Climate change in perspective

Our concerns about global warming have an age-old resonance.

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Many people think that the threat of 'global warming' arose only towards the end of the twentieth century. But the idea of human (anthropogenic) interference with climate has an important — although often overlooked — historical dimension. Climate change, either natural or anthropogenic, has been discussed from the classical age onwards, evolving from the expected benefits of climate engineering to today's fear of global disaster.

People have always been aware of climatic variation — in the freezing of rivers or success of harvests, for instance[1]. Whether these changes were interpreted as natural or man-made depended mainly on the philosophy of the time. In the Middle Ages, change was seen as a natural process, the systematic deterioration of a living, and thus ageing, world. Anthropogenic changes were thought of as man's attempt to fulfil God's task of completing creation, whereas negative events were seen as a heavenly riposte to bad behaviour, such as punishment for tolerance towards witches[2].

By the eighteenth and nineteenth centuries, interest focused on the effects of deforestation and other forms of land use. The colonies of North America, for example, were thought to have become more temperate as a result of deforestation during colonization[3]. By 1890, climate change was discussed in modern terms: "Deforestation, as a part of agricultural expansion everywhere, must necessarily result in less rainfall and more frequent droughts. This view is most poignantly expressed by the saying: man walks the earth and desert follows his steps! ... The Italian government has been paying special attention to reforestation and its expected improvement of the climate ... The alternation of periods of heavy rainfall with droughts must be prevented ... In the United States, deforestation is seen as the cause of a reduction in rainfall ... The committee chairman of the AAAS has demanded decisive steps to extend woodland to counteract the increasing drought. In Vienna in 1873, the Congress for Agriculture and Forestry discussed the problem in detail. When the Prussian house of representatives ordered a special commission to examine a proposed law concerning the preservation and planting of forests, it pointed out that the falling water levels of Prussian rivers was one of the most serious consequences of deforestation, and could only be reversed by reforestation. The same concerns were raised in Russia."[4,5]

Optimism about the benefits of climate engineering was replaced with fear of 'climate weapons'.

More exotic ideas about human influence on climate mirrored technological developments. Lightning conductors (in 1816 in Switzerland), nuclear explosions in the 1950s, supersonic transport in the 1970s, and space traffic have all been blamed for climatic deterioration[6]. In the first half of the twentieth century, optimism about the potential of science and technology was reflected in plans to improve climate on an almost hemispheric scale by redirecting the Gulf Stream or Siberian rivers, or blocking the Bering Strait. Later, this optimism was replaced by concern that adversaries might develop 'climate weapons' — perhaps for modifying the global ocean circulation — and an international agreement banning them was prepared[7]. The possibility of a nuclear winter following from military action was discussed in the 1980s, as was the effect of burning oil wells in Kuwait at the beginning of the 1990s.

The modern concern about carbon dioxide as an agent of anthropogenic climate change can be traced back to the end of the nineteenth century and the Swedish chemist Svante Arrhenius. In 1933, a paper in *Monthly Weather Review* identified a significant warming trend, which in 1938 was related to the human greenhouse effect. This warming was followed by a global cooling, thought to be the first indication of a new ice age, accelerated by aerosols from industrial pollution blocking out sunlight. Eventually, Arrhenius's theory was revived, supported by the strong warming in the 1980s and 1990s, palaeoclimate findings and sophisticated modelling studies. As in the nineteenth century, the concept of anthropogenic climate change became news, advocated by scientists. Government bodies were established to advise on suitable action.

Although most of the historical concerns over climate turned out to be exaggerated, we are not claiming that the present concept of global warming is flawed. We are convinced that greenhouse gases are accumulating in the air, and strongly believe that near-surface temperatures are rising in response. But we are not convinced that present and future climate change will have a significant impact on society and global ecosystems.

Today, as in the past, the claim that anthropogenic climate change is associated with a serious impact on human society is still a hypothesis, often based on simplistic methodology. An important contrast with many of the earlier cases is that climate change is now perceived as negative. Of course, this view is not limited to climate change. Until the 1950s, it was thought that science would improve living conditions. Nowadays, it is often seen as a threat. When modern science scribbles on the wall, it is no longer about emancipation from nature but about possible disaster — nuclear war, genetic manipulation, climate change.

Many scientists realize that our knowledge of the climate system will always suffer from significant uncertainty because of its open, complex and heterogeneous character and the long timescales involved. Thus, studies of climate change are bound to be characterized by high uncertainty and high stakes, with public, antagonistic debates not only between scientists but also activists and other non-specialists[8,9]. However, age-old concerns about extremes of climate are part of the cultural background[2], for scientists as well as the public. This subjectively genuine concern, nourished by the mass media, underlies the activist scientists, who wield the same apocalyptic scenario of drought, delugial floods and devastating storms as their historical counterparts. ■

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