

## WELCOME TO THE KLIMAHHAUS

Watch the video [Welcome to the Klimahaus](#).

### Overview

During a visit to the [Klimahaus](#) in Bremerhaven, you will explore global climates and observable changes in glaciation, rainfall, sea level, and surface temperatures. You will examine claims, analyze and evaluate data, and pose questions to clarify patterns in the evidence used to support a claim.

The *Klimahaus* is a climate tour along the eighth meridian that runs through Bremerhaven. When Axel Werner took the actual journey, he wondered if greenhouse gases emitted by simple actions, like turning on a light bulb in Bremerhaven, could cause climate change in a distant location. A single light bulb may seem trivial; however, according to the Intergovernmental Panel on Climate Change, electrical power production accounts for 37 percent of the global carbon dioxide emissions. As Axel Werner traveled to remote rural regions, the light bulb became a metaphor for carbon dioxide emissions from more urbanized regions. (IPCC, n.d.).

Your journey through the *Klimahaus* will take you through nine locations and five continents. Along the way, you will be asked to consider how greenhouse gas emissions affect climates and to evaluate your personal impact on the planet.

## Climate and Climate Change

Analyze the “[Separating Human and Natural Influences on Climate](#)” graph from the U.S. Global Change Research program on GlobalChange.gov, which shows the correlation between these influences on climate change. Models that account only for the effects of natural processes cannot explain the warming observed over the past century. Models that include both human and natural factors explain the warming trend. There is abundant evidence that human influences, such as the burning of fossil fuels, are leading to increased levels of [greenhouse gases](#) in the atmosphere, which are magnifying the natural [greenhouse effect](#) and causing the Earth’s temperature to rise. This is causing climate change.

To understand climate change, you need to understand climate. Climate comprises the long-term atmospheric conditions associated with a location. The climate of a region is defined by average monthly temperatures and rainfall. Climate averages are calculated from 30 or more years of data. Average monthly temperatures and rainfall can be shown on a climograph. The connection between human influences and climate change is evident in a steady increase in temperature.

### Analyze the [Separating Human and Natural Influences on Climate](#) Graph

What is the purpose of this graph?

Next, read the *x*- and *y*-axis labels. How are the data organized?

Then, look for patterns in the data. What is the trend in observed global average temperature change over time?

How does the observed temperature change line compare to the trend for natural factors only?

How does the observed temperature change line compare to the trend when both human and natural factors are included?

What cause-and-effect relationship can be inferred from the data?

### Natural and Human Factors

Natural factors that influence climate include variations in incoming solar radiation and volcanic activity. Human factors that influence climate include the burning of fossil fuels, production of cement, and agricultural activity. The following graphs show the percentage of atmospheric carbon dioxide emissions by natural processes and human activities.

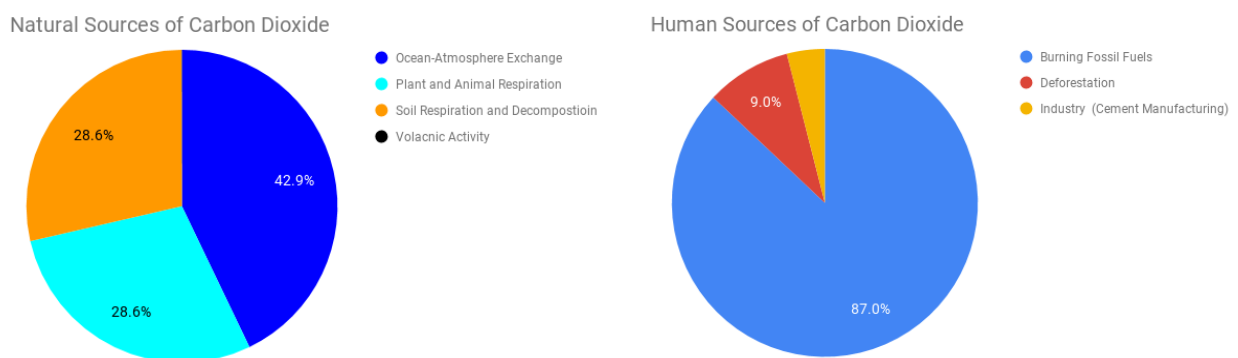


Figure 2: These graphs are based on data retrieved from the “[What’s Your Impact?](#)” website.

Ask questions that could be answered by collecting and analyzing data to explain the rise in global temperatures, explain the effect of rising temperatures on global climates, and develop mitigation or adaptation strategies for survival.

**Essential Question**

How do our actions at home contribute to climate change around the globe?

You will ask and answer the essential question by:

- Exploring the effect of natural events and human activities on global climates.
- Asking questions that identify and clarify evidence of an argument.
- Analyzing climate and climate change impacts in your own community.
- Creating visual representations of your evidence.
- Communicating your findings using evidence to support your claims.
- Using evidence to structure an argument for action that can be taken to adapt to or mitigate the effects of climate change in your community.

## **THE KLIMAHHAUS**

### **Introduction**

Climate is the long-term atmospheric conditions associated with a location. Climate is defined by average monthly temperatures and rainfall.

Factors that influence climate at a specific location include:

- Latitude
- Elevation
- Proximity to a large body of water
- Ocean currents
- Topography
- Prevailing winds
- Vegetation

If you are unfamiliar with how each of these factors influences climate, use reference resources and models to explore the effects of each climate factor. As you explore the *Klimahaus* in Bremerhaven, pay attention to the factors that may influence climate at each location and the observed signs of climate change at each location.

### **Exploring the *Klimahaus***

Watch the video [Welcome to the Klimahaus](#).

After a good night's sleep in Bremen, it's time to board the bus for a 45-minute trip to the *Klimahaus* in Bremerhaven. After your tour guide, Peter, confirms attendance with your chaperones, he turns on the microphone.

“*Moin.*” When no one responds, Peter continues, “*Moin.* That means good morning in the northern parts of Germany. So let's start again. *Moin!*”

You and your friends enthusiastically respond, “*Moin.*”

We are on our way to Bremerhaven to explore the *Klimahaus*. Who can translate *Klimahaus* into English?”

Mehedy, who is sitting near the front of the bus, raises his hand. Peter nods to him to answer. “Climate house.”

“Very good. Yes, *Klima* is climate, and *Haus* is house. In German, we connect the two words to make one: *Klimahaus*. In English, you would keep the words separated and say “Climate House.”

“Today we will be taking a walk on the eighth meridian to discover climates and climate change.” Peter continues with the history of *Klimahaus*.

“Between 2004 and 2006, *Bremen*-based architect Axel Werner undertook a journey to discover the global climate connections among locations along the eighth meridian, a line of longitude that runs through Bremerhaven, Germany.”

“Traveling with Israeli American filmmaker B. Z. Goldberg, Werner talked to people on five continents as Goldberg captured the stories of people living along the eighth meridian. Throughout the journey, Werner and Goldberg focused on local climate and the effects of climate change on the local environment and people. Their documentary captured the unexpected and unintended consequences of human activities that affect climate on a global scale.”

“Werner purposefully chose small villages to document personal stories. His essential question was simple: How can turning on a light bulb in Bremerhaven affect climate in, for example, Niger? What do you think he meant?” Peter calls on Sara.

“A light bulb uses electricity. Electricity produces carbon dioxide emissions. Maybe he meant how do carbon dioxide emissions for electricity affect global climate or how do our choices affect people far from where we live.”

“How do your choices affect someone else far from where you live?” Peter repeats so that everyone can hear. “That is a big idea to think about as we tour the *Klimahaus* and hear the stories of people interviewed by Werner and Goldberg.”

“Goldberg’s eighty-one documentary film segments are the focal points for exhibits at the *Klimahaus*, a unique interactive experience on the eighth meridian in Bremerhaven. Opened in 2009, *Klimahaus* interactive experiences are constantly updated to reflect the latest scientific findings. To do so, *Klimahaus* partners with some of the most prestigious climate research organizations in Germany, including the Max Planck Institute for Meteorology, the German Weather Service, and the Alfred Wegener Institute for Polar and Marine Research. As a visitor to the museum, you will explore climate and climate change mechanisms.”

“It is important to note that the exhibits at *Klimahaus* present evidence as observations and data. The goal is to keep the focus on evidence.”

“During your tour, I encourage you to identify evidence of climate change and to ask questions to clarify the observations and data used to support a climate or climate change argument. We will pass out an organizer now so that you can begin to think about the journey you will be taking. We should be arriving in Bremerhaven in about 30 minutes.”

### **Asking Questions to Identify and Clarify Evidence**

As you move through the *Klimahaus* stations, identify and collect evidence of climate factors and climate change correlations, causes, and effects. Formulate questions that could

clarify evidence through further research. Dig deeper through explorations and modeling. Finally, choose a climate topic from the *Klimahaus* tour and construct a scientific argument supported by evidence. Present your scientific argument as a slideshow, video, or pictorial essay.

### **Location of the *Klimahaus* in [Bremerhaven](#)**

Stepping off the bus, you feel the fresh, cool July morning breeze coming from the harbor. Clouds hang low on the horizon. Bremerhaven is located at 8° 5' E, 53° 53' N. This city of more than 110,000 residents straddles both banks of the *Geeste* River at its junction with the *Weser* River, which flows north from Bremen to Bremerhaven.

Bremerhaven is on the east side of the Weser Estuary. Ecosystems in the waters around Bremerhaven support both riverine and estuarine ecosystems. Water from the Weser Estuary flows north into the North Sea and water levels fluctuate with tidal movements. Because of its location, Bremerhaven is an important global port city.

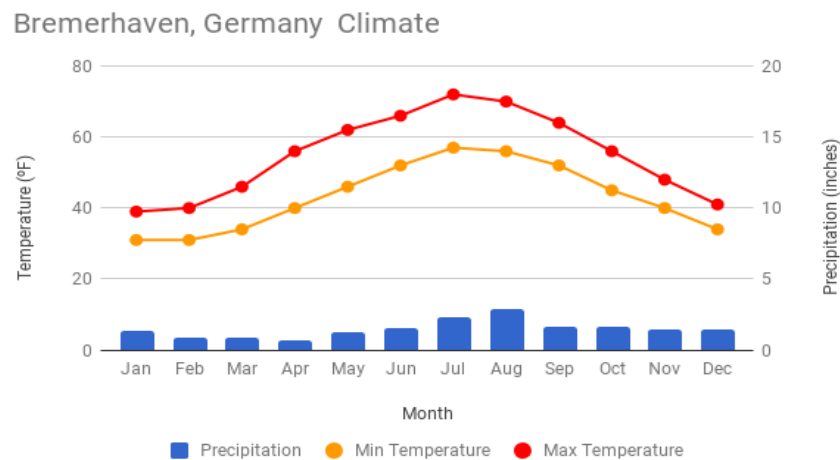
Although industry in Bremerhaven is geared primarily to supporting marine trade activity, the Bremerhaven Company for Investment Promotion and Urban Development GmbH includes allocation of manufacturing and assembly space for offshore wind turbines in its long-term planning. Concrete made from cement is an important material for infrastructure and building construction in Bremerhaven. Marine transport vessels and support equipment like cranes and trucks use fossil fuels for diesel engines and electricity-generating turbines. Renewable energy sources for electricity generation is increasingly replacing fossil fuel combustion.



From March through July, prevailing winds travel over water from the northwest. The pattern shifts from August through February to prevailing winds from the southwest that travel over land. The topography of Bremerhaven is flat, and the elevation is 6.5 feet above sea level.

### Explore Bremerhaven

1. Use Google Earth to develop a sense of place.
2. Use the data and information on the climograph to observe patterns in rainfall and temperature.



3. Read "[Germany Prepares for Mediterranean Climate](#)" (Witkop, 2009).
4. Explore atmospheric carbon dioxide at [NASA Global Climate Change: Vital Signs of the Planet](#).
5. Identify factors that influence climate.
6. Identify sources of carbon dioxide and other greenhouse gas emissions.

Learn more by investigating the [Klimahaus](#) website.

<b>Predicted Climate Change</b>	<b>Climate Change Threat</b>	<b>Climate Change Impact</b>
Increased precipitation and more frequent heavy rain events	Sea-level rise	Damage to buildings and infrastructure from flooding in coastal areas and along rivers
More frequent summer heat waves	Frequent storm surges, river flooding	Damage to human health, buildings, and infrastructure from heat in urban areas

### **Engineering Application**

Propose a mitigation and/or an adaptation strategy for sea-level rise and storm surges.