

## **Climate Change Lesson 10 - Air Pollution**

### **Objectives**

- Students will understand the sources, causes, and effects of air pollution
- Students will be able to explain how air pollutants affect the temperature of the atmosphere
- Students will be able to explain the current global threats of air pollution
- Students will be able to explain different regulations and techniques that are currently in place and could be put in place to mitigate air pollution
- Students will provide solutions for how humans mitigate bad air quality events in the future
- Students will gain an awareness of the importance of conferences

### **Background information:**

Human beings are dependent on a mixture of oxygen, carbon dioxide and water vapor in the atmosphere around us. Without these substances, life would not exist. The atmosphere refers to the layers of air that surround the Earth while air is an invisible mixture of gases surrounding Earth. Air is composed of many different types of gases, but also contains liquids and solid particles. The layer of atmosphere directly above the Earth is the troposphere. This layer supports all of our weather. The stratosphere, directly above the troposphere, is composed of 'good ozone' and shields the Earth from harmful radiation. Air pollution comes from a variety of sources and travels freely around the Earth. Scientists classify air pollution into five categories; point or stationary sources, such as factories or power plants, mobile sources, specifically motor vehicles and engines, area sources, which includes livestock and home pollution, natural sources, such as volcanoes and fires, and wet and dry deposition, or solid particulates.

### **Vocabulary**

- Air pollutants
- Air pollution
- Carbon monoxide
- Clean Air Act of 1970
- Lead
- Nitrogen oxide
- Non-point source pollution
- Ozone
- Particle matter
- Point-source pollution
- Primary pollutants
- Secondary pollutants
- Sulfur dioxide

### **Materials**

Classroom computer with Internet, iPads/notebooks/student computers, access to a library and/or books

### **Warm Up**

Have partners share their knowledge of air pollution, recording key ideas on a piece of paper. After two minutes, tell them to identify three main things they know. Now have partners join another group to create a foursome and repeat the process, allowing them to share answers before cooperatively determining three main things. Repeat with an eight-person group before finally completing as a whole class. Write the three agreed-upon concepts on the board.

### **Lesson**

- Teach students the five properties of air: *takes up space, has mass, can move, exerts pressure, can do work*
- Identify some of the main causes, effects and sources of air pollution: *burning fossil fuels for energy (cars, trains, planes, boats, factories, oil refineries, agriculture), cities, ozone layer, wood-burning and coal burning fireplaces*
- Define Air Quality Index (AQI): *The measurement used to determine levels of pollution in the air*
- Go over Clean Air act 1970 (<https://www.epa.gov/laws-regulations/summary-clean-air-act>)
- Identify different pollutants: *Nitrogen oxides, carbon monoxides, hydrocarbons, sulphur oxides (usually from factories), sand or dust particles, and organic compounds that can evaporate and enter the atmosphere*

### **Assignment**

Split students into groups of 3-4. Each group will be assigned a country who uniquely contributes to global air pollution. Each group will become an expert on their country's pollutant, the type of air pollution it contributes to the atmosphere, and will come up with strategies to mitigate this problem on a local and global scale. At the end of the class students will come together and present their research and solutions at a mock air pollution conference. Students can create a slideshow presentation using photos/graphs/other visuals etc. Students will be encouraged to ask questions at the end of each presentation.

#### **Alternative Assignment:**

Groups are assigned different roles eg. person/professional or a group of people/company that are causing air pollution. For example, a farmer, factory worker/ CEO of a fossil fuel factory, CEO of a car company, a clothing factory, a politician, taxi drivers union, meat factory farmer, non-eco-friendly house owner, etc. Each role will be accompanied by a specific way in which they are contributing to the harmful effects on the quality of air. Each group will have to come up with strategies or new policies that will need to be put in place in order to reduce their impact on the quality of the air.

#### **Assignment for a younger grade:**

If you had a creature living with you that had asthma problems and you could create a new environment for it to live in – how would you design an environment that would emit the least amount of pollutants in the air? What would you change about your current city?

Link to lesson plan: [http://www.pbs.org/parents/seekoworld/lessons1\\_1.html](http://www.pbs.org/parents/seekoworld/lessons1_1.html)

## **Wrap Up**

Students have to write down one thing they learned from the conference, one thing they will commit to doing and one thing they will ask the government to do to help reduce our poor air quality. Students will be asked to stick their piece of paper with their own commitment on the wall in the classroom.

## **Resources**

[https://www.teachengineering.org/lessons/view/cub\\_air\\_lesson01](https://www.teachengineering.org/lessons/view/cub_air_lesson01)

<http://communities.earthportal.org/EPCommunity/view/article/51cbea407896bb431f68356f/>

<https://www.epa.gov/clean-air-act-overview/air-pollution-current-and-future-challenges>

<https://airnow.gov/index.cfm?action=aqibasics.aqi>

<https://www.epa.gov/laws-regulations/summary-clean-air-act>

<https://www.nationalgeographic.org/activity/measuring-air-quality/>