



# TEACHING HUMAN DIGNITY

## *Climate Change Investigation*

TEACHER GUIDE





## Resource Description

This “Climate Change Investigation” is a project-based resource that helps students investigate both the scientific and moral aspects of climate change. In his 2015 encyclical *Laudato Si*, Pope Francis explains that all humans have a moral obligation to care for God’s creation. He focuses specifically on climate change and the urgent need to combat its disastrous consequences. Many Catholic institutions have since responded to the Pope’s call to action. The Sisters of Mercy state that “care for the earth is one of the primary critical concerns for society today and requires practices and policies designed to protect all creation from unnecessary destruction, including...climate change.”

From a scientific perspective, this resource challenges students to create a resource that details the causes of climate change. Since the Industrial Revolution, humans have been creating greenhouse gases as they burn fossil fuels for energy. These gases trap the heat that reflects off the earth from the sun, much like a blanket or greenhouse, thereby making the planet warmer. Using air trapped in ancient sea ice to analyze what earth’s climate was like in the past, scientists have studied the relationship between increasing amounts of greenhouse gases in the atmosphere and higher global temperatures; an overwhelming majority of them currently accept this explanation for climate change and have ruled out every alternative.

According to the Catholic Church, climate change is a global crisis that harms every aspect of our world. Besides the devastation to natural ecosystems, a warming planet disproportionately affects the poor, many of whom do not have the financial resources for air conditioning or hurricane-resistant homes. Food scarcity is another issue as people struggle to cultivate plants and animals that cannot adapt to higher temperatures, which has led to droughts and water shortages. Hunger, in turn, causes people to flee from their native countries in order to provide a better life for their families. Recent research even suggests that climate change adversely affects pregnant women, especially those who identify as BIPOC.

### **Suggested Subject Area:**

Science; Religion/Theology

### **Ideal For:**

- ◆ introducing students to the science of climate change and its global impact
- ◆ introducing students to Catholic moral teaching relating to climate change
- ◆ creating connections between the science of climate change and the moral imperative to act in a manner that effectively responds climate change
- ◆ highlighting connections between climate change and other justice issues

## Goals

### STUDENTS WILL:

- ◆ understand how greenhouse gases enter the atmosphere
- ◆ articulate the ecological effects of climate change on the planet
- ◆ explain how certain populations, especially the poor and marginalized, are more vulnerable to the effects of climate change
- ◆ investigate how climate change is a moral issue that requires our proactive response
- ◆ integrate the science of climate change with the sociological
- ◆ explore ways in which the student can act now to help respond to climate change

## Things to Consider

**Student Guide.** The student directions are intentionally left vague with regard to what kind of resource they should be creating. They could create pamphlets, posters, or other printed materials, or, depending on the school's resources, students could create online resources such as websites.

*Adobe Spark is a free app for iPads, but students could also use Google Sites to create their websites. If students are limited in their access to technology, you may consider having them create a series of posters or use a tri-fold board.*

**Curated Resources.** All resources have been vetted and approved for student use. All articles should be publicly available, although some resources like the New York Times have a limit on the number of free articles a person can access before requiring subscription or school access.

**Validity of Climate Change.** Some students may question whether climate change is an established science. Because of this, students are asked directly to answer questions related to this concern within their project: What evidence proves that climate change is caused by human activity? How do we know that this evidence is trustworthy and reliable?

*It is important to note that scientific truth and religious/moral truth are different. The distinctions are explained in "Faith and Science: What is True?" from the curated resources.*

**Faith and Science.** Some students may also question how a scientific topic like climate change intersects with their Catholic faith. It may be helpful to require or strongly encourage all students to read The Gospel of Creation (§62-100) section from *Laudato Si* in answering the questions on *The Morality of Climate Change*.

**Responding to Climate Change.** As part of this project, students are required to suggest practical ways to combat climate change within a particular community, such as school. You may choose to have students share their work with their families, the school more broadly, or even the larger community.

**Student Feedback.** A suggested feedback form is included within the materials. It is recommended that teachers have students review each other's work and provide constructive feedback. There are numerous options for students to choose from in each section of curated resources. Student feedback is not only helpful for the critiquing process but also in allowing students to engage with materials they might not have chosen for their own project.

## Before Beginning

- ◆ The teacher should define the type of resource students will be asked to create, write a list of options, or set basic parameters for the resource.
- ◆ The teacher should give students access to the grading rubric which provides a somewhat higher level of detail about project expectations.
- ◆ The teacher should let students know that they will be asked to review the work of their peers and provide constructive feedback. The teacher should share the feedback form with students, either digitally or as a hard copy. The teacher may consider creating a Google form with the feedback questions for easier use in collecting and distributing feedback.
- ◆ If students are creating online resources such as a website, the teacher should provide a place in which to collect the students' links to their website and share them with the rest of the class.
- ◆ The teacher should share with the students the list of curated resources and tell the students that they should use the resources provided to them. There is also a list of websites at the end of the list that students can access and use as needed/desired.

## Climate Change Investigation

For this assignment, you'll explore the reality of climate change from three different angles—*the science of climate change, the morality of climate change, and responding to climate change*. For each angle, you will be required to review videos and articles from the provided list of curated resources and use these to answer the accompanying questions.

**As you work on this project, be creative in the way you present the information.**

### The Science of Climate Change

- ◆ Include your name in a prominent location.
- ◆ Include at least one picture. Be sure to reference the source(s).
- ◆ Include at least one of the videos provided in the curated sources. Write a short summary (2-3 sentences) of the video.
- ◆ You must paraphrase (in your own words) at least two of the articles provided in the curated resources. Be sure to reference each article.

#### Answer the following questions:

- ◆ What three molecules are considered to be greenhouse gases?
- ◆ How do these greenhouse gases enter the atmosphere?
- ◆ How do these greenhouse gases contribute to climate change?
- ◆ What evidence proves that climate change is caused by human activity?
- ◆ How do we know that this evidence is trustworthy and reliable?

## The Morality of Climate Change

- ◆ Include your name in a prominent location.
- ◆ Include at least one picture. Be sure to reference the source(s).
- ◆ Include at least one of the videos provided in the curated resources. Write a short summary (2-3 sentences) of the video.
- ◆ You must paraphrase (in your own words) at least two of the resources provided in the curated resources. Be sure to reference each resource.

### Answer the following questions:

- ◆ According to the Catholic Church, why is climate change a moral issue?
- ◆ What are five ecological effects that climate change has on the planet, including its land, water, air, wildlife, and plants?
- ◆ What are five sociological effects that climate change has on humanity, including the poor, minority groups, and other countries?

## Responding to Climate Change

- ◆ Include your name in a prominent location.
- ◆ Include at least one picture. Be sure to reference the source(s).
- ◆ Include at least one of the videos provided in the curated resources. Write a short summary (2-3 sentences) of the video.

### **Answer the following questions:**

- ◆ What are 10 specific ways that we can combat climate change at our school (or in another community you belong to)?
- ◆ Why are each of these actions or activities helpful to combat climate change?



# Answers

## 1. What three molecules are considered to be greenhouse gases?

*Carbon dioxide, methane, and nitrous oxide are the primary greenhouse gases.*

## 2. How do these greenhouse gases enter the atmosphere?

*Electricity: Burning fossil fuels (coal, oil, and natural gas) for energy releases carbon dioxide into the atmosphere.*

*Agriculture: Cows release methane gas, deforestation releases carbon dioxide into the air, and nitrogen fertilizers release nitrous oxide.*

*Manufacturing: Fossil fuels are burned for energy, releasing carbon dioxide into the atmosphere. The creation of materials such as cement and steel involves chemical reactions that release carbon dioxide.*

*Transportation: Cars, airplanes, cargo ships, and trucks all release carbon dioxide.*

## 3. How do these greenhouse gases contribute to climate change?

*Greenhouse gases trap the heat that reflects off the earth from the sun, much like a blanket or greenhouse, thereby making the planet warmer.*

## 4. What evidence proves that climate change is caused by human activity?

*Trapped air: Using air trapped in ancient sea ice (from Greenland, Antarctica, and tropical mountain glaciers), scientists have analyzed earth's historical climate--both greenhouse gas levels and temperature, in order to understand how the climate responds to changes in the levels of greenhouse gases. Ancient evidence can also be found in tree rings, ocean sediments, coral reefs, and layers of sedimentary rocks. Global warming is currently happening approximately 10 times faster than warming after other ice-ages. In addition, the carbon dioxide from human activities is increasing more than 250 times faster than after the last ice age with just natural sources of carbon dioxide.*

*Global climate models: Earth's climate has varied throughout history, due largely to small shifts in the Earth's orbit that in turn change the amount of solar energy the Earth receives from the sun. Even with a history of climate variation, the extent of global warming that has occurred since the mid-20th century is unlike any historical record of natural causes of global warming. The extent of global warming mirrors the increase of greenhouse gas emissions by human activities.*

*Observations via satellite: Satellites have allowed scientists to gather big picture data about the planet and its climate. This data reveals the signals of a changing climate.*

*NASA instrumentation: The functioning of NASA instrumentation is based on the discovery in the mid-19th century by scientists that carbon dioxide and other gases could trap heat in earth's atmosphere.*

**5. How do we know that this evidence is trustworthy and reliable?**

*Scientific truth is based on a process of rigorous testing over years and community agreement and consensus. (NOTE: This is different from religious truth or faith which is based on assenting to God’s self-revelation. See “Faith and Science: What is True?” from the curated resources for a fuller description of this distinction.)*

*An overwhelming majority of scientists currently accept that greenhouse gases cause climate change.*

**6. According to the Catholic Church, why is climate change a moral issue?**

*In the creation accounts in the book of Genesis, God gives human beings the task of tilling and keeping the garden. Human beings are not tasked with dominating creation but with caring for it. We are to be stewards of the earth—to care for the earth in love, just as God cares for us. In addition to this task of caring for creation, we must recognize that humans are an integral part of creation. We too are creatures, and as creatures we are dependent on the earth for our survival and flourishing. If we fail to care for the earth, we are in essence failing to care for our sisters and brothers—those who live on the earth now and those to come in the future. Climate change impacts all of humanity. It affects our food and water, our health, our homes, our safety from violent storms, and the list goes on. Our care of creation is also our care for our sisters and brothers, especially those least among us who are most vulnerable to the impacts of climate change.*

**7. What are five ecological effects that climate change has on the planet, including its land, water, air, wildlife, and plants?**

*Some effects include: warming ocean temperatures; droughts; more powerful storms; rising sea levels; higher global temperatures; loss of plant, animal, and sea life.*

**8. What are five sociological effects that climate change has on humanity, including the poor, minority groups, and other countries?**

*Some effects include: food scarcity; water shortages; destruction of homes; changes in migration patterns; medical complications for pregnant women and their babies.*

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