



## Glossary

**Abiotic** – An object, substance or process that doesn't involve living organisms.

**Adaptations** – Special traits that help living organisms survive in a particular environment. These adaptations may be structural (size and shape or body temperatures, or needs for minerals), or behavioural (differing ways of reacting to the environment).

**Aerosols** – Solid or liquid particles dispersed in the air, including dust, soot, sea salt crystals, spores, bacteria, viruses and other microscopic particles. Aerosols are often regarded as air pollution, but many aerosols have a natural origin.

**Air** – A mixture of gases and aerosols that composes the atmosphere surrounding Earth. The primary gases of dry air are nitrogen (78%) and oxygen (21%). Trace gases and aerosols make up the remaining 1%. The trace gases include argon, neon, helium, krypton and xenon; hydrogen; and the greenhouse gases. The water vapour content of air can also be significant, but is highly variable with time and from one region to the next. In some locations it can be virtually absent, while in others it can represent a few percent of air volume. Most air is found in the lowest 10 kilometres of the atmosphere.

**Albedo** – The fraction of solar energy (shortwave radiation) reflected from the earth's surface back into space. When you look at the globe, you see that the clouds are mostly white but the ocean is a dark blue. The clouds have a higher albedo than the surface of the ocean.

**Arctic** – The northern polar region of the Earth which includes almost the whole area of the Arctic ocean and adjacent areas of Eurasian and North American continents. Technically the term "Canadian Arctic" covers the part of Canada that is north of the Arctic Circle, but we often use the term to describe everything north of the tree line.

**Arctic circle** – This is the parallel of latitude that runs approximately 66.5° north of the Equator. Within the Arctic Circle, the arctic sun is above the horizon for, at least, 24 continuous hours per year at the time of the summer solstice, and at winter solstice, the arctic sun is below the horizon for at least 24 continuous hours.

**Atmosphere** – The mixture of gases and aerosols – the air – that surrounds the earth in layers, protecting us from dangerous cosmic rays, powerful ultraviolet (UV) radiation from the sun, and even meteors on collision course with earth. Although traces of atmospheric gases have been detected well out into space, 99% of the mass of the atmosphere lies below about 25 to 30 km in altitude, while 50% is concentrated in the lowest 5 km (less than the height of Mount Everest).



**Biodiesel** – A biofuel in which organically-derived oils (soybean or canola oils, animal fats, waste vegetable oils, or microalgae oils) are combined with alcohol and blended with conventional diesel fuel or used by itself (see also “Biomass power”)

**Biofuel** – See “Biomass power”

**Biogas** – Gas, rich in methane, which is produced by the fermentation of animal dung, human sewage or crop residues in an airtight container. It is used as a fuel to for stoves and lamps, to run small machines and to generate electricity. Biogas fuels do not usually cause pollution to the atmosphere, and because they come from renewable energy resources they have great potential for future use.

**Biomass** – The total quantity or mass of living material within a specified area at a given time.

**Biomass power** – Biomass power is energy produced by the burning of biofuels — plant material and animal waste, and specifically grown crops. Biomass material may include tree and grass crops, and forestry, agricultural and urban waste. It includes biogas (see “Biogas”), and other fuels such as wood, ethanol (an alcohol fuel made partly from corn), and agricultural waste. Unlike other renewable fuels, biofuel energy does release carbon dioxide into the atmosphere, but it only returns to the atmosphere as much as the plant removed through photosynthesis during its lifetime.

**Biome** – A very large ecosystem. There are six main biomes in the world: tundra, taiga (boreal forest); desert; tropical rainforest, savannah (grasslands); and marine. The climate in a region, along with the soil, terrain and elevation, helps to define what biome category it fits into.

**Biotic** – Refers to something in the environment that is alive, such as animals, plants, or bacteria

**Boreal forest** – See “Taiga.”

**Carbon cycle** – The combined processes – including photosynthesis, decomposition, and respiration – by which carbon moves between the atmosphere, oceans, and living organisms. For example, carbon (in the form of CO<sub>2</sub> in plant sugar molecules) could be trapped in a plant. When that plant eventually dies and decays or burns, the carbon is once again released to the atmosphere. Living plants absorb carbon from the atmosphere, through photosynthesis, starting the cycle again.

Over very long periods of time (millions of years) the biomass from plants is buried under sediment and placed under extreme pressure that allows it to eventually form coal. This carbon is then removed from the active carbon cycle. Coal can be extracted from the earth and burned, thus releasing CO<sub>2</sub> into the atmosphere and returning it to the active cycle.



**Carbon Dioxide (CO<sub>2</sub>)** – A heavy colourless gas that is formed especially in animal respiration and in the decay or combustion of animal and vegetable matter. CO<sub>2</sub> is absorbed from the air by plants in photosynthesis. It is one of the greenhouse gases.

**Carbon sink** – Carbon sinks are areas that absorb and hold onto lots of carbon dioxide – oceans, soil and forests. A carbon “sink” can become a carbon “source”. For example, a growing forest is a carbon sink as it absorbs more carbon than it releases. But when it burns, it becomes a carbon “source” as it releases lots of carbon into the atmosphere. (See “Carbon cycle.”)

**Climate** – The average weather for a particular region and time period. In other words, climate is the weather you would expect to have in a particular region.

**Climate change** -- Climate change is a change in the “average weather” that a given region experiences. When we speak of climate change on a global scale, we are referring to changes in the climate of the Earth as a whole, including temperature increases (global warming) or decreases, and shifts in wind patterns and precipitation.

**CO<sub>2</sub>** – See “Carbon Dioxide.”

**Convection** – The transfer of heat by the movement of heated liquid or gas. Vertical rising of heat energy (heat convection) in the atmosphere occurs when a shallow layer of air in contact with a hot surface warms up, becomes more buoyant (warmer air is less dense than colder air), and rises, taking with it the energy that it has stored.

**Crude oil** – Crude oil is the mixture of petroleum liquids and gases (including impurities such as sulphur) that is pumped out of the ground by oil wells.

**Diesel** – Diesel is a fuel, which like gasoline, is refined from oil. It is heavier and oilier than gasoline, and has a higher energy density. It is generally cheaper, too, because it needs less refining than gasoline. The diesel engine is a high-efficiency engine that uses higher compression than gasoline engines. The efficiency of the engine and the energy density of the fuel, means that diesel engines generally get better mileage than equivalent gasoline engines.

**Deforestation** – Deforestation is the long-term removal of trees from an area because of changes in land use. Trees absorb carbon dioxide from the atmosphere by photosynthesis, helping to regulate the greenhouse effect. Deforestation releases significant amounts of CO<sub>2</sub> into the atmosphere because of soil disturbance, burning, and removal of above ground biomass from the ecosystem.



**Desertification** – Long-term damage to dry lands caused by drought and by human activities such as over cultivation, deforestation, and poor irrigation practices that turn the land into a desert, unable to grow anything. Existing dry lands, which cover over 40% of the total land area of the world, mainly in Africa and Asia, are most at risk for desertification resulting from drought caused by climate change.

**Drought** – Long periods without any rain.

**Ecosystem** – The community of all of the living things in an area. It includes surroundings, plus all the ways in which the living things interact with each other and their surroundings.

**Energy** – Energy comes in different forms — heat (thermal), light (radiant), mechanical, electrical, chemical, and nuclear. There are two types of energy — stored (potential) energy and working (kinetic) energy. For example, the energy from the food that you eat is stored in your body as chemical energy until you use it. Much of the energy we use comes from non-renewable sources such as fossil fuels (coal, oil and gas). Renewable energy sources include solar power, wind power and hydroelectric power.

**Energy audit** – An assessment of how much energy your home consumes, combined with suggestions on how you can make your home more energy-efficient. An audit shows you where your house is losing energy, and how your insulation, heating and cooling systems could be made more efficient. You can perform a simple energy audit yourself, or have a professional energy auditor carry out a more thorough audit.

**Evaporation** – The process of turning water to vapour (from a liquid to a gas). At 100°C, the boiling point, all water will rapidly be turned to vapour, because the energy supplied to heat the water is enough to break apart all the molecular bonds. At temperatures between 0°C and 100°C, only some of the molecules in the water have enough energy to escape to the atmosphere and the rate at which water is converted to vapour is much slower. The rate of evaporation depends on temperature of the air (an increase of 10°C will double the rate of evaporation) and the dryness or humidity of the air will (drier air has a greater “thirst” for water vapour than moist air). Evaporation is an important part of the water cycle.

**Feedback loops (positive and negative)** – In the climate system a “feedback loop” refers to a pattern of interacting processes where a change in one variable, through interaction with other variables in the system, either reinforces the original process (positive feedback) or suppresses the process (negative feedback). For example, increased global warming will cause increased evaporation, leading to increased cloud cover. This increased cloud cover could have a positive feedback effect on global warming, because it will insulate the earth, keeping more heat in. But it could also have a negative feedback effect, because clouds have a lot of reflectivity, and could reflect more solar energy into space.



**Food chain** – A food chain is a sequence of organisms, each of which uses the next lower member of the sequence as a food source. Algae, for instance, are at the bottom of the marine food chain. Plankton eat algae and are in turn eaten by fish, which are then eaten by seals. These different layers are sometimes called links in the food chain.

**Fossil fuels** – Fossil fuels are fuels containing carbon – coal, oil and gas – that were formed over millions of years through the decay, burial and compaction of rotting vegetation on land, and of marine organisms on the sea floor. Burning fossil fuels is the major way in which humans add to the greenhouse gases in the atmosphere.

**Geothermal energy** – Power generated by the harnessing of heat from the interior of the earth when it comes to – or close to – the earth’s surface. The regions with highest underground temperatures are in areas with active or geologically young volcanoes. The term geothermal energy is also sometimes used to describe groundsource heating (see “groundsource heating”)

**GHGs** – See “Greenhouse gases.”

**GHG emissions** – The greenhouse gases we discharge into the air. The major emission adding to the greenhouse effect is carbon dioxide (CO<sub>2</sub>), but other emissions, such as methane and nitrous oxide, absorb energy more efficiently than CO<sub>2</sub> and thus have a higher impact per amount emitted.

**Glacier** – A very large body of ice moving slowly down a slope or valley or spreading outward on a land surface

**Global warming** – The earth has warmed up by about 0.6°C in the last 100 years. During this period, human emissions of greenhouse gases have increased, largely as a result of the burning of fossil fuels and deforestation. Scientists now think that these increased emissions, leading to the enhanced greenhouse effect, are the cause of global warming.

**Greenhouse effect** – The effect produced by greenhouse gases allowing incoming solar energy to pass through the Earth’s atmosphere, but preventing most of the outgoing heat from the Earth from escaping into outer space. This effect, which is necessary to maintain life on earth, helps to keep the Earth 33°C warmer than it would be without the presence of an atmosphere. Unfortunately, because of excess GHG emissions, the GHGs are now trapping too much heat. This is sometimes called the enhanced greenhouse effect.

**Greenhouse gases (GHGs)** – Gases such as water vapour, carbon dioxide, methane and nitrous oxide, that allow incoming solar radiation to pass through the Earth’s atmosphere, but prevent most of the outgoing infrared (heat) radiation from the surface and lower atmosphere from escaping into outer space. See also “GHG emissions.”



**Groundsource heating** – A system that captures the earth’s underground warmth in pipes, and transfers it into a building using a heat-pump.

**Habitat** – The natural environment of a plant or animal, including its food supply, climate, and shelter

**Hydropower** – Hydroelectric energy uses the force of moving water to create electricity. Generally, the water is dammed and released in controlled amounts through a system of turbines. Large-scale hydropower currently accounts for about 20% of the world’s electricity supply.

**Idling** – The practice of keeping a vehicle engine running, without moving the vehicle. Excessive idling wastes an enormous amount of fuel and money and generates needless greenhouse gas emissions.

**Intergovernmental Panel on Climate Change (IPCC)** – A panel set up by the United Nations in 1988 to review scientific information on climate change. This panel involves over 2,000 of the world’s climate experts. Many of the climate change facts and future predictions we read about come from information reviewed by the IPCC.

**Kyoto Protocol** – In December 1997 in Kyoto, Japan, industrial nations agreed to reduce their collective emissions of greenhouse gases by 5.2% from 1990 levels by the period 2008 to 2012. 160 countries have endorsed the Kyoto Protocol. In order for the Kyoto Protocol to come into force, 55 countries that produced 55% of the developed world’s 1990 carbon dioxide emissions must now ratify it. The European Union ratified in May 2002, Japan in June 2002, and Canada in December 2002. However, those ratifying so far only collectively represent about 44% of developed country emissions. The United States has decided not to ratify the Protocol and Russia is still undecided about ratification. If Russia ratifies, the Protocol will come into force.

**Methane** – A colourless, odourless, non-toxic gas that is produced by organic matter decomposing in an environment without much oxygen – a landfill or a swamp, for instance. Methane is one of the greenhouse gases, and is the main ingredient in natural gas. Methane is also a biogas fuel (see “Biogas”) a renewable energy source, increasingly used as a source of power on large farms where there is lots of animal manure.

**Model (climate)** – A climate model is a method of simulating the behaviour of the climate, to give us a picture of past climates, and to predict future climate change. The basic laws and other relationships necessary to model the climate are expressed as a series of mathematical equations. The climate however, is a very complex system, and climate models require supercomputers to calculate the complicated interactions between landforms, atmosphere and emotions.



**Nitrous Oxide** – A colourless, non-flammable gas with a sweetish odour, commonly known as “laughing gas”, and sometimes used as an anaesthetic. Oceans and rainforests naturally produce nitrous oxide. Nitrous oxide is produced by a range of human activities including: nylon and nitric acid production; the use of fertilizers in agriculture, use of catalytic converters in cars and the burning of organic matter. As are carbon dioxide and methane, nitrous oxide is a greenhouse gas.

**Non-renewable energy** – Energy that can be used only once. Most non-renewable sources of energy (oil, gas and coal) produce greenhouse gases when they are used.

**Oil** – Oil (sometimes called petroleum) is formed from the decayed remains of animals and plants. Under the influence of heat and pressure, the decayed matter breaks down first into liquids and into gases. Both the liquid (petroleum) and gas phases (natural gas) collect in pools under the earth’s surface. After a drilling and pumping process to extract it, oil is refined and turned into a variety of petroleum-based products.

**Permafrost** – The layer of permanently frozen ground that underlies nearly half of Canada, existing wherever ground temperatures remain below 0° C (on average) throughout the year, and where summer heat fails to reach it.

**Petroleum products**- Petroleum is another word for oil (see “Oil”). After being pumped up from the earth, petroleum is refined and turned into many products, including kerosene, benzene, gasoline, paraffin wax, and asphalt. Other materials that we use every day, like plastic and nylon, are also petroleum-based products.

**Photosynthesis** – The process by which green plants use light to synthesize organic compounds from carbon dioxide and water. In the process, oxygen and water are released. Plants create a very important reservoir (or “sink”) for carbon dioxide. See “Carbon cycle” for more on this.

**Photovoltaic cells** – Cells, usually made of specially-treated silicon, that transfer solar energy from the sun to electrical energy.

**Precipitation** – Rain, hail, mist, sleet, snow or any other moisture that falls to the earth.

**Reflectivity** – The fraction of solar energy reflected from a surface (as compared to the fraction that is absorbed by the surface). See also “albedo.”

**Renewable energy** – Energy that comes from sources such as sun, wind and falling water – sources available in an unlimited supply. (See “Solar power,” “Wind power,” “Hydro power,” “Geothermal energy,” and “Biomass power.”)

**Small-scale hydro** – Small hydro-electric power generating projects that vary in size from 5 kw to 30 MW, which either use a “run-of-the-river” turbine, or a small dam to generate power.



**Solar power** – Energy derived directly from the sun. *Passive* solar heating involves the design of homes and other buildings to make full use of direct sunlight for heating purposes. Houses can be designed with large windows in the south facing walls and small windows in the north facing walls, reducing the need for other heating sources such as electricity or fossil fuels. *Active* solar heating includes the use of solar panels to heat large tanks of water mainly for domestic hot water systems and swimming pools. Active solar radiation also includes the use of photovoltaic cells, where the solar energy is converted to electricity.

**Sub arctic** – Sub arctic regions lie just south of the Arctic Circle, characterized by very cold winters, and brief, often warm, summers. This kind of climate offers some of the most extreme seasonal temperature variations found on the planet. In winter, temperature can drop to  $-40^{\circ}$  and in summer, the temperature may rise to  $30^{\circ}$  C above zero. Vegetation in sub arctic climates is usually sparse, as only hardy species can survive the long winter and make use of the short summer.

**Taiga** – One of the six biomes, taiga is another word for boreal forest. Taiga exists in northern areas that have 40-100 centimetres per year of precipitation, much of it snow. The forest contains conifer species (*Abies*, *Picea*, *Larix*, and *Pinus*), and some deciduous trees. Ground cover is mostly mosses and lichens.

**Tidal energy** – Tidal changes in sea level can be used to generate electricity by constructing dams across coastal bays or estuaries which have large differences between low and high tides. The difference in water levels creates water pressure that can drive turbines, creating electricity.

**Tundra** – One of the six biomes, tundra is the open Arctic terrain between the treelike and the ice regions of the far north. Shrubs and small vegetation grow on the tundra that covers much of Nunavut, the Northwest Territories and northern Yukon.

**Turbine** – A mechanism that spins to create power. It is made up of a rotor with blades or cups. Moving water, air, steam or gases turn the blades or cups. This spinning action activates a generator to create electricity.

**Water cycle** – The water cycle is the movement of water from the surface of bodies of water, to the atmosphere, to precipitation. Water vapour enters the atmosphere by evaporation from surface bodies of water and from plants and trees. When the air becomes saturated, excess water vapour is released as condensation. This condensation is the source of all clouds and precipitation. The cycle of evaporation, condensation and precipitation is called the water cycle of the earth and atmosphere.

**Water vapour** – See “Water cycle.”



**Weather** – The specific condition of the atmosphere at a particular place and time. It is measured in terms of such things as wind, temperature, humidity, atmospheric pressure, cloudiness, and precipitation. In most places, weather can change from hour-to-hour, day-to-day, and season-to-season. (For more on long-term weather patterns, see “Climate.”)

**Wetlands** – Areas that are neither fully terrestrial nor fully aquatic. In wetlands, the water table is at, near, or above the land surface, or the area is saturated for long periods. Currently, wetlands cover about 14% of Canada. Most of these wetlands are found in the Prairies and southern NWT, but there are also important ones in the northern Yukon. These wetlands provide important homes to rare or threatened species, particularly birds.

**Wind power** – Air moves around the earth because of the differences in temperature and atmospheric pressure that exist. Wind turbines harness the movement of air to produce energy. The wind turns the blades, which turn a rotor shaft. This produces mechanical power used to drive an electric generator.