

CARS CARS CARS
Lesson Plan & Teacher's Guide
Grades 2-8



Dear Teacher,

San Diego and Imperial County have unhealthy air pollution. Both areas do not meet state clean air standards for smog (ozone) and particle matter. For good overall health, all living things need to breathe clean air.

Vehicle exhaust causes the majority of local air pollution. About 50% of San Diego's smog-forming emissions come from cars, trucks and buses. Vehicles also contribute to particle matter air pollution. Imperial County's pollution comes from vehicles, diesel engines and agricultural processes. Air pollution makes breathing more difficult and contributes to asthma and other respiratory disease.

All of us must do our part to fight air pollution. Kids and adults alike can take action to help clean the air. If we drive less, carpool, combine trips, drive low or zero emission vehicles and keep our cars properly maintained we can make our air cleaner to breathe. By providing the "**CARS CARS CARS**" Lesson Plan to your students, you do a great deal to educate future drivers about air pollution, the role vehicles play and what can be done to help.

Thank you for your assistance in helping to improve San Diego and Imperial County's air quality. For additional information or materials please call the American Lung Association at (619) 297-3901.

Sincerely,

American Lung Association of
San Diego & Imperial Counties

◆ **Objectives**

Students will:

1. Be informed that breathing dirty air is unhealthy to the lungs and body.
2. Be informed that our community has an unhealthy air pollution problem.
3. Discuss what air pollution is and what causes air pollution.
4. Discuss how to reduce air pollution from vehicles.
5. Discuss what children and adults can do to help make the air cleaner to breathe.
6. Draw a picture that shows what actions kids or their families can take to reduce air pollution from vehicles.

MINUTES	ACTIVITIES	AUDIO/VISUAL
5	1. Introduction	Inside Your Lungs Poster
20	2. Group Discussion	
20-30	3. Poster Activity	
Total: 45-55 Minutes		

◆ Classroom Introduction

1. Tell your class that people and animals all need clean air to breathe.

[Hold up the "Inside Your Lungs Poster"]

Explain that air enters the body through the lungs. Air (oxygen) keeps our bodies alive and breathing clean air keeps our lungs healthy.

2. Explain that the lungs show the effect of the air they breathe in. If we breathe only clean air our lungs stay healthy and pink. But, when we breathe dirty (polluted) air, our lungs change color and darken from particles present in the air. Breathing dirty air can damage our lungs and make us sick.
3. Explain that we live in a community where the air outside is not clean. Mention that San Diego and Imperial have an unhealthy air pollution problem. Tell students that San Diego and Imperial do not meet state health standards for smog and particle matter. Ask if anyone has noticed that on some days the air outside is brown. Have you ever seen smoke coming out of the tailpipe of a car, truck or bus? Where?
4. Tell the class that today they are going to learn about how air pollution, especially from cars can harm their lungs and what can be done about it.

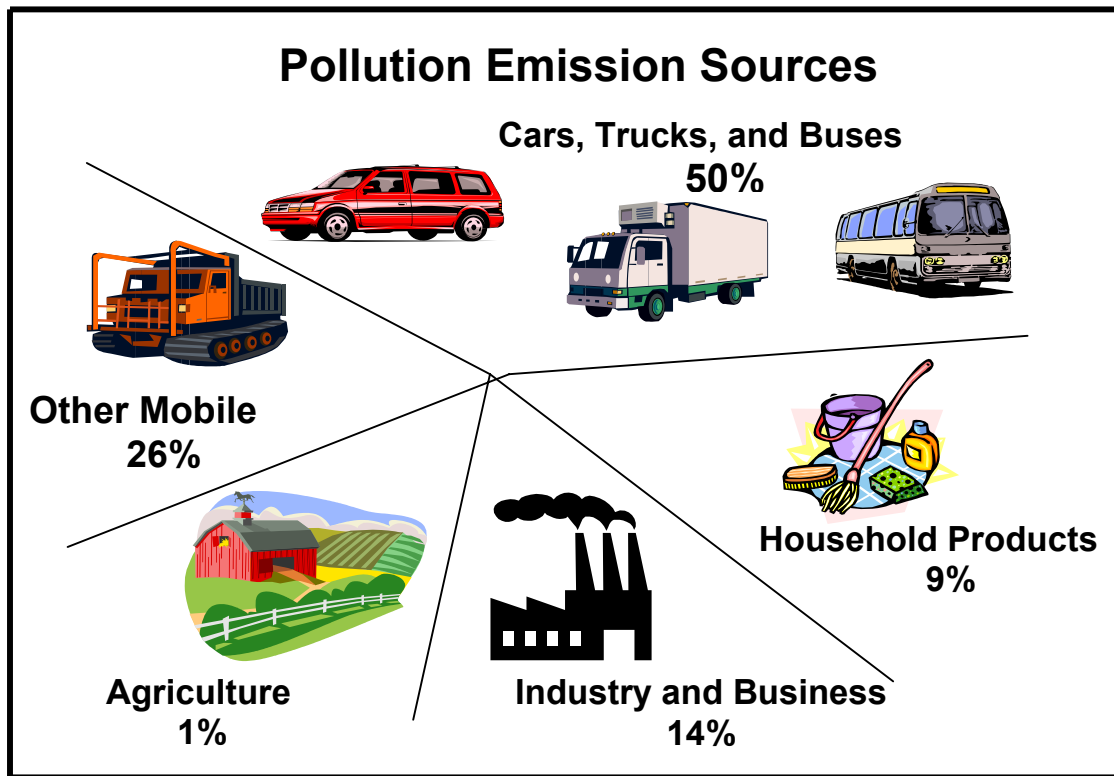
◆ Group Discussion

Conduct your group discussion by asking the following questions:

1. Air pollution comes in many forms from man-made and natural sources. Gases, particles and a variety of chemicals can enter the air when fuels are burned for electricity, or when gasoline is burned in cars. Industrial processes like welding or painting and agricultural processes like field burning or soil tilling cause air pollution.
2. In San Diego most of our air pollution comes from vehicles such as cars, trucks and buses. In fact, about 50% of our air pollution comes from vehicles.
3. In Imperial County air pollution comes from vehicles, diesel engines and agricultural processes.
4. Can you name some sources of air pollution?

[Draw the following chart on the whiteboard for your class.]

Source: San Diego Air Pollution Control District Annual Report ©2003



2. A lot of our air pollution comes from vehicles. For vehicles to work they need to be powered by fuel. The majority of vehicles on the road use gasoline for fuel. Gasoline does not burn completely and some of it comes out of a vehicle's tailpipe as air pollution. These pollutants react with sunlight to form smog, which is bad for our lungs. Do you know what pollutants are caused by vehicle emissions?
- Carbon Monoxide: An odorless, invisible gas that enters the body through the lungs, and forms a compound that depletes oxygen in the blood, putting a strain on the lungs and heart.
 - Hydrocarbons: Byproducts of burning gasoline that react with nitrogen dioxide and sunlight to form smog (ozone) air pollution, which irritates the eyes, nose and throat, while causing headaches, chest pains and difficulty breathing.
 - Nitrogen Dioxide: Besides contributing to the formation of smog (ozone) air pollution, this gas can damage lung tissue, aggravate asthma and lower the body's resistance to infection.
 - Particulate Matter: Particulate matter is composed of microscopic particles including dust, soil, mold, pollen, smoke, soot and ash. Very fine particles (PM_{2.5}), which hurt our lungs the most, are formed in the air by a chemical reaction. Emissions from combustion sources such as vehicles, diesel engines and industrial facilities are sources of fine particulate matter pollution. Particulate matter can damage the lungs directly by inflaming or destroying the lung tissue.

E. Toxic Air Emissions: In addition to smog and particulate matter, gasoline and diesel fuels contribute to toxic air emissions. Toxic air emissions contain chemicals, such as benzene, which can contribute to cancer and other health effects. Diesel fuel in particular produces very harmful fine particles we can breathe when it burns.

3. Breathing dirty air can make you feel sick and hurt your lungs. Have you ever felt sick on a smoggy day? How did you feel?

Short-Term Health Effects

- | | |
|--------------------|------------------------|
| 1. Irritated eyes | 6. Shortness of breath |
| 2. Sore throat | 7. Wheezing |
| 3. Cough | 8. Feel tired |
| 4. Headache | 9. Nausea |
| 5. Chest tightness | |

Long-Term Health Effects

1. Less lung power (harder to blow up balloons)
 2. Irritated airways
 3. More colds and lung infections
 4. More susceptible to asthma (wheezing problems)
4. Since a lot of our air pollution comes from vehicles, to clean up the air we need to do something about reducing this source of air pollution. Can you think of some ways to reduce smog from cars, trucks and buses?

Some ways to reduce smog and particles from cars, trucks and buses are:

1. Ask parents and others to drive less - Try biking, walking, carpooling, or using public transit instead of driving.
 2. Combine trips - Cars pollute more when their engines are not warmed up. This is called a cold start. In fact, more than half the pollution happens when drivers start the car. It takes several minutes to warm up a pollution-saving device in your car called a catalytic converter so that it operates efficiently. If the car sits for more than an hour, the cold start process begins again. So, by combining errands into one trip, you can lower your car's contribution to air pollution.
 3. Ask your parents or school to consider buying a vehicle that causes less air pollution. Vehicles that pollute less include:
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- A. Vehicles that are powered by fuels that burn cleaner than gasoline called “Alternative Fuels”.
- B. Vehicles that produce less air pollution include California’s Low-Emission Vehicles such as – Low Emission Vehicle (LEV), Ultra-Low Emission Vehicle (ULEV) and Super-Ultra Low-Emission Vehicle (SULEV) and alternative fuel vehicles like natural gas, propane and electric vehicles. Let’s take a look at some of the benefits of alternative fuel vehicles. (Refer to Chart A.)

CHART A – Alternative Fuels Vehicle Chart

Fuel	Propane Vehicles	Natural Gas (Methane) Vehicles	Methanol Vehicles	Ethanol Vehicles	Electric Vehicles
Description	Propane is liquified petroleum gas.	Natural gas, or methane, originates in the ground, but is also made from biomass.	Methanol is also called wood alcohol or methyl alcohol and is made from natural gas, wood, coal, or biomass.	Ethanol is a liquid alcohol fuel produced from biomass, grain or agricultural waste.	Electricity powers electric cars. Power is stored in batteries or fuel cells.
Advantages	<ul style="list-style-type: none"> • Cheaper than gasoline today • Most widely available clean fuel today • Somewhat lower emissions of ozone-forming hydrocarbons and toxics • Excellent fuel, especially for fleet vehicles 	<ul style="list-style-type: none"> • Very low emissions of ozone-forming hydrocarbons, toxics and carbon monoxide • Can be made from a variety of feedstocks, including renewables • Excellent fuel, especially for fleet vehicles 	<ul style="list-style-type: none"> • Excellent automotive fuel • Low emissions of ozone-forming hydrocarbons and toxics • Can be made from a variety of feedstocks including renewables 	<ul style="list-style-type: none"> • Excellent automotive fuel • Low emissions of ozone-forming hydrocarbons and toxics • Made from renewable sources • Can be domestically produced 	<ul style="list-style-type: none"> • Potential for zero vehicle emissions • Power plant emissions easier to control • Can recharge at night when power demand is low
Disadvantages	<ul style="list-style-type: none"> • Cost will rise with demand • Limited supply 	<ul style="list-style-type: none"> • Higher vehicle cost • Lower vehicle range • Less convenient refueling 	<ul style="list-style-type: none"> • Fuel could initially be imported • Somewhat lower vehicle range 	<ul style="list-style-type: none"> • High fuel cost • Somewhat lower vehicle range 	<ul style="list-style-type: none"> • Current technology is limited • Higher vehicle cost; lower vehicle range, performance • Less convenient refueling

Source: Facts about Alternative Fuels, American Lung Association.

Car buyers in California now have a lot of choices when selecting a car to buy that causes less air pollution. **Refer to the EPA Green Vehicle Guide at:**

www.epa.gov/autoemissions/select.htm and www.fypower.org/save_gasoline/ websites to look at different car models and the amount of smog and green house gases each produces.

When shopping for a vehicle, remember to look under the hood and read the Vehicle Emission Control Information Label. This label clearly shows what emission standards a vehicle was designed to meet and includes important tune-up and engine identification information.

Teachers Note: **Hybrid vehicles** are more energy efficient, but they do not necessarily produce less air pollution emissions. Refer to EPA's Green Vehicle Guide online at www.epa.gov/autoemissions/select.htm to compare hybrids to other makes and models. For the latest information on **Fuel Cell vehicles**, please log on to: www.fuelcellpartnership.org.

4. Ask your parents to give the family car a tune-up - A vehicle that is properly maintained pollutes a lot less and gets better gas mileage. To properly maintain a vehicle it's important to:
 - Keep your engine properly tuned.
 - Maintain fluids at proper levels.
 - Ensure that fuel lines and fuel line filters are in good condition.
 - Properly seal fuel-tank caps.
 - Keep tires properly inflated.
 - Don't top off the gas tank when fueling because gasoline spillage evaporates and contributes to smog.
 5. Support the Smog Check Program - The California Smog Check program helps identify cars, which pollute excessively. The new Smog Check program will be responsible for removing an additional 100 tons of pollutants from California's air everyday.
 6. Report cars with excessive tailpipe emissions. Call 1-800-28-SMOKE (1-800-287-6653) in San Diego to report "smoking vehicles" you see on the roads.
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◆ How to Protect Your Health From Smog

Sometimes the air becomes so dirty government officials announce a "health advisory" or a "smog alert". Do you know what to do when the air is not good?

Things To Do On Smoggy Days

1. Avoid strenuous exercise (running, bicycling)
2. Play indoors if you can
3. Pay attention to how you feel
4. Drink a lot of fluids
5. Avoid, dust, smoke and sprays
6. Carpool and use less electricity

◆ Poster/Drawing Activity

Distribute the Kids for Clean Air™ poster paper to your class (or blank poster paper). Ask students to draw a picture showing what they can do to help reduce air pollution from cars, trucks and buses.

Note: If participating in the American Lung Association's "Kids for Clean Air Poster Contest" explain contest guidelines. Remember to submit student entries to the Association by completing and returning the Teacher Evaluation Form and the pre/post quizzes. For more information call the American Lung Association at: (619) 297-3901.

Acknowledgments

The American Lung Association of San Diego and Imperial Counties would like to thank our sponsors for their support of the *Kids for Clean Air™* program. These sponsors include the **San Diego Air Pollution Control District and Advanced Transportation Technology Program at Miramar College.**



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