ANTHROPOCENE: JOURNEY OF A CONCEPT

By Victor Anderson, September 2014

The concept of "the Anthropocene" has travelled a long way in a short time. This paper discusses its journey from its origins in geology, through biology and social science, to its implications and uses in politics. The story of the Anthropocene's journey sheds some light on the relationships between natural and social science, and on different political responses to the ecological predicament we all now find ourselves in.

The first four sections here each correspond to a stage in the journey: (1) the emergence of "Anthropocene" as a concept in geology, (2) the idea of "Anthropocene" as a stage in the evolution of the biosphere; (3) the way in which the idea of "Anthropocene" was taken up in social science; (4) how "Anthropocene" arrived in political discourse, and what has been happening to it there. Sections 5 and 6 discuss the relationship between "Anthropocene" and other large-scale concepts such as "capitalism" and "sustainable development".

One of the curious features of this journey across disciplinary boundaries is that the assumption within geology that the Anthropocene and the Holocene (the epoch that precedes it) are distinct and cannot overlap, contrasts with the implication in much social science and political discussion that we are in fact, and perhaps should be, currently living in such an overlap. I will try to explain the reasons for that shift in what follows.

1. ANTHROPOCENE AS A GEOLOGICAL CONCEPT

"Anthropocene" is, originally and above all, a geological concept. [1] The word has been chosen to suggest its membership of a set of concepts referring to geological epochs. Going back in time, we have the Holocene, Pleistocene, Pliocene, Miocene, Oligocene, Eocene, and Palaeocene. Together, these epochs cover the past 65 million years, the time since the catastrophe that wiped out the dinosaurs.

"Anthropocene" therefore makes a very big claim: that the changes which have taken place recently in the earth system are on the same scale of significance as the past changes which marked the transition from one epoch to the next.

"Anthropocene" used as a geological concept makes an additional claim: that these changes are significant in terms of what they have done, or are now doing, to the geology of the planet. This in turn implies that these changes would be evident to some future geologist, even a geologist of some different species to our own, looking at this planet perhaps 10 million years in the future. Such a geologist – whether an extraterrestrial, highly advanced rodent, or maybe some sort of transhuman cyborg – would be able to tell that something significant had happened at the start of the Anthropocene, a transformation of a sort which had changed the geological nature of the Earth.

In fact, evidence of this sort does exist, and some of it may well still be apparent 10 million years into the future. Most obviously, humans have mined metals and stone from beneath the Earth's surface, and used them to construct buildings, transport routes, and cities. Perhaps more fatefully (and more evident to future geologists), humans have extracted oil, coal, and gas from beneath the Earth, and released it in the form of gases into the atmosphere, modifying the planet's climate. Humans have also diverted waterways, built dams, and caused sediment to be discharged. These and other ways in which our species has altered the planet look like they count on a geological scale.

It is important to emphasise that this is a geological scale – both in the sense that we are concerned here with the movement and modification of rocks and minerals, and also in the sense of the very long timescale involved. Crucially for the "Anthropocene" concept, geological time completely dwarfs historical time. The Anthropocene (depending on when we believe it began, an issue I will come to later) may be seen to encompass every scheme and epoch of historical periodisation. Feudalism, capitalism, the Middle Ages, Renaissance, Enlightenment, Industrial Revolution, modernity, postmodernity – from this perspective, all can be seen as mere sub-divisions of the Anthropocene.

Geologists are well-organised internationally. A concept like "the Anthropocene", with the claims it implies, is not adopted by geologists simply because some geologists take up the idea and write about it. A formal process and structure are involved. The principal body through which geologists are organised is the International Union of Geological Sciences (IUGS). Within that, its largest and oldest constituent part is the International Commission on Stratigraphy. The Commission has not accepted the Anthropocene into the family of epochs. Its charts and reports end with the Holocene.

The Commission may eventually accept the proposal to recognise the Anthropocene as a new epoch of geological time. [2] As perhaps befits a geological body, it moves very slowly. It is currently gathering evidence and debating arguments. Some of these arguments are worth briefly outlining now, so that we can gain a sense of the contrast between the hesitancy of geologists towards the "Anthropocene" concept, and the enthusiasm with which the concept has been received by many social scientists.

One response from geologists is that the way in which "Anthropocene" has been taken up by social scientists and people involved in environmental politics should itself be sufficient to warn off sober scientific geologists. The concept has become too politicised, and in its short life, already too weighed down with value-laden and emotive baggage. Better to steer clear of all this if we want to be taken seriously! [3]

Another response is that it is too early to tell. Let's wait and see what the hyper-intelligent rodent geologist 10 million years into the future actually finds. We cannot know now what results of human activity they will or won't be able to see, or will or won't regard as significant. It is a matter for them what they will reckon about this current time. Geology can only be done in retrospect. It is not some sort of contemporary history, able to analyse what is happening in the present. That is not what geologists do.

Perhaps a more serious problem, particularly for the less conservative sections of the geological professions, is the question of when the Anthropocene began. One version of the Anthropocene is that it began around 1950. That was the date which at one point was fixed

as “the present” so that dating of objects as “BP”, before the present, wouldn’t constantly have to be re-dated. It is also approximately the date of the beginning of what has been called “the Great Acceleration”, the period during which human impacts on the planet have expanded and accelerated far beyond their previous scale. The Great Acceleration shows up in a whole series of graphs, such as those for world population, total GDP, water use, motor vehicles, fertiliser consumption, and so on. They all show the same basic pattern. [4]

For other advocates of the Anthropocene, however, it is necessary to trace back the roots of the Great Acceleration. It can be seen to be merely the culmination of trends that have been going on for a long time, at least since the Industrial Revolution. We might therefore date the Anthropocene as beginning in 1850, or maybe 1750. Perhaps the use of coal-powered steam engines is where it began.

A third version of the Anthropocene has it starting much earlier than that. Humans have been modifying their environment in significant ways at least since the beginnings of agriculture. Perhaps the beginning of the Anthropocene coincided with what is currently regarded as the beginning of the Holocene, the end of the Ice Age, roughly 11,500 years ago. This is problematic because it follows that therefore the Holocene could in its entirety simply be renamed “Anthropocene”, with the advantage that it would be a term with a more definite meaning (“epoch of humans”, whereas “Holocene” simply means “recent epoch”). Or perhaps we should give up on the idea of the “Anthropocene”, and simply regard recent developments as part of the Holocene: just more Holocene, perhaps “late Holocene”.

That doesn’t sound so exciting, but perhaps it makes sense for geologists and in terms of the geological timescale. But “Anthropocene” is no longer simply a geological concept. It is also a biological and ecological concept, partly as a result of powerfully combining with the notion of “planetary boundaries”.

2. THE EVOLUTIONARY CONTEXT: ANTHROPOCENE MEETS PLANETARY BOUNDARIES

“Anthropocene” is not only a geological concept, but also a biological concept. It belongs, again, with categories such as “Pliocene” and “Jurassic”, which each have a role both in geology and also in evolutionary biology.

There are very good reasons why the dividing of time into epochs and periods in evolutionary biology should correspond to the way it is divided up in geology. Biological change has often been triggered by geological change. For example, periods in which almost all the land on the planet is gathered together as a single mass (as with Pangaea) will have less coastline, and therefore less opportunity for the types of species which can live successfully in coastal areas. Times when land is arranged so that what were previously two separate continents become joined (as with North and South America) are times in which it is possible for species to migrate from one continent to another. Times when continents are joined from north to south (as with the Americas) are times when there is a blockage to east-west ocean currents, with consequences for both climate and biology. [5]

The plate tectonics movements that move, split, and gather together continents are geological processes which are amongst the most important forces driving evolutionary

biological change. Some of this process of change acts through affecting climate, for example because changes in global temperature create changes in sea level, again affecting the configuration of the continents, oceans, and islands.

There is therefore nothing unusual about a geological time period corresponding to a time period in evolutionary biology. Although the Anthropocene does not have an independently geological cause – it is driven principally from within the development of the human species and its technologies – it fits this pattern, by describing a state of affairs not only within geology but also within the evolutionary process.

It is a state of affairs in which one species is clearly dominant above all the rest. The human species has adapted to living in a very wide variety of habitats across the planet. Humans have moved other species from continent to continent, most obviously in the case of food crops. Humans have domesticated, farmed, and factory farmed, other species on a colossal scale. Humans are modifying the atmosphere and climate, especially through fossil fuels and land use change. In the development of crop breeding, genetic modification, and synthetic biology, humans are increasingly harnessing not only other species but also the basic biological processes of life. All of this put together is unprecedented, even though we might find parallels for just one form of dominance from amongst a range of other species.

The Anthropocene is therefore truly "the epoch of humans". It also implies far more than that: it is the epoch of humans seen in a very long-term, geological and evolutionary, context. It helps to describe and place what is going on currently – human achievements and predicaments – in terms of the evolutionary processes of which these are part. This in turn locates the "Anthropocene" concept not only within mainstream geological, evolutionary, and ecological science, but also in the same field of debate as (amongst others) the work of Vladimir Vernadsky, Teilhard de Chardin, and James Lovelock, with their concepts of "biosphere", "noosphere", and "Gaia". [6]

In a "big picture" of this sort we can, for example, see the Anthropocene as the natural development or culmination of various trends within primate, or (going further back) earlier mammal, or (going even further back) earlier vertebrate evolution, with the development of the nervous system, senses, brains, and capacity for social interaction and creativity giving the human species the capability for achieving the dominance which the Anthropocene now represents.

The concept of the "Anthropocene" has been given a further boost by the opportunity which has been presented by the construction of another key concept intended as a way of locating and summarising key features of our current time: the concept of "planetary boundaries". [7] This is because the definitions interlock. The Anthropocene has been defined, in part, as being the epoch which follows after the previous epoch, which was the Holocene (this is unless one believes the Anthropocene began when the Holocene began). If the Anthropocene follows on after the Holocene, it then has a key connection with the idea of "planetary boundaries". This is because "planetary boundaries" are defined as ecological limits within which there is a "safe operating space", enabling humans and other species to live within "Holocene conditions". So if we move beyond those boundaries, we are in great danger of finding ourselves outside the Holocene – or in other words, in the Anthropocene. [8]

On this picture, the current transition of the planet beyond the boundaries – and three of the boundaries have been exceeded already (climate, biodiversity, nitrogen) – is the transition from Holocene to Anthropocene. On that view, we might even say that the Anthropocene hasn't started yet, and won't unless we have exceeded all, or most, or some fateful combination of, the nine planetary boundaries.

Proposals and movements intended to keep humanity within the boundaries can therefore we seen as attempts to stop the Anthropocene from ever starting, or at least to make it as short as possible before we return to the safer conditions of the Holocene. This is a picture which lends itself to the view that the Anthropocene is inherently "bad" and the Holocene inherently "good". This view suggests a choice: between the Anthropocene version of the future and a future in which human beings have in some way become reconciled with other species and the ecological processes and integrity of the planet, as with Thomas Berry's concept of "the Ecozoic", a word which ambitiously suggests a parallel with whole geological eras (much larger than mere epochs such as the Holocene) such as Palaeozoic, Mesozoic, and Cenozoic. [9]

Others have proposed that we stand at a different fork in the road: between a "bad Anthropocene" and "a good Anthropocene". This conception of where we stand now in the evolutionary process is one that takes us beyond ideas with which natural scientists feel at home. We are now into an area of debate where "Anthropocene" has been taken up within social science and politics.

3. THE SOCIAL SCIENCE OF THE ANTHROPOCENE

The concept of the "Anthropocene" has been taken up more enthusiastically by some social scientists than it generally has by natural scientists. It brings together in one convenient coherent package many different features of the world which are of interest to social scientists studying global environmental change. It also significantly provides an alternative, or possibly a complement, to other concepts which might play this role, such as "capitalism" (a point which will be discussed in a later section).

The use of the "Anthropocene" concept draws attention to, and puts the emphasis on, the sheer scale of the human impact on the planet. The impact itself is in the spotlight, rather than issues about the forms of social organisation which have created that impact, or any of the traditional sociological issues about class or power relations within human societies. Sheer scale is what matters above all for the Anthropocene, and that in itself creates a challenge to dominant social science ways of looking at human society.

There is also a perhaps more subtle change taking place than simply a change in the size of the total human footprint: a change in the relationship between humanity and nature. The concept of "nature" has of course been a contested one for centuries. Many landscapes which appear to be "natural" are the result of numerous generations of farming. Many areas of conserved "nature" are in reality intensively managed, deliberately to keep them looking "natural". The idea of "nature" has played many different roles in philosophy, theology, poetry, and politics. It has never been straightforward. [10]

Now nature has entered a new stage, one which is highly significant for the environmental movement, which has up to now tended to define its mission as the protection, conservation, and/or defence of "nature" or "the natural world", as if such things exist. But maybe that depends on a "pre-Anthropocene paradigm", a failure to face the reality that the planet and our species are one single entity, with human impacts on such a scale and so wide-ranging that there is nothing left which can be described as "nature". The idea of "nature" suggests that there are parts of the world which remain still somehow exempt from, or outside of, the Anthropocene, the era of human domination of the planet. But perhaps part of the meaning of the concept of the "Anthropocene" is that there are no such areas. In that sense, we have now reached "the end of nature".

Thoughts along these lines have led to the idea of "next nature", a version of nature which is inevitably co-created jointly by human beings, other species, and the physical environment. This removes any normative implication (or even the possibility) of anything being "unnatural". Genetically modified organisms, for example, are therefore just as natural as those which are unmodified, because human actions and technologies are just as much part of nature ("next nature" that is) as the actions of any other species are. [11]

"Anthropocene" opens up other important issues too. How, historically, did we get to this stage in evolution? What caused it? Is the Anthropocene fundamentally the outcome of the sophisticated social ability of human beings, our capacity for empathy and organisation? Is it the inevitable outcome of technological development? Is it simply the contingent product of a particular way of organising economic life that we could change, thereby evolving our species, and hence the planet, in some different direction?

We might say that "Anthropocene" is a geological concept with ecological implications, but which has causes that can only be investigated through social science. However it is difficult to remain within the confines of the idea of studying society scientifically. Almost inevitably we find ourselves wanting to draw conclusions, about whether the Anthropocene is "good" or "bad" or could be either; about how to use the enormous amount of human power it implies, or how to reduce that power and reaffirm the natural world; about whether "Anthropocene" explains more than a category such as "capitalism" does, and whether the features of the world it draws attention to are more or less important than those implied by other similarly large explanatory categories; and about whether recognition of the reality of the Anthropocene implies a need for urgent support for green politics and green economics, whether it renders both of those sets of ideas now unrealistic and impossible to put into practice, or whether it points to the need for some sort of "new environmentalism".

Like any other concept with a lot of implications and a bandwagon rolling for it, it has multiple political uses. The next section explores the "Anthropocene" as a political concept.

4. THE POLITICAL USES OF "THE ANTHROPOCENE"

All wide-ranging concepts have political implications and uses. Sometimes these are relatively straightforward. However, the politics of the Anthropocene are complex and contested, for reasons that go beyond the perhaps more straightforward questions of scientific validity touched on earlier in this chapter.

What does it mean for us now to be living in the Anthropocene? There are two very different stories which have been constructed around the concept of "the Anthropocene", and they have very different implications. They could be said to represent, or perhaps even to crystallise in a particularly clear form, two different versions of "the environmental agenda", and it is easily possible to imagine the environmental movement in future splitting along the dividing line between the two.

One story, which we could call the "greener" of the two, links the Anthropocene very closely with the analysis of "planetary boundaries". The Holocene has provided relatively stable and favourable circumstances for the flourishing of the human species. It is not the only possible state of the planet, of course, and very different life forms, climatic conditions, and configurations of land and sea, have existed at different times. What is at stake is therefore not "saving the planet", but maintaining relatively good conditions within it for human beings. The Holocene can be seen as providing a "safe operating space", which it is dangerous to move outside.

We are currently in the process of doing exactly that. The concept of the "Anthropocene" enables us to say that we are moving out of the Holocene and into a new successor epoch. In doing so, we are in a process of transition beyond the safe operating space and out into a new and clearly unsafe space.

Three of the nine planetary boundaries proposed in this analysis have already been exceeded: for climate, biodiversity, and nitrogen. The Anthropocene will be an epoch in which there is a destabilised climate, with overall global warming, sea level rise, and numerous consequences from climate change. It will be much poorer than the Holocene in terms of biodiversity and ecosystem functioning. It will also be an epoch in which the nitrogen cycle has been disrupted and excess nitrogen has become a widespread pollutant.

If current trends continue, the other planetary boundaries will also be exceeded. The Anthropocene will be a time of freshwater shortages, phosphorus pollution, acidified oceans, lack of "wild land" not appropriated for crops, atmospheric particulates, and chemical pollution. In the case of one of the boundaries, the state of the ozone layer, our species has successfully taken action to reverse previous trends and stay within Holocene conditions, perhaps indicating that this is possible more generally.

If the Anthropocene is defined in terms of the boundaries which characterise "Holocene conditions", the Anthropocene becomes a bleak prospect, which we are already entering into. On the basis of this account, it is almost inevitable that the notion of a "good Anthropocene" is a contradiction in terms.

Yet a "good Anthropocene" has its advocates, and they have a different story – but also, I would argue, a different concept of what the term "Anthropocene" means. The key motto of this story is a quotation from Stewart Brand, founder and editor of 'The Whole Earth Catalog', who famously said: "we are as gods and we might as well get good at it". More recently, he has developed what he calls "ecopragmatism", which includes environmentalist arguments for nuclear power and genetically modified crops. Similar policy conclusions have been argued for (in a book which also outlines the planetary boundaries analysis) by Mark Lynas in 'The God Species'. Andrew Revkin of 'The New York Times' has explicitly declared that he wants to see a "good Anthropocene". [12]

On this view, there can be no turning back to a state of affairs in which humans are no longer the dominant force shaping the planet. The issue then becomes what we want it to be like and how we should shape it.

This is not only a different story but also a different conception of the "Anthropocene". Its advocates are not deliberately wanting to exceed the nine planetary boundaries or nonchalant about the prospect of moving beyond them. They are happy with the idea of human dominance, but at the same time they are not wanting to move outside the Holocene's "safe operating space" or indifferent about that possibility.

We could characterise their position as one in favour of locating ourselves within an **overlap between Holocene and Anthropocene**: "Holocene conditions" (staying within the boundaries) combined with "Anthropocene powers" (human-created technologies, economies, and modification of environments).

This doesn't suit geologists: for them, one epoch begins when the previous one ends (with a so-called "golden spike"), no overlaps. Perhaps it is part of the price of transferring a concept from geology into social science that it changes from one which admits of no overlaps or ambiguities to become one which does.

Support for nuclear power is a contingent aspect of the policy agenda of some "good Anthropocene" advocates. Support for genetically modified crops and other organisms can actually be regarded as part of the definition of that position. Support for geo-engineering to combat climate change is also associated with it. These are examples of the use of human power on a large scale, with major consequences. These are not the technologies for a species shrinking back in horror from having made a big impact on the world.

However there is more than this at stake in the question of the politics of the Anthropocene. A third position (which I am not interested to discuss here, but which should be mentioned for the sake of completeness) is that we can either live safely outside the boundaries – because, for example, biodiversity loss is not really a problem if we can find other species, or technological substitutes which can provide the same ecosystem services – or that we are not really exceeding them anyway because, for example, virtually all the world's climate scientists are wrong.

More interestingly, there is also a fourth position about the politics of the Anthropocene, which is to view it as a problematic concept because of its relationship to other similarly wide-ranging concepts, such as "capitalism" and "modernity". The additional questions this raises will be discussed the next section.

5. A UNIFYING CONCEPT?

No single term expresses the whole reality of the world in any particular period, and which word one chooses to highlight says a lot about which features of the world one regards as the most important. It is easy to see why geologists in particular might favour the term "Anthropocene", because it refers to major recent and current developments in the geology of the planet, such as the extraction of minerals, the burning of fossil fuels, and the physical impacts from diverting rivers. Similarly, evolutionary biologists might easily take the view

that what is happening now biologically is principally the result of human activity, which has brought agriculture, large-scale habitat destruction, mass extinction, and now genetic modification and synthetic biology.

The situation becomes more complex when “Anthropocene” moves from natural science into social science and politics. Both of those fields take it for granted that human beings are centre stage, and focus on what is going on within human society. Very many different types of things are going on of course, and they cannot all be easily grouped together under the “Anthropocene” heading. In these fields, “Anthropocene” is in some respects either competing with other wide-ranging concepts, such as “capitalism” and “modernity”, or is raising questions about its relationship with those other concepts.

All this may become clearer if we try to imagine what a simplistic version of a Marxist critique of the “Anthropocene” would look like. The use of “Anthropocene” could be seen as a means of supplanting “capitalism” as a focus of analysis, diverting attention away from the class nature of current society, thereby serving the interests of the capitalist class, who prefer their own existence and power to remain in the background rather than being seen as being a key causal factor or as a problem. Its use in a way implying negative connotations might also be viewed as an attempt to deny or suppress a very important (and even, according to Marx, defining) feature of human life: the drive to transform the material world through work and technology. In the Anthropocene, there is clearly a great deal of human transformation of the material world going on, and a Marxist would be unlikely to believe this was necessarily a bad thing. The evaluation of the Anthropocene would have to depend on whose interests these large-scale transformations are being carried out in. There would be no nostalgia for the supposed simplicity of undisturbed nature.

Does the ecological crisis change any of this? Not necessarily, because it can simply be seen as an outcome of capitalism and its failure to properly co-ordinate economic activity and take full account of its effects. However, the problem here is not seen from a Marxist perspective to be one of the scale of human transformation of the environment, but one of the type of transformation, with a more benign, responsible, and socially just type of transformation being envisaged in what could be called (though I have never seen the two words put together before) “a socialist anthropocene”, although (as with the “ecopragmatist” position), this would have to be an Anthropocene remaining within “Holocene conditions”, i.e. within the planetary boundaries.

“Anthropocene” also has a connection with an old debate about capitalism and Communism. Before the fall of the USSR and other Communist regimes, and the increasing shift to the use of market forces in China, many commentators were struck by the similarities in the environmental impacts of East and West, Communism and capitalism. Both seemed essentially irresponsible and destructive in the impacts of their economic activity on the local and global environment. Could this be because of some feature in common between them? From that thought grew the idea that capitalism and Communism were simply two species within some larger category defined by the types of technology they used or by the dominance of science, economics, and secularism within them: hence concepts such as “industrial society”, “industrialism”, “managerialism” and “modernity” (and also, pitted against them, “alternative technology” and “alternative consciousness”). This in turn has led to a new twist in recent decades, with concepts referring to changes in society in the form of

"post-industrial society", "information society", "postmodernity", "postbureaucratic" and "postsecularism". [13]

"Anthropocene" now does some of that work of describing what is in common between capitalism and Communism, although perhaps with the fall of Communism we no longer really need a concept to play this particular role. Although "Anthropocene" highlights some features of human society – above all, impacts on the environment – rather than others (such as the basis of the economy or society's worldviews) – it is arguably now the most important feature of the present that it highlights. If the ecological crisis has now become the most important problem facing our species, then it seems reasonable for a concept such as "Anthropocene" to be foregrounded in social science and politics.

This argument can go a stage further. Here is a concept which has become genuinely interdisciplinary, and as a result it fits very well within efforts to approach the ecological crisis on an interdisciplinary basis, which is really the only way it can adequately be approached. Geologists, biologists, sociologists, economists, historians, political scientists and political activists can all actually be talking about the same thing - if we are careful about some of the issues about definition which I have referred to - using a concept which provides some degree of unification to their different forms of investigation.

6. ANTHROPOCENE AND OTHER FRAMINGS

Care is also needed regarding the relationship with some other ways of framing discussion about global ecology and human impacts. As well as its relationship with "planetary boundaries" and "capitalism" as overview concepts, "Anthropocene" also has problematic connections with other concepts which similarly cover a great deal of ground, such as "sustainable development" and "green economy". The meanings of both these terms have been much debated, but so far relatively little has been said about their relationship with the "Anthropocene".

"Development" is a notoriously imprecise word, and the term "sustainable development" is best regarded as a deliberately ambiguous political concept designed to bring together a broad-based coalition of different interests, viewpoints, organisations, and individuals, as a way of achieving change. I would argue that it has had some success in that respect, although at the cost of some lack of clarity in the debate.

However if we define "sustainable" as meaning "within planetary boundaries", then "sustainable development" becomes development which remains within Holocene conditions. As the earlier discussion has shown, this is compatible with being within the Anthropocene, in the sense of a period in which human modification of the global environment is a major feature of the planet's workings. "Sustainable development" is then located within the suggested "Holocene/Anthropocene overlap".

However "sustainable development" plays a role which "Anthropocene" cannot: it indicates a desired process of change, pointing towards possible strategies and actions, whereas "Anthropocene" is more a way of reporting on a particular set of existing facts. "Anthropocene" is the state we are in as a planet; "sustainable development" is a possible response (or in fact, a wide range of possible responses) to that state.

Similarly “green economy” is also ambiguous. It can be seen and used as a means of signposting a new direction for capitalism (“green capitalism”), or as implying the necessity of moving beyond capitalism to a new, non-capitalist form of economy. It plays a role similar to “sustainable development”, both for its coalition-building capacity, and as a basis for generating strategies and actions. It covers less scope than “sustainable development”, because it obviously refers specifically to the economy; but this is arguably the most important aspect of society that needs to be changed in order to achieve sustainability and keep within Holocene conditions.

It is not particularly productive to argue about which term should be dominant over the others. For policy debate and policy formulation purposes, “green economy” and “sustainable development” have become well-established and are unlikely to be abandoned simply because of the rise of the “Anthropocene” as a concept. However, what “Anthropocene” does achieve, along with “planetary boundaries”, is a powerful way of summing up, and making it possible to visualise, an overall understanding of where we as a particular species and “we” as an entire “earth community” now stand when this is seen in a very long-term perspective.

This is where the greatest usefulness of the “Anthropocene” concept is to be found. Without that sense of long-term perspective, it becomes impossible to grasp the significance of the present moment and of the more-than-historic importance of decisions currently being made, or failing to be made.

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September 2014

NOTES

[1] See 'The Anthropocene: a new epoch of geological time?', eds. Mark Williams, Jan Zalasiewicz, Alan Haywood & Mike Ellis, theme issue of 'Philosophical Transactions of the Royal Society A'. Vol 369, number 1938 (Royal Society Publishing March 2011).

[2] Anthropocene Working Group of the International Commission on Stratigraphy: http://quaternary.stratigraphy.org/workinggroups/anthropocene/

[3] See 'Is the Anthropocene an issue of stratigraphy or pop culture?', Whitney J Autin & John M Holbrook, in 'GSA Today' vol 22, number 7 (2012).

[4] See Gary Peterson, 'Visualising the Great Acceleration' (based on work by Will Steffen and others): http://rs.resalliance.org/tag/great-acceleration/

[5] See for example 'History of Life', Richard Cowen (Wiley 5th ed: 2013).

[6] Vladimir Vernadsky: 'The Biosphere' (Synergetic Press 1986, abridged from French edition 1929). Teilhard de Chardin: 'The Phenomenon of Man' (Collins 1959, originally published in French 1955). James Lovelock: 'Gaia' (Oxford University Press 1979). Elisabet Sahtouris: 'Gaia: the human journey from chaos to cosmos (Simon & Schuster 1989). Brian Swimme & Thomas Berry: 'The Universe Story' (HarperCollins 1992).

[7] Johan Rockstrom et al.: 'Planetary Boundaries: exploring the safe operating space for humanity' (Ecology & Society Vol 14 no 2 2009). http://www.ecologyandsociety.org/vol14/iss2/art32/

[8] Rockstrom et al. say on their first page: "... we must take the range within which Earth System processes varied in the Holocene as a scientific reference point for a desirable planetary state."

[9] Thomas Berry: 'The Ecozoic Era' (1991), New Economy Coalition website http://neweconomy.net/publications/lectures/berry/thomas/the-ecozoic-era

[10] See Raymond Williams on 'Nature' in 'Keywords' (1983): http://en3326pastoral.blogspot.co.uk/2011/10/raymond-williams-nature-from-keywords_25.html

[11] Koert van Mensvoort & Hendrik-Jan Grievink: 'Next Nature' (Colophon 2011).

[12] Stewart Brand: 'Whole Earth Discipline' (Atlantic Books 2010). Mark Lynas: 'The God Species' (Fourth Estate 2011). See the interchange between Andrew Revkin and Clive Hamilton (2014) on the Grist website: http://grist.org/climate-energy/is-the-anthropocene-a-world-of-hope-or-a-world-of-hurt/

[13] See Krishan Kumar: 'From Post-Industrial to Post-Modern Society' (Blackwell 1995).