

Review of Key Information from Part One

What influences made the atmosphere of Earth hospitable to human life?

When it first formed, 4.6 billion years ago, Earth's atmosphere could not support life. Seven-hundred million years ago, the first multi-cellular life forms emerged which released oxygen. Later, living things began to absorb carbon dioxide from sea water and build carbonate skeletons. In time, plants began to photosynthesize, creating an oxygen-rich atmosphere that was able to support animal life. Eventually, coral reefs formed, absorbing vast amounts of carbon dioxide from the atmosphere. Over these four-and-a-half billion years, an ecosystem with an atmosphere that was finally hospitable to human life began to emerge.

As the ancestors of humans evolved, what hampered their ability to thrive and increase in number?

The Pleistocene Era lasted from 1.8 million to 11,550 years ago. Glaciation – the formation, movement and recession of glaciers – was a time of frequent and traumatic climate swings. The freezing conditions of the coldest phase of an ice age made it very difficult for plants and animals to survive.

What was the major factor that moderated Earth's temperature so that humans could flourish?

The development of agriculture 10,000 years ago launched what has been referred to as "the long summer" – a period during which Earth's temperature averaged 57 degrees. Wet agriculture, such as practiced in flooded rice paddies in eastern Asia, led to an increase in methane emissions. The methane created an atmospheric "greenhouse" over Earth, letting in the sun's rays, without allowing as much warmth to escape out to space. Ten thousand years ago, the added methane was just enough to create an atmosphere that suited humans perfectly. For the past 10,000 years, the greenhouse effect has had a positive influence for humans on Earth.

What is the greenhouse effect?

Sun rays warm the surface of Earth. Earth absorbs some of the heat from the rays and also reflects some of it off the Earth's surface. But only a small amount of the heat energy emitted from the surface goes through the atmosphere and back into space. Methane, water vapor, carbon dioxide and other gases in the atmosphere create a kind of shield which holds the incoming solar heat in the atmosphere. As greenhouse gases are increased, the shield thickens and traps even more heat, thus increasing the warming of the surface.

What is one of the major factors that have influenced the climate to heat up so rapidly in just 200 years?

Since the Industrial Revolution began – around 200 years ago – our use of oil, coal and gas has forced carbon dioxide and other greenhouse gases into the atmosphere in disturbingly large amounts. Coal provides nearly half of the electric energy generated in the United States. Renewable sources of energy, such as wind, solar and geothermal, produce only 2.3% of the energy used by the U.S.

What is the key question that no one can answer whose answer will determine how radical the climate will change?

There were 160 parts per million of carbon dioxide in the atmosphere at the dawn of agriculture, 10,000 years ago. There were 280 parts per million at the start of the Industrial Revolution. Today there are 380 parts per million. No one knows at what level a tipping point is reached, beyond which it will be impossible to avoid climate change with far ranging undesirable consequences.