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## ANTHROPOGENIC CLIMATE CHANGE – A REASON FOR CONCERN SINCE THE 18TH CENTURY AND EARLIER

*Abstract:* Since about 10 years the concept of anthropogenic climate change has left academic circles and become a major public concern. Some people consider „global warming” as the major environmental threat of the planet. Even though mostly considered a novel threat, a look into history tells us that it is not, at least not in European thinking. Climate change, due to natural and anthropogenic reasons has often been discussed from classical times to the time of renaissance. Environmental change including climate change was seen by some as a biblical mandate, to „complete the Creation”. In line with this view, the prospect of climate change was considered as a promising challenge in more modern times. Only since the middle of the 20th century, anthropogenic climate change became a menacing prospect. The concept of anthropogenic climate change seems to be deeply embedded in popular thinking, at least in Europe, which resurfaces every now and then after scientific discoveries. As such climate change research is bound to be a post-normal science. Of course, the present threat may be much more real than any of the historical predecessors, which turned out to be overestimated.

*Key words:* climate change, anthropogenic and natural climate variability, perceptions of climate, history of perceptions.

In 1890, the geographer Eduard Brückner (1890; Stehr and von Storch 2000) wrote in his dissertation about anthropogenic climate change and natural climate variability, about winner and loser states, and about parliamentary committees dealing with the implications of climate change: „*Very old and wide-spread is the opinion that forests have an important impact on rainfall. ... If forests enhance the amount and frequency of precipitation simply by being there, deforestation as 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! ... It is not surprising that under such circumstances the issue of a link between forests and climate has ... been addressed by governments. Lately, the Italian government has been paying special attention to reforestation in Italy and its expected improvement of the climate. ... It must be prevented that periods of*

*heavy rainfall alternate with droughts. ...In the United States deforestation plays an important role as well and is seen as the cause for a reduction in rainfall. ... committee chairman of the American Association for Advancement of Science demands decisive steps to extend woodland in order to counteract the increasing drought. ... some serious concerns. In 1873, in Vienna, the congress for agriculture and forestry discussed the problem in detail; and when the Prussian house of representatives ordered a special commission to examine a proposed law pertaining to the preservation and implementation of forests for safeguarding, it pointed out that the steady decrease in the water levels of Prussian rivers was one of the most serious consequences of deforestation only to be rectified by reforestation programs. It is worth mentioning that ... the same concerns were raised in Russia as well and governmental circles reconsidered the issue of deforestation."*

Most contemporary climatologists, dealing with the prospect of climatic impact factors such as increasing atmospheric concentrations of greenhouse gases and aerosols and advising the international community through the Intergovernmental Panel on Climate Change (IPCC), take it for granted that the concept of anthropogenic climate change is of relatively recent origin. (By „climate change“ we do not mean changes of the local climate by the expansion of cities, clearing of single forests and other local modifications of land use. Instead we are referring to changes of regional, continental and global scale.) It is surprising for them, and most of the public, that “anthropogenic climate change” is by no means novel. As we can see from Brückner’s discussion, concerns over extensive transformations of the earth’s climate have been expressed in Europe since the 18th century enlightenment and earlier. In historical times, climate change was thought to be related to changing land-use.

A comprehensive analysis of the Western thought about nature and culture from classical times to the end of the 18th century is offered by Glacken (1967). The concept of human agency in changing not only climate but the environment as a whole prevails in Europe since classical times. Theophrastus, from the 4th century BC, may be seen as a pioneer, who stood at the beginning of a long history of speculation concerning climatic change and its impact on humans - climatic determinism (Stehr, von Storch 1999). In the eighteenth century, the Scottish philosopher and historian David Hume (1711-1776) speculated that the recent warming would be caused by human deforestation, which would allow the rays of the sun to reach the surface of the earth. A contemporary, H. Williamson, published evidence for his view that the northern colonies of America had become more temperate in the aftermath of colonization (Williamson 1770). Others claimed that the human action would render climate more irregular and less predictable (Glacken 1967). These theories were challenged by others, pointing out that the evidence was false because of incompatible data and observations.

People were aware of climate variations, which were evident in, for instance, the freezing of rivers, the success of harvests and the damages done by storms to dikes (e.g., Lamb 1982; de Kraker 1999). They speculated about the reasons for these changes, which had a significant impact on the daily life. An obvious solution was the reference to God, who steers climate partly as a response to people’s behavior. In medieval times, for instance, it was proposed that climatic anomalies, or extreme

events, were a punishment for parishes too tolerant to witches (Behringer 1988). On the other hand, man was considered as placed on Earth to complete the Creation (Glacken 1967). Environmental change was a task given to mankind by God himself. An alternative view was that Earth would be organic, and therefore age with time: "...array of occurrences seriously regarded as evidence of decay; almost any natural phenomenon was suitable: air pollution, storminess, weather changes, earthquakes, volcanoes, and so forth" (Glacken 1967).

In more modern times, many more cases of perceived anthropogenic climate changes have emerged. De- and reforestation, as documented by Brückner, were prominent in the 19th century; but since the early 20th century other mechanisms were suggested, mainly changing oceanic conditions and changing atmospheric composition.

Arrhenius (1896) was the first to calculate how an increased concentration of carbon dioxide in the atmosphere might affect the air temperature. The theory was rejected in the early decades of this century, but Kincer (1933) already in 1933 advised the public about a significant warming trend. This trend was later confirmed by Callendar (1938), who related it to the human greenhouse effect. (For a historical review, refer to Fleming (1998).) In the 1940s the warming came to an end and a cooling trend developed, and in the 1970s it was claimed that this cooling was the first indication of a new Ice Age, possibly brought on by industrial pollution. It was speculated that future human pollution would reduce the incoming sun light so that the global mean temperature would sink by 3.5°C which would almost certainly be enough to force Earth into a new Ice Age (Rasool, Schneider 1971). In the 1970s Arrhenius' theory was revived, and a wealth of additional evidence, ranging from a strong warming in the 1980s and 90s, paleoclimatic evidence and improved modeling capabilities brought the concept in the center of public interest. The Intergovernmental Panel on Climate Change was established for advising the Earth governments about suitable policy actions to avoid dangerous climate change due to greenhouse gases and aerosols.

Also other "things" brought into the atmosphere raised concern in the public. In 1816, the year of the Tambora eruption, Swiss citizens attacked newly established lightning conductors, blaming them for the adverse weather (*Neue Züricher Zeitung*, 21 June and 9 July 1816). The worry of nuclear explosions causing climate change was wide spread in the 1950s and 60s. Kempton et al (1995) reports about concern about the implications of space traffic. More seriously were concerns about the effect of supersonic transport in the 1970s, the nuclear winter scenario in the 1980s and the effect of burning oil wells in Kuwait in the beginning of the 1990s (Cotton, Pielke 1995; Cahalan 1992).

Another means of changing deliberately climate was seen in changing oceanic conditions. Ideas were brought up to redirect the Gulf Stream, or Siberian rivers, with the objective of improving the climate in the Arctic and North Atlantic (Ponte 1976). Similar ideas were formulated for the Bering Strait. It was even speculated that the Soviets would plan for a dam in the Bering Strait with the purpose of aggressively deteriorating the climate of the US west coast. In fact, an international

agreement banning “climate weapons” between the USA and the Soviet Union was prepared (Ponte 1976). Research in the stability of the Gulf Stream has revealed that a significant deceleration could be triggered by global warming (Rahmstorf 1995, 1997; Manabe, Stouffer 1996). Also the Assuan Dam in Egypt was presented as a human leverage for terminating the Gulf Stream (Johnson 1977). The Dam would reduce the flow of fresh water into the Mediterranean Sea. This reduction along with enhanced evaporation caused by global warming would result in a saltier outflow from the Mediterranean Sea into the Atlantic eventually causing the Gulf Stream to cease. Subsequent quantitative analysis revealed that the impact of the Assuan Dam would be much too small to have an effect (Rahmstorf 1998).

In view of these cases, it seems reasonable to speak of a „history of anthropogenic climate changes“. Most of the instances were not „real“. All cases were associated with the perception of significant discontinuities. The apprehended changes were seen in earlier times often as positive, but since about a century mostly as a threat to society.

Which social and cultural processes make the concept of anthropogenic climate change not merely an episodic but an almost permanent issue that challenges scientists and alarms non-expert? Under present circumstances, such social processes likely include the need for scientists to frame their problems so that they fit the area of their expertise, the readiness of members of the scientific community to engage in public agenda setting and the desire of scientists to have a presence in the media (Bray, von Storch 1999). The fact that the concern about climate prevailed not only in the recent decades but for many centuries indicates is indicative that humans depend fundamentally on the reliability of climate, and that sometimes this reliability is perceived as being endangered. It is interesting to note that climate change mostly takes the an apocalyptic form, with the appearance of extremes, more severe droughts and floods, and more violent storms (Glacken 1967; Ponte 1976). We suggest that anthropogenic climate change is of permanent, often dormant concern for people in the West. It can be revived any time by weather extremes, which are, at least in modern times, not taken as rare but normal events but as scripture on the wall spelling upcoming home made disaster. In former times, the attention ceased after a while when conditions returned to normal.

Because of the open, complex character of the climate system (Oreskes et al. 1994), the long-time scales involved and homogeneity problems of the observational record, knowledge about the climate system will always suffer from significant uncertainty. On the other hand, as we have seen, is climate change an important topic, arousing the public’s interest and concern. Thus climate change research is bound to be post-normal science (Funtowicz, Ravetz 1985), characterized by high uncertainty and high stakes (Bray, von Storch 1999), with policy and science influencing each other, and public, antagonistic debates not only among scientists but activists and other non-experts as well.

In most instances on our list, the actual threat of anthropogenic climate change was either absent or an extravagant claim made by the scientific community. Of course, in the present case of „Global Warming“, we do not know at this time if it is a real

threat or if the warnings are exaggerated. The IPCC is examining the scientific evidence with great care and in 1995 made its famous statement that „the balance of evidence suggests that there is a discernible human influence on global climate.“ (Houghton et al. 1996). We will have to see how climate will develop in the next decades.

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