

CLEARING THE AIR

introduction

The air we breathe can contain a variety of pollutants that are harmful to our health and the environment. This is an increasing problem throughout the world and we are beginning to witness its detrimental consequences. Worldwide, it is estimated that 4 million people, more than half of them in lower- and middle-income countries, die every year from **particulate matter (PM)** found in outdoor air pollution.¹ Additionally, about 2.6 billion people in the world cook and heat their homes with coal and **biomass**, further exacerbating **carbon emissions** and health consequences.²

There is an urgent need to reduce levels of air pollution caused by human activities across the globe. Reversing adverse effects on humans and ecosystems requires long-term actions and commitments, such as enforcing air quality standards and improving cleaner technologies.

Vocabulary: biomass, carbon emissions, particulate matter (PM)

materials

- Large sheet of butcher paper or poster board
- Sources for news articles
- Article: “New Delhi Introduces Campaign to Curb Air Pollution Ahead of Winter”
- Student Worksheet
- Sticky notes

procedure

1. Before class, recreate the chart below on butcher paper or poster board and display in an easy-to-reach location. Students will be adding to it during the class.

Causes of Air Pollution	Location of Problem	Effects of Air Pollution	Solutions to Problem



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concept

Current industrial and individual practices must be modified to avoid further environmental and health problems caused by air pollution.

objectives

Students will be able to:

- Find and analyze news articles examining various issues and challenges surrounding air pollution.
- Identify and discuss causes, effects, and solutions of air pollution.
- Differentiate the sources of and solutions to air pollution between industrialized and non-industrialized countries.

subjects

Environmental Science (General and AP), AP Human Geography, Geography, English Language Arts, Health

skills

Researching, synthesizing research, reading comprehension, understanding cause and effect, critical thinking

method

Students find articles about air pollution issues and use the information to create a class cause and effect chart of air pollution, as well as possible solutions.

Print the *New York Times* article “[New Delhi Introduces Campaign to Curb Air Pollution Ahead of Winter](#)” and make a copy for each student. Note: the article is behind a paywall so you must have a NYT subscription to access.

2. Have students explore the World Air Quality Index’s [interactive air quality map](#) that displays real-time data from worldwide EPAs. As a class, discuss locations with high levels of air pollution along with any other observations students may have.
3. Ask each student to collect one news article about air pollution. They may use newspapers, journals, or online news sources to find credible articles. Alternately, they may write a summary of a news show or documentary on television. The following list of topics can serve as a guideline for students in their search:
 - Smog in a large city
 - Effects of a country’s rapid industrialization on air quality and public health
 - Cities’ efforts to control particulate matter
 - Legislation passed in regards to air pollution
 - Health studies about the effects of breathing dirty air
 - Impact on outdoor art due to air pollution
 - Traffic and industry’s role in climate change
 - The connection between air pollution and acid rain (and the effects of acid rain)
 - Air quality in a megacity
 - Effects of indoor air pollution (often due to burning biomass for cooking)
4. After allowing time for students to collect articles and/or summaries, distribute the article “New Delhi Introduces Campaign to Curb Air Pollution Ahead of Winter” and a copy of the Student Worksheet to each student. Using the New Delhi article as a sample and the master chart, model how to analyze an article and complete the Student Worksheet.

Example of chart for the sample article:

Causes of Air Pollution	Location of Problem	Effects of Air Pollution	Solutions to Problem
<ul style="list-style-type: none"> • Agricultural fires • Vehicle exhaust • Industrial emissions • Firecrackers • Construction dust 	New Delhi, India	<ul style="list-style-type: none"> • Can make viral infections (such as COVID-19) more dangerous • Air pollution-related diseases 	<ul style="list-style-type: none"> • Anti-dust campaign • Reduce smoke from agricultural burning • Mobile app for citizens to lodge complaints and post photos

5. Using information from their article or summary, have students complete the Student Worksheet. Emphasize that students should include as much information as possible on their charts, but that it is possible not every column will have something listed.

6. Distribute sticky notes to each student and instruct them to transcribe the information from their chart onto the sticky notes. Each unique idea should be on a separate sticky note. You might want to check students' notes for accuracy as they write.
7. As students complete their sticky notes, invite them to post the notes onto the class chart.

discussion questions

1. Which of the causes on the chart are increased with population growth? Do any of the causes seem unrelated to a growing number of humans?

Answers will vary based on causes students identify.

2. Make a list of important factors for a realistic plan to reduce air pollution. Using these guidelines, which ideas mentioned in the "solutions" section seem most feasible? Which seem least feasible?

Factors may include cost, convenience, community receptiveness (such as aesthetic concerns with wind turbines), current state of technology, the likelihood that those in power will go along with the solution, etc.

3. What differences exist between the air pollution problems in more developed countries compared to less developed countries? Are there also differences in the kinds of solutions they seek? What factors contribute to these differences?

More developed countries are often wealthier, and their problems may stem from luxury items and industry itself. This includes carbon dioxide emissions from large numbers of cars, methane from large herds of cows because the country's residents can afford more meat, and acid rain from factories. Less developed countries may have older or less regulated technology that creates more emissions, such as out-of-date factories or oil drills. Poorer sanitation systems also may allow more human and industrial waste to pollute the water and air, and wood-burning stoves may lead to indoor air pollution. Both kinds of countries may look for cleaner technology and better governmental regulation, but these solutions may take different forms based on the point at which each country starts. More developed countries may pay particular attention to reducing individual consumption.

4. Are there any direct links between specific causes of air pollution and certain effects?

There are many linkages, but a partial list includes:

- *Particulate matter from burning fossil fuels in vehicles or industrial processes can cause inflammation of the lungs and heart disease, as well as damage soil for plants.*
- *Smog from coal burning and vehicle emissions can result in emphysema, bronchitis, or asthma, and the greenhouse gases released intensify global warming, which can disrupt the growing cycle of plants and alter the habitat of plants and animals.*
- *Chlorofluorocarbons from cleaning solvents or refrigerants deplete ozone and increase UV ray exposure, leading to increased risk of skin cancer and harming the cyanobacteria that supply many plants with nitrogen.*
- *Indoor air pollution from mold can cause neurological problems, carbon monoxide from cigarettes or defective central heat can cause nausea or death, and asbestos in building materials can cause lung cancer.*

5. Do you see any themes in the Effects of Air Pollution column? Are you able to group the effects into categories? (It may be helpful to have the students move the sticky notes around and into groups of similar effects in order to find appropriate categories.)

Students will most likely see effects dealing with health problems and others dealing with environmental damage.

6. Which items in the Causes of Air Pollution column tend to create more health problems? Which tend to contribute more to environmental damage?

Answers will vary. You may want to refer students to the Earth Matters' Background Reading, "Gasping for Clean Air," which describes the extent of health problems and environmental problems from specific pollutants.

assessment

Collect and assess the Student Worksheets. Students complete an exit ticket explaining the most interesting trend or pattern they saw among the charted articles.

follow-up activity

Have students research one U.S. regulation that has been implemented to reduce air pollution through the Clean Air Act and write 2-3 paragraphs summarizing their findings and including measurable results. Suggested list of items that the EPA regulates are:

- car emissions
- coal-fired power plants
- refineries
- steel mills
- cement plants
- household and farming chemicals
- industrial equipment
- vessels and large ships
- air crafts

¹United Nations Environment Programme. (2020, February 11). What's in the air? World Urban Forum launches world's real-time air quality databank. Retrieved from <https://www.unenvironment.org/news-and-stories/story/whats-air-world-urban-forum-2020-launches-worlds-largest-real-time-air>

²World Health Organization. (2021, September 22). Household air pollution and health. Retrieved November 23, 2021 from <https://www.who.int/news-room/fact-sheets/detail/household-air-pollution-and-health>

CLEARING THE AIR | student worksheet

Name: _____

Date: _____

Article Title: _____

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