

An abstract graphic design featuring several overlapping circles in various shades of light blue. A thin, vertical blue line runs down the right side of the composition. The circles vary in size and opacity, creating a layered effect. The text 'Climate Change' is positioned on the left side, above a horizontal line that extends from the left edge to the vertical line.

Climate Change

Climate Change

Introduction

Climate change is defined as a change in global or regional climate patterns that is largely due to increased levels of carbon dioxide and other greenhouse gases (GHGs) in the atmosphere. Under natural processes, these gases act like a blanket around the planet, insulating it from heat loss, regulating global temperatures, and helping to enable life to exist on Earth. However, human activities such as the extraction and burning of fossil fuels (oil, coal), deforestation, and wetland drainage are increasing the amount of GHGs in the atmosphere. There is now a larger amount of heat-trapping gases in the lower atmosphere, which is altering Earth's natural systems.

“Climate change is not just a problem for the future. It is impacting us every day, everywhere.”

– Vandana Shiva



Growing concentrations of GHGs in the atmosphere are resulting in an increase in global average temperature, which in turn is leading to changes in Earth's climate patterns, such as changing precipitation patterns, and ultimately affecting the health and well-being of ecosystems and the human societies that depend on them. The impacts that climate change have had and will continue to have on our natural and social environments are complex and are a cause for great concern. Most importantly, climate change is caused by us and it affects all of us. It is a long-term problem that is difficult to solve given its global nature (as GHGs are emitted by all countries), its intimate relationship with the global economy, and uncertainty regarding its specific impacts over time on our economies, societies, and natural systems.

There are two primary types of strategies that governments and communities use to deal with climate change:

- **Mitigation strategies:** strategies that help to reduce the drivers of climate change either by reducing the release of GHGs into the atmosphere (such as by using new technologies or improving public transit systems) or by removing GHGs from the atmosphere (such as by planting trees, which use carbon dioxide to grow) (see *mitigation*) (IPCC, 2012).
- **Adaptive strategies:** strategies that enable people to plan for how changes in historical climate conditions (temperature, rainfall, length of the growing season) will have an impact on our built environment, economic activities, health, and biodiversity. This could be building new

floodways and dykes for places that traditionally have not seen flooding in the past but are now flood-prone areas (IPCC, 2012).

In response to the effects of climate change, many countries, communities, businesses, and individuals are all working to raise awareness on climate issues, expand the use of existing green technologies, and update policies in recognition of our new, less predictable climate of the future.

In the past decade climate change has become a topic of focus in the media and among the general public, but it has already been discussed for some time by scientists, government officials, and private sector companies. Below is a brief timeline of events:

- In 1972, the first UN Conference on the Human Environment took place in Stockholm, Sweden. Through this conference it was recognized that humans influence their environment and that all people have the basic human right to live a dignified life with emphasis on well-being, and all people bear the responsibility to protect and improve the environment for present and future generations (UNEP, 1972).
- In 1987, the Brundtland Commission released a report called *Our Common Future*. The Brundtland Report defines sustainable development as development that meets the needs of the present without compromising the ability of future generations to meet their own needs. This definition of sustainable development is still agreed upon today. The Montreal Protocol was also adopted in 1987. This agreement aimed to protect the ozone layer by reducing the production and consumption of ozone-depleting substances (some of which are also GHGs) that could be released into the atmosphere (UNEP Ozone Secretariat).
- In 1988, the Intergovernmental Panel on Climate Change (IPCC) was established by the United Nations Environment Programme and the World Meteorological Organization. The IPCC provides authoritative scientific, technical, and socio-economic information on the risks, impacts, and adaptation options associated with climate change.
- In 1992, the United Nations Framework Convention on Climate Change (UNFCCC) is adopted in Rio de Janeiro, Brazil, during the Earth Summit; it came into effect in 1994. It marked international recognition of the existence of climate change and is intended to stabilize GHG concentrations “at a level that would prevent dangerous anthropogenic (human-induced) interference with the climate system.” (IPCC, 2007).
- In 1997, a protocol to the UNFCCC was adopted in Kyoto, Japan, and entered into effect in 2005. The Kyoto Protocol broke new ground by establishing legally binding targets that required industrialized countries to reduce their GHG emissions. However, the targets were

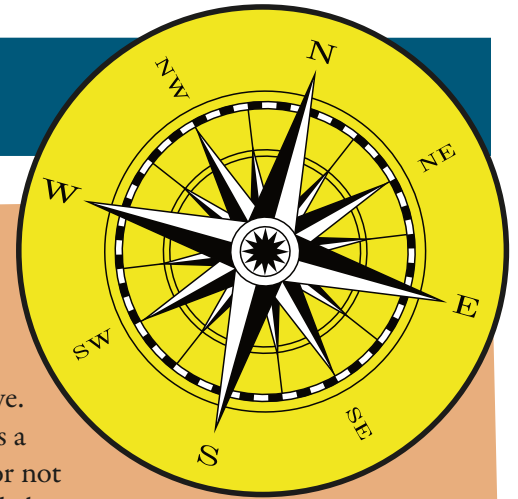


not met by a number of developing countries (including Canada) and the release of GHGs continued to rise.

- In 2007, the IPCC released its fourth Assessment Report, which documented observed increases in global average temperatures and other signs of an already changing climate. It also tracked the continuing increase in global GHG emissions from human activities since pre-industrial times, noting a 70% increase between 1970 and 2004 (IPCC, 2007).
- In 2013, the IPCC released its fifth Assessment Report, which stated with 95 percent confidence that humans are the main cause of current global warming, and likely the cause of all global warming over the past 60 years. This was considered to be an important milestone, as there was now scientific evidence to support these claims.
- In September 2015, the international community adopted the Sustainable Development Goals, of which Goal 13 calls on all countries to “take urgent action to combat climate change and its impacts.”
- In December 2015, 195 member countries of the UNFCCC adopted the Paris Agreement, the first legally binding climate agreement in which all countries (developed and developing) agreed to take actions to limit the rise in global average temperature to well below 2°C above pre-industrial levels.
- As of 2017, the record for the warmest recorded year has been broken three years in a row.



For more information, visit http://unfccc.int/essential_background/items/6031.php



Exploring the Issues

Research on climate change can be looked at from both a pure science (e.g., biology/chemistry, etc.) and social science perspective. It is important that inquiry research, as with all research, ensures a quality evaluation of all the sources used to determine whether or not information is fact or opinion. The following are some suggested climate change–related issues for inquiry.

Complexity and Uncertainty

There is uncertainty about how the climate will change in the future, in part because the degree of global warming will depend on the speed and extent to which there is reduction in GHG emissions. There is also uncertainty regarding the social and economic consequences of climate change. This makes planning for future climate risks at the local and international levels difficult.

The Resource Use Paradox

There is a paradox being played out that human well-being, as considered by most, is dependent on the ability of economies to prosper. Conversely, this prosperity is determined by increased consumption of primary resources (e.g., oil, lumber, crops, etc.). As these resources, many of which are non-renewable, are consumed, a burden is placed on the environment, which in turn causes impacts on the same human well-being the economy is trying to improve.

For example, we cannot extract/use all fossil fuels without causing severe climate change. As it becomes more expensive to extract fossil fuels, we recognize how dependent some economies are on the extractive industry. This is evident through job losses in areas where the local economy is dependent on the extractive industry (we can see this in Alberta since mid-2015).

Costs – Social, Economic, Environmental

Environmental costs, according to the OECD, are “costs connected with the actual or potential deterioration of natural assets due to economic activities” (OECD).

Traditionally economists, finding it difficult to place a dollar value on the environment, have externalized the costs associated with negative impacts on the environment. Externalizing a cost means that the financial burdens resulting from damage to the environment (e.g., atmospheric emissions from industry that degrade air quality and can cause respiratory problems) are not borne by the persons causing the damage but by others (such as taxpayers) who are affected by the damage (Trucost). This situation raises questions regarding how to understand the full cost of economic activities (like building a house or driving a car), whether polluters should pay for the damage that they cause directly and/or indirectly, and how to more equitably share the costs.



Essential Questions

Inquiry questions related to climate change issues may include the following:

- How do we know climate change is occurring?
- What major activities are producing the GHGs contributing to climate change?
- How does the media influence the way we see climate change?
- Who is affected most by changing weather patterns in Canada and globally?
- What is the difference between climate change and global warming?
- What efforts are being taken locally and globally to help stop/slow down climate change?
- What actions can we take now to reduce the risk posed by changing climate conditions and sea level rise?
- How do different countries view the threat posed by climate change and to respond to the changes expected to occur (i.e., developed countries with histories of emissions versus less developed countries wanting to industrialize vs. small island states)?

Industrialized versus Developing Nations

Who is affected? How are they affected?

While human activities in all countries around the world contribute to GHG emissions, it is the industrialized nations such as China, USA, and India that produce the most emissions. Agreements such as the Kyoto Protocol and the Paris Agreement aim to decrease overall GHG emission levels. The Kyoto Protocol was developed with the recognition that developed countries historically were responsible for higher levels of GHG emissions and should thus be more responsible for curbing them. This concept is called “common but differentiate responsibility.” Under the Paris Agreement, all countries have agreed to take actions to reduce their emissions consistent with their individual capacities.

All countries around the world will experience climate change in one way or another, but the type of risks that they are facing and their capacity to adapt to changes differs.

Developing countries, already dealing with a variety of social, economic, and political issues, have less capacity to adapt to changes in climate and increases in extreme weather events. Developed countries are obligated under the UNFCCC to provide support to help developing countries adapt to climate change (UNFCCC, 2014b). The issue of how much support should be provided is still under debate.

Rural Livelihoods

Currently almost 80 percent of poor people around the world depend on agriculture for their livelihood. Many of these farmers cultivate marginal lands and have limited access to essential inputs such as quality seed, implements, fertilizers, and irrigation. As a result of increased variability and intensity of weather patterns and global temperatures, agricultural livelihoods and food supplies are becoming increasingly vulnerable and unpredictable. Staple food prices have been increasing steadily over the past decade with a distinct spike in 2008, which resulted in a global food crisis.



Gender

When we consider the ways in which climate change affects society, we need to consider the importance of gender in this equation. In most instances, especially within developing countries,

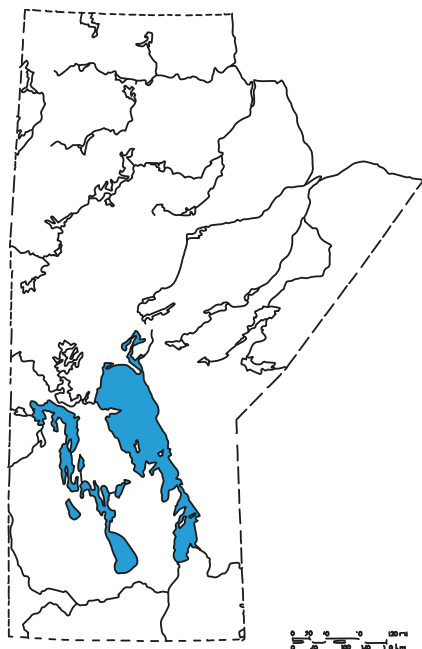
women are more vulnerable to the effects of climate change than men. In part, this is because they make up a larger percentage of the world's poor, often have less access to education, less political voice, are less mobile, and are more reliant on livelihoods based on natural resources (such as fishing) (UNWomen). For example, women are increasingly responsible for agricultural production as men migrate to urban centres in search of better economic activities, but often lack access to credit, agricultural extension support, and technology that would help them increase crop production and their adaptive capacity.

For more information, see *UN WomenWatch Factsheet* at [www.un.org/womenwatch/feature/climate_change/downloads/Women and Climate Change Factsheet.pdf](http://www.un.org/womenwatch/feature/climate_change/downloads/Women_and_Climate_Change_Factsheet.pdf)

Ecosystems

As the climate changes, ecosystems are placed under greater stress. While plants and animals have traditionally adapted to environmental changes over time, the climate is now changing at a faster rate, making it more difficult for some species to adapt at the same pace, resulting in a loss of biodiversity in the ecosystem. Biodiversity is an important factor in ecosystem health. As the number and types of species are depleted, ecosystems become increasingly more vulnerable to climate change (EPA, 2010).

As an example, we can look to Lake Winnipeg, where over the past several decades the ecosystem's health has degraded drastically. Some of the main environmental issues contributing to the lake's declining health include nutrient loading (that is, large amounts of phosphorous and nitrogen entering the system) and the introduction of foreign invasive species. These nutrients cause an increase in the instance of algae blooms, which furthers the production of toxins in the water that can affect other aquatic species and humans (Environment Canada and Manitoba Water Stewardship).



Zebra mussels (an invasive species) were discovered in Lake Winnipeg in 2013. Scientists do not yet know what the effects of zebra mussels will be on the lake, but it could mean a reduction in algae (not the blue-green algae growing as a result of nutrient loading) that other species need for food as well as a reduction in native mussel populations.



According to the Lake Winnipeg Foundation, in 10 years, a 90 percent loss in native mussel species populations can be expected (Lake Winnipeg Foundation). Both zebra mussels and blue-green algae in the lake are placing large amounts of stress on the ecological balance of the lake's ecosystem, making it more vulnerable to future changes in the local climate.

For more information on zebra mussels in the lake, see www.lakewinnipegfoundation.org/zebra-mussels-101

Source: Lake Winnipeg Foundation

Climate Change and Food Security

The impacts climate change has on food security are complex and varied. Because of population growth and dietary changes, food needs are increasing rapidly. According to the United Nations Food and Agriculture Organization (FAO), food needs will increase by 60 percent by 2050. The challenge set before the international community sees the need to improve food security globally, while at the same time reducing the amount of GHGs that the agriculture sector produces (industrialized agriculture is a significant contributor to GHG emissions globally).

The balance between food security and more sustainable production can be met in two ways. The first is to reduce the amount of GHGs emitted into the atmosphere by adapting technologies and agriculture techniques to reduce emissions and account for the impacts of climate change. The second is to create improved food distribution networks that reduce the amount of food lost and wasted on a global scale. Currently, one-third of the food the world produces falls into these categories. Wasted and lost food not only account for about eight percent of total GHG emissions each year, but also place an enormous strain on our collective ability to ensure food security for all people based on our abilities to produce a limited amount of food each year (FAO).

Climate Change Adaptation

Adaptation involves changing behaviour in order to adjust to the surrounding environment to reduce its negative effects on health and well-being, and to take advantage of opportunities that these changes might create. Climate adaptation is an essential concept in relation to climate change. As environments change, societies also need to react to new circumstances. Adaptation can be passive or reactionary to a change, or it can anticipate potential change and act in advance to reduce vulnerability to the environment.

Also important to this topic is the issue of adaptive capacity. The IPCC (2012) regards adaptive capacity as “the combination of strengths, attributes and resources available...that can be used to prepare for and undertake actions to reduce adverse impacts, moderate harm, or exploit beneficial opportunities.” The adaptive capacity of a community, company, or country is determined by non-climatic factors, such as economic, demographic, governance, and environmental factors. Countries that have weak health care systems, degraded ecosystems, poorly functioning economies, and limited infrastructure, and that are not peaceful have limited adaptive capacity and therefore are more likely to be negatively affected by climate change.

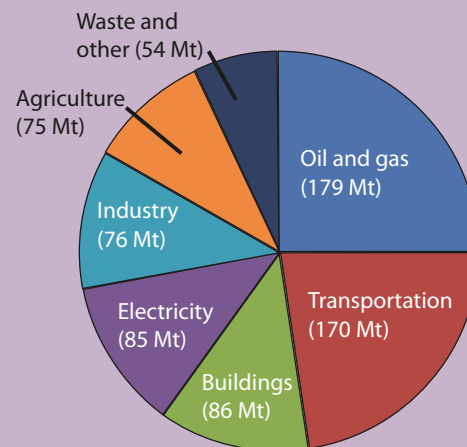
For more detailed information on this subject, see www.iisd.org/ckn/pdf/va_foundation_final.pdf

Did You Know?

According to the 5th Climate Change Report from the IPCC (2014), it is clear increases in GHGs have been greatly influenced by economic and population growth and are “extremely likely” to be the main cause of observed global warming since the mid-20th century. Some noticeable consequences of increased GHGs include extreme weather events, decreases in extreme cold temperatures, increases in extreme high temperatures, increases in sea levels, and increases in the number of heavy precipitation events in many regions around the world. (ECCC)

Climate change brings a range of risks to health, from deaths in extreme heat to changing patterns of infectious diseases. (WHO)

Distribution of greenhouse gas emissions by economic sector, Canada, 2013



Source: ECCC, 2017.

Global food loss and waste accounts for about eight percent of total GHG on a yearly basis. In 2015, one-third of all the food produced in the world was lost or wasted, accounting for CDN 3.7 trillion per year, including environmental and social costs. (FAO)

Deforestation and forest degradation account for approximately 10–11 percent of global GHG emissions. Logging and fires increased GHG emissions from 0.4Gt CO₂ in the atmosphere to 1.0 Gt between 1990 and 2015. (FAO)

People from the island nation of Tuvalu in Polynesia became the first climate refugees in 2014. The nation is situated on a low-lying island in the South Pacific. The population was forced to migrate due to rising sea levels threatening their communities. This island people were given residency in New Zealand during the summer of 2014 because rising tides and encroachment of salt water into their drinking water supply prevented them from returning to live on their island. (Allen)



Thought-Provoking Quotations

“Men argue. Nature acts.”
– Voltaire

“The race is now on between the techno-scientific and scientific forces that are destroying the living environment and those that can be harnessed to save it... If the race is won, humanity can emerge in far better condition than when it entered, and with most of the diversity of life still intact.”

– Edward O. Wilson

“One of the biggest obstacles to making a start on climate change is that it has become a cliché before it has even been understood.”

– Tim Flannery

“The more clearly we can focus our attention on the wonders and realities of the universe about us, the less taste we shall have for destruction.”

– Rachel Carson

“One way to open your eyes is to ask yourself, “What if I had never seen this before? What if I knew I would never see it again?”

– Rachel Carson

“To leave the world better than you found it, sometimes you have to pick up other people’s trash.”

– Bill Nye

“Climate change is a result of the greatest market failure the world has seen. The evidence on the seriousness of the risks from inaction or delayed action is now overwhelming. . .The problem of climate change involves a fundamental failure of markets: those who damage others by emitting greenhouse gases generally do not pay. . .”

– Nicholas Stern

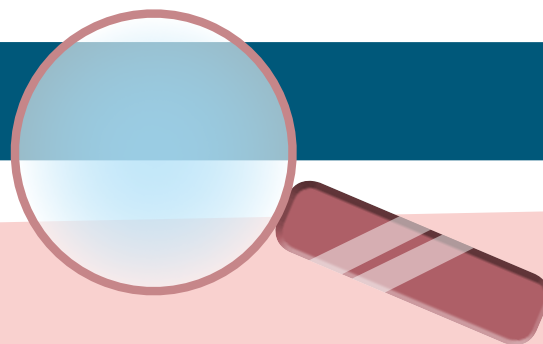


Making a Difference

Name	How they make a difference
Nicholas Stern	A celebrated economist, Nicholas Stern has been the chair of the Grantham Research Institute on Climate Change and the Environment at the London School of Economics and Political Science since 2008. In 2006, Stern produced a report called "The Stern Review Report on the Economics of Climate Change." This report has helped to bridge the spheres of economics and the environment and how they interact with each other, bringing them into the international public forum.
James Hansen	James Hansen is a professor in the department of Earth and Environmental Sciences at Columbia University, where he is director of the Program on Climate Science, Awareness and Solutions. In 1988, he gave a testimony to U.S. Congress on climate change, which helped to spread awareness about global warming. James Hansen at Columbia University: www.columbia.edu/~jeh1/
Christiana Figueres	Christiana Figueres is a Costa Rican diplomat, appointed as executive secretary of the UNFCCC in 2010. In 1995, Figueres founded the NGO, Center for Sustainable Development of the Americas (CSDA). Figueres was also a member of the Costa Rican negotiating team at the UNFCCC between 1995–2009 and played an instrumental role in convening and running the COP21 in Paris in 2015. Christiana Figueres' personal webpage: http://christianafigueres.com/
David Suzuki	David Suzuki has been speaking out about the dangers of climate change and the importance of environmental sustainability for over 30 years. While his work focuses mainly on Canadian issues, Suzuki is well known internationally for his environmental activism. He has worked as a broadcaster with the CBC <i>The Nature of Things</i> , as well as other science related programs such as <i>Quirks and Quarks</i> and <i>Science Magazine</i> . He has written and directed many influential environmental books and documentaries. The David Suzuki Foundation was started in 1990 and has been advocating for sustainable practices in government and industry and has carried out large public education campaigns. David Suzuki Foundation: www.davidsuzuki.org/



Name	How they make a difference
Al Gore	<p>After a long political career in the U.S. government, Al Gore has taken a stand on climate change and has become one of the most influential activists of our time. He speaks internationally on the subject and has written numerous books and documentaries. The most well-known of these is <i>An Inconvenient Truth</i> (2006), a documentary that exposed the undeniable effects of climate change to the American people and the world. For his work on environmental advocacy, Gore won the Nobel Prize in 2007 and shared a prize from the Intergovernmental Panel on Climate Change.</p> <p>Al Gore: www.biography.com/people/al-gore-9316028#bush-v-gore</p> <p>Also see: Tedtalk: <i>Al Gore: New thinking on the climate crisis</i> (2008). https://www.ted.com/talks/al_gore_s_new_thinking_on_the_climate_crisis</p>



Glossary

For additional glossary terms referring to climate change, please refer to the IPCC glossary of terms. Available online at https://www.ipcc.ch/pdf/special-reports/srex/SREX-Annex_Glossary.pdf

Climate Change Adaptation:

Climate change adaptation refers to any actions in the social, economic, and political spheres, taken to help communities cope with a changing climate as a response to or in preparation of changes occurring in the surrounding natural environment.

The Victorian Centre for Climate Change Adaptation Research has provided additional definitions, available online at www.vcccar.org.au/climate-change-adaptation-definitions

Carbon Markets:

A trading system through which countries may buy or sell units of greenhouse gas emissions in an effort to meet their national limits on emissions, either under the Kyoto Protocol or under other agreements, such as that among member states of the European Union. (OECD)

Carbon Footprint:

The total amount of greenhouse gases that are emitted into the atmosphere each year by a person, family, building, organization, or company. A personal carbon footprint includes greenhouse gas emissions from fuel that an individual burns directly, such as by heating a home or riding in a car. It also includes greenhouse gases that come from producing the goods or services that the individual uses, including emissions from power plants that make electricity, factories that make products, and landfills

where trash gets sent. (EPA, n.d.)

Carbon Sequestration:

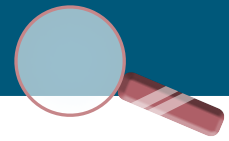
Terrestrial, or biologic, carbon sequestration is the process by which trees and plants absorb carbon dioxide, release the oxygen, and store the carbon. Geologic sequestration is one step in the process of carbon capture and sequestration (CCS), and involves injecting carbon dioxide deep underground where it stays permanently. (EPA, n.d.)

Climate:

It is a long-term average that describes the kind of weather or characteristic meteorological conditions you can expect in an area, region, province, or country. The climate is the synthesis of day-to-day weather conditions in a particular area and is represented by the collection of statistics over a period of time—often 30 years or more. (ECCC, 2013)

Climate Change:

Refers to “any significant change in the measures of climate lasting for an extended period of time. In other words, climate change includes major changes in temperature, precipitation, or wind patterns, among other effects, that occur over several decades or longer.” (EPA, n.d.)



Divestment:

The opposite of *investment*. Divestment involves selling off assets in a company or other institution.

Drought:

“A drought is an extended period of dry weather which lasts longer than normal and leads to measurable losses in businesses such as farming.”
(ECCC, 2013)

Eco-system:

“Any natural unit or entity including living and non-living parts that interact to produce a stable system through cyclic exchange of materials.” (EPA, n.d.)

El Niño:

“El Niño is Spanish for “little boy” and it is what local South American fisherman call a warmer than usual current along the western coast of that continent at Christmas time. Most years, the strong and prevailing trade winds blow westward, dragging the warmest surface waters across the Pacific to Australia and Indonesia. But every 2 to 7 years, these trade winds weaken or change direction. This allows the warm waters to change direction and head toward the coast of South America, increasing water temperatures there as much as 5°C. This causes changes in atmospheric pressure which, in turn, trigger a shift in global weather patterns. La Niña, which is Spanish for “little girl,” is a pool of cooler than normal water that replaces the warmer than normal El Niño current off the west coast of South America. It may be as much as 2°C lower than the average sea surface temperature of 28°C. In contrast to El Niño, La Niña

brings colder winters to western Canada and Alaska and drier, warmer weather to the American south-east.” (ECCC, 2013)

Forecast:

“A forecast provides a description of the most likely weather conditions one is likely to encounter in the near future. The public forecast includes information about the temperature and probability of precipitation, and may also include cloud cover, wind speed, and other weather phenomena.” (ECCC, 2013)

Global Warming:

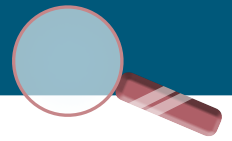
“The increase in the surface temperature of the earth. This term is most often used to describe the warming that the earth is experiencing as a result of increased emissions of greenhouse gases (GHGs).” (MSS)

Greenhouse Effect:

“This term describes the warming of the lower atmosphere caused by atmospheric gases such as water vapour, carbon dioxide and methane containing the heat from the earth’s surface. The natural greenhouse effect keeps the surface temperature of the earth warmer than it would be if all the radiation from the sun escaped immediately.” (ECCC, 2013)

Greenhouse Gas (GHG):

“Any gas that absorbs infrared radiation in the atmosphere is a GHG. These include: carbon dioxide (CO₂), methane (CH₄), Nitrous oxide (N₂O), Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), Sulphur hexafluoride (SF₆), water vapor (H₂O) and ozone (O₃).” (MSS)



Mitigation:

Climate change mitigation, according to the United Nations Environment Program (UNEP) includes “efforts to reduce or prevent emissions of GHGs. This can mean using new technologies and renewable energies, making older equipment more energy efficient or changing management practices or consumer behaviour...” (UNEP, n.d.)

Ozone:

“Ozone is a pungent-smelling, slightly bluish gas which is a close chemical cousin to oxygen. About 90 per cent of the earth’s ozone is located in a natural layer high above the surface of the globe in region of the atmosphere called the stratosphere.

Here, it protects the earth and all that lies within it from the harmful effects of the sun’s ultra-violet radiation by absorbing much of it”. (ECCC, 2013)

Sustainable Development:

The concept of sustainable development comes from the Brundtland Commission report *Our Common Future* (1987): “development which meets the needs of current generations without compromising the ability of future generations to meet their own needs”. This means improving the standard of living by protecting human health, conserving the environment, using resources efficiently and advancing long-term economic competitiveness. (WCED)



Resources

Books

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Websites

BBC News. *A Brief History of Climate Change*.

“BBC News environment correspondent Richard Black traces key milestones, scientific discoveries, technical innovations and political action.”

www.bbc.com/news/science-environment-15874560

The Nature Conservancy. *What’s My Carbon Footprint?*

The Nature Conservancy works “to protect the lands and waters that plants and animals need to survive—for us and for future generations.” It has provided a carbon footprint calculator that students can use to get an idea of how much carbon they are responsible for releasing into the atmosphere.

www.nature.org/greenliving/carboncalculator/

Carbon Market Institute. *Home Page*.

“The Carbon Market Institute (CMI) is an independent membership-based not-for-profit organisation. As the peak body for carbon market participants, CMI has established an important role in the evolution of the carbon market in Australia. The Institute facilitates the networks, knowledge exchange and commercial interaction amongst key government policy makers and regulators, industry, financiers and investors, professional services companies and technology solution providers.”

www.carbonmarketinstitute.org/

Carbon Trade Exchange (CTX). *Home Page*.

CTX creates commercialized technology platforms to operate spot exchanges in multiple global environmental commodity markets, including carbon, renewable energy certificates (RECs), and water, providing an exchange in which sellers and buyers are matched in a secure and efficient manner.

<http://ctxglobal.com/>



David Suzuki Foundation. *Home Page*.

The David Suzuki Foundation “collaborates with Canadians from all walks of life, including government and business, to conserve our environment and find solutions that will create a sustainable Canada through science-based research, education and policy work.”

www.davidsuzuki.org/

Environment Canada. *Teacher’s Corner*.

This site provides educators with lesson plans, teacher’s guides, weather curricula, and additional teaching tips.

<https://ec.gc.ca/meteoaloeil-skywatchers/default.asp?lang=En&n=1267075A-1>

Intergovernmental Panel on Climate Change.

www.ipcc.ch/

International Institute for Sustainable Development. *Resilience*.

“Shocks and stresses from climate change, environmental degradation, rapid demographic shifts and conflict are placing unprecedented pressures on ecosystems and livelihoods, potentially overwhelming existing capacities to respond. We believe that building resilience requires flexibility, diversity and redundancy so that ecological, social and economic systems are better able to withstand and adjust to change.”

<https://www.iisd.org/program/resilience>

Purch. *Live Science*.

“For the science geek in everyone, Live Science offers a fascinating window into the natural and technological world, delivering comprehensive and compelling news and analysis on everything from dinosaur discoveries, archaeological finds and amazing animals to health, innovation and wearable technology.”

www.livescience.com/environment/

Manitoba Conservation and Water Stewardship. *What is Climate Change?*

This page provides a brief, easy-to-understand overview of climate change.

www.gov.mb.ca/conservation/climate/climate_change.html

NASA. *Global Climate Change: Resources for Educators*

This page provides links to various websites that “provide reviewed listings of the best available student and educators resources related to global climate change, including NASA products.”

<http://climate.nasa.gov/resources/education/>



University of Winnipeg. *Prairie Climate Atlas*

The Prairie Climate Atlas (2016) is a series of climate maps developed by Danny Blair and Ryan Smith of the University of Winnipeg.

<http://climate.uwinnipeg.ca/index.html>

Climate Action and UNEP. *Sustainable Innovation Forum 2015 (COP 21)*

“The Sustainable Innovation Forum is an annual event brought to you by Climate Action and United Nations Environment Programme (UNEP).”

www.cop21paris.org/

Nature Conservancy of Canada. *Home Page*.

“The Nature Conservancy of Canada (NCC) protects areas of natural diversity for their intrinsic value and for the benefit of our children and grandchildren.”

www.natureconservancy.ca/

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“We know seas are rising and we know why. The urgent questions are by how much and how quickly. Available to download, this infographic covers the science behind sea level rise, who’s affected, how much melting ice is contributing, and what NASA is doing to help.”

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Many stories on climate change, such as “Canadians Uninformed about Climate Change.”

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Technology, Entertainment and Design (TED). *Tedtalks: Environmental Studies: Climate Change* (n.d.).

“TED Studies, created in collaboration with Wiley, are curated video collections — supplemented by rich educational materials—for students, educators and self-guided learners. In *Climate Change*, speakers give talks that boldly illuminate the nature and scale of current-day climate science, policy and ethics. They explore the economics and psychology of individual and collective action—or inaction—on climate change in order to assess the costs of our choices and opportunities for change.”

Available online at <https://www.ted.com/read/ted-studies/environmental-studies>

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The *Information is Beautiful* website is “dedicated to distilling the world’s data, information and knowledge into beautiful, interesting and, above all, useful visualizations, infographics and diagrams.” Search here for a variety of interesting and informative infographics on a variety of subjects including climate/climate change.

Available online at www.informationisbeautiful.net/

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