

**CLEAN AIR
CHAMPIONS**



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AIR PUR**

“Getting Active for Cleaner Air”

Education Resource Kit

Objectives

This Kit is targeted at the **10-13 year age group**. It offers educators and participants simple and fun, physically active games with themes based on air pollution and health. The main **objectives** are to:

- ◆ Integrate the disciplines of physical fitness, health, and environmental education (specific to air quality issues) in a fun, active way;
- ◆ Instill in the participants an understanding and a sense of responsibility for both their health and the well-being of the environment in which they live; and
- ◆ Provide educators with a range of teaching tools and resources related to air quality, health, and physical activity.

What's Inside This Kit

- ◆ A dynamic **colour poster featuring Canadian Olympic and National Team athletes** with the slogan **"Be A Clean Air Champion"**.
- ◆ Informative, easy to read **Fact and Information Sheets** for educators.
- ◆ **Games and Activities** to promote physical activity and learning .
- ◆ A list of related **Links and Web Sites**.
- ◆ Cool **"I'm A Clean Air Champion" stickers** as incentives.

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AIR POLLUTION

Air pollution is a serious problem in Canada and throughout the world. It is linked to heart and lung problems such as worsening of asthma and breathing difficulties. The people most sensitive to the health effects of air pollution include children, people with heart or lung disease, seniors, and individuals who are physically active outdoors.

What Is In Air Pollution?

There are several chemical compounds present in the atmosphere that contribute to air pollution and smog. Evidence gathered to date indicates that two of the most harmful components of air pollution are ground-level ozone and fine airborne particles. Their sources are varied and include emissions from vehicles, fossil fuel burning engines, industries and factories, chemical sprays, oil-based paints, and airborne dust, to name the most significant.

The word "smog" was first coined in London, England decades ago to describe a particularly severe episode of smoke and fog. It is now used to refer to a specific combination of airborne particles, gases and chemicals that together affect our health and our natural environment.

Air pollution has no boundaries and can travel great distances in the atmosphere. You can be exposed in either urban or rural environments. Air pollution can occur in both summer and winter and its levels may vary. This can be because of air temperature, sunlight, wind patterns, thermal inversions (interactions between warm and cold air masses), and topography (mountains, large bodies of water etc.).

Ground-Level Ozone And Particulates

Ground-level ozone (O_3) is produced by a chemical reaction between sunlight, **nitrogen oxides** (NO_x) and **volatile organic compounds** (VOCs). While these compounds come from both natural and human activities, human activities are responsible for the significant increases in ground-level ozone in modern times. About 95 per cent of nitrogen oxides from human activity come from the burning of coal, gas and oil in motor vehicles, homes, industries and power plants. VOCs come mainly from fuel combustion and from the evaporation of liquid fuels and solvents.

Ground-level ozone is a colourless gas that should not be confused with the **atmospheric ozone layer** which is the beneficial layer of ozone surrounding the Earth and protecting us from harmful ultraviolet radiation, a leading cause of skin cancer.

Particulates are fine solid or liquid particles produced primarily by the burning of fossil fuels, transportation, the smelting industry, the pulp and paper and wood industries, and wood smoke. Particulates include metals such as copper and zinc as well as compounds of nitrogen and sulphur that begin as gases and form into particles in the atmosphere. The particles give smog its hazy yellow-brown colour and affect visibility.

All forms of particulates, such as soot or dust, are not the same, and each impacts human health differently. Large particulates are about 10 microns in size or larger. They come from mining and construction, or are blown off roads and fields. They are not nearly as hazardous to our health as the small particulates. Small particulates are about 2.5 microns in size or one-tenth the diameter of a human hair. They come primarily from vehicle emissions, fuel combustion and industrial activities. These tiny particulates penetrate deep into our lungs causing damage to the lung tissue, particularly the bronchioles and alveoli and are also absorbed into the circulatory system.

Did You Know?

About 40% of nitrogen oxides come from transportation (cars, trucks, buses, and trains), about 25% from thermoelectric power stations, and the balance from other industrial, commercial, and residential combustion processes.

(Environment Canada, FAQ on Acid Rain, www.ec.gc.ca)

Other Components Of Air Pollution

Nitrogen dioxide (NO_2) is a principal member of the family of nitrogen oxides (NO_x). It is a toxic, irritating gas that results from all combustion processes.

Sulphur dioxide (SO_2) is a colourless gas that smells like burnt matches. It can be chemically transformed into acidic pollutants such as sulphuric acid and sulphates (sulphates are a major component of fine particles). The main sources of airborne SO_2 are coal-fired power generating stations and smelters. Sulphur dioxide is also the main cause of acid rain, which can damage crops, forests and whole ecosystems (see below).

Carbon monoxide (CO) is a colourless, odourless and tasteless gas that comes primarily from vehicle emissions.

Acid rain is a by-product of air pollution. It is the result of chemical reactions of nitrogen and sulphur in the atmosphere. The resulting acidic water droplets can be carried long distances by prevailing winds, returning to Earth as acid rain, snow, or fog. Acid rain is not only damaging to aquatic and terrestrial ecosystems but also to human health. This can take the form of acid deposition on the food and water we consume, increased levels of heavy metals in our drinking water, and a contributor to respiratory problems, particularly in children.

Did You Know?

More than 80% of all Canadians live in areas with high acid rain-related pollution levels.

(Environment Canada, FAQ on Acid Rain, www.ec.gc.ca)



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Climate Change And Air Pollution - Are They Connected?

The burning of fossil fuels is the major connection between **climate change** and air pollution.

Emissions and gases such as carbon dioxide, methane, and nitrous oxide act like a blanket close to the Earth's surface and help trap its radiant heat, keeping our lower atmosphere warm. The majority of scientists believe that increased production of these gases is contributing to changes in the Earth's climate, a phenomenon also referred to as **global warming**. The possible effects of this trend are numerous, including hotter temperatures, more diseases transmitted by rodents, ticks or mosquitoes due to changes in precipitation and temperature, and more severe and frequent extreme weather events such as heat waves, storms, floods and tornadoes.

Did You Know?

The 10 warmest years in global meteorological history have all occurred in the past 15 years.

(Government of Canada, What is Climate Change? <http://climatechange.gc.ca>)

Air quality is also seriously affected by global warming. Hotter days and increased sunlight, which are results of global warming, produce optimal conditions for the creation of ground-level ozone.

HEALTH IMPACTS

What Are The Potential Health Effects From Air Pollutants?

There is a direct relationship between exposure to air pollution and effects on human health. A variety of pollutants in both indoor and outdoor air are associated with respiratory problems in adults and children. Respiratory effects range from subtle symptoms such as sore throat to increased cough and wheeze, increased rates of asthma attacks, reduction in lung capacity and an increased risk of death. For a comprehensive look at the health effects of air pollution refer to the Health Canada web site at www.hc-sc.gc.ca/air.

Did You Know?

The number of children afflicted with asthma has increased 400 per cent in the past 15 years; it now affects 11 per cent of Canadian children.

(The Children's Health Project, Canadian Environmental Law Association and Ontario College of Family Physicians, 2000)

Who Is At Greatest Risk?

Those most seriously impacted by air pollution include children, seniors, people with cardio-respiratory conditions, and people who are physically active outdoors.

Children are at risk from the health effects of air pollution because they spend more time being active outside, they breathe faster for their body weight, and their bodies are developing.

Seniors are also very susceptible to air pollution because they often have suppressed or compromised cardiovascular and immune systems, and in many cases, pre-existing lung disease. Those with **heart conditions** may also be at greater risk. Recent evidence indicates that air pollution can affect the heart by increasing not only heart attack risk, but also sending up blood pressure and accelerating the heart rate.

When they are exercising hard, **athletes** and those **physically active outdoors** can increase their intake of oxygen by as much as ten times the levels at rest. Endurance athletes can process as much as twenty times the normal air intake as they breathe more rapidly and more deeply, and bypass the cleansing mechanisms of the nasal passageways. This combination of factors, plus the frequent and long-term exposure to high doses of air pollution, means that athletes and people physically active outdoors are at greater risk from the health effects of air pollution.

Warning:

"Exercising in highly polluted areas can lead to serious health damage".

(American Lung Association)

Getting Active A Must

There is no doubt that there are significant benefits to being physically active. Not only are there direct benefits to physical, mental, and social development, there are long-term benefits to society as a whole in terms of a healthier population, and considerable savings in health care costs.

We encourage all Canadians to be physically active but to do so wisely and safely. Be aware of daily air quality readings, modify outdoor exercise workouts if air quality is poor, especially on smog alert

Did You Know?

The benefits of regular physical activity include better health, improved fitness, better posture and balance, better self-esteem, weight control, stronger muscles and bones, feeling more energetic, relaxation and reduced stress, and continued independent living later in life. Conversely, health risks of inactivity include premature death, heart disease, obesity, high blood pressure, adult-onset diabetes, osteoporosis, stroke, depression, and colon cancer.

(Canada's Physical Activity Guide to Healthy Active Living, 1998, Health Canada and Canadian Society for Exercise Physiology)

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days, and avoid high traffic areas at peak traffic times as much as possible.

We also encourage you to consult your health care practitioner if you have any concerns about exercise, air quality, and your health.

TAKING STEPS

How You Can Avoid Exposure To Air Pollution.

- ◆ As a general rule, **avoid heavy traffic areas when exercising outdoors.**
- ◆ **On smog alert days, keep strenuous outdoor exercise, and playtime, to a minimum.**

What You Can Do To Prevent Air Pollution.

- ◆ **Get active for your health and the environment** - choose **physical activity** as your method of transportation whenever it is safe and possible to do so - **ride your bike, walk, jog, in-line skate ...**
- ◆ **Reduce energy consumption** - use the air conditioner only when absolutely necessary, adjust the thermostat, reduce the amount of time in the shower, turn off the lights, TV and computer - all of these actions will reduce smog as most energy production causes pollution.
- ◆ Take **public transportation** instead of being driven
- ◆ Rally support for your school to **participate** in International Walk to School Day and other **Active & Safe Routes to School Programs** like "No Idling".
- ◆ Encourage parents to **carpool** whenever possible.
- ◆ Use **air-friendly products** - avoid using aerosol sprays and cleaners and oil-based paints.

Did You Know?

Each motorized trip that is switched to cycling or walking avoids releasing 2.6 grams of hydrocarbon, 20 grams of carbon dioxide and 1.6 grams of nitrogen oxide **per passenger-mile.**

(Sectoral Task Force Report on Transportation, Ontario Round Table on Environment and Economy, 1992)

GAMES AND ACTIVITIES

Goals

- ◆ Focus attention on air pollution and its impact on human health.
- ◆ Motivate educators to implement physical activity as a tool to teach students about air pollution.
- ◆ Introduce a new, fun way for students to learn about air pollution while being physically active.
- ◆ Inspire youth to do their part to prevent and reduce air pollution.

1. Air Care:

Objective: To bring attention to issues related to air pollution and its impact on our health

Space: Gymnasium; large field; recreation room

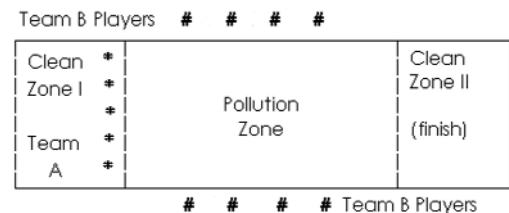
Equipment: pylons, soft rubber or foam balls

Description:

- ◆ Players are divided into two teams (suitable, fun names assigned such as "The Rollers" or "The Scrubbers").
- ◆ A rectangular playing area is marked out using the pylons.

Team A lines up at one end of the playing area in the safe "Clean Zone I". The other team lines up on each perpendicular side of the playing area facing each other. The object of the game is for the Team A to run across the playing area to the opposite "Clean Zone II" (see diagram).

As Team A tries to make it through the "Pollution Zone" safely, Team B members attempt to hit Team A with soft Nerf-type (soft foam) "pollution balls". If a player is hit with a ball they join the other team. When all the players on Team A either reach the safe "Clean Zone II" or are hit by "pollution balls" the teams switch.



The process is repeated with each team. The supervisor is given the opportunity to increase or decrease the number of "pollution balls" handed out in order to simulate more or less air pollution. The more pollution, the harder it will be for the teams to make it to the "safe zones" without being affected.

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Discussion:

1. **True or False?** The ozone layer acts as a natural filter of UV rays.
2. **True or False?** The depletion of ozone is causing a general warming of the Earth's surface.
3. What are some ways human beings are harming the atmosphere and altering the balance of gases?
4. What can we do to reduce the amount of harmful gases released into the atmosphere?
5. **True or False?** Simply wearing sunscreen will solve the problems caused by a depleted ozone layer.
6. What are the long-term effects a gradual warming of the earth will have on plants, animals and humans?

2. Clean Air Obstacle Course:

Objective: Youth learn to appreciate the complexity of the issues and how they can help reduce air pollution
Space: Large recreation room or outdoor playing field
Equipment: 4 large sturdy hula-hoops, 32 bean bags, 4 large bins, 16 volleyballs (or balls of similar size), 5 pylons (or markers), a timer

Description:

- ◆ Divide players into teams of four.
- ◆ Use pylons to define the four corners of the playing area and the centre. The obstacles should be setup in each corner near the pylons.
- ◆ Each team is assigned to one corner and at the start signal each of the four teams completes all three obstacles from their corner.
- ◆ Each team must remain inside a "carpool" hula-hoop during the entire game.
- ◆ The game is timed. The winner is the team that finishes all obstacles in the fastest time.

Obstacle 1: Trash Toss - All members of the team stand in their hoop and throw two bean bags each into their bin approximately 3 metres from their start point. Any missed bean bags must be retrieved by the team and re-thrown from the start point until all are in the bin.

Obstacle 2: Hustle Bustle - The teams must circle the outside of the playing area once, starting and finishing in their corner. They must go outside of all the pylons without disturbing the other teams, or letting the hula-hoop touch the ground.

Obstacle 3: Hop & Clean - While still in their carpool hula-hoop, each team member must place a pollution particle (a volleyball) between their knees and hop with it from their corner around the

centre pylon and back to their corner - any dropped particles must be retrieved and the team must re-start at the point where the ball first fell (supervisor may need to be referee at this obstacle).

Discussion:

1. **True or False?**
 - Vehicles are not a major source of air pollution.
 - Airborne particles can cause lung damage.
 - Trees do not help clean our air.
 - Garbage dumps are a major source of methane gas.
2. How can we cooperate to improve air quality?
3. How does carpooling improve air quality?
4. What are some of the transportation services/programs in your community that help reduce air pollution?

3. Clean Air Shuffle:

Objective: Youth learn the value of teamwork and to appreciate how air pollution issues are interconnected
Space: Large playing area
Equipment: Large gym mats (for 6-8 participants) - two mats per group. Coloured tennis or golf balls

Description:

- ◆ Divide participants into even-numbered teams (names reflect positive forces like "The Sweepers" or "The Carpoolers").
- ◆ Establish a start line and a finish line.

Each team begins by standing on one mat at the start line - with the other mat directly in front of the mat they are standing on. When the activity begins, all members of each team will step on to the new mat (heading towards the finish). Once on, they must pick up the first mat, lift it over their heads, place it in front of them and continue the process towards the finish line. This will appear similar to a leapfrog activity. All team members must be on a mat AT ALL TIMES!

To add excitement the playing area becomes a polluted environment and the players attempt to cross over the pollution to a "Clean Air Environment". As the students cross the polluted area, one team member picks up as many balls in the polluted area as possible. Each different coloured ball represents one of the elements in air pollution (carbon dioxide, nitrogen oxide, acid rain etc.).

The team that collects the most balls to clean the air, and make it to the finish line before the others, wins.

Discussion:

1. How can you help to clean up the air? Your school? Community?
2. In what ways does air pollution harm our health?
3. Why do you have to be careful during a Smog Alert Day?
4. Are there certain times of day that are better than others for playing or exercising outside?

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4. Clean Air Hopscotch:

Objective: Reinforce air quality vocabulary
Space: A large, flat surface for setting board e.g., gymnasium, paved yard, or hallway
Equipment: Tape and/or chalk, small tokens for throwing

Description:

Hopscotch boards can be designed in different shapes and sizes for a variety of age levels and abilities and can be adapted to include both positive and negative aspects of air quality. The negative terms (e.g., chlorofluorocarbons) could be designed as squares you should not land on, and if you do, you must begin again. Chalk can be used to draw outdoor boards, and for indoor boards, masking or painters green tape works well (will not stick to floors).

Some word/term suggestions: chlorofluorocarbons, ozone, carbon dioxide, oxygen, trees, walk, emissions, fossil fuels, greenhouse gases, climate change, atmosphere, etc. (see Terms of Reference Table).

Discussion:

1. Is it important to understand what smog and air pollution are all about? Why?
2. Can you make a difference or is the problem just too large?

5. Trivia Tag:

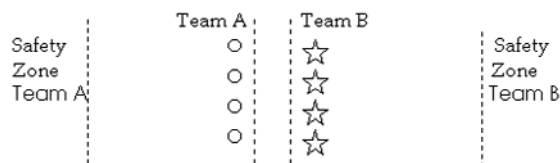
Objective: To confirm youth's understanding of air quality issues.
Space: Large playing area
Equipment: Eight pylons

Description:

- ◆ Divide the group into two teams.
- ◆ Set up a playing area by having two lines approximately 3 metres apart designated by pylons. Behind each of these lines set up another parallel line about 20 - 30 metres back.

The two teams (Team A and Team B) line up facing each other on their respective lines. The leader reads a question to which the answer is either true or false (see questions and answers supplied below). If the answer is true then Team A chases Team B and tries to touch them before they get behind their safety zone. If the answer is false then Team B chases Team A and tries to catch them before they make it behind their safety zone.

Once someone is tagged by a member of the opposite team they become that team's member.



After each question and chase, repeat the question and discuss the correct answer while the teams return to their starting positions. The game ends when all the players are on one team or when the questions have all been asked and the team with the most people wins. The questions can be adapted to suit specific levels of understanding, however, it is important to have an equal number of true and false answers.

Questions

1. Using less energy at home will help reduce air pollution. **True**
2. Carbon monoxide smells like burnt matches. **False.**
3. Air quality can be affected by climate change. **True**
4. Riding your bike to school is good for your health. **True**
5. Children are at less risk from air pollution than the average adult. **False**
6. Ground-level ozone is not a component of smog. **False**
7. Ground-level ozone protects us from ultraviolet radiation. **False**
8. People with asthma can be affected by air pollution. **True**
9. Taking public transportation regularly produces more air pollution than taking a car. **False**
10. Soot and dust are types of particulate matter. **True**
11. Sulphur dioxide is the main cause of acid rain. **True**
12. Transportation emissions are not important factors in air pollution. **False.**



Terms Of Reference

Word / Term	Definition
Atmosphere	The layer of gases surrounding the Earth: it filters out most of the sun's UV rays and it serves as a storehouse for gases that comprise air.
Carbon Dioxide (CO₂)	A colourless, odourless gas, one of the most important of the greenhouse gases and essential to plant life on Earth.
Chlorofluorocarbons (CFCs)	Human-made chemicals that create holes in the atmospheric ozone layer.
Climate Change	Results from the greenhouse effect and will cause major disruptions in various ecosystems around the world.
Global Warming	An increase in the average temperature of the Earth's surface in response to an increase in emission and greenhouse gases.
Greenhouse Effect	The insulating effect produced by gases in the Earth's atmosphere. It traps radiant heat and warms the planet.
Ground-Level Ozone	Formed by a reaction between nitrogen oxides and volatile organic compounds in the presence of sunlight. Levels have been greatly increased by human activities such as the burning of fossil fuels.
Methane Gas	A deadly gas byproduct of the breakdown of organic material - high concentrations found in garbage dumps. It contributes to the erosion of the ozone layer.
Ozone Layer	A gas layer in the upper atmosphere that acts as a natural filter blocking UV rays from the sun.
Particulates	Fine dust and soot particles from natural and human-made sources such as industrial activity, fossil fuel combustion, agriculture, fires etc.
Smog	A discoloured haze that is a combination of airborne particles, gases, and chemicals (ground-level ozone) that together affect our health and our natural environment.
Volatile Organic Compounds (VOCs)	VOCs are a major cause of ground-level ozone as a result of their chemical reaction with sunlight. They come mainly from fuel combustion and from the evaporation of liquid fuels and solvents.

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Links And Web Sites

GOVERNMENT OF CANADA

Health Canada - Health and Air Quality Program www.hc-sc.gc.ca/air

Environment Canada www.ec.gc.ca

MEDICAL

Canadian Association for Physicians for the Environment www.cape.ca

Canadian Lung Association www.lung.ca/children/grades4_6/respiratory/ (inside the Respiratory System, Teacher's Resource)

The Children's Environmental Health Network www.cehn.org (range of issues and information including Child Safety Tips for Parents)

ENVIRONMENTAL

Clean Air Champions www.cleanairchampions.ca (an organization that works with respected athletes to encourage Canadians to get active for the environment)

Go for Green www.goforgreen.ca (Active & Safe Routes to School, The Active Living and Environment Program)

Pembina Institute www.pembina.org (has curriculum materials for climate change lessons and other air quality issues)

Pollution Probe www.pollutionprobe.org (environmental watchdog focused on topical issues including air, water, soil quality and policy)

ENVIRONMENTAL EDUCATION AND SAFETY

Detour Publications www.detourpublications.com (a non-profit, on-line bookstore specializing in sustainable transportation and urban ecology).

Environmental Education Directory www.webdirectory.com/education/k-12

Green Teacher www.greenteacher.com/contents/contents66.html (focused on environmental education issues in Canada)

Safe Kids Canada www.safekidscanada.ca/English/Home.html (guidelines and suggestions of how to promote and encourage safety for children)

FITNESS

Canadian Association for Health, Physical Education, Recreation, and Dance (CAHPERD) www.cahperd.ca

Canadian Fitness and Lifestyle Institute www.cflri.ca (statistics on levels of fitness and related issues in Canada)

For further information contact:

Air Health Effects Division
Safe Environments Programme
Health Canada
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Ottawa ON K1A 0K9

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Or visit:
www.hc-sc.gc.ca/air

Or visit
www.cleanairchampions.ca