Societal responses to the Anthropocene

BY CRISPIN TICKELL*

Ablington Old Barn, Ablington, Cirencester GL5 7AN, UK

This article discusses the societal responses to the Anthropocene. First we need to confront the effects of our own population proliferation in all its aspects; next to look again at economics and replace consumerism as a goal; then to work out new ways of generating energy; to manage and adapt to what is in effect climate destabilization; to give higher priority to conservation of the natural world; and last to create the necessary institutional means of coping with global problems in a world in which society is more integrated than ever before.

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1. Societal responses to the Anthropocene

The idea that humans could so transform the land surface, seas and atmosphere of the Earth to establish a new geological epoch in their own name is startling in itself, and would have amazed earlier generations. Yet, since the beginning of the industrial revolution some 250 years ago, humans have profoundly affected the Earth and all life on it. The consequences are becoming more evident every day, but in the longer term remain almost unknowable. The character of soils, the chemistry of the oceans and atmosphere, the selective breeding of species of all kinds and their movement round the world are producing a world beyond our reckoning. Hence the Anthropocene [1,2].

It falls to this generation to try and measure the impact on society, and work out what might be done to mitigate or adapt to change in the broad human interest. Little is more difficult than learning to think differently. Yet, it is hard even to define the principal problems without upsetting longstanding traditions, beliefs, attitudes and the often unspoken assumptions on which we build our lives. It took a long time for previous generations to accept the antiquity of the Earth, the mechanisms of evolution, the movement of tectonic plates, the shared genetic inheritance of all living organisms, and the symbiotic and to some extent self-regulating relationship between the physical, chemical, biological and human components of the Earth system (e.g. [3]). Some still reject the whole idea.

*sircrispintickell@googlemail.com

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The impacts that together constitute the Anthropocene can be defined in many ways. In broad terms, we are exploiting and in some respects running down the Earth’s natural capital, including the biosphere, and damaging the ecosystem services on which we all depend. This is hard to reconcile with our experience of the bonanza of inventiveness, exploitation and consumption since the industrial revolution. All successful species, whether bivalves, beetles or humans, multiply until they come up against the environmental stops, reach some accommodation with the rest of the environment, and willy-nilly restore some balance. Are we near to those stops?

In September 2009, Rockström et al. [4] identified nine scientific stops or boundaries that humans would cross at their peril. Three had already been crossed: climate change, loss of biodiversity, and interference with the nitrogen and phosphorus levels. The other six were stratospheric ozone depletion, ocean acidification, use of fresh water, changes in land use, chemical pollution and atmospheric aerosol loading.

But these stops, however important, are only half the story. There are six more general ones where the societal responses are critical. First we need to confront the effects of our own proliferation in all its aspects; next to look again at a lot of economics and replace consumerism as a goal; then to work out new ways of generating energy; to manage and adapt to what is in effect climate destabilization; to give higher priority to conservation of the natural world; and last to create the necessary institutional means of coping with global problems in a world in which society is more joined together than ever before. As has been well said by Lord Rees of the Royal Society, we cannot afford to be stupid. In the future global village, we cannot afford to have too many village idiots.

When future generations look back on the Anthropocene, they may well find the multiplication of our own species its most conspicuous feature. No one knows how many of us there were in—say—1800, but a good guess would be a billion, itself an extraordinary increase over the preceding 2000 or 3000 years. By 1927, the figure had risen to around 2 billion. Then came the biggest increases of all: to 3 billion in 1960 to 5 billion in 1987 and to 6.9 billion today. Every year sees 78 million more people. Some predict a rise to around 9 billion by the middle of the twenty-first century, and even more after that.

As an amazingly successful animal species, are we anywhere near an accommodation with the finite resources of the Earth and its living environment? Was Thomas Robert Malthus right when in 1798 he wrote that ‘Population, when unchecked, increases in a geometrical ratio. Subsistence only increases in an arithmetical ratio; and ‘The power of population is infinitely greater than the power in the Earth to produce subsistence for man?’ In short, can the Earth afford us?

The debate has aroused strong feeling on all sides. At one extreme are those who believe, in the words of the Bible, that God gave humans dominion over the Earth, and told them ‘to be fruitful and multiply, and replenish the Earth, and subdue it’. At the other extreme is the position of the Chinese government that, dismayed by a giddy increase in the Chinese population, established the controversial one child/one family policy in 1980. This has already slowed the rate of increase in China and there are reasonable prospects that the population will eventually level off at between 1.4 and 1.5 billion.
Within the international institutions, the United Nations Fund for Population Activities (crafty wording in itself) has to tread very carefully in both its language and its activities. In the 1960s, population issues were widely debated, notably after the publication of *The Population Bomb* by Paul Ehrlich in 1968, forecasting fairly imminent disaster. The disaster did not happen, and as with Malthus there were those who dismissed the thesis, and others who said that the disaster had simply been postponed. But the subject remains highly sensitive, well reflected in all work on the subject and at international conference.

With the resumption of the debate in the twenty-first century, the picture changed again, well brought out in Fred Pearce’s book *Peoplequake* [5]. Few now deny the perils of high population for society and the resources on which it depends, but the peak of increase may have passed, and in some parts of the world female fertility is declining. If the average replacement rate is around 2.1 children per woman, more than 60 countries are already below it and others are following. Even without authoritarian policies, such as those in China, there could be drastic reductions in population levels by the end of this century. For example, there could be less than half present numbers in Europe. In some quarters, this has caused more anxiety than relief, and some governments have adopted policies to encourage more children. How and why have these societal responses taken place?

There are many factors and many differences between regions, but high among many of them is the rise of women in society. This is more marked in industrial than in other countries, but to some extent it is visible almost everywhere. Women are no longer regarded primarily as baby-making machines, and marriage or childbirth takes place later in a woman’s career. Where women have equal status with men and are as well educated they tend to have fewer children. Nor do as many need children to look after them in old age. Then there are the effects of technology that has reduced demand for labour, particularly in rural areas, and contributed to unemployment in cities. Contraceptive devices are more widely available. At the same time migration has greatly increased within and between countries in response to changing environmental conditions and social pressures.

Where population has continued to increase, it is at least partly because people are living longer. What has been called the rise of the wrinklies, particularly in industrial countries, has helped keep total numbers higher than they would otherwise have been, not least for the immediate future. Rising living standards and expectations for a better life may not be universal, but the trend towards lower population is clear, and forecasts of a world level of 9 billion or more may be misconceived. Any major disaster such as epidemics, disease of all kinds, rapid climate change or damage to food supplies could drastically reduce human numbers, as has happened many times before in history. At the same time, the effects of human proliferation remain one of the greatest environmental, social and security problems. We should not rely on catastrophes to restore the balance between our species and the rest of the natural world.

Another feature of the Anthropocene has been the philosophy of what might be called consumer economics. Since the industrial revolution and with the help of Adam Smith, an ideology of the market has developed that places most value on production of goods and productivity generally. This has given economic growth top priority. Prosperity, and even the health, wealth and wellbeing of society, have been measured by such devices as gross domestic product and gross national
product (what have been called gross domestic embellishments), with excessive reliance on cost–benefit analysis. This has involved a failure to bring in true costs and externalities. Indeed, as has been well said, externalities could be more important than internalities. Markets are marvellous at fixing prices but incapable of recognizing costs.

There is now a growing emphasis on valuing public good and public bad within the economy, and on the role of regulation, both public and private, with general agreement that polluters should pay for any damage they may do. Change is already underway, not least as a result of the current economic crisis. We have recently (2009) had the report of the Commission led by Stiglitz et al. [6] on the subject. But so far we lack methods of measuring human health, wealth and wellbeing that take proper account of environmental circumstances and availability of resources. Material wealth and happiness are far from being the same thing. The message from China is the need to control market forces within a framework of the public interest.

Until the beginning of the Anthropocene, the energy needed to animate human society came from muscle—human and other animal muscle—and management of water and wind. The great change came from the use of fossil fuels: first coal, then oil and now gas. Indeed, the phenomenon encapsulates the industrial revolution, and modern society as we know it is the product.

There are two relatively new factors that profoundly affect the societal response. First is the realization that supplies are limited. Estimates vary all the time as technologies develop, but oil will probably be scarce in less than 40 years, gas in 60 years and coal in 220 years. There is a changing balance of consumption between them. For example, in the European Union, electricity supplies from gas have risen to 25 per cent and from coal have fallen to 20 per cent. There is increasing fear of dependence on certain suppliers, whether they be in the Middle East or Russia. Energy security is now high politics. In the meantime, demand continues to increase. In China energy use doubled between 1990 and 2006, and is likely to double again by 2025.

The second new factor is better understanding of the cumulative effects of fossil fuel use and combustion on the chemistry of the atmosphere and the environment generally. Here, the science is robust. The relationship between greenhouse gases and the surface temperature of the Earth is well established, and although some debate continues on the degree of human responsibility for the current increase in carbon dioxide in the atmosphere, the consequences of our continuing dependence on fossil fuels could be more serious than the prospect of their depletion. The risks of failure to take action are much greater than those of continuing as we are.

Hence, the new interest in making more effective use of what fossil fuels remain, and such measures as sequestration of carbon or global auctions of permits to emit greenhouse gases. But the main interest has been in developing alternative sources of energy. They include nuclear power, whether fission or fusion; solar energy on the ground or through geoengineering; power from biofuels; tidal and ocean power; a return to wind and hydro power; geothermal power using the heat beneath our feet; and a range of new electrification technologies.

Whatever ideas or technologies are pursued, their effects on the structure and functions of society will be a major feature of the Anthropocene. At the moment there is particular focus on climate change. There has been a deluge of
books, reports and conferences on the subject, including Lord Stern's review of 2006 on the social and economic implications, the Fourth Assessment of the Intergovernmental Panel on Climate Change [7] and the preparatory work for the Copenhagen conference in December 2009. The general message of the science remains clear, but there are many uncertainties and complexities. So far the societal responses have been mixed and uncertain with wide variations between countries.

These responses illustrate the gulf between science and politics. Scientists work on different degrees of uncertainty and probability, and their time scales can reach far into the future. Politicians, business leaders, indeed most people want black and white answers. Their concerns are immediate or at least short term, and they look for practical and so far as possible painless solutions to problems.

Yet measures to cope with climate change do not fit most categories. Apart from the implications for energy generation and supplies, the effects range far and wide across the international spectrum, and most of the necessary societal responses are yet to come. They include relationships between states, and the search for what has been called climate justice (how the countries that inadvertently caused the problem compensate those most suffering from the consequences); measures to change climate-related technologies involving agriculture, transport in all its forms, waste disposal and uses of water (storage capacity, reservoirs, sewage systems and so on); the degree and direction of investment, private as well as public, required to cope; the design and functioning of cities and the buildings within them; sea-level rise, acidification and loss of marine resources; changes in the diversity of plants and animals worldwide, with heavy losses in many of them; changes in human health with the risk of new epidemics; changes among the micro-organisms on which we all depend; and breaches of the various boundaries which Rockström et al. [4] identified in 2009. It is a formidable list and shows how difficult it is to estimate the societal responses to any of them.

It also underlines the need for a global and comprehensive approach. The proposal from the United Nations Environment Programme in 2009 for a Global Green New Deal brings out well the practical implications of what that ambiguous word ‘development’ could and should mean. In the longer term we need a World Environment Organization, or something similar, to be the partner of the World Trade Organization, and act as a coordinating mechanism for the 200 or more specialized and often overlapping environmental agreements which already exist.

At the same time we must recognize the difficulties in persuading the whole international community to agree to a wide variety of difficult commitments, some inflicting more pain than others, and of course with different impacts in different parts of the world. One of the lessons of the conference at Copenhagen in December 2009 was the need to go for what has been called pluralities of agreement; in other words, groups of countries, such as the G20, which can agree on specific measures among themselves, and later try and fit them into a global framework.

What could drive the world community in this direction? There are three broad factors for change. First is political leadership in identifying, confronting and managing the issues as they present themselves. Second is pressure from public opinion, whether from the corporate sector, non-governmental organizations or
communities generally. Third is what might be called benign catastrophes in which things can go demonstrably and attributably wrong and lessons can be learnt accordingly. In the last few years, there has been some but not sufficient leadership; public opinion has become much more aware of the issues; and fortunately for the present generation not too many catastrophes, benign or otherwise.

On the grounds that nearly all forecasting turns out to be wrong, and we should expect the unexpected, it may be useful to look ahead further into the Anthropocene and even consider what might follow in the future. In doing so we must do a lot more to understand what is happening now, and draw the necessary conclusions for policy.

First we are likely to be living in a more globalized world of rapid communication. There is already a kind of universal language of electronics. Ideas, units of information—or memes—will pass almost instantaneously between countries, communities and individuals. The wiring of the planet with fibre optics, cellular wireless, satellites and digital television is transforming human relationships. For the first time, there will be something like a single human civilization. More than ever humans can be regarded, like certain species of ants, as a super-organism.

Communities are likely to be more dispersed without the daily tides of people flowing in and out of cities for work. Their numbers are eventually likely to be less than in the world today. Agriculture could be more local, various and specialized, and energy and transport systems less centralized. Other developments in information technology raise the question of evolution itself. At present, we can alter isolated genes while disregarding the complexity—and totality—of what genes could do. It is possible to imagine the creation of genetically modified humans as has long been suggested by writers of science fiction from H. G. Wells onwards.

We must hope without total confidence that in the next few hundred years humans will have worked out, and will practise, an ethical system in which the natural world has value not only for human welfare but also for and in itself. We are tiny parts of a gigantic system that requires total and unremitting respect. For the moment, there is a real danger of our descendants living in a genetically impoverished world. The human super-organism still has to learn to take its place alongside other super-organisms.

Our species is certainly a peculiar one, and its impact on the Earth has been so great that the term Anthropocene for the current epoch is well justified. If our species survives, as we must hope it does, then it may take new paths of evolution. In the meantime, let us remember how small and vulnerable we are as creatures of a particular environment at a particular moment in time.

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