

# The Rise and Fall of Civilizations in a Climate Perspective

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## Abstract

Civilizations flourished during the warm periods, such as the Bronze Age, the Roman era, and the medieval times, when weather conditions were relatively stable with more precipitation in the tropic and subtropical areas. Civilizations experienced decline or succumbed during the cold periods, such as 1 200 to 500 BC, 300 to 700 AD and the Little Ice Age, when weather conditions were more unstable with less precipitation in the tropical and subtropical areas.

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## 1. Introduction

It's finally acknowledged by most historians that climate conditions affect the rise and fall of civilizations. This extended abstract is based on a book on climate history which is available in Norwegian (Brekkestø 2022) and Swedish (Brekkestø 2024). Based on this book also a talk at the 2023 Climate Conference in Copenhagen is available as an extend abstract (Brekkestø and Bergsmark 2023).

In this summary it is shown how a very dry period from 4 400 to 2 000 BC affected the subtropical and tropical areas of the globe lead to migrations of people towards rivers where several civilizations started (section 2), and how favourable conditions led to rise of civilizations (section 3,5 and 7), and finally how the cultures deteriorated during the cold periods (section 4.6 and 8).

## 2. A long period of drought caused migrations

After the Holocene climate optimum approx. 8 000 to 7 000 BC, a 2 400 year long period of cooler and dryer conditions followed. The temperatures dropped significantly, and it became much dryer. Ice cores from glaciers on Kilimanjaro and in the Himalayas, as well as lake sediments from Egypt clearly show this very dry period. It also became considerably colder in large areas, including in the eastern Mediterranean area.

This period, often referred to as a 'mega drought', led to migrations in several parts around the world. People left areas that dried up and moved towards places where they could still find water, most often large rivers. This for instance happened in Northern Africa. A large part of Northern Africa area had since the end of the last Ice Age, been a savannah with several lakes and river systems, now dried up and gradually turned into the Sahara Desert. The peoples who had lived in this area mostly migrated towards the east and the Nile Valley. The same development took place in the Middle East where people migrated towards the rivers Tigris and Euphratus, and in the areas around the Indus River.

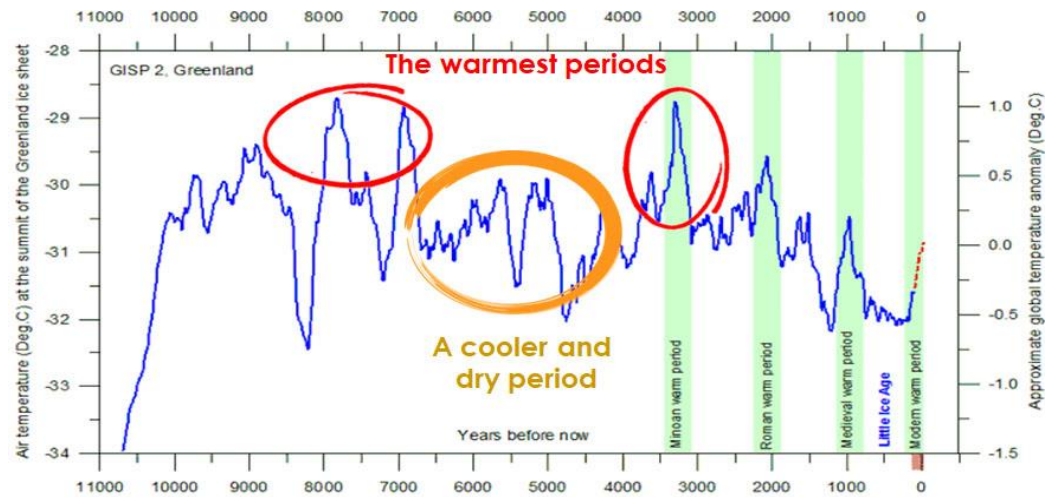


Figure 1. Estimated Holocene temperatures. Left: Temperatures from Greenland ice cores (Alley 2004). Right: Estimated global temperatures based on other proxy data (Box et al. 2009).

### 3. Favourable climatic conditions enabled the rise of civilizations

#### 3.1 The first Civilizations

How is a civilization defined? Most historians agree that three factors must be present:

- 1) An urban development with division of labour and social classes.
- 2) Some form of monumental architecture
- 3) The use of a written language

The first civilizations that developed were Sumer / Mesopotamia from 4 000 BC, The Old Egyptian Kingdom from 3 500 BC, The Indus Valley from 3 000 BC and finally the Chinese empire from 1 600 BC. The three first ones arose during the dry period 4 400 – 2 000 BC and were founded on access to water (rivers). All four of them developed and consolidated during the Bronze Age period from 2 500 to 1 200 BC.

#### 3.2 The climate during The Bronze Age 2 500 to 1 200 BC

Favourable climatic conditions around the world gave good times in most of the world. The Bronze Age enjoyed temperatures up to 2 - 3 °C higher than today in Northern hemisphere and 1 to 2 °C globally (Ljungqvist 2017). Asia and the Middle East had abundant precipitation, which enabled the emergence of large agricultural communities. The first Chinese civilization emerged and expanded during this period from approx. 1600 BC. (Xia-dynasty). In Northern Europe enjoys a warm climate with mild winters which provides good conditions for the development of agriculture. Millet is cultivated in Denmark during this period, which requires an average temperature 2 °C higher than today (Myhre 2021). In Norway the tree limit is approx. 300 meters higher than today, and high mountain ranges like the Hardanger and Dovre plateaus were wooded most of this period (Brox 2914). By 2 000 BC all the glaciers in Norway and in the Alps had melted away, and there were hardly any glaciers in Iceland and at Svalbard (Johannessen 2007; Carstens 2014).

#### 3.3 European integration during the Bronze Age

Several regions in Europe had flourishing cultures during the Bronze Age. The civilizations in the southeast were communicating with the cultures in the western and northern regions. There was an extensive north-south trade with for instance weapons, jewelry, and glass. There was also an exchange of technology regarding for instance boat building, and long-distance travelling (Cline 2021).

### 3.4 Mediterranean civilizations during the Bronze Age

Cultures and civilizations around the eastern and central parts of the Mediterranean such as the Minoans, the Hittites, the Mycenaeans, Mesopotamia (later Assyria), Cyprus, and Egypt all had an extensive trade amongst themselves: They traded with tin, copper, grain, timbers etc. They had extensive diplomatic connection letters and envoys, and the ruling class often practiced inter-marriage between the various kingdoms (Cline 2021).

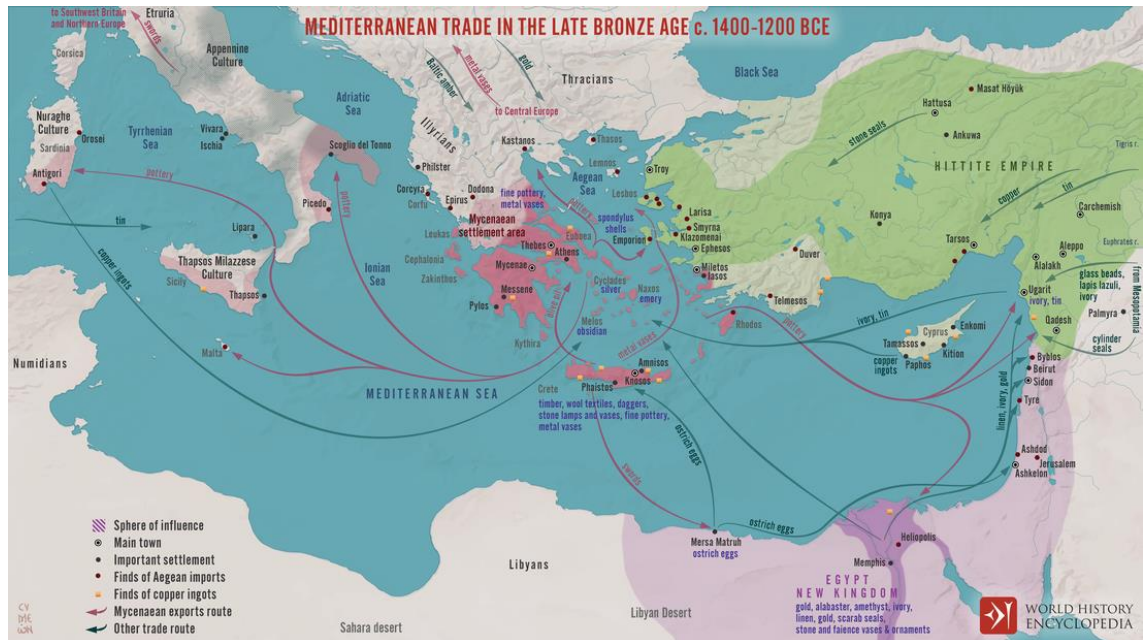


Figure 2. Mediterranean trade routes in the late Bronze age 1400 – 1200 BC (Cline 2021).

## 4. The collapse of the Mediterranean civilizations

Around 1200 BC a dramatic climatic deterioration took place that led to the collapse of several of the Mediterranean civilizations. Recent research (analyses of pollen, sediments, ice cores etc.) shows, among other things, a sudden global cooling with more ice in North-Atlantic, a 200 year long, severe drought in subtropical areas, a sudden drop in the sea temperatures in the eastern Mediterranean of 2-3 °C and a failing monsoon in Asia and eastern Africa (Cline 2021).

This climatic deterioration led to crop failure, hunger, collapse in the trade, revolts, migrations (invasions by the «The Sea People») and war, which in turn led to the collapse in several of the civilizations. Due to the existence of i.e. Egyptian written sources it has been possible to pinpoint this collapse to the year 1177 BC.

The only surviving civilization on the Mediterranean was the Egyptian, but in decline, with reduced amount of water in The Nile. The old Kingdom came to an end and was replaced by The New Kingdom. It also led to the decline in Mesopotamia / Assyria and the Indus Valley civilization completely disappeared (Cline 2021).

## 5. Improved climatic conditions allow cultural growth

### 5.1 Improved climate from 500 BC and the emergence of new civilizations

From approx. 500 BC temperatures were rising again globally and there was an increase in rainfall in the Mediterranean, the Middle East and in the East (Frankopan 2023) A similar improvement also took place in Central America, which saw the emergence of The Mayan culture emerges

from 300 BC. Parallel with the improved climatic conditions in the Mediterranean the development new civilizations emerged. During the great era of Greek antiquity from 480 to 30 BC (from 146 BC under Roman rule) democracy developed in Athens (from the early 400s) and the construction of the Parthenon started (the mid 400s). The Roman republic developed from approx. 500 BC with the expansion of its borders beyond today's Italy from around 400 BC. In China the construction of the Great Wall started during the 300s BC and the greater Chinese Empire was established from 221 BC.

### *5.2 A short period of instability in the 40 BC replaced by new favorable conditions*

In the 40 BC volcanic eruptions (Okmok in Alaska and others) a short period of climatic instability with cold and wet conditions in Europe led to unrest and attacks against the Roman Empire. However, the climate quickly stabilized again, and during the two first centuries AD with favorable climatic conditions, the period known as Pax Romana from 27 BC to 180 AD was a particularly peaceful and stable period in the Roman Empire. Whereas the drop in temperature during the 40 BC meant several years of drought in East Africa and a reduced water flow in the Nile which resulted in crop failures and hunger in Egypt and may have been a contributing factor to the end of Egypt's independence, the two first centuries AD represented a good period with stable Nile floods and ample crops (Frankopan 2023).

## **6. The Migration period and the climate catastrophe 550 AD**

With the increasingly colder, drier and more unstable climate from the 200s, and waves of attacking migrants from the north and the east, the Roman Empire disintegrated, and Rome fell in year 410. Then, from 536 a virtual climate catastrophe started caused by several massive volcanic eruptions (probably in Iceland, North America and Southeast Asia): An abrupt and significant global cooling caused crop failures over large parts of the world, followed by 100 years of extreme weather and hunger (Johannssen 2007). A sudden drop of 2 - 3 °C in the Northern hemisphere and 3 - 4 °C in the Nordic countries (Ljungqvist 2017) where large areas were completely depopulated (Iversen m. fl. 2017). Reports of several years of severe drought in China, Peru the Middle East and Persia, and snowfalls in China in midsummer. (Ljungqvist 2017; Hoffmann & Ochoa 2005).

## **7. The warm Middle Ages**

From the mid700s temperature had finally recovered and a 400 year long period with higher temperatures and stable conditions started that enabled cultural and economic growth around the globe. The 900s, the warmest century enjoyed a global 1 - 2 °C higher than today (Ljungqvist 2017). In Europe the forest lines and agriculture several hundred meters higher than today. In Svalbard glaciers were significantly smaller than today, the limit of summer pack ice 100 km farther north of Iceland than today (Lamb 1982) and the Norse cultivated barley in Greenland allowed by a temperature 1,5 °C warmer than today (Lamb 1972; Steen Henriksen 2012).

Europe experienced a heyday of craftsmanship and architecture (e.g. Byzantine churches, Gothic cathedrals). Abundant monsoon rains gave a rise in Chinese and Indian culture and architecture and allowed the building of Angkor Wat. In South America the Chimú culture flourished from the 800s and the Inca Empire from the 1100s (Fagan 2008).

## **8. The Little Ice Age**

### *8.1 Dramatic climatic deterioration and cultural decline*

The cold, wet and unstable climate from the early 1300s with floods, failing crops and hunger

reduced the European population by 1,5 million before the Black Death killed 50 to 80 million more in the late 1340s (Fagan 2000). The climate did not improve during the late 1300s and the 1400s, and the Inquisition laid its grips on Europe. The coldest period, the 1600s, saw freezing conditions in Europe, Asia and South America, accompanied by severe droughts in the East, the Middle East, the Sahel region and South America (Fagan 2000). China and Japan suffered widespread hunger and rebellions, while witch hunts took place in Europe with a typical conviction: with magical powers having produced bad weather (Blix Hagen 2019). In South America children were sacrificed on a large scale, in the hope of propitiating the gods.

### *8.2 The Little Ice Age culminates, and the western, modern civilization is founded*

The early 1700s saw a rapid rise in temperatures, and a culmination of the Little Ice Age and rising temperatures, although with several setbacks until the early 1900s. Also in the 1700s, the foundations of the modern, western civilization were laid:

- 1) The Age of Enlightenment with science, reason, freedom and tolerance,
- 2) the end of Feudalism and
- 3) the start of the Industrialization.

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