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A history of human perceptions of anthropogenic climate change in the past 1000 years.

Nowadays, the concept of anthropogenic climate change is widely understood as a “new” concept, but a closer examination of the history of ideas reveals that claims of humans deliberately or unintentionally changing climate is a frequent phenomenon in western culture. Also, extreme weather phenomena have in the past often be explained by adverse human interference. A preliminary list of claims of anthropogenic climate modifications is presented; the remarkable similarity of the anthropogenic climate change debate in the second half of the 19th century is compared o the present situation.

Most observers take it for granted that the concept of anthropogenic climate change is of relatively recent origin. In the following we will demonstrate that the notion of anthropogenic climate change is by no means novel.

Concerns over extensive transformations of the earth’s climate have been expressed since the 18th century enlightenment and earlier. And it is plausible that initial discussions contained strong religious elements. In the following we present a list of cases. It seems reasonable to speak of a “history of anthropogenic climate changes”. Most of the cases were not real; as a matter of fact, none of them proved to be associated with significant impacts related to the suggested dynamical link. But all cases were associated with the perception of significant discontinuities; in most instances the apprehended change was seen as a threat; only rarely were they welcomed as a improvement.

1. Religious interpretations of climate anomalies, such as the prolonged wet period in England in the early 14th century, explained the adverse climatic conditions as the divine response to people’s life-style.
2. Our oldest case documented by contemporary scientific writing related the “improvement” of climate of the North American colonies to the clearing of the landscape by the settlers.
3. In many parts of Europe, the adverse conditions related to the unusual wetness of the Tambora summer of 1816 was ascribed to the new practice of using lightning conductors.

4. In the 19th century scientists, in Europe and in North America, were confronted with the concept that the climate would be constant on historical time scales; however, scientists found significant differences between mean precipitation and temperature when averaged over different multi-year periods. Also, scientists claimed that the water levels of rivers would fall continuously. This led to the hypotheses that either the assumption of constant climatic conditions would be false or that the observed changes would be caused by anthropogenic causes - mainly deforestation or reforestation.
5. There are reports that both the extensive gun-fire during the first World War and the initiation of short wave trans-Atlantic radio communication were blamed for wet summers in the 1910s and 20s.
6. In the first part of the 20th century a remarkable warming took place in large parts of the world. In 1933, this warming was documented, and the uneasy question "Is the climate changing?" was put forward in *Monthly Weather Review*. Some years later, in 1938, Callendar related the warming to human emissions of carbon dioxide into the atmosphere, a mechanism described some 40 years earlier by Arrhenius.
7. After World War II scientists noticed a cooling and speculated about whether this cooling was the first indication of a new Ice Age, possibly brought on by human actions, mostly emissions of dust and industrial pollution. It was speculated that human pollution would increase by a factor of as much as 8 which could increase the opacity of the atmosphere within hundred years by 400%. This in turn would significantly reduce incoming sun light so that the global mean temperature would sink by 3.5K.
8. After World War II, the new practice of exploding nuclear devices in the atmosphere caused wide spread concern about its climatic implications.
9. Plans for rerouting Siberian rivers have been discussed for more than 1000 years. The plans visualize benefits in supplying semi-arid regions with water, and an improved climate. A byproduct was thought to be an ice-free Arctic ocean. This would shorten the winters and extend the growing season; the increase of evaporation from the open water would transform the Arctic climate into a maritime climate with moderate temperatures and busy harbours along the Russian North coast.
10. Engineering or manipulating with the climate system became popular in the first half of the 20th century. Rerouting Siberian rivers was one such example; another plan was put forward in 1912 with the idea of changing the Gulf Stream with the purpose of improving the climate not only in North America but also the Arctic and Europe. The idea of

modifying ocean currents was later pursued by scientists from the USA, USSR and other nations. In most cases, these schemes revolved around the building of a dam, which would for instance block the flow through the Bering Strait.

11. Close to the idea of climate engineering is the military use of climate modifications. The idea to change the course of the Gulf Stream had been put forward already in the 18th century by Benjamin Franklin, who envisaged a northward diversion of the Gulf Stream as a powerful weapon against the British Empire. A perceived attack using climate as a weapon is a purported Soviet plan in the 1950s to build a “jetty 50 miles or more long out from near the eastern tip of Siberia. The jetty would contain several atomic powered pumping stations that would push cold Arctic waters down through the Bering Strait. This would ... inject increasing amounts of icy waters into the ocean current that flows down the west coast of Canada and the United States. The result would be colder, more stormy weather throughout North America and enormous losses to the American economy in agriculture, work days and storm damage.”
12. In the 1960s and 70s aircraft industries in the USA, Europe and Soviet Union designed supersonic civil air planes. These plans created substantial criticism. Scientist argued that the exhaust from such planes would damage the ozone layer in the stratosphere and the climate in general.
13. A popular, but for natural scientists somewhat surprising mechanism links space traffic to a deteriorating global climate.
14. The ongoing deforestation of tropical forests is of great concern to many people, who are afraid not only of reduction in the variety of species but also changes in global climate.
15. Anthropogenic aerosols are considered powerful agents for changing the global climate. One scenario deals with the emission of aerosols mainly from burning forests and fossil fuels. A dramatic version is that of “nuclear winter” – in which it was assumed that the explosion of a multitude of nuclear bombs in a future war would create a high flying veil of soot particles which would effectively shut off solar radiation and cause a collapse of the biosphere.
16. The stability of the Gulf Stream in the Atlantic Ocean has also raised some concern. Ocean models exhibit a markedly nonlinear behavior of the Atlantic circulation with two stable states, one with an active Gulf stream and another without such a northward transport moderating the European climate. Both states are stable within a certain range of conditions, but when the system is brought to the margins of these ranges, the systems

switch abruptly to the other state. In the global warming debate the risk of a “collapse” of the gulf stream is put forward with the paradox that while the globe is becoming warmer, Europe and Northeast America may experiencing possibly colder conditions.

It is interesting to speculate about the social and cultural processes which made and make the concept of anthropogenic climate change not merely an episodic but an almost permanent issue that challenges scientists and alarms non-experts. It would also be interesting to find out why the notion of an anthropogenic challenge to the natural climate has been repeatedly forgotten and re-invented.

Under present circumstances, such social processes likely include the need for scientists to frame their problems so that the solution fits his or her area of expertise, the readiness of members of the scientific community to engage in public agenda setting associated with a certain bias toward more dramatic scenarios as well as ideological elements such as genuine general concerns about the state of the environment and the desire of scientists to have a presence in the media. On the other hand, one can hardly argue that the detection of a fragile global climate has always been a purely scientific construction. The fact that the concern about the reliability of the climate and possible responses by nature to human action was in evidence not only in the recent decades but for many centuries indicates, so it seems that humans depend in some fundamental sense on the reliability of climate, and that professionals as well as non-professionals often considered the possibility and the threat that this reliability might be jeopardized. Insofar as the natural climate is seen as contingent, the kinds of concerns expressed in combination with the perceived anthropogenic challenges to nature are a social construction.

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 as in earlier cases. The fact that 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.” and that other official bodies such as the Enquete Commission of the Deutscher Bundestag voiced grave concerns, may be considered as support of the reality of the envisioned threat.

However, one hundred years ago, parliaments and governments in Europe (e.g. Prussia, Italy, and Russia) also established distinguished committees that were asked to deal with the reality of anthropogenic climate change related to deforestation. And about 200 years ago the British Parliament was discussing the climatic implications of human modifications in British tropical colonies.

More detailed accounts:

Stehr, N., H. von Storch and M. Flügel, 1996: The 19th century discussion of climate variability and climate change: analogies for present day debate? World Res. Rev. 7, 589-604

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Stehr, N. and H. von Storch, 2000: Von der Macht des Klimas. Ist der Klimadeterminismus nur noch Ideengeschichte oder relevanter Faktor gegenwärtiger Klimapolitik? Gaia 9, 187-195

Stehr, N., H. von Storch and M. Flügel, 1996: The 19th century discussion of climate variability and climate change: analogies for present day debate? World Res. Rev. 7, 589-604

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