

# 10 Climate change and civilisation collapse

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Like most things, collapse explanations are subject to fashion, and the one most in the limelight today is climatic change ... Right now mega-drought is the 'hot' explanation for the Classic [Maya] collapse, and the usual bandwagon effect is in full career among many of my colleagues, although others remain properly suspicious of drought as the triggering mechanism.

David Webster, *The Fall of the Ancient Maya*, London 2002

## **Introduction**

One of the most powerful drivers of environmental gloominess and cultural pessimism is the spectre of ecological apocalypse. The mutation of age-old, religious end-time prophecies into secular predictions of natural cataclysms and societal collapse – in short, the emergence of environmental apocalypticism – is perhaps the most significant ideological development in the western world since the demise of Marxism.

Marxist doctrine, let us never forget, crumbled because its predicted, and eagerly anticipated, disintegration of free market economies never transpired, but communist economies and totalitarian dictatorships have mostly come to sticky ends. Deeply infuriated by the failure of their predictions and the unremitting vibrancy of capitalism, many disillusioned believers turned to ecological pessimism and environmental determinism. Not for the first time in the long history of apocalyptic movements, new wine was poured into old bottles.

Many ideologues replaced their old beliefs in economic decline and breakdown with the new principle of ecological decay and disaster.

There is no shortage of physical factors that can produce natural disasters and social deterioration. These could include catastrophes due to asteroid and comet impact, the failure of global agriculture due to volcanic super-eruptions, the reappearance of a new ice age, epidemic diseases, etc. However, none of these horror scenarios has alarmed the public as much as the alleged peril of human-caused global warming.

Originally, this idea was a theoretical speculation about the supposedly negative impact of increasing CO<sub>2</sub> emissions into the earth's atmosphere. Recently, these speculations have turned into a veritable scare. We are warned that if we fail to drastically reduce CO<sub>2</sub> emissions, this will cause global warming which will trigger social upheaval and natural disaster everywhere. Some of the experts on civilisation collapse have argued that dealing with climate change 'will require substantial international cooperation, without which the 21st century will likely witness unprecedented social disruptions'.<sup>1</sup>

This chapter argues that environmental determinism is the latest fad in explaining past societal evolution and civilisation collapse. It is beyond doubt that a number of complex societies fell apart during the last 4,000 years. Climate change is one possible explanation for those collapses, but no one has identified the basic dynamics or driving forces of societal dissolution. Warmer periods have had a considerably benign role in social, economic and technological progress, but global cooling and cold spells have been largely detrimental to societies. Today, in contrast, we have the technological capacity to deal with climatic changes, even with events that may have been catastrophic in the past.

### **Historical evidence for civilisation collapse**

To further amplify the alarm that a warming climate would lead to collapse of human civilisation, a number of researchers have turned their attention to historical examples of societal breakdown and have incriminated 'climate change' for the disintegration of ancient societies.<sup>2</sup> From the downfall of the Akkadian civilisation to the demise of the ancient Mayans and the Roman Empire, climate change is increasingly named as the cause of a number of ancient civilisation collapses.<sup>3</sup>

The discovery of warming and cooling cycles during the Holocene – the present geological era – has drawn attention to historical climate events such as the Little Ice Age, a prolonged cold spell that affected wide areas of the globe for several hundred years.

There is increasing evidence that the climate in the Holocene era has been much more variable than once believed. Abrupt climatic downturns in the form of temperature decreases appear to have been significant enough to cause agricultural disruptions and other adverse effects in a number of historical cases. Warmer temperatures, on the other hand, have never contributed to the decline or disintegration of any society. Climate alarmists consistently fail to mention that warm periods during the Holocene have played a considerably benign role in social, economic and technological progress. Global cooling and cold spells, on the other hand, have been largely detrimental to society's advance and evolution.

Throughout much of human history, cities, regions and entire states have come and gone. The stability of agriculture-based societies has always relied on the constancy of climatic conditions. Archaeological research has unearthed heaps of empirical evidence for the inherent vulnerability of agricultural societies to climatic change. Since agricultural production relies on factors such as fertile soils, precipitation or irrigation, prolonged climatic downturns, droughts or desiccation have regularly led to mass migration and resettlement. Some regions which were once inhabited 5,000 years ago (such as parts of the Sahara) today are deserts – barren and abandoned.

But relocation of a society does not necessarily mean the unmitigated 'collapse' of a society. Neither are episodes of climate changes detrimental to all, or negative in all of their aspects. If a social group abandons terrain which has become sterile, it does not mean 'societal failure' if they move to more fertile territory. In fortunate circumstances, the movement of social groups to new territory is beneficial and can lead to higher levels of societal complexity.

The desertification of the Saharan region 7000 to 5000 years ago, for example, set in motion a significant advance in societal evolution. It is now generally thought that the environmental pressure behind these events may also have been the main impulse that led to the foundation of complex urban civilisations along the Nile, Euphrat and Tigris rivers.<sup>4</sup>

In short, the evolution of society during the Holocene has been

marked by recurrent patterns of expansions and downturns. Some cultural declines have been gradual, occurring over centuries, and others have been more abrupt. Warfare, power struggles, diseases, overpopulation, economic disruptions, droughts, or natural disasters can facilitate a breakdown in social order and a decline in cultural complexity. Internal causes (such as political conflicts or over-farming) can combine with external causes (such as war or natural disaster) to bring about malfunction and failure.

There is unambiguous evidence that a number of urban civilisations which had once acquired high levels of social complexity (such as the Akkadian, Roman and Mayan civilisations) declined and disintegrated. Yet despite burgeoning research and mounting data, no one has identified the basic dynamics or driving forces of societal dissolution. What we know for certain, however, is that every age has its own favourite explanations for the collapse of civilisations before it. The latest fad for such explanations is environmental determinism.

### **What wrecked the Roman Empire in the West?**

Consider the decline and fall of the western Roman Empire. For centuries, scholars have mulled over the possible reasons for its demise. According to traditional assumptions, barbarian invasions which ransacked Rome in AD 476 brought about the Empire's fall. The end of classical civilisation came 100 years later after an epidemic of bubonic plague swept the region, and invasions by Slavic tribes brought wide-scale destruction.

Ancient authors attributed the social decadences and Roman decline to mounting bureaucracy and excessive taxation. Writers during the Enlightenment (Edward Gibbon, for instance) favoured moral and religious explanations and blamed Christian anti-paganism for Rome's downfall. Marxist historians, on the other hand, preferred economic and social factors, blaming class conflicts, political struggles and imperial over-stretch.<sup>5</sup> The emergence of the environmental movement illustrates that the focus has shifted yet again. Rather than considering internal and social factors, environmentalists prefer ecological explanations, blaming population growth, environmental degradation, deforestation or 'climate change'.<sup>6</sup>

Around AD 540, parts of Europe did indeed experience rapid cooling. This period corresponds with worldwide accounts of a significant

climatic downturn due to a mysterious dust-veil event.<sup>7</sup> The cause of this cooling is still unknown, but some researchers speculate that it was either the result of a massive volcanic eruption or due to some cosmic dust loading of the stratosphere. Tree-ring data from Europe and North America indicate a significant temperature drop around AD 536. They also show that the tree-ring widths returned to pre-AD 535 scale in the late 540s, suggesting that the climatic downturn lasted for some fifteen years.<sup>8</sup> Other research suggests that the cold period began as early as AD 500 and lasted for more than 200 years.<sup>9</sup>

Evidently, there is no consensus about the duration or cause of the 'European Dark Ages Cold'. Nor is there any agreement about whether the Roman Empire tumbled because of a climatic downturn, due to political and economic discord, or as a consequence of a multitude of factors. After all, the onset of a cool period did not lead to the crash of the Byzantine Empire, which survived for another 500 years. Thus, we remain in the dark about the real reasons why Europe's classical civilisation ended in the West but continued in the East.

### **The fall of the Akkadian Empire**

The Akkadian Empire dominated large parts of Mesopotamia during the late third millennium BC. At some time between 2350 BC and 2200 BC, it disintegrated. Traditional explanations for its demise range from warfare and internal rebellion to socio-political dissolution. In recent years, 'climate change' has become the most popular theory not just for the cessation of the Akkadian Empire, but for the seemingly simultaneous collapse of other urban civilisations around the world.

A number of researchers are convinced that in 2200 BC, an abrupt drop in global temperatures occurred that disrupted the weather around the globe.<sup>10</sup> One of these researchers, Yale University archaeologist Harvey Weiss, claims:

The Akkadian empire of Mesopotamia, the pyramid-constructing Old Kingdom civilisation of Egypt, the Harappan 3B civilisation of the Indus valley, and the Early Bronze III civilizations of Palestine, Greece, and Crete all reached their economic peak at about 2300 BC. This period was abruptly terminated before 2200

BC by catastrophic drought and cooling that generated regional abandonment, collapse, and habitat-tracking.<sup>11</sup>

Abrupt climatic downturns are not unusual since they repeatedly occur in response to significant volcanic eruptions and other atmospheric dust-loading events. The abrupt cooling in 2200 BC, however, is thought to have disturbed agricultural production around the globe for three centuries. This cooling is assumed to have triggered catastrophic sandstorms and mega-droughts, subsequently prompting societal disintegration on a global scale.<sup>12</sup>

But how compelling is the case for 300-year-long sandstorms, droughts and climatic disaster? What physical mechanism could have triggered such a global calamity? So far, there have been no convincing answers to these questions. In fact, there remain grave doubts within the scientific community about this entire theory, particularly with regard to its magnitude, its physical causation and its chronology.

For a start, archaeological evidence seems to be irreconcilable with its basic premises. Fifty years ago, French archaeologist Claude Schaeffer discovered that most Near Eastern settlements had been repeatedly destroyed and abandoned throughout the 2000 years of Bronze Age cultures (~3000–1200 BC). In short, the recurring destruction and abandonment of Bronze Age settlements is the norm, not the exception, throughout the Near East. There also seems to be archaeological evidence for seismic activity at the end of the Early Bronze Age, which would be incompatible with a simplistic climate model of civilisation collapse.<sup>13</sup>

Even more doubts have been raised about the chronology of the events in question. Marie-Agnès Courty, a leading team member of the Tell Leilan excavations<sup>14</sup> which formed the basis of the original idea, has recently revised the dating of the ‘abrupt’ onset of environmental change to 2350 BC, thus shifting the date by some 150 years.<sup>15</sup> Butzer<sup>16</sup> and Baillie,<sup>17</sup> two of the world’s leading paleo-environmental researchers, have highlighted the inherent imprecision of the dating methods used.<sup>18</sup>

In any case, the claim for an abrupt worldwide climatic downturn in 2200 BC is difficult to sustain if such a global disaster does not show up in the most sensitive and reliable climate indicator, Californian and European tree rings! Critics have thus underscored the elusiveness of any conclusions drawn from a still unreliable chronology:

Are we looking at an event starting in 2400 or 2350 or 2200 or 2180? Butzer with his '2400–1900 BCE' has broadened the debate to a full half millennium – a time period so long that we could reasonably expect some environmental changes to be recorded in most areas.<sup>19</sup>

Other researchers have pointed out that certain civilisations, such as the Bronze Age culture of the Mediterranean island of Crete, were not at all affected by the hypothetical climate disaster.<sup>20</sup> In fact, a number of cities in the Near East and on the Indian subcontinent appear to have expanded and progressed to higher social complexity during the nadir of the supposed mega-drought.<sup>21</sup>

Furthermore, advocates of the climate catastrophe theory have not yet presented a coherent physical model that would provide an explanation for an abrupt climate crash which persisted for 300 years. Even American tree-ring data, which is cited as confirmation of the global scale of the prolonged catastrophe, only shows a slow and gradual decrease in temperatures which returned to the pre-cold average in 2056 BC.<sup>22</sup>

Regardless, many Akkadian settlements were abandoned after 2200 BC while people moved south, where irrigation-fed agriculture continued. While the Akkadian state and its imperial bureaucracy crumbled, elements of the culture itself relocated and lived on. And not everyone fled the area since nearby settlements continued their existence at diminished levels. Nevertheless, the evidence for some sort of natural calamity seems undeniable. While no one knows what brought it about, its overall societal effects on Mesopotamia and the Near East – let alone the rest of the world – are far from certain.

### **The Maya civilisation is dead, long live the Maya civilisation**

The decline and fall of the Classic Maya civilisation around AD 800 is another popular case in point – climate change is blamed for its demise. Modern-day ecological concerns such as population growth and environmental degradation are frequently cited as the cause of the Maya 'collapse', but climate change has certainly become the most popular culprit in recent years.

Recurrent droughts and mega-droughts on the Yucatan Peninsula of Mexico have been a persistent feature of Mesoamerican civilisations

for centuries. There is a wealth of paleo-environmental evidence that local and regional climates have varied considerably during the last 10,000 years.<sup>23</sup> In addition, there is ample evidence that Maya migrations, the abandonment of settlements and societal ‘mini-collapses’ were recurring features of a highly volatile culture.

According to a number of researchers, the event which triggered the Classic Maya ‘collapse’ was an abrupt climatic incident and a prolonged drought that began early in the ninth century AD. In keeping with this scenario, food production dropped drastically as a result of the mega-drought, resulting in large-scale famines. Ensuing endemic diseases caused plagues and epidemics. In view of such chaos, the disintegration of social and political structures most probably contributed to the breakdown.<sup>24</sup>

The climate change hypothesis of Maya collapse includes a variety of supposed causes, factors and effects. This multitude of suggestions is not entirely new. It is actually characteristic of research on civilisation collapse. As early as the 1930s, two pioneering Mayanists published a list of hypothetical explanations for the demise of the Classic Maya which included climatic change, exhaustion of the soil, epidemic diseases, earthquakes, war, national decadence and religious superstition. As David Webster points out, even after 70 years of painstaking research, these are still the same basic assumptions for its termination.<sup>25</sup> Indeed, one Mayanist has claimed to have counted as many as 100 distinct theories, explanations and hypotheses for the Maya ‘collapse’.<sup>26</sup>

More recently, the mega-drought hypothesis has received further support with research that provides additional evidence of a hundred-year drought punctuated by shorter but multi-year droughts at around 810, 860, and AD 910.<sup>27</sup> According to this theory,

rapid population expansion during a climatically favourable period from about 550 to 750 AD left the civilisation operating at the limits of the environmental carrying capacity. This left the Mayan society highly vulnerable to subsequent multi-year droughts and led to its collapse.<sup>28</sup>

The very term ‘civilisation collapse’ may be altogether inappropriate, however, or at least misleading. The Maya culture was neither finished for good, nor were all of its settlements abandoned at the end of the

Classical period. Some regions show clear evidence of the continuity of Maya occupation and culture. These areas were mainly located in the northern plain of Yucatan and inland around a chain of lakes. Many Maya migrants, it would appear, fled the droughts and resettled where water sources were still readily available. It was in these settlements that the Spanish discovered a highly complex Maya society when they arrived in the sixteenth century.

### **The fall of complex and the rise of hyper-complex civilisations**

Whatever the details of societal decline and disintegration in antiquity, it is beyond doubt that a number of complex societies fell apart during the last 4000 years. Such temporary breakdowns, however, have never been unmitigated or total. Most unsuccessful ancient societies recovered after a period of marked decline and regularly emerged more robust and dynamic. After all, the general trend of cultural evolution during the last 10,000 years has not been intermittent breakdown of societies but relentless technological progress, increased social complexity and much improved safety measures against the forces of nature.

The imagery of powerful civilisations breaking down has nonetheless contributed to a mindset which is increasingly fretful about the fate of our own civilisation. All too often, these worries are based on misleading analogies with agricultural societies that were especially vulnerable to environmental stress and lacked the benefits of modern technologies to cope with changes.

According to climate alarmists, predicted global warming will cause even more unstable conditions in our modern world which might be populated by up to 10 billion people in a few decades. This reasoning suggests that today's 'overcrowded earth' may hamper such adaptation:

The magnitude of expected temperature changes gives a sense of the prospective disruption. These changes will affect a world population expected to increase from about 6 billion people today to about 9 to 10 billion by 2050. In spite of technological changes, most of the world's people will continue to be subsistence or small-scale market agriculturalists, who are similarly vulnerable to climatic fluctuations as the late prehistoric/early historic societies.

Furthermore, in an increasingly crowded world, habitat-tracking as an adaptive response will not be an option.<sup>29</sup>

Contrary to popular belief, the biggest climatic risk to the stability of complex societies is not global warming, but global cooling, and the potential risks this would pose to agricultural food production. While such a natural disaster could be triggered by large asteroid impact or a volcanic super-eruption, the probability that any such event will occur in any given century is remote.<sup>30</sup>

It would be unwise, though, to simply discard the idea of catastrophic climate change. Given the probable, albeit unproven, likelihood that climatic downturns have contributed to the decline and even downfall of past societies, we should consider just how vulnerable our own civilisation might be to a recurring fall in temperatures.

Climatic downturns, even much-dreaded abrupt cooling events, no longer threaten society with agricultural catastrophes, nor will they inevitably lead to societal decline and collapse. Genetic engineering of crops and seeds already allows the development of cold-resistant plants. In the future, biotechnology (e.g. using a gene from a cold-resistant fish) will be able to produce cold-resistant crops that can grow even in very cold climates. Genetic engineering has already increased the natural defences of many crops and allowed them to survive droughts and cold which are normally fatal to plants. There is no reason to doubt that future crops will be designed to withstand even drier, colder and saltier conditions.

If these revolutionary developments do not reassure the alarmed public, there has also been enormous progress in applying cloud-seeding technologies to ameliorate the impact of periodic severe droughts in a number of countries around the globe. These and other forthcoming mitigation strategies would potentially give our civilisation technologies that could enable us to survive climatic crises which ancient and simpler societies may have found overwhelming.

Tomorrow's hyper-complex societies will be able to withstand prolonged droughts thanks to technological advances and economic efficiency. While self-reliant, agricultural societies are essentially rigid and extremely vulnerable to climatic stress factors, inter-connected high-technology cultures are much better sheltered from possible catastrophes, because of modern technologies and mitigation strategies.

In fact, technological progress and bio-technological developments

have been advancing to levels where the age-old fears of mega-drought and mega-famine are gradually disappearing in most regions of the world. Given the accelerating evolution of disaster-resistant crops, weather engineering and other mitigation technologies, I hope that before long we will also overcome climate angst based on historical analogies that no longer match up.

## Notes

- 1 Weiss and Bradley (2001).
- 2 Weiss and Bradley (2001).
- 3 DeMenocal (2001); Mapes (2001).
- 4 Claussen *et al.* (1999).
- 5 Tainter (1990).
- 6 Pointing (1991).
- 7 Keys (1999).
- 8 Baillie (1999).
- 9 Berglund (2003).
- 10 Weiss (2000).
- 11 Weiss (2001).
- 12 Weiss *et al.* (1996); Weiss (2000).
- 13 Peiser (1998).
- 14 See <http://research.yale.edu/leilan/> for more information about this project.
- 15 Courty (1998).
- 16 Butzer (1996).
- 17 Baillie (1998).
- 18 Butzer (1996) and Baillie (1998).
- 19 Baillie (1998).
- 20 Manning (1996).
- 21 Butzer (1996); Possehl (1996).
- 22 Weiss (2000).
- 23 Gill (2000).
- 24 *Ibid.*
- 25 Webster (2000).
- 26 *Ibid.*
- 27 Haug *et al.* (2003).
- 28 Webster (2000).
- 29 Weiss (2001).
- 30 Engvild (2003).

## Bibliography

- Baillie, M., *A Slice Through Time* (London, B. T. Batsford, 1995)
- Baillie, M. (1998), Book Review: 'Third Millennium BC Climate Change and Old World Collapse', *Journal of Archaeological Science* 25(2): 185–7
- Berglund, B. E. (2003), 'Human impact and climate changes – synchronous events and a causal link?' *Quaternary International* 105, pp. 7–12
- Butzer, K. W., 'Sociopolitical Discontinuity in the Near East c. 2200 BCE: Scenarios from Palestine and Egypt', in Dalfes, H. N., Kukla, G. and Weiss, H. *Third Millennium B. C. Climate Change and Old World Collapse* (Berlin, New York, Springer, 1996), pp. 245–96.
- Claussen, M., Kubatzki, C., Brovkin, V., Ganopolski, A., Hoelzmann, P. and Pachur, H. J. (1999), 'Simulation of an abrupt change in Saharan vegetation in

- the mid-Holocene, in *Geophysical Research Letters*, vol. 26, no. 14, pp. 2037–40.
- Courty, M.-A. (1998), 'The Soil Record of an Exceptional Event at 4000 B. P. in the Middle East', in Peiser, B. J., Palmer, T. and Bailey, M. E. (eds) *Natural Catastrophes during Bronze Age Civilisations*. British Archaeological Reports S728: Oxford, UK.
- Cullen, H. M., deMenocal, P. B., Hemming, S., Hemming, G., Brown, F. H., Guilderson, T. and Sirocko, B. (2000), 'Climate change and the collapse of the Akkadian empire: Evidence from the deep sea', *Geology* 28 (4) pp. 379–82.
- DeMenocal, P. B. (2001), 'Cultural Responses to Climate Change during the Late Holocene', *Science*, 292 pp. 667–72.
- Engvild, K. C. (2003), 'A review of the risks of sudden global cooling and its effects on agriculture', *Agricultural and Forest Meteorology*, 115 pp. 127–37.
- Gill, R. B., *The Great Maya Drought. Water, Life and Death* (Albuquerque, University of New Mexico Press, 2000).
- Haug, G. H., Gunther, D., Peterson, L. C. D., Sigman, M., Hughen, K. A. and Aeschlimann, B. (2003), 'Climate and the collapse of Mayan civilization', *Science*, 299 pp. 1731–5.
- Keys, D., *Catastrophe: An Investigation into to Origins of the Modern World* (London, Century, 1999).
- Manning, S. W., 'Cultural Change in the Aegean c. 2200 B. C.', in Dalfes, H. N., Kukla, G. and Weiss, H. *Third Millennium B. C. Climate Change and Old World Collapse* (Berlin, New York, Springer, 1996), pp. 149–72.
- Mapes, J. (2001), 'Climate Change Linked to Civilization Collapse', *National Geographic News*, 27 February. Available at: [http://news.nationalgeographic.com/news/2001/02/0227\\_climate4.html](http://news.nationalgeographic.com/news/2001/02/0227_climate4.html)
- Peiser, B. J. (1998), 'Comparative Analysis of Late Holocene Environmental and Social Upheaval', in Peiser, B. J., Palmer, T. and Bailey, M. E. (eds), *Natural Catastrophes during Bronze Age Civilisations*. British Archaeological Reports S728, Archaeopress: Oxford, pp. 117–39.
- Pointing, C., *A Green History of the World* (London, Penguin, 1991).
- Possehl, G. L. (1996), 'Climate and the Eclipse of the Ancient Cities of the Indus', in Dalfes, H. N., Kukla, G. and Weiss, H., *Third Millennium B. C. Climate Change and Old World Collapse* (Berlin, New York, Springer, 1991), pp. 193–244.
- Radford, T. (2001), 'Discovery heralds way for plants to survive drought', *Guardian*, 28 June.
- Tainter, J. A., *The Collapse of Complex Societies* (Cambridge, Cambridge University Press, 1988).
- Thompson, L. G., Mosley-Thompson, E., Davis, M. E., Henderson, K. A., Brecher, H. H., Zorodnov, V. S., Mashiotta, T. A., Lin, P.-N., Mikhalenko, V. N., Hardy, D. R. and Beer, J. (2002), 'Kilimanjaro Ice Core Records: Evidence of Holocene Climate Change in Tropical Africa', *Science*, 298, pp. 589–93.
- Webster, D., *The Fall of the Ancient Maya* (London, Thames & Hudson, 2002).
- Weiss, H., Courty, M.-A., Wetterstrom, W., Guichard, F., Seniro, L., Meadow, R. and Curnow, A. (1993), 'The Genesis and Collapse of Third Millennium North Mesopotamian Civilization', *Science*, 261:995–1004.

- Weiss, H., 'Beyond the Younger Dryas. Collapse as Adaptation to Abrupt Climate Change in Ancient West Asia and the Eastern Mediterranean', in Bawden, G. and Reycraft, R. (eds), *Confronting Natural Disaster: Engaging the Past to Understand the Future* (Albuquerque, University of New Mexico Press, 2000).
- Weiss, H. and Bradley, R. S. (2001), 'What drives Societal Collapse?', *Science*, 291 pp. 609-10.
- Wright, K. (1998), 'Empires in the Dust', *Discover Magazine*, March 1998, pp. 22-4.
- Yoffee, N. and Cowgill, G. L., *The Collapse of Ancient States and Civilizations* (Tucson and London, The University of Arizona Press, 1988).