



THE GREEN TEAM Clean Air Activities

THE GREEN TEAM
A program of the
Massachusetts Department
of Environmental Protection

E-mail: recycle@thegreenteam.org

www.thegreenteam.org

IDLING REDUCTION PLEDGE

OBJECTIVES

The Idling Reduction Pledge is a teaching tool to empower students to help reduce air pollution at school and in the community. This activity will help students:

1. Understand the concept of air quality and how it affects health;
2. Understand how vehicle exhaust contributes to air pollution;
3. Take action to improve air quality.



BACKGROUND INFORMATION with GLOSSARY

What is air quality?

"Air quality" is a term used to describe how clean or polluted the air is. Air quality is influenced by weather conditions and pollution released to the air from motor vehicles, factories, power plants and other sources.

Why is good air quality important?

Clean air is a resource on which we all depend. Air pollution negatively affects our health and the environment. Asthma, bronchitis, heart disease and lung cancer can be caused by smog, fine particles and other pollutants in the air we breathe. Children are particularly susceptible because their lungs are still developing and they breathe more air than adults do. Air pollution can also harm plants and animals and contribute to climate change.

How much and what kinds of pollutants come from motor vehicles?

While there are many sources of air pollution, at least 40% of smog-forming pollutants come from cars, buses and trucks. Gasoline and diesel engines emit carbon monoxide, carbon dioxide, particulates, hydrocarbons, nitrogen oxides and sulfur dioxide. Some of these combine with sunlight to form ground-level ozone, a major component of smog. Together, all the vehicles on the road are the biggest single source of smog and ground-level ozone and the second biggest source of greenhouse gases (after electricity generation) in the United States. Diesel engines are also a major source of particulates.

How can we reduce air pollution from motor vehicles?

A simple way to cut down on air pollution from motor vehicles is to eliminate unnecessary idling by turning off the engine when parking or waiting. Idling wastes fuel and adds to pollution. Exhaust from idling vehicles accumulates in and around schoolyards and buildings and can enter the buildings through air-intake vents and open doors. Because buses and cars frequently idle at schools, these buildings are especially vulnerable. With everyone's cooperation — parents, school bus drivers, and staff — we can clean up the air around our schools and communities by turning off our engines as soon as we pull into the driveway or parking lot at school, home and other locations about town.

ACTIVITY

Discuss air quality, air pollution and vehicle exhaust with your students. Explain how idling contributes to air pollution. Even though they may not drive yet, students can explain what they have learned and encourage their parents/guardians to eliminate unnecessary idling. Make a copy of the Idling Reduction Pledge for each student to bring home and ask their parents/guardians to sign. Discuss their results and encourage students to think of other ways they can help reduce pollution from vehicle exhaust (e.g. ride a bike, walk, carpool, take public transportation, encourage family to purchase a fuel efficient car, research alternative fuel vehicles or design their own). Students may monitor vehicle idling at the school before and after pledges are signed.

NEW Idling Reduction Materials are now available at www.thegreenteam.org. Preprinted Idling Reduction Pledge Cards, bumper stickers, windshield decals, palm cards, and "Idle-Free Zone" signs for outdoor posting are available free to GREEN TEAM members. Consider providing decals or bumper stickers to students who return signed pledges.



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IDLE-FREE SCHOOLS

The Idling Reduction Pledge is one component of a statewide idling reduction campaign supported by the Massachusetts Department of Environmental Protection. In addition to your students' GREEN TEAM participation, your school may also ask bus drivers and parents to eliminate unnecessary idling when picking up and dropping off students, and can post "Idle-Free Zone" signs in your school driveway or parking lot. These signs are available free to GREEN TEAM members at www.thegreenteam.org. To learn more or request additional materials, visit <https://www.mass.gov/guides/transportation-air-quality>.



ADDITIONAL RESOURCES

STATE AND FEDERAL AGENCIES

Because the pollutants emitted by motor vehicles have significant health and environmental impacts, they are regulated by the federal Environmental Protection Agency (EPA) and in Massachusetts by the Massachusetts Department of Environmental Protection (MassDEP).

MassDEP uses several programs to reduce emissions from motor vehicles, such as requiring that new cars meet California standards, and periodic testing to ensure that vehicles on the road are maintained and not polluting excessively. Massachusetts state laws (M.G.L. Chapter 90, Sections 16A and 16B) and MassDEP's anti-idling regulation [310 CMR 7.11(1) (b)] prohibit unnecessary vehicle idling for more than five minutes. State and federal laws and regulations alone, however, cannot eliminate air pollution – it is up to each of us to take actions that sustain rather than degrade our environment.

WEB SITES

For more information about air quality in Massachusetts and the pollutants discussed in this activity, visit the Massachusetts Department of Environmental Protection's web site: <https://www.mass.gov/topics/air-quality>. For daily air quality forecasts in Massachusetts, visit: <http://eeaonline.eea.state.ma.us/dep/massair/web/#/pollution/map/max>.

For more information about air quality in the United States, visit the U. S. Environmental Protection Agency's web site: www.epa.gov/environmental-topics/air-topics.

For real-time air quality forecasts and additional teacher resources about air quality, visit: www.airnow.gov, a site sponsored by the U.S. Environmental Protection Agency.

For Information about fuel economy of specific cars and alternative fuels, visit www.fueleconomy.gov, sponsored by the U.S. Department of Energy.

For "Give Your Car a Break-Trip Tally" and other sustainable transportation activities such as the Junior Solar Sprint, visit www.thegreenteam.org/wp-content/uploads/2020/08/Give-your-Car-a-Break-Trip-Tally-Lesson-Plan.pdf, Northeast Sustainable Energy Association's website.

For a manual and curriculum on developing a "Safe Routes to Schools" walk-to-school program at your school, visit MassDOT's Safe Routes to School program website: <https://www.mass.gov/safe-routes-to-school>.

For more educational resources and activities on clean air, visit "Air Pollution: What's the Solution?" at www.ciese.org/curriculum/airproj, an educational web site designed for grades 6-9 by the Center for Innovation in Engineering and Science Education (CIESE) at Stevens Institute of Technology, the Northeast States for Coordinated Air Use Management (NESCAUM) and the U.S. Environmental Protection Agency.

For more clean air educational resources, visit <https://www.4cleanair.org/wp-content/uploads/Documents/EducationalResourcesAQAW-2020.pdf> on the National Association of Clean Air Agencies (NACAA) website.

For more information about the environmental impact of vehicle idling, including an infographic and resources for schools, see Sustainable America's "Turn it Off" campaign at www.iturnitoff.com/#/savings.

Clean Air Activity - Suggested Grades: Kindergarten through Twelfth Grade



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GLOSSARY (Additional glossaries for different age levels can be found on the web sites listed above)

Air quality - A term used to describe how clean or polluted the air is.

Carbon dioxide or CO₂ – A colorless, odorless gas formed during combustion and respiration. It is comprised of one carbon atom and two oxygen atoms. Carbon dioxide is a major greenhouse gas.

Carbon monoxide or CO – A poisonous gas produced by incomplete fossil fuel combustion, released in the exhaust of motor vehicles. Carbon monoxide is comprised of one carbon atom and one oxygen atom and is colorless and odorless.

Climate Change - This term is commonly used interchangeably with "global warming" and "the greenhouse effect," but is a more descriptive term. Climate change refers to the buildup of man-made gases in the atmosphere that trap the sun's heat, causing changes in weather patterns on a global scale. The effects include changes in rainfall patterns, sea level rise, potential droughts, habitat loss, and heat stress.

Combustion – The process of burning; a chemical process accompanied by heat in which substances combine with oxygen in air.

Diesel engine – A type of internal combustion engine powered by diesel fuel, often used in buses, trucks, trains and heavy machinery. Diesel engines are about 30% more fuel efficient than gasoline engines, but emit more particulate pollution.

Diesel fuel - A form of liquid petroleum used to power diesel engines. The federal government is requiring cleaner diesel fuel and engines that operate with reduced emissions. A great deal of work is ongoing to make cleaner diesel engines and fuel available, such as ultra low sulfur diesel fuel and biodiesel (a blend of diesel fuel and vegetable oils).

Exhaust – Waste gases from an engine.

Fine Particles - Microscopic pieces of matter such as those found in smoke and haze, that are 2.5 microns in diameter or smaller. For comparison, the thickness of a human hair is about 50 microns! Fine particles can pass through the throat and nose and enter the lungs.

Fossil Fuel - Fuel derived from ancient organic remains, for example, petroleum, gasoline, diesel, coal and natural gas.

Fuel – Material burned as a source of energy, warmth or light.

Gasoline – A fuel distilled from petroleum used to power motors and vehicles with gasoline engines.

Gasoline engine - A type of internal combustion engine powered by gasoline, often used in cars, SUV's, minivans and small trucks.

Global warming – A rise in the Earth's temperature caused by an increase in "greenhouse" gases.

Greenhouse gas – Any gas that traps heat in the atmosphere, creating a "greenhouse effect" and contributing to global warming. Carbon dioxide, methane, particulate matter, nitrous oxide, fluorinated compounds, and ozone are some of the compounds considered to be greenhouse gases.

Ground-level ozone – Ozone or O₃, consists of three oxygen atoms. Ozone is a toxic gas. When ozone forms at ground level, it becomes the predominant ingredient of smog. Ozone near the ground is created through a series of chemical reactions involving sunlight, nitrogen oxides, volatile organic compounds and other waste gases produced as a result of fossil fuel combustion in motor vehicles, power plants, industrial boilers, etc. Ground-level ozone irritates eyes, nose, and throat, aggravates asthma, heart and lung disease, and decreases lung function. (Unlike the ozone in the upper atmosphere, ground-level ozone has no beneficial effects. See stratospheric ozone).



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GLOSSARY (Continued)

Hydrocarbons – Chemical compounds that consist entirely of carbon and hydrogen. Hydrocarbons are formed during incomplete fuel combustion and released in motor vehicle exhaust. When combined with nitrogen oxides in the presence of sunlight, hydrocarbons produce ground-level ozone and smog.

Idling – Operating a gas or diesel engine while the vehicle is not moving, such as while parking or waiting.

Nitrogen oxides or NOx - By-products of fuel combustion containing nitrogen and oxygen atoms in various combinations (e.g., nitrogen dioxide). Nitrogen oxides contribute to the formation of ground-level ozone, smog, and acid rain.

Particulates – A mixture of extremely small particles and tiny liquid droplets. Particulate pollution may consist of acids (such as nitrates and sulfates), organic chemicals, metals, soil or dust particles.

Pollutant – Any substance introduced into the environment that adversely affects the health of humans, animals, or ecosystems or the usefulness of a resource (such as air, water, soil, vegetation).

Pollution – Contamination of air, water, soil or other natural resources by a substance that because of its chemical composition or quantity prevents the functioning of natural processes and produces undesirable environmental and health effects.

Smog – A noxious mixture of air pollutants, sometimes visible as a brown haze. The word is a blend of “smoke” and “fog” and was coined in London in the early 1900’s when coal smoke polluted fog. Nowadays, smog refers to a mix of ground-level ozone, nitrogen oxides, volatile organic compounds and particles in the air from sources such as vehicle exhaust, smoke, and industrial emissions. Sunlight causes chemical reactions among many of these compounds, which can increase their harmful effects.

Stratospheric ozone – Ozone or O₃, occurs naturally in the stratosphere from solar-induced chemical reactions, and at that altitude it protects us and our environment from the sun’s harmful ultraviolet rays.

Sulfur dioxide or SO₂ - Sulfur dioxide, consisting of one sulfur atom and two oxygen atoms, is produced during combustion of fossil fuels such as coal, oil, gasoline and diesel. Sulfur dioxide and other sulfur oxides are a major source of fine particle pollution and contribute to acid rain.

