ONTARIO ecoschools écoécoles de l'ONTARIO

A TOOL KIT FOR SCHOOLS:

CLIMATE LEADERSHIP

TABLE OF CONTENTS

Acknowledgements

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EcoSchools Canada is a registered charity that aims to nurture environmental leadership, reduce the ecological impact of schools, and build environmentally responsible school communities. EcoSchools Canada administers the Ontario EcoSchools program.

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CLIMATE LEADERSHIP

Climate change is the defining issue of our time.
Climate change affects every person in every nation across the world. We have all heard about the impacts: melting glaciers, more severe weather, increased flooding of coastal cities, and greater threats to food and water availability. The threat to our world as we know it is significant and cannot be ignored.

Climate change is linked to our everyday choices.
Climate change is primarily caused by the burning of fossil fuels that release greenhouse gases into our atmosphere, which are then trapped in the atmosphere, contributing to rising temperatures. The more fossil fuels we burn in daily activities, the more we contribute to the problem. As we learn more about our individual and societal role in climate change, we can take the steps needed to mitigate (or reduce) its effects.

Climate change is political.
While most people in the world experience the negative effects of a changing climate, low-income and marginalized communities are the most vulnerable to the devastating impacts, from droughts to natural disasters. Understanding the undeniable links between climate change, inequality, and human rights is referred to as climate justice – an integral part of the climate change conversation.

It's time to take a stand for humans, animals, and ecosystems across the globe. Every person has the power to become a climate change leader.

Students as climate leaders
Students are the next generation to live with the impacts of climate change, and the ones who will shape the blueprint of how it will be addressed. It's time to encourage meaningful dialogue and action on the complexities of climate change, both inside and outside of the classroom. An important first step is to recognize everyone's unique role in contributing to, and mitigating, the problem.

CLIMATE LEADERSHIP

A resource for change

This kit is designed to educate students about climate change. It provides ideas and inspiration to mobilize school communities to take action and become changemakers.

There are many ways to learn about climate change, but here we focus on three main areas: consumerism, food, and transportation, with related activities and lesson plans. Each section of the kit seeks to reframe climate change from a vast global topic to a concrete problem that can be addressed through everyday actions.

We hope that this resource will be a launch pad for students to explore further and take action at school, at home, and in their communities.

How to be a climate leader

- Learn about the science behind climate change. What are the root causes? What are the time scales? Where are impacts being felt?
- Learn about the various ways that greenhouse gases are released into the atmosphere through human activity.
- Think about how you can make choices in your life to mitigate climate change.
- Make a list of the actions you will take to reduce your climate footprint.
- Spread the word! Share your knowledge with others and inspire them to take action too!

CLIMATE CHANGE 101:
UNDERSTANDING THE SCIENCE OF CLIMATE SCIENCE

Definition

Climate change occurs when long-term weather patterns are altered due to increased levels of greenhouse gases in the atmosphere.

Anthropogenic (or human-related) climate change can be defined as a change in global climate caused by human activity that goes beyond natural climate variations.[1]

Weather and Climate: What's the difference?

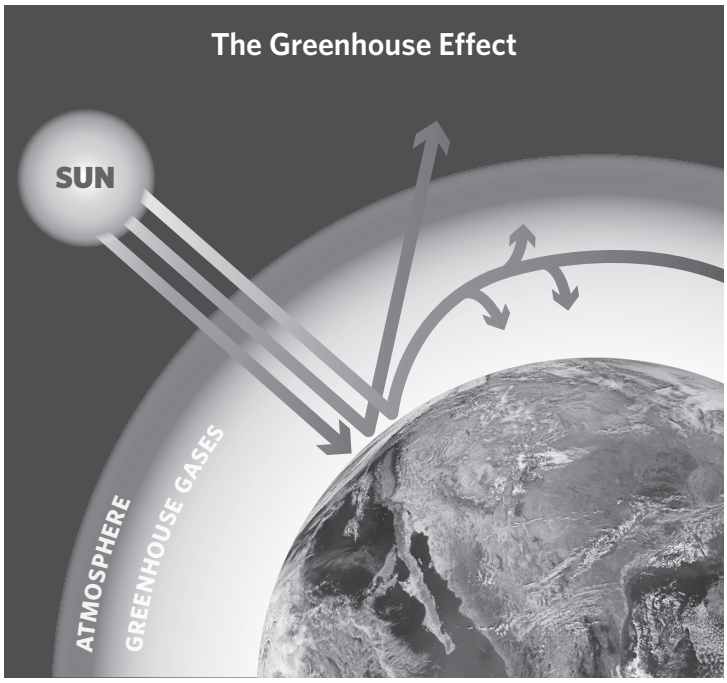
The key difference between weather and climate is the length of time being observed. Weather is what happens outside every day. For example, today is warm and windy; tomorrow will be cool and rainy. In contrast, climate is the average weather over a longer period of time (i.e., annual or multi-year). Every region around the world has an average climate. For example, in Barrie, Ontario, residents experience four seasons, from cold winters of -10°C to warm summers of 25°C. If you average out the weather in all regions across the planet, Earth has an average climate that is approximately 14°C.[2]

Both weather and climate include measurements of temperature, cloud cover, and precipitation (rain and snow), but because climate is measured over a longer period of time it is possible to identify patterns or trends.

While daily changes in the weather are normal, a change in the Earth's climate is something that could have a major impact on the environment.[3] This is because ecosystem processes (like plants and trees flowering in spring) and technologies that we are surrounded by (like the electricity grid) are adapted to work in certain predictable conditions. When those conditions change or become more unpredictable, ecosystem processes and technologies may begin to break down.

What controls the climate?

The climate is powered by the Sun's energy radiating onto the Earth. Energy from the Sun is absorbed by the Earth's surface and atmosphere creating heat. Some of this heat is reflected back into space, but most of this heat is trapped on its way out by gases in the atmosphere that cover the Earth like a blanket. This trapping of heat energy by atmospheric gas is called the *greenhouse effect*.



CLIMATE CHANGE 101:
UNDERSTANDING THE SCIENCE OF CLIMATE SCIENCE

Greenhouse gases

Some of the most significant contributors to the greenhouse effect are water vapour (H_2O), carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and ozone (O_3). The higher the concentration of these gases, the more heat is trapped within the atmosphere and the higher the Earth's surface temperature becomes.[4]

The concentration of these greenhouse gases (GHGs) has fluctuated naturally over billions of years, but in the past 150 years, human activity (primarily through the burning of fossil fuels) has resulted in the rapid accumulation of billions of extra tons of carbon dioxide and methane in the atmosphere. These higher concentrations of GHGs is causing the Earth's temperature to rise, which contributes to climate change.

How do humans contribute to climate change?

Humans contribute to climate change by increasing the levels of greenhouse gas in our atmosphere. Through activities such as the burning of fossil fuels and deforestation, the atmosphere contains 32% more carbon dioxide today than at the beginning of the twentieth century.[5] As a result, the rate of global warming over the last 50 years is almost double the rate of warming over the last 100 years. Worldwide, 14 of the last 15 years have been the warmest on record[6]. Driving cars, using a computer, and throwing garbage into the landfill all increase the concentration of greenhouse gases in the atmosphere.

What is carbon dioxide?

Carbon dioxide is a naturally occurring gas made of carbon and oxygen. Humans and animals inhale oxygen from the air for survival and then exhale carbon dioxide. Conversely, plants and trees absorb carbon dioxide, which helps them grow, and then release oxygen into the air. Carbon dioxide is also produced from rotting organic materials (like garbage in a landfill) and from the burning of fossil fuels (like driving a car). Carbon dioxide is a greenhouse gas and a major contributor to climate change.

What are fossil fuels?

Fossil fuels are natural resources such as coal, oil, and natural gas. They are formed from the remains of ancient plant and animal life. We rely on the burning of fossil fuels to power our vehicles and industries, heat and cool our buildings, and run our appliances.

THERE ARE MANY WAYS HUMANS CONTRIBUTE TO CLIMATE CHANGE

DRIVING CARS

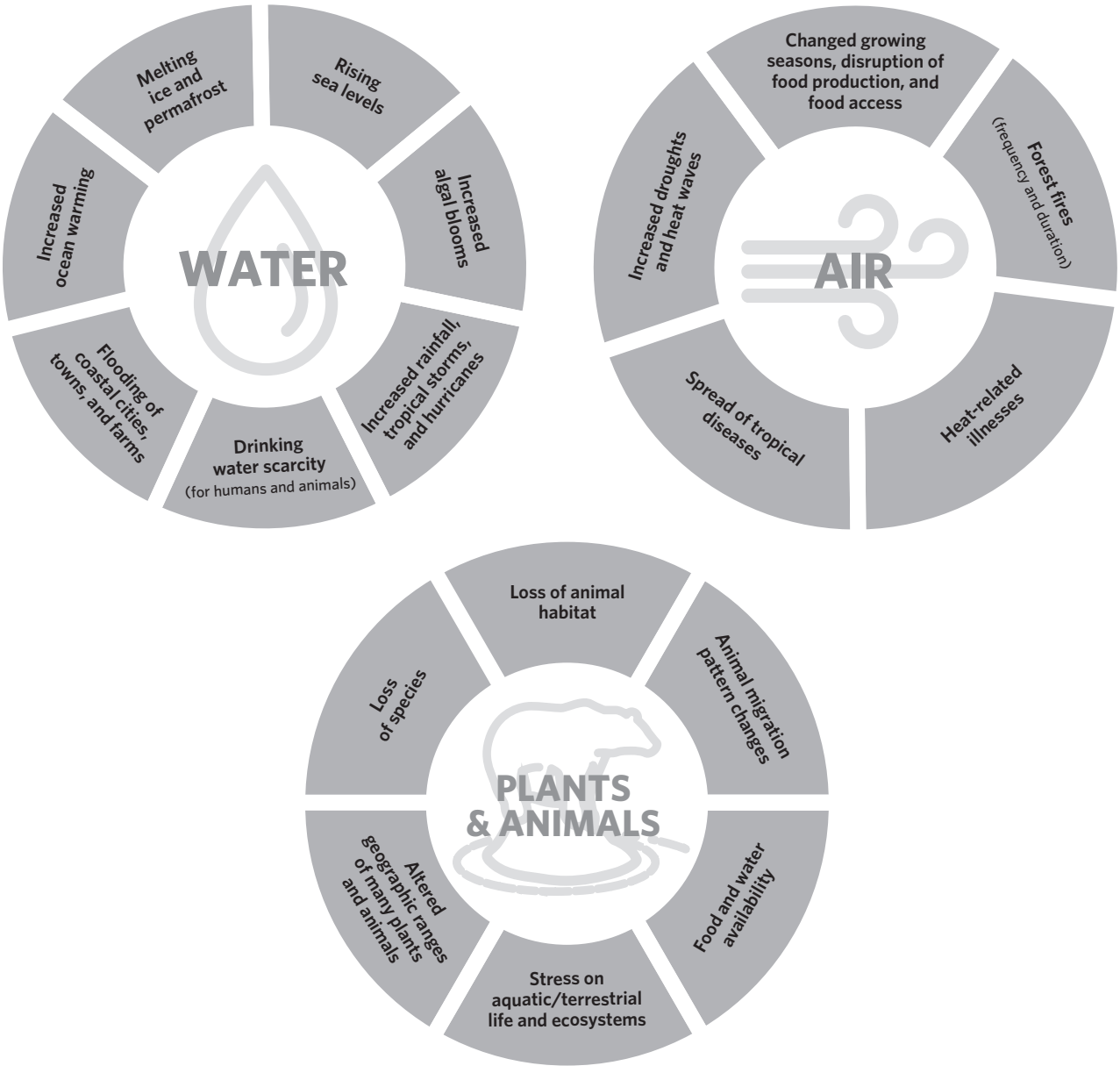
USING ELECTRICITY

CUTTING DOWN TREES

CLIMATE CHANGE 101:
UNDERSTANDING THE SCIENCE OF CLIMATE SCIENCE

Why should I care about climate change?

Climate change has already had noticeable impacts on the natural world. In the near future, those impacts are expected to continue, with increasing consequences for humans, animals, and ecosystems across the globe. The following diagrams outline some of these impacts:



To consider: What are some other impacts of climate change that you've heard about, or observed, in your region or in the news?

CLIMATE CHANGE ACTION IN ONTARIO

Governments across the world are working hard to respond to the realities of a changing climate. Communities, provinces, and nations are enacting regionally appropriate policies to encourage change in how people live, to shift away from producing greenhouse gases, and to slow human-related climate change. Faced with this challenge, the government of Ontario has taken a strong stance in the fight against climate change.

Ontario's Go Green action plan

In 2007, Ontario released *Go Green: Ontario's Action Plan on Climate Change*.[7] This plan announced commitments such as ending coal-fired power and large investments in public transit. The province also set clear targets for reductions in greenhouse gas emissions:

- 6% below 1990 levels by 2014
- 15% below 1990 levels by 2020
- 80% below 1990 levels by 2050

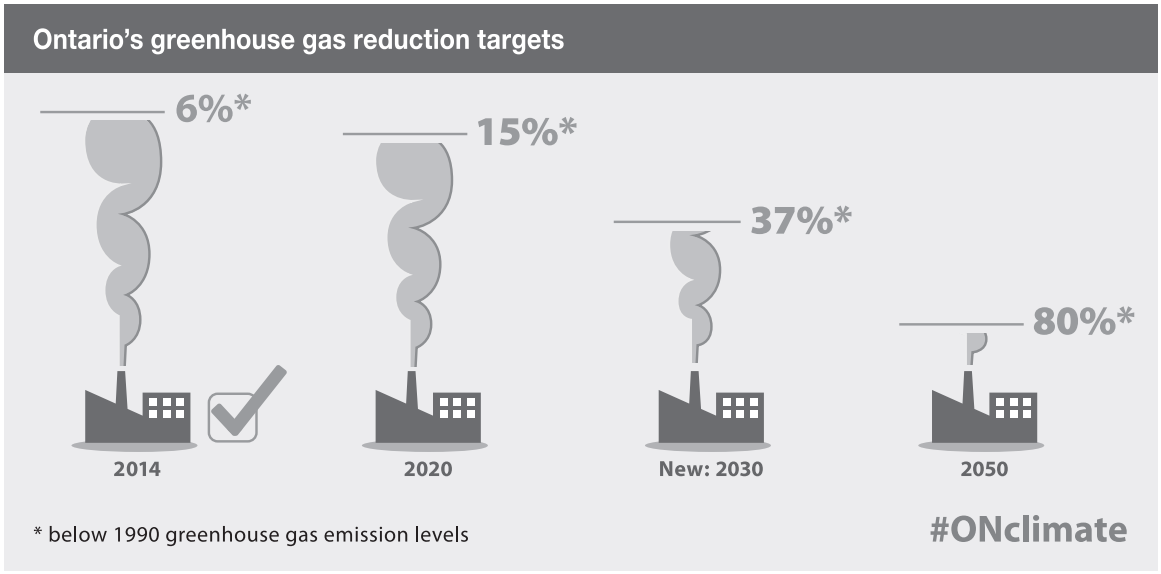


Image from *Ontario's Climate Change Strategy*[8]

Ontario's climate change strategy

Early in 2015, the Ontario Ministry of the Environment and Climate Change (MOECC) asked Ontarians for input into how the province should combat climate change. More than 1,200 individuals and over 200 businesses, organizations, and First Nations and Metis communities attended in-person consultations and provided feedback through emails and the government website. As a result of this process, the MOECC published *Ontario's Climate Change Strategy*[9] and Ontario became the first province in Canada to set a mid-term greenhouse gas emission target for 2030. The target is to reduce emissions 37% below 1990 levels by 2030.

CLIMATE CHANGE ACTION IN ONTARIO

Ontario's climate change action plan

In June 2016 the province released *Ontario's Five Year Climate Change Action Plan*, which outlines stronger strategies to reduce provincial greenhouse gas emissions. The five-year plan outlines how the government will combat climate change and ensures that proceeds from the province's recently finalized *cap and trade program* are invested back into green projects to help households and businesses reduce greenhouse gas pollution. The plan has eight main action areas: transportation, buildings and homes, land-use planning, industry and business, collaboration with indigenous communities, research and development, government, and agriculture, forests, and lands.[10] Each of these action areas will target the 171 megatonnes of CO_2 that the province generates each year.

ONTARIO'S EMISSIONS BY SECTOR

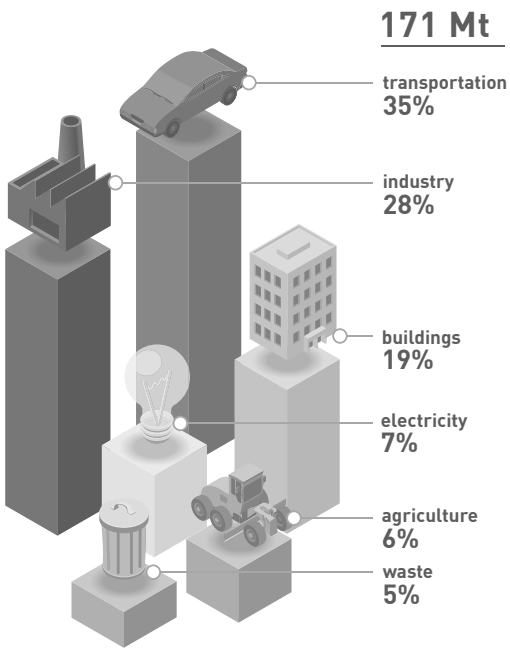


Image from *Ontario's Climate Change Action Plan*[11]

Cap and Trade

Cap and trade is a government-directed approach to reducing greenhouse gases, which is currently being implemented in Ontario.

- **Cap** refers to a limit set by the government on the amount of greenhouse gas pollution that can be released annually in Ontario. Each year this limit is lowered, requiring industry and other greenhouse gas polluters to reduce their emissions.
- **Trade** requires that big polluters buy permits to emit greenhouse gases. If they emit less than their permit, they can sell or trade their credits to other companies.

Cap and trade provides incentive for big polluters to cut emissions, since they must pay for the pollution they create. It also encourages these companies to find new ways of reducing their greenhouse gas emissions, such as investing in new clean technologies.

Ontario's *cap and trade program* is expected to generate approximately $1.8 billion each year. This revenue will be used to support projects and investments that help to mitigate climate change.[12]

CREATING A LOW-CARBON ECONOMY

A low-carbon economy aims to reduce the output of all greenhouse gas emissions into the biosphere. The burning of carbon-based fossil fuels accounts for 80% of the global energy supply and is a main contributor to anthropogenic (human-related) climate change.[13] A low-carbon economy looks to reduce these carbon emissions, as well as other compounds such as methane and nitrous oxide.

A low-carbon economy gives people and businesses reason and motivation to reduce their carbon footprint, and creates impetus for the adoption of low-carbon technologies (such as buying an electric car or installing solar panels on one's home). A low-carbon economy invests in new technologies, processes, and products that are not linked to fossil fuels. Achieving a low-carbon economy requires a commitment to reduce our fossil fuel consumption at all levels of society. This commitment must be reflected in government policy, industry practices, and individual lifestyles.

It is important to note that in this definition, as in many discussions about climate change, the term *carbon* is often used interchangeably with carbon dioxide (CO_2), and greenhouse gas (GHG) emissions.

HOW CAP AND TRADE AND THE CLIMATE CHANGE ACTION PLAN WORK TOGETHER

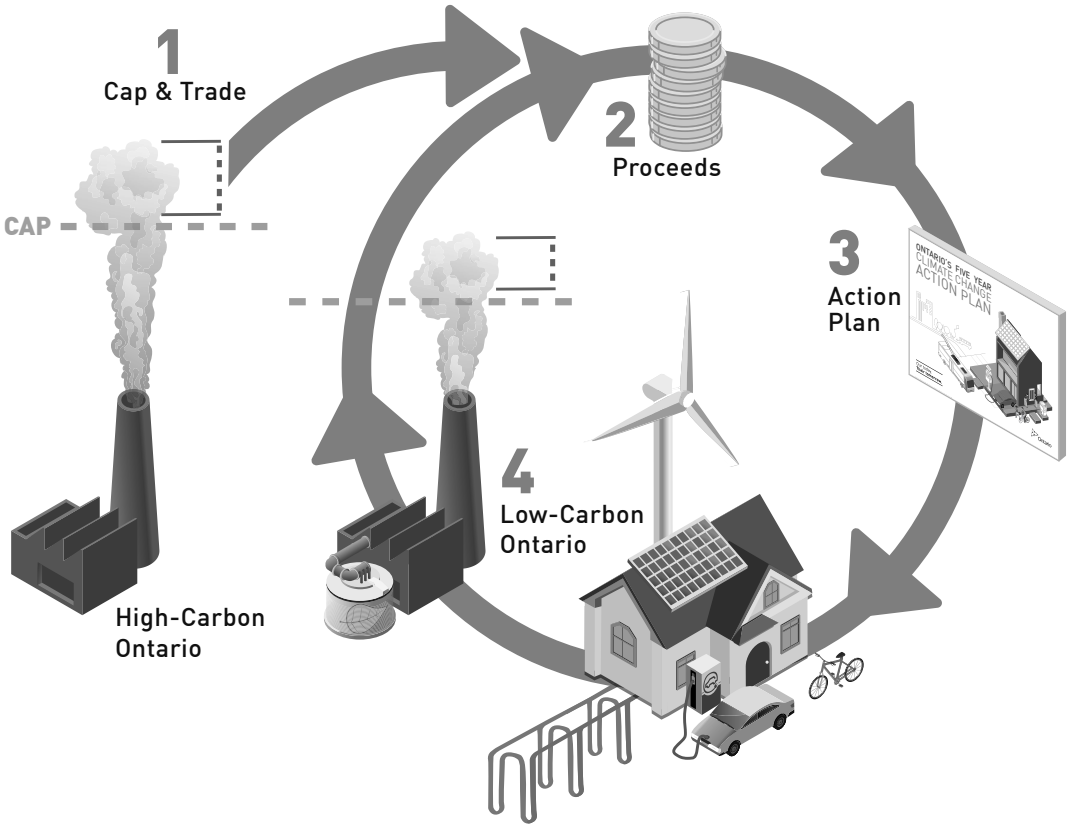
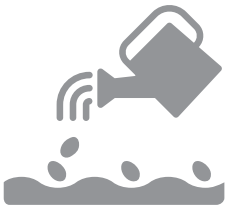


Image from *Ontario's Climate Change Action Plan*[14]

BE A CLIMATE LEADER

TAKE TRANSIT AND CARPOOL

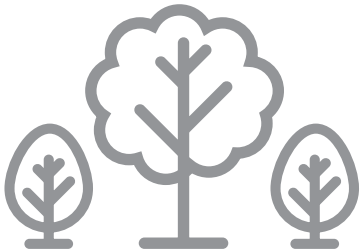


PLANT A GARDEN

INVEST IN ALTERNATIVE ENERGY

BIKE MORE

SUPPORT LOCAL



PLANT TREES

WALK & ROLL

REDUCE, REUSE, RECYCLE

BRING WASTE-FREE LUNCHES

TURN OFF LIGHTS

TURN DOWN HEAT

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CLIMATE LEADERSHIP AT SCHOOL

CLIMATE CHANGE & CONSUMERISM

Consumerism is an economic and cultural ideology that encourages the acquisition of goods and services. It is a belief that both personal happiness and economic prosperity stem from consumption, primarily of material goods (such as clothes and electronics).

It is estimated that 1.7 billion people around the world belong to the "consumer class".[15] The consumer class includes people that are able to purchase non-essential goods (items that go above and beyond satisfying basic needs) such as expensive cars, fancy jewelry, and big houses.[16]

So, what is the problem with consumerism? Beyond the question of whether consuming brings greater happiness, a major consequence of consumerism is its devastating environmental impacts. Making new products requires a lot of energy and resources while producing billions of tons of waste each year. In fact, many of the environmental issues that burden our world today, including climate change, can be linked to this consumer appetite for throwaway items such as the newest cell phone model, or "fast fashion".

One of the most powerful shifts to a more sustainable world lies in our everyday choices. Simple decisions such as not buying the latest gadget, choosing to bike rather than drive, or using a reusable water bottle can help to mitigate climate change.

Facts and figures

Consumerism

- Household consumerism is responsible for an estimated 60% of global greenhouse gas emissions and between 50% and 80% of total land, resource, and water use.[17]
- The manufacturing of everyday goods is responsible for 20% of carbon dioxide emissions and 35% of global electricity use.[18]
- Canada's ecological footprint is well beyond our Earth's capacity to support us. It is estimated that we would need between three or four Earths to maintain our current level of consumption.[19]

Waste

- Approximately 11.2 billion metric tons of solid waste are currently being collected around the world every year, and the decay of the organic portion is contributing around 5% of global greenhouse gas emissions.[20]

Energy

- Over half of the world's electricity is produced by burning coal, oil, and gas.[21]
- Canada is one of largest consumers of energy in the world on a per capita basis.[22]
- Heating accounts for 80% of residential energy use in Canada and is a significant source of emissions. If all Canadians lowered their thermostats by just two degrees Celsius this winter, it would reduce greenhouse gas emissions by about 4 megatons – that's equivalent to taking nearly 700,000 cars off the road![23]

Climate leadership at school: Consumerism

Marketers, businesses, and advertisers target students. In fact, corporations spend millions of dollars to capture the youth market by way of the classroom and school.[24] With increasing concerns about the substantial environmental problems associated with consumerism, schools are a fantastic place to take action on this issue. For instance, some schools have campaigned to "ban the bottle" – halting the marketing of bottled water to students. Being critical of consumerism is increasingly taught in the classroom, and learning the effects of consumption on the environment is key to understanding the power of personal choices.

Students and schools can be climate leaders by educating members of their community and taking action on reducing emissions related to overconsumption (and the disposal of goods). Consider running campaigns for students, staff, and families on the benefits of making climate-friendly consumer choices.

Reduce your Consumer Footprint: Host a whole school campaign

There are many ways to involve the whole school community in climate leadership around consumerism, waste reduction, and energy consumption. School EcoTeams can develop and present the following events and initiatives:

Reduce Consumption, Reduce Consumerism

- **Clothing swap:** clothing can have significant environmental impacts – from the pesticides needed to grow a cotton plant, the water needed to manufacture a T-shirt, and the loads of clothing accumulating in landfills each year. Have fun, refresh your wardrobe, and reduce your footprint by hosting a clothing swap at school.
- **CarrotMob:** every consumer purchase is a vote for how you want the world to be, so a purchase from an environmentally conscious business is a vote for sustainability. Gather a group of students, a.k.a. the CarrotMob, together to shop at a local business – this brings the business a mob of customers in exchange for their commitment to a sustainable practice or initiative.[25]
- **Buy Nothing Day:** reflect on alternatives to our consumer culture and get creative. Set up a free store or trading zone with donated items where all items are up for grabs but no money is exchanged; host an upcycling workshop where you refresh unwanted items into something fun and new; or delve into media literacy and get the message out there by creating spoof ads and hanging them around the school (check out Adbusters for more ideas and inspiration![26]).

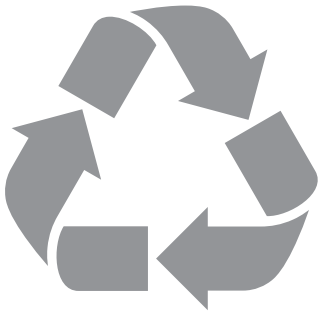
Reduce Consumption, Reduce Waste

- **Bottled water free day:** educate your school about bottled water and its impact on the environment. Commit to reducing the use of bottled water at school and consider selling reusable water bottles for students to purchase as a fundraiser.
- **Back the tap:** Ontario is home to some of the cleanest water in the world. Choosing tap water helps cut back on plastics and pollution.
- **Paper reduction campaign:** When trees are cut down for paper, they no longer do the necessary work of absorbing carbon dioxide from the atmosphere. Paper production also contributes to air, water, and land pollution. Consider making GOOS boxes for all classes in your school, hosting a book swap (with clear environmental messaging), or campaign your school to use electronic forms of communication, source recycled paper, and always photocopy on both sides of the page.
- **Waste-free lunches:** school lunches are a major source of waste in schools. Reduce the amount of food and packaging waste heading to the landfill by hosting a waste-free lunch day. Take it a step further and host these days regularly on "Trashless Tuesdays" or "Wasteless Wednesdays".

Life cycle analysis

Life cycle analysis assesses the environmental impact of a product through each stage of its life, from production to disposal. While the specific stages of every product differ, there are usually common stages for all products, including resources extraction, resource processing, product manufacturing, product shipment, product consumption, and, finally, product disposal. Each step of a product's life can have negative environmental consequences and generate greenhouse gas emissions. Considering these impacts can provide insight into products that are more, or less, damaging to the environment.

Classroom activity:
Have students select a product they commonly use such as a cell phone or pair of shoes. Have students research the life cycle of the item, from resource extraction to product disposal. Have students list the ways that this product impacts climate change. Finally, have students propose some solutions to reduce the impact of the product.



REDUCE REUSE RECYCLE

Waste contributes to 5% of Ontario's overall greenhouse gas emissions – that's nine megatonnes per year!

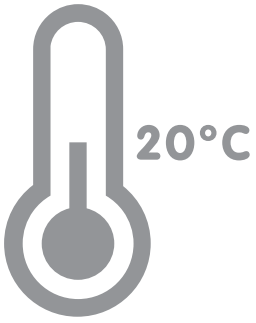
Reduce Consumption, Reduce Energy Use

- **Earth Hour:** Earth Hour is a global movement for action on climate change. Join the movement and turn off your lights, computers, and other electronic devices for one hour at school.
- **Lights-off lunches:** Turning off the lights can significantly reduce the amount of energy that your school is using. Enjoy the peace of eating in a sunlit-room while reducing your energy footprint. Try it once and if it goes well, run the campaign once a month or once a week.
- **Sweater day:** National Sweater Day is a fun way to learn about the importance of saving energy and reduce emissions. Turn the thermostat down by two degrees Celsius and have students stay warm by flaunting their coolest sweater. Get principals and teachers involved too!
- **Lights-off/Monitors-off:** Make sure energy isn't being wasted when leaving the classroom. Run campaigns to remind students to turn off lights and electronics when not in use. Create posters, hang stickers, and provide awards (like a golden lightbulb) for classes that are doing a good job.

Energy & Consumerism

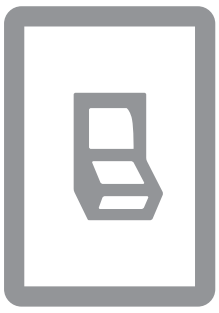
An important way to mitigate climate change is to reduce energy consumption. The manufacturing of consumer products is very energy intensive and very wasteful. By reducing how much we consume we can significantly decrease energy pollution.

There are also other ways we can reduce our energy footprint. Think of the energy you use at home and at school. How can you reduce your energy use?



TURN DOWN THE HEAT

If all Canadians lowered their thermostat by two degrees Celsius we would reduce greenhouse gas emissions by about 4 megatons - that's like taking 700,000 cars off the road!



TURN OFF LIGHTS

Electricity use in Ontario generates 11 megatonnes of greenhouse gases each year

CLIMATE CHANGE & FOOD

What we eat has an impact on climate. In fact, the global food system accounts for approximately one-third of all human-created greenhouse gas emissions.[27] It is also a major source of land and water degradation. The relationship between food and climate change is complicated but important to understand. It is hard to imagine that your banana-mango smoothie has contributed to climate change. Yet, many of those delicious smoothie ingredients have been shipped far distances (bananas from Costa Rica and mangos from Mexico) and have likely required synthetic fertilizers and pesticides in their farming. Your morning smoothie has generated a lot of transportation and farming-related emissions to get to your blender. Similarly, your Thursday-night steak dinner has produced a considerable quantity of greenhouse gases in its production. The food grown to feed the cows, the land they grazed on, and the large volume of methane that the cows release into the atmosphere as a digestive by-product (cow farts) also directly impacts the climate. By learning about the global food system, such as how our food is grown and where it comes from, we can start making climate-friendly food choices.

Facts and figures

To understand the unique and extensive relationship between food and climate, it is important to consider the life cycle of your food. How it was grown, manufactured, packaged, and transported all play a role in greenhouse gas emissions and, as a result, climate change. There are three main ways food can be linked to climate change:

Food Production

- Animal agriculture (meat and dairy production) generates a significant volume of greenhouse gases (such as methane and nitrous oxide) and is estimated to be responsible for 18% of all greenhouse gas emissions.[28]
- Livestock require large swathes of land for grazing and occupy 30% of Earth's entire land surface for this purpose.[29] This need for space has been a significant cause of deforestation. Forests are carbon sinks: when cleared for livestock, they can no longer help to mitigate climate change by absorbing and storing carbon in their trees and soil.
- Livestock are often fed grain. To produce 1 kilogram of beef there is a need for 5 to 7 kilograms of grains.[30] Consider all of the land and resources needed to grow, process, and transport this grain that is going to feed our food, grain that could also be directly feeding the estimated 805 million people who go hungry each day.[31]
- Red meat accounts for about 150% more greenhouse gas emissions than chicken or fish.[32]
- Commercial agriculture frequently uses synthetic pesticides and fertilizers, which are often made from fossil fuels. Manufacturing and transporting these chemicals use significant quantities of energy and produce greenhouse gases. These chemicals also contaminate land, air, and water.
- When large farms require extensive plowing and machinery to process their products, they generate greenhouse gas emissions.
- It is estimated that agriculture is responsible for 75% of deforestation across the world.[33]

Food Transportation

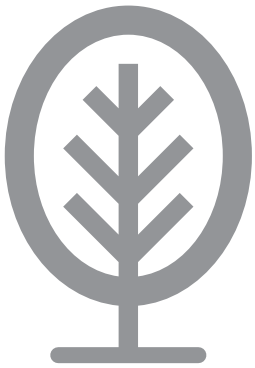
- Food miles refer to the distance food is transported from the time of its production until it reaches the consumer.
- The average meal travels 1,200 kilometres from the farm to plate.[34]
- Food grown closer to home is often considered to be more climate-friendly. This is primarily due to fewer greenhouse gas emissions associated with transportation, compared to items travelling far distances.
- When foods have to travel long distances, they often need to be refrigerated to ensure they don't spoil. The energy used to store this food generates greenhouse gas emissions.

Food Waste

- Each year, over one-third of the food that is grown around the world goes to waste. This is primarily due to food spoiling in transit or being discarded by consumers.[35]
- Approximately 1.3 billion tons of food is wasted each year, which is worth nearly $1 trillion at retail prices.[36]
- The energy that goes into the production, harvesting, transporting, and packaging of that wasted food generates more than 3.3 billion metric tons of carbon dioxide. If food waste were a country, it would be the world's third largest emitter of greenhouse gases, behind the United States and China.

SUPPORT LOCAL

The average meal travels 1,200 kilometres from the farm to plate



PLANT TREES

It is estimated that agriculture is responsible for 75% of deforestation across the world

Climate leadership at school: Food

Did you know that one student's lunch will generate approximately 30 kilograms of waste per school year, or an average of 8,500 kilograms of waste per school each year?[37] With increasing concerns about the health and environmental issues associated with our food choices, schools are a fantastic place to take action to reduce this type of pollution.

Students and schools can be climate leaders by educating members of their community and taking action on reducing food-related emissions. One way is to run campaigns for students, staff, and families on the options and benefits of making climate-friendly food choices.

Reduce Your Food Footprint: Host a whole school campaign

There are many opportunities to involve the whole school community in climate leadership food activities. Some options include:

- **Climate-friendly food pledges:** kick off your campaign by asking students to make a pledge to be climate food leaders. Collect the pledges and display them in a common area of the school.
- **The great big crunch:** distribute local apples or carrots to all school members and take a synchronized bite into crunchy, fresh local produce.
- **Local recipe day:** buying local food reduces the distance your food travels, decreases greenhouse gas emissions, and supports your local farmer and local economy. Have each class at your school research local foods and create a local food recipe book for students, staff, and families. Consider making these recipes as a fundraiser!
- **Climate-friendly food day:** invite local farmers, food organizations, and community members to attend a climate-friendly food day. Host student bulletin boards, information booths, as well as presentations from invited guests.
- **Meatless Mondays:** make the commitment as a school to go meat-free for one lunch per week. Remind students, teachers, and families about the positive effect eating less meat will have on climate change. Take it a step further and challenge families to go meat-free for breakfast and dinner on Mondays as well.
- **Vegetarian/vegan potlucks:** create a school food celebration by sharing vegetarian/vegan recipes at a potluck. This could be a great opportunity to try meat alternatives and learn about climate-friendly food choices.
- **Plant a food garden:** growing vegetables at school provides the opportunity for rich learning. You can grow your food without chemicals while eliminating transportation-related emissions.

CLIMATE CHANGE & TRANSPORTATION

Today, moving goods and people from one location to another is a necessity. In many places around the world, people are having to travel farther distances between where they live, work, learn, shop, play, and relax. People have also become reliant on the global economy, where items such as clothes, food, and electronics are shipped great distances between manufacturers and consumers. All this transportation generates increased air pollution, water contamination, and greenhouse gas emissions, which directly contribute to climate change. Human dependence on cars, trucks, buses, trains, and planes has become not only a major contributor to greenhouse gas emissions but also an increasingly difficult problem to confront. In fact, according to Ontario's *Climate Change Action Plan*, transportation represents one of the largest challenges Ontario faces in achieving its emission reduction targets.[38] By choosing modes of transportation that rely less on fossil fuels such as biking, walking, carpooling, and taking transit, we can help to meet these targets.

Facts and figures

- Globally, transportation is the fastest growing source of CO_2 emissions and produces roughly 23% of the global carbon emissions from fuel combustion.[39]
- Transportation is responsible for more than 28% of Canada's total greenhouse gas emissions.[40]
- 35% of Ontario's greenhouse gas pollution is caused by the transportation sector, with cars and trucks responsible for more than 70% of the total.[41]
- Since 1990, vehicle emissions in Ontario have been rising steadily due to increased vehicle ownership, commuting distance, and population growth.[42]
- About 11 million passenger and commercial vehicles regularly travel Ontario roads.[43]
- Distances of up to 5 kilometres are travelled more quickly door to door by bicycle than by car.[44]
- Eliminating four short car trips every week can reduce carbon dioxide emissions up to 100 kilograms per year.[45]
- Nine families can reduce carbon dioxide emissions by 1,000 kilograms if they participate in a Walking School Bus throughout the year.[46]

TAKE TRANSIT AND CARPOOL

35% of Ontario's greenhouse gas pollution is caused by the transportation sector

WALK AND ROLL

Nine families can reduce carbon dioxide emissions by 1,000 kilograms if they participate in a Walking School Bus throughout the year

Climate leadership at school: Transportation

Did you know that 42% of students are driven to school each day?[47] With increasing concerns about the health and environmental problems associated with driving cars, schools are a fantastic place to take action to reduce this type of pollution.

Students and schools can be climate leaders by educating members of their community and taking action on reducing transportation-related emissions. One strategy is for students, staff, and families to host campaigns on the options and benefits of using active and sustainable modes of transportation.

Reduce Your Transportation Footprint: Host a whole school campaign

There are several opportunities to involve the whole school community in climate leadership transportation activities. EcoTeams can develop and present the following events and initiatives:

- **Climate-friendly transportation pledges:** kick off your campaign by asking students to make a pledge to be a climate leader. Collect the pledges and display them in a common area of the school.
- **Weekly walk and roll:** get active and create zero emissions by designating one day a week to walking and rolling to school. Get creative with the campaign name: Move-it Mondays, Walk and Wheel Wednesdays, or Fitness Fridays.
- **Walking School Bus:** for elementary schools, consider joining up with two or more families and create a Walking School Bus.
- **Anti-idling campaign:** help to improve air quality and reduce emissions around your school by encouraging drivers to turn off their engines while waiting in the school zone.[48]
- **Commuter club:** carpooling and taking public transit are great options to alleviate traffic congestion, improve air quality, and reduce carbon emissions. Hang out with friends and reduce your carbon footprint by creating a commuter club at your school.
- **Walking and biking clubs:** get students committed to active transportation by participating in a weekly walking and biking club. Consider inviting parents to join once a month.
- **Community walk day:** host a community walk day with students, family, and staff. Invite a community leader to guide your walk and share insights and history about your community. Or have students plan and guide a walk in their neighbourhood!

CLASSROOM LESSONS

CALL TO ACTION: CLIMATE CHANGE LETTER-WRITING CAMPAIGN

Getting Started

BACKGROUND

A letter-writing campaign provides students with the opportunity to voice their concerns and take action on a shared cause. Students can conduct research on selected environmental issues and formulate a persuasive letter to any person (or people) of influence with the aim of inciting change. The letters can be based on diverse issues, from commenting on a government's policy on resource management to trying to make a change to your school's recycling system. People of influence can include a school board representative, principal, mayor, community member, member of parliament, city councillor, prime minister, or federal scientist, to name a few. Through this lesson, students can learn about the relationship between environmental issues and civic action.

Materials

- Optional: computer lab
- Optional: paper, pencils, envelopes, and stamps
- Optional: chart paper or chalkboard

Curriculum

There are many ways to incorporate a letter-writing campaign into classroom lessons for a range of grades and subject matter. Consider integrating the project into one of the following subject areas: Canadian and World Studies, Language, English, Science, Science and Technology, or Social Science.

LEARNING ACTIVITY

Ignite

Based on curriculum connections, a pertinent local or global issue, or student interest, have the class (or individual students) select an environmental issue that they would like to research. Student findings will form the basis of the letter-writing campaign.

- *Ask:* When you think about your community, your province, your country, and the world, what environmental issue is important to you? (You may write these down on chart paper or a chalkboard).
- *Ask:* Who is a person of influence? How and why do these people have influence? (You may write these examples down on chart paper or a chalkboard).

Explore

After the issue has been selected, have students conduct research in groups or individually. Select research questions that are pertinent to the issue, class, and grade level. Some questions may include:

- What is the environmental issue?
- How does this issue negatively impact humans, animals, ecosystems?
- Why is this issue important to you?
- What do experts say about this issue?
- What policies or laws influence this issue?
- What is a proposed solution to the problem? What person/people of influence would be best to direct this letter to?
- How can a person of influence help to solve this problem?

Act

Have students draft the letter based on their research.

Tips

- Personalize the letter (tell them why this issue matters to you)
- Keep the letter short and concise (no longer than a page)
- Make sure information is accurate and up to date
- Proofread the letter to ensure there are no spelling or grammar errors
- Sign and date the letter
- Ask for a response
- Use the proper form of address and salutation for the person you are contacting
- *Did you know?* Sending letters to an MP is free, so you do not need a stamp

Reflect & Discuss

Once the letters have been completed, email or mail the letter to the person of influence. As a class, reflect on the activity:

- How did it make students feel to learn about an issue and take action by writing a letter?
- What other ways can students take action on these issues?
- What are the next steps in this campaign?
- How can the class get more people involved in learning about this issue and supporting solutions?

Extensions

Involve the broader school community in the campaign. Create a presentation, video, or newsletter to inform others about the issue. Create a petition and get as many signatures as possible.

Resources

- **Write2Know:** Write2Know is an online letter-writing campaign that gives you the opportunity to ask federal scientists and ministers questions. Sign prewritten letters or write your own using their guidance and resources. http://write2know.ca
- **Government of Canada – Styles of address:** you can find a list of proper salutations for dignitaries at http://canada.pch.gc.ca/eng/1452017684393

BECOME A CLIMATE CHANGE SCIENTIST: CITIZEN SCIENCE RESEARCH

Getting Started

BACKGROUND

Citizen science refers to the collection and analysis of data relating to the natural world by members of the general public. Typically, these projects are in collaboration with professional scientists and scientific organizations. There are many great citizen science initiatives that engage students in scientific activities such as monitoring natural process, conducting species counts, and observing changes to surrounding ecosystems. These activities can help students understand the impact of climate change on humans, animals, and ecosystems. Information collected during these experiments can be used for classroom lessons and are then shared with the wider scientific community.

Materials

- Optional: chart paper or chalkboard
- Optional: computer lab
- Optional: magnifying glasses, clipboards with paper and pencil

Curriculum

There are many ways to incorporate a citizen science project into a variety of science lessons for a range of grades from kindergarten to grade 12.

LEARNING ACTIVITY

Ignite

Get students thinking about what a scientist does to track climate change. Guide conversation around how scientists monitor climate change and how students can help contribute to this research as citizen scientists. Write student answers on chart paper or chalkboard.

Guiding questions for younger students:

- What is a scientist? *A person who tries to understand our world, or how things in our world work. Some scientists study the natural world (like bees, weather, oceans, or plants).*
- How do you think scientists study the natural world? B*y looking at it and recording what they find. By conducting experiments.*
- How can we, as a class, become scientists and conduct scientific investigations? *Choose something in nature, observe it, and record what we find.*

Guiding questions for older students:

- What causes climate change? *Greenhouse gas emissions from driving cars, throwing away garbage, using electricity, etc.*
- What are the effects of climate change? L*oss of animal or plant species, increased rainfall, etc.*
- How might scientists monitor the effects of climate change? *Monitoring a change in natural processes (i.e., tracking rainfall over time), conducting species counts (tracking the number of bees in a particular region), and observing changes to surrounding ecosystems (tracking if plants start flowering at different times).*
- How might we be able to contribute to this body of knowledge? *Participate in citizen science by collecting data to share with professional scientists.*

Explore

- There are many citizen science projects that students can contribute to (see resource list below). Select a project for younger students or have older students research and select the projects they would like to learn more about.
- As a class, create a document that outlines what the citizen science project monitors and how it contributes to climate change research.
- Outline the steps that need to be taken to properly monitor the selected item (location, time of year, observation methods, etc.).
- Follow clear safety procedures, ensure that students are dressed appropriately for the weather, and create distinct boundaries for exploration.
- Get outside to observe and record your findings. Select any materials appropriate or necessary to your investigations (e.g., magnifying glasses, clipboards, paper, etc.). Have students input their results into the science database upon completing the observations.

Reflect & Discuss

As a class, discuss what you saw and how it made you feel. Would it make sense to go out and observe again? Take time to review all the findings and what trends can be observed. Discuss how it felt to contribute to the greater science community.

Extensions

- Schedule regular class monitoring over a period of time (weeks or months). Create a graph with the data you have collected.
- Design an information campaign on the item you are monitoring. Let other people know about your citizen science research and get them involved in the fun and research.
- Host a school-wide monitoring event and invite parents and community partners.

Resources

Links to some citizen science projects:

- FrogWatch: www.naturewatch.ca/frogwatch
- PlantWatch: www.naturewatch.ca/plantwatch
- IceWatch: www.naturewatch.ca/icewatch
- WormWatch: www.naturewatch.ca/wormwatch
- Bird Studies Canada: www.birdscanada.org
- North American Butterfly Association Butterfly Counts: www.naba.org/butter_counts.html
- Monarch Watch: www.monarchwatch.org
- Bumble Bee Watch: www.bumblebeewatch.org
- Rink Watch: www.rinkwatch.org
- Directory of Ontario Citizen Science: www.ontarionature.org/directory-of-citizen-science/home.php

MEASURING YOUR CARBON FOOTPRINT

Getting Started

BACKGROUND

What is a carbon footprint? Like the footprints you leave behind in sand, your carbon footprint is the carbon dioxide (CO_2) you leave behind after using technology that results in the emission of greenhouse gases. Whether it's from the gasoline in our cars or the electricity that powers our homes and schools, our carbon footprints are stampeding through the atmosphere. We can reduce the size of our footprints by making changes to our lifestyle, consumer choices, and investing in low-carbon technologies such as wind, solar, and geothermal power. The carbon footprint is a way to roughly measure the impact of a person's lifestyle on the environment.

Materials

- Paper for foot templates
- Pencils, pencil crayons, and/or markers
- Optional: chart paper, chalkboard
- Optional: computer and design application

Curriculum Connections

There are many ways to incorporate this activity into classroom lessons for a range of grades and subject matter. Consider integrating the project into one of the following subject areas: Canadian and World Studies, Science, Science and Technology, and the Arts.

LEARNING ACTIVITY

Ignite

Get students thinking about their carbon footprint. Review important concepts listed in the Climate Change 101 section (page 4).

Guiding questions for students:

- What is climate change? *Climate change is long-term changes to weather patterns.*
- What causes climate change? *Climate change occurs when increased levels of greenhouse gases are released into the atmosphere.*
- How do humans contribute to climate change? *Humans contribute to climate change primarily by burning fossil fuels, through activities such as driving cars, using electricity, and disposing of garbage into landfills.*
- How do you think that you contribute to climate change? *Driving to school, generating waste, wasting electricity, etc.*

Write answers on chart paper or a chalkboard.

Explore

- Have students research the carbon footprint and think about all the ways that they generate greenhouse gas emissions.
- Have students create a list of their daily activities that contribute to climate change.
- Have students think about ways that they can reduce their impact on the environment.
- Have each student trace their foot (or provide a footprint template) and then create a design demonstrating their climate impact on the footprint. They may also add solutions, illustrations, and any additional research they would like to share. You may provide pencils, pencil crayons, and markers. This project may also be designed using a computer design program.

Reflect & Discuss

Have students reflect on the activity. What were they suprised by? What changes do they want to make in their lives to reduce their carbon footprint?

Extensions

- Have students calculate their carbon footprint by finding and using an online carbon footprint calculator.
- Have students compare their carbon footprint to someone in another country or to a selected animal.
- Have students create their own carbon footprint quiz to hand out to students across the school.
- Take the message to your schoolmates and family. Teach them about their carbon footprint and challenge them to make changes to their lifestyle.

Resources

- Classroom Energy Diet Challenge (how-big-are-your-carbon-feet): http://energydiet.canadiangeographic.ca/2016/main/challenge/110/how-big-are-your-carbon-feet
- Global Footprint Network: www.footprintnetwork.org
- Zero Footprint Youth Calculator: http://meetthegreens.pbskids.org/features/carbon-calculator.html
- Inquiry to Student Environmental Action: http://web.stanford.edu/group/inquiry2insight/cgi-bin/i2sea-r2a/i2s.php?page=fpcalc

Follow-up activity

Planting trees remains one of the cheapest, most effective means of drawing excess CO_2 from the atmosphere. According to the United Nations Environment Programme (UNEP) an average tree absorbs 12 kg of CO_2 per year.

- As a class, count the number of trees on your school property.
- How much CO_2 do all the trees on your school ground absorb each year?
- Based on your calculations, how do these trees off-set your carbon footprint?
- How many trees as a class would you need to plant to neutralize your class footprint?

HOW TO REDUCE YOUR CARBON FOOTPRINT

- **Reduce your transportation footprint:** take public transit, carpool, walk, or bike.
- **Reduce your energy footprint:** turn off lights when they are not required, turn down the heat, rely on natural lighting from the sun, ensure electronics are efficient, support clean energy sources (such as wind, solar, geothermal).
- **Reduce your food footprint:** eat locally produced and organic food, cut down on the amount of beef and dairy you consume, reduce your food waste.
- Other ways to reduce your carbon footprint: reduce water usage, reuse and recycle, plant a tree.

What else can you do?

REFERENCES

1. Intergovernmental Panel on Climate Change. (2014). *Climate Change 2014, Synthesis Report.* Retrieved February 2016, from: www.ipcc.ch/report/ar5/syr/
2. Cain, F. (2015, December). *Earth Surface Temperature.* Retrieved August 2016, from: www.universetoday.com/48328/earth-surface-temperature
3. National Wildlife Federation. (n.d.). *Climate 101.* Retrieved August 2016, from: (http://climateclassroomkids.org/educators/climate-101/
4. Intergovernmental Panel on Climate Change. (n.d.). *FAQ 1.3: What is the Greenhouse Effect?* Retrieved February 2016, from: www.ipcc.ch/publications_and_data/ar4/wg1/en/faq-1-3.html
5. The Region of Peel. (n.d.). *Climate Change: Grade 9 Planning to be part of my Region! Planning Peel – A Lesson Plans Series.* Retrieved August 2016, from: www.peelregion.ca/planning/teaching-planning/pdfs/Grade9forWeb.pdf
6. Government of Ontario. (2015). Ontario's Climate Change Strategy. Retrieved August 2016, from: www.ontario.ca/page/climate-changestrategy.
7. Government of Ontario. (2007). *Go Green: Ontario's Action Plan on Climate Change.* Retrieved August 2016, from: www.climateontario.ca/doc/workshop/2011LakeSimcoe/Ontarios%20Go%20Green%20Action%20Plan%20on%20Climate%20Change.pdf
8. Government of Ontario. (2015). Ontario's Climate Change Strategy. Retrieved August 2016, from: www.ontario.ca/page/climate-changestrategy.
9. Government of Ontario. (2015). *Ontario's Climate Change Strategy.* Retrieved August 2016, from: www.ontario.ca/page/climate-change-strategy.
10. Government of Ontario. (2016). *Ontario's Climate Change Action Plan.* Retrieved August 2016, from: www.applications.ene.gov.on.ca/ccap/products/CCAP_ENGLISH.pdf
11. Government of Ontario. (2016). Ontario's Climate Change Action Plan. Retrieved August 2016, from: www.applications.ene.gov.on.ca/ccap/products/CCAP_ENGLISH.pdf
12. Government of Ontario. (2016). *Ontario's Climate Change Action Plan.* Retrieved August 2016, from: www.applications.ene.gov.on.ca/ccap/products/CCAP_ENGLISH.pdf
13. The Organisation for Economic Co-operation and Development. (n.d.). *Aligning Policies for a Low-Carbon Economy.* Retrieved February 2016, from: www.oecd.org/environment/Aligning-Policies-for-a-Low-carbon-Economy.pdf.
14. Government of Ontario. (2016). *Ontario's Climate Change Action Plan.* Retrieved August 2016, from: www.applications.ene.gov.on.ca/ccap/products/CCAP_ENGLISH.pdf
15. Mayell, H. (2004). As Consumerism Spreads, Earth Suffers, Study Says. *National Geographic.* Retrieved August 2016, from: http://news.nationalgeographic.com/news/2004/01/0111_040112_consumerism.html
16. The Free Dictionary. (n.d.). "Consumer Class". Retrieved August 2016, from: http://financial-dictionary.thefreedictionary.com/Consumer+Class
17. Jacobs, S. (2016). Consumerism plays a huge role in climate change. Grist. Retrieved August 2016, from: http://grist.org/living/consumerism-plays-a-huge-role-in-climate-change/
18. United Nations Environment Programme. (n.d.). *Climate Change Mitigation: Manufacturing.* Retrieved August 2016, from: www.unep.org/climatechange/mitigation/Manufacturing/tabid/104340/Default.aspx
19. McDonald, C. (2015). How many Earths do we need? *BBC*. Retrieved August 2016, from: www.bbc.com/news/magazine-33133712
20. United Nations Environment Programme. (n.d.). *Climate Change Mitigation: Waste.* Retrieved August 2016, from: www.unep.org/climatechange/mitigation/Waste/tabid/104349/Default.aspx
21. WWF Global. (n.d.). *Changing Energy Use.* Retrieved August 2016, from: wwf.panda.org/what_we_do/footprint/climate_carbon_energy/changing_energy_use/
22. David Suzuki Foundation. (n.d.). Four places to cut your carbon. Retrieved August 2016, from: www.davidsuzuki.org/what-you-can-do/reduce-your-carbon-footprint/four-places-to-cut-your-carbon/; The World Bank (2014). *Electric power consumption (kWh per capita)*. Retrieved August 2016, from: http://data.worldbank.org/indicator/EG.USE.ELEC.KH.PC?year_high_desc=true
23. WWF Canada. (n.d.). *National Sweater Day.* Retrieved August 2016, from: www.wwf.ca/events/sweater_day/
24. Bowers, C. (n.d.). *Education, the individual, and consumerism.* Retrieved August 2016, from: www.eolss.net/sample-chapters/c11/E6-61-05-07.pdf
25. Carrotmob. (nd.) *About Carrotmob.* Retrieved August 2016, from: www.carrotmob.org/about
26. Adbusters (n.d.) SpoofAds. Retrieved August 2016, from: www.adbusters.org/spoofads/
27. Gilbert, N. (2012). One-third of our greenhouse gas emissions come from agriculture. Retrieved August 2016, from: http://www.nature.com/news/one-third-of-our-greenhouse-gas-emissions-come-from-agriculture-1.11708
28. Food and Agriculture Organization of the United Nations. (2006). Livestock's long shadow: environmental issues and options. Retrieved August 2016, from: ftp://ftp.fao.org/docrep/fao/010/a0701e/a0701e.pdf
29. David Suzuki Foundation. (n.d.). *Food and climate change.* Retrieved August 2016, from: www.davidsuzuki.org/what-you-can-do/food-and-our-planet/food-and-climate-change/
30. David Suzuki Foundation. (n.d.). *Food and climate change.* Retrieved August 2016, from: www.davidsuzuki.org/what-you-can-do/food-and-our-planet/food-and-climate-change/
31. Smith, R. (2015). How Reducing Food Waste Could Ease Climate Change. *National Geographic.* Retrieved August 2016, from: http://news.nationalgeographic.com/news/2015/01/150122-food-waste-climate-change-hunger/
32. Weberm C.L. and Matthews, H.S. (2008). Food-Miles and the Relative Climate Impacts of Food Choices in the United States. *Environmental Science & Technology, 2008, 42 (10)*. Retrieved August 2016, from: http://pubs.acs.org/doi/pdfplus/10.1021/es702969f
33. Climate Change, Agriculture and Food Security. (n.d.) *Food Emissions.* Retrieved August 2016, from: https://ccafs.cgiar.org/bigfacts/#theme=food-emissions
34. David Suzuki Foundation. (n.d.). *Food and climate change.* Retrieved August 2016, from: www.davidsuzuki.org/what-you-can-do/food-and-our-planet/food-and-climate-change/
35. Smith, R. (2015). How Reducing Food Waste Could Ease Climate Change. *National Geographic.* Retrieved August 2016, from: http://news.nationalgeographic.com/news/2015/01/150122-food-waste-climate-change-hunger/
36. Smith, R. (2015). How Reducing Food Waste Could Ease Climate Change. *National Geographic.* Retrieved August 2016, from: http://news.nationalgeographic.com/news/2015/01/150122-food-waste-climate-change-hunger/
37. Recycling Council of Ontario. (n.d.). Waste-Free Lunch Challenge. Retrieved August 2016, from: www.rco.on.ca/waste-free_lunch_challenge
38. Government of Ontario. (2016). *Ontario's Climate Change Action Plan.* Retrieved August 2016, from: www.applications.ene.gov.on.ca/ccap/products/CCAP_ENGLISH.pdf
39. www.worldbank.org/en/news/feature/2012/08/14/urban-transport-and-climate-change
40. David Suzuki Foundation. (n.d.). Transportation Solutions. Retrieved August 2016, from: www.davidsuzuki.org/issues/climate-change/science/climate-solutions/transportation-solutions/
41. Government of Ontario. (2016). *Ontario's Climate Change Action Plan.* Retrieved August 2016, from: www.applications.ene.gov.on.ca/ccap/products/CCAP_ENGLISH.pdf
42. Government of Ontario. (2016). *Ontario's Climate Change Action Plan.* Retrieved August 2016, from: www.applications.ene.gov.on.ca/ccap/products/CCAP_ENGLISH.pdf
43. Government of Ontario. (2016). *Ontario's Climate Change Action Plan.* Retrieved August 2016, from: www.applications.ene.gov.on.ca/ccap/products/CCAP_ENGLISH.pdf
44. Active and Safe Routes to School (n.d.). Retrieved August 2016, from: www.saferoutestoschool.ca
45. Active and Safe Routes to School (n.d.). Retrieved August 2016, from: www.saferoutestoschool.ca
46. Active and Safe Routes to School (n.d.). Retrieved August 2016, from: www.saferoutestoschool.ca
47. Active and Safe Routes to School (n.d.). Retrieved August 2016, from: www.saferoutestoschool.ca
48. Active and Safe Routes to School (n.d.). Retrieved August 2016, from: www.saferoutestoschool.ca