on the later stages, from the start of fossil fuel use that empowered societies with an unprecedented amount of energy and capacity for action (Fischer-Kowalski and Haberl, 2007). There will, inevitably be further stages. For example, the greater part of projected global warming, marine flooding of coastal lands and biodiversity loss have not yet happened.

We are now living at a time around six decades on from the start of the Great Acceleration. During that time, not only has the pace of change accelerated, so has the connectedness of human–environment interactions and the range of impacts on ecosystems and ecosystem services. There is a growing awareness among both environmental and social scientists and the general public for the need to understand the likelihood of regional and global instabilities, including identifying those paths that could take us beyond safe operating spaces towards tipping points.

In response, we have seen the development of increasingly powerful research tools to explore present conditions and likely future trends, as well as a lively engagement with global change themes across a wide range of disciplines, spanning the whole spectrum from engineering to the humanities. This therefore must be the core time frame for the new journal, though it is important that, wherever possible, studies should be viewed in the context of the longer-term evolution of human–environment relationships. The drivers and legacy of human–environmental interactions during the pre-industrial and industrial periods cannot be ignored. Irrespective of the time frame within which contributions are placed, or indeed the lack or transgression of time frames, there are important criteria and priorities to be considered in framing the aims and scope of the new journal:

- global, or at least major continental/ocean basin significance in any environmental processes, human activities or human–environment interactions under consideration. We aim to emphasize 'macro-scale' perspectives on processes potentially affecting Earth and global systems, but recognise that case studies on a more limited regional scale may provide the key to wider understanding and applications;
- significant contributions to the understanding of present-day problems of human–environmental relations and their perception, assimilation and transformation into effective action;
- the application and development of complexity and resilience science concepts and tools for addressing the past and future behaviour of social-ecological systems;
- the promotion of appropriate methods to underpin decision-making in response to complex human–environment interactions or within social-ecological systems;
- relevance to our appraisal of future trends, threats and alternative responses;

- the development of conceptual frameworks for defining and communicating the challenges of the Anthropocene beyond the specialist scientific community;
- the portrayal and evaluation of key political responses to the major challenges posed by the changing Earth System;
- the articulation of cultural, behavioural, ethical and aesthetic responses to current and future global change in different societies;
- the evaluation of new technologies developed in response to the emerging problems posed by human activities and climate change;
- engagement with issues of governance, sustainability, human demography and human health in response to environmental change and human population growth.

Even if the above outline were intended to delimit the range of concerns for *The Anthropocene Review*, it would give enormous transdisciplinary scope. The intention here, however, is to be indicative, rather than prescriptive. The potential goes beyond what any group can spell out and holds enormous promise for what is a challenging and exciting new publishing venture.

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