

Climate Change Glossary

Climate change is a complex topic and there is a need to work from a common set of terms. The following terms have been gathered from numerous sources including NOAA, IPCC, and others. Included are the most commonly referred to terms in climate change literature and news media.

Acclimatization

The physiological adaptation to climatic variations.

Adaptability

See Adaptive capacity.

Adaptation

Adjustment in natural or human systems to a new or changing environment. Adaptation to climate change refers to adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities. Various types of adaptation can be distinguished, including anticipatory and reactive adaptation, private and public adaptation, and autonomous and planned adaptation.

Adaptation assessment

The practice of identifying options to adapt to climate change and evaluating them in terms of criteria such as availability, benefits, costs, effectiveness, efficiency, and feasibility.

Adaptation benefits

The avoided damage costs or the accrued benefits following the adoption and implementation of adaptation measures.

Adaptation costs

Costs of planning, preparing for, facilitating, and implementing adaptation measures, including transition costs.

Adaptive capacity

The ability of a system to adjust to climate change (including climate variability and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with the consequences.

Additionality

Reduction in emissions by sources or enhancement of removals by sinks that is additional to any that would occur in the absence of a Joint Implementation or a Clean Development Mechanism project activity as defined in the Kyoto Protocol Articles on Joint Implementation and the Clean Development Mechanism. This definition may be further broadened to include financial, investment, and technology additionality. Under “financial additionality,” the project activity funding shall be additional to existing

Global Environmental Facility, other financial commitments of Parties included in Annex I, Official Development Assistance, and other systems of cooperation. Under “investment additionality,” the value of the Emissions Reduction Unit/Certified Emission Reduction Unit shall significantly improve the financial and/or commercial viability of the project activity. Under “technology additionality,” the technology used for the project activity shall be the best available for the circumstances of the host Party.

Adjustment time

See response time.

Aerosols

A collection of airborne solid or liquid particles, with a typical size between 0.01 and 10 mm that reside in the atmosphere for at least several hours. Aerosols may be of either natural or anthropogenic origin. Aerosols may influence climate in two ways: directly through scattering and absorbing radiation, and indirectly through acting as condensation nuclei for cloud formation or modifying the optical properties and lifetime of clouds. See indirect aerosol effect.

Afforestation

Planting of new forests on lands that historically have not contained forests.

Algal blooms

A reproductive explosion of algae in a lake, river, or ocean.

Alpine

The biogeographic zone made up of slopes above timberline and characterized by the presence of rosette-forming herbaceous plants and low shrubby slow-growing woody plants.

Alternative energy

Energy derived from non-fossil-fuel sources.

Ancillary Benefits

Complementary benefits of a climate policy including improvements in local air quality and reduced reliance of imported fossil fuels.

Anthropogenic

Resulting from or produced by human beings.

Anthropogenic emissions

Emissions of greenhouse gases, greenhouse gas precursors, and aerosols associated with human activities. These include burning of fossil fuels for energy, deforestation, and land-use changes that result in net increase in emissions.

Allocation

Under an emissions trading scheme, permits to emit can initially either be given away for free, usually under a 'grandfathering' approach based on past emissions in a base year or an 'updating' approach based on the more recent emissions. The alternative is to auction permits in an initial market offering.

Aquifer

A stratum of permeable rock that bears water. An unconfined aquifer is recharged directly by local rainfall, rivers, and lakes, and the rate of recharge will be influenced by the permeability of the overlying rocks and soils. A confined aquifer is characterized by an overlying bed that is impermeable and the local rainfall does not influence the aquifer.

Arid regions

Ecosystems with less than 250 mm precipitation per year.

Atmosphere

The gaseous envelop surrounding the Earth. The dry atmosphere consists almost entirely of nitrogen (78.1% volume mixing ratio) and oxygen (20.9% volume mixing ratio), together with a number of trace gases, such as argon (0.93% volume mixing ratio), helium, and radiatively active greenhouse gases such as carbon dioxide (0.035% volume mixing ratio) and ozone. In addition, the atmosphere contains water vapor, whose amount is highly variable but typically 1% volume mixing ratio. The atmosphere also contains clouds and aerosols.

Biodiversity

The numbers and relative abundances of different genes (genetic diversity), species, and ecosystems (communities) in a particular area.

Biofuel

A fuel produced from dry organic matter or combustible oils produced by plants. Examples of biofuel include alcohol (from fermented sugar), black liquor from the paper manufacturing process, wood, and soybean oil.

Biomass

The total mass of living organisms in a given area or volume; recently dead plant material is often included as dead biomass.

Black carbon

Operationally defined species based on measurement of light absorption and chemical reactivity and/or thermal stability; consists of soot, charcoal, and/or possible light-absorbing refractory organic matter.

Bog

A poorly drained area rich in accumulated plant material, frequently surrounding a body of open water and having a characteristic flora (such as sedges, heaths, and sphagnum).

Boreal forest

Forests of pine, spruce, fir, and larch stretching from the east coast of Canada westward to Alaska and continuing from Siberia westward across the entire extent of Russia to the European Plain.

Bottom-up models

A modeling approach that includes technological and engineering details in the analysis. See also top-down models.

Burden

The total mass of a gaseous substance of concern in the atmosphere.

Capacity building

In the context of climate change, capacity building is a process of developing the technical skills and institutional capability in developing countries and economies in transition to enable them to participate in all aspects of adaptation to, mitigation of, and research on climate change, and the implementation of the Kyoto Mechanisms, etc.

Carbonaceous aerosol

Aerosol consisting predominantly of organic substances and various forms of black carbon.

Carbon credit

A permit that allows an entity to emit a specified amount of greenhouse gases. Also called emission permit. Buying a carbon credit is like building a credit reserve for later withdrawal of some type.

Carbon cycle

The term used to describe the flow of carbon (in various forms such as carbon dioxide) through the atmosphere, ocean, terrestrial biosphere, and lithosphere.

Carbon dioxide (CO₂)

A naturally occurring gas, and also a by-product of burning fossil fuels and biomass, as well as land-use changes and other industrial processes. It is the principal anthropogenic greenhouse gas that affects the Earth's radiative balance. It is the reference gas against which other greenhouse gases are measured and therefore has a Global Warming Potential of 1.

Carbon dioxide (CO₂) fertilization

The enhancement of the growth of plants as a result of increased atmospheric carbon dioxide concentration. Depending on their mechanism of photosynthesis, certain types of plants are more sensitive to changes in atmospheric carbon dioxide concentration. In particular, plants that produce a three-carbon compound (C₃) during photosynthesis—including most trees and agricultural crops such as rice, wheat, soybeans, potatoes, and vegetables—generally show a larger response than plants that produce a four-carbon

compound (C₄) during photosynthesis—mainly of tropical origin, including grasses and the agriculturally important crops maize, sugar cane, millet, and sorghum.

Carbon footprint

The amount of carbon an entity of any type (e.g., person, group, vehicle, event, building, corporation) emits into the atmosphere.

Carbon market:

A system for buying, selling and trading carbon credits. The regulatory carbon market is based on government regulations such as international Kyoto accords, or recent legislation in California. A voluntary carbon market refers to systems for trading carbon offsets as opposed to carbon credits

Carbon neutral

Being carbon neutral involves calculating your total climate-damaging carbon emissions, reducing them where possible, and then balancing your remaining emissions, often by purchasing a carbon offset.

Carbon offset

Paying to plant new trees or investing in "green" technologies such as solar and wind power. Often these payments are a monetary donation to an environmental fund and/or endowment.

Carbon sink

Anything sequestering carbon such as trees and other vegetation, forests, oceans and grasslands.

Carbon source:

Anything emitting carbon into the atmosphere including forest fires, car exhaust, factories, livestock.

Carbon tax

A tax on energy sources which emit carbon dioxide into the atmosphere.

Catchment

An area that collects and drains rainwater.

Chlorofluorocarbons (CFCs)

Greenhouse gases covered under the 1987 Montreal Protocol and used for refrigeration, air conditioning, packaging, insulation, solvents, or aerosol propellants. Since they are not destroyed in the lower atmosphere, CFCs drift into the upper atmosphere where, given suitable conditions, they break down ozone. These gases are being replaced by other compounds, including hydrochlorofluorocarbons and hydrofluorocarbons, which are greenhouse gases covered under the Kyoto Protocol.

Climate

Climate in a narrow sense is usually defined as the “average weather” or more rigorously as the statistical description in terms of the mean and variability of relevant quantities over a period of time ranging from months to thousands or millions of years. The classical period is 30 years, as defined by the World Meteorological Organization (WMO). These relevant quantities are most often surface variables such as temperature, precipitation, and wind. Climate in a wider sense is the state, including a statistical description, of the climate system.

Climate change

Climate change refers to a statistically significant variation in either the mean state of the climate or in its variability, persisting for an extended period (typically decades or longer). Climate change may be due to natural internal processes or external forcings, or to persistent anthropogenic changes in the composition of the atmosphere or in land use. Note that the United Nations Framework Convention on Climate Change (UNFCCC), in its Article 1, defines “climate change” as: “a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.” The UNFCCC thus makes a distinction between “climate change” attributable to human activities altering the atmospheric composition, and “climate variability” attributable to natural causes. See also climate variability.

Climate feedback

An interaction mechanism between processes in the climate system is called a climate feedback, when the result of an initial process triggers changes in a second process that in turn influences the initial one. A positive feedback intensifies the original process, and a negative feedback reduces it.

Climate model (hierarchy)

A numerical representation of the climate system based on the physical, chemical, and biological properties of its components, their interactions and feedback processes, and accounting for all or some of its known properties. The climate system can be represented by models of varying complexity—that is, for any one component or combination of components a “hierarchy” of models can be identified, differing in such aspects as the number of spatial dimensions, the extent to which physical, chemical or biological processes are explicitly represented, or the level at which empirical parametrizations are involved. Coupled atmosphere/ocean/sea-ice general circulation models (AOGCMs) provide a comprehensive representation of the climate system. There is an evolution towards more complex models with active chemistry and biology. Climate models are applied, as a research tool, to study and simulate the climate, but also for operational purposes, including monthly, seasonal, and interannual climate predictions.

Climate prediction

A climate prediction or climate forecast is the result of an attempt to produce a most likely description or estimate of the actual evolution of the climate in the future (e.g., at seasonal, interannual, or long-term time-scales). See also climate projection and climate scenario.

Climate projection

A projection of the response of the climate system to emission or concentration scenarios of greenhouse gases and aerosols, or radiative forcing scenarios, often based upon simulations by climate models. Climate projections are distinguished from climate predictions in order to emphasize that climate projections depend upon the emission/concentration/radiative forcing scenario used, which are based on assumptions, concerning, for example, futures CIO-economic and technological developments that may or may not be realized, and are therefore subject to substantial uncertainty.

Climate scenario

A plausible and often simplified representation of the future climate, based on an internally consistent set of climatological relationships, that has been constructed for explicit use in investigating the potential consequences of anthropogenic climate change, often serving as input to impact models. Climate projections often serve as the raw material for constructing climate scenarios, but climate scenarios usually require additional information such as about the observed current climate. A “climate change scenario” is the difference between a climate scenario and the current climate.

Climate system

The climate system is the highly complex system consisting of five major components: the atmosphere, the hydrosphere, the cryosphere, the land surface and the biosphere, and the interactions between them. The climate system evolves in time under the influence of its own internal dynamics and because of external forcings such as volcanic eruptions, solar variations, and human-induced forcings such as the changing composition of the atmosphere and land-use change.

Climate variability

Climate variability refers to variations in the mean state and other statistics (such as standard deviations, the occurrence of extremes, etc.) of the climate on all temporal and spatial scales beyond that of individual weather events. Variability may be due to natural internal processes within the climate system (internal variability), or to variations in natural or anthropogenic external forcing (external variability). See also climate change.

Co-benefits

The benefits of policies that are implemented for various reason sat the same time—including climate change mitigation—acknowledging that most policies designed to address greenhouse gas mitigation also have other, often at least equally important, rationales (e.g., related to objectives of development, sustainability, and equity). The term co-impact is also used in a more generic sense to cover both the positive and negative sides of the benefits. See also ancillary benefits.

Co-generation

The use of waste heat from electric generation, such as exhaust from gas turbines, for either industrial purposes or district heating.

Coping range

The variation in climatic stimuli that a system can absorb without producing significant impacts.

Coral bleaching

The paling in color of corals resulting from a loss of symbiotic algae. Bleaching occurs in response to physiological shock in response to abrupt changes in temperature, salinity, and turbidity.

Cost-effective

A criterion that specifies that a technology or measure delivers a good or service at equal or lower cost than current practice, or the least-cost alternative for the achievement of a given target.

Cryosphere

The component of the climate system consisting of all snow, ice, and permafrost on and beneath the surface of the earth and ocean. See also glacier and ice sheet.

Deepwater formation

Occurs when seawater freezes to form sea ice. The local release of salt and consequent increase in water density leads to the formation of saline coldwater that sinks to the ocean floor.

Deforestation

Conversion of forest to non-forest.

Deposit–refund system

Combines a deposit or fee (tax) on a commodity with a refund or rebate (subsidy) for implementation of a specified action.

Desert

An ecosystem with less than 100 mm precipitation per year.

Desertification

Land degradation in arid, semi-arid, and dry sub-humid areas resulting from various factors, including climatic variations and human activities. Further, the United Nations Convention to Combat Desertification defines land degradation as a reduction or loss in arid, semi-arid, and dry sub-humid areas of the biological or economic productivity and complexity of rain-fed cropland, irrigated cropland, or range, pasture, forest, and woodlands resulting from land uses or from a process or combination of processes, including processes arising from human activities and habitation patterns, such as: (i) soil

erosion caused by wind and/or water; (ii) deterioration of the physical, chemical, and biological or economic properties of soil; and (iii) long-term loss of natural vegetation.

Detection and attribution

Climate varies continually on all time scales. Detection of climate change is the process of demonstrating that climate has changed in some defined statistical sense, without providing a reason for that change. Attribution of causes of climate change is the process of establishing the most likely causes for the detected change with some defined level of confidence.

Disturbance regime

Frequency, intensity, and types of disturbances, such as fires, insect or pest outbreaks, floods, and droughts.

Diurnal temperature range

The difference between the maximum and minimum temperature during a day.

Drought

The phenomenon that exists when precipitation has been significantly below normal recorded levels, causing serious hydrological imbalances that adversely affect land resource production systems.

Economic potential

Economic potential is the portion of technological potential for greenhouse gas emissions reductions or energy efficiency improvements that could be achieved cost-effectively through the creation of markets, reduction of market failures, or increased financial and technological transfers. The achievement of economic potential requires additional policies and measures to break down market barriers. See also market potential, socio-economic potential, and technological potential.

Ecosystem

A system of interacting living organisms together with their physical environment. The boundaries of what could be called an ecosystem are somewhat arbitrary, depending on the focus of interest or study. Thus, the extent of an ecosystem may range from very small spatial scales to, ultimately, the entire Earth.

Ecosystem services

Ecological processes or functions that have value to individuals or society.

El Niño Southern Oscillation (ENSO)

El Niño, in its original sense, is a warmwater current that periodically flows along the coast of Ecuador and Peru, disrupting the local fishery. This oceanic event is associated with a fluctuation of the intertropical surface pressure pattern and circulation in the Indian and Pacific Oceans, called the Southern Oscillation. This coupled atmosphere-ocean phenomenon is collectively known as El Niño Southern Oscillation, or ENSO. During an El Niño event, the prevailing trade winds weaken and the equatorial countercurrent

strengthens, causing warm surface waters in the Indonesian area to flow eastward to overlie the cold waters of the Peru current. This event has great impact on the wind, sea surface temperature, and precipitation patterns in the tropical Pacific. It has climatic effects throughout the Pacific region and in many other parts of the world. The opposite of an El Niño event is called La Niña.

Emissions

In the climate change context, emissions refer to the release of greenhouse gases and/or their precursors and aerosols into the atmosphere over a specified area and period of time.

Emissions permit

An emissions permit is the non-transferable or tradable allocation of entitlements by an administrative authority (intergovernmental organization, central or local government agency) to a regional (country, sub-national) or a sectoral (an individual firm) entity to emit a specified amount of a substance.

Emissions quota

The portion or share of total allowable emissions assigned to a country or group of countries within a framework of maximum total emissions and mandatory allocations of resources.

Emissions Reduction Unit (ERU)

Equal to 1 tonne (metric ton) of carbon dioxide emissions reduced or sequestered arising from a Joint Implementation (defined in Article 6 of the Kyoto Protocol) project calculated using Global Warming Potential. See also Certified Emission Reduction Unit and emissions trading.

Emissions tax

Levy imposed by a government on each unit of CO₂-equivalent emissions by a source subject to the tax. Since virtually all of the carbon in fossil fuels is ultimately emitted as carbon dioxide, a levy on the carbon content of fossil fuels—a carbon tax—is equivalent to an emissions tax for emissions caused by fossilfuel combustion. An energy tax—a levy on the energy content of fuels—reduces demand for energy and so reduces carbon dioxide emissions from fossil-fuel use. An ecotax is designated for the purpose of influencing human behavior (specifically economic behavior) to follow an ecologically benign path. International emissions/carbon/energy tax is a tax imposed on specified sources in participating countries by an international agency. The revenue is distributed or used as specified by participating countries or the international agency.

Emissions trading

A market-based approach to achieving environmental objectives that allows, those reducing greenhouse gas emissions below what is required, to use or trade the excess reductions to offset emissions at another source inside or outside the country. In general, trading can occur at the intracompany, domestic, and international levels.

Energy efficiency

Ratio of energy output of a conversion process or of a system to its energy input.

Energy intensity

Energy intensity is the ratio of energy consumption to economic or physical output. At the national level, energy intensity is the ratio of total domestic primary energy consumption or final energy consumption to Gross Domestic Product or physical output.

Energy service

The application of useful energy to tasks desired by the consumer such as transportation, a warm room, or light.

Energy transformation

The change from one form of energy, such as the energy embodied in fossil fuels, to another, such as electricity.

Environmentally Sound Technologies (ESTs)

Technologies that protect the environment, are less polluting, use all resources in a more sustainable manner, recycle more of their wastes and products, and handle residual wastes in a more acceptable manner than the technologies for which they were substitutes and are compatible with nationally determined socio-economic, cultural, and environmental priorities. ESTs in this report imply mitigation and adaptation technologies, hard and soft technologies.

Equivalent CO₂ (carbon dioxide)

The concentration of carbon dioxide that would cause the same amount of radiative forcing as a given mixture of carbon dioxide and other greenhouse gases.

Erosion

The process of removal and transport of soil and rock by weathering, mass wasting, and the action of streams, glaciers, waves, winds, and underground water.

Eustatic sea-level change

A change in global average sea level brought about by an alteration to the volume of the world ocean. This may be caused by changes in water density or in the total mass of water. In discussions of changes on geological time scales, this term sometimes also includes changes in global average sea level caused by an alteration to the shape of the ocean basins. In this report, the term is not used in that sense.

Evaporation

The process by which a liquid becomes a gas.

Evapotranspiration

The combined process of evaporation from the Earth's surface and transpiration from vegetation.

Exposure

The nature and degree to which a system is exposed to significant climatic variations.

External cost

Used to define the costs arising from any human activity, when the agent responsible for the activity does not take full account of the impacts on others of his or her actions.

Equally, when the impacts are positive and not accounted for in the actions of the agent responsible they are referred to as external benefits. Emissions of particulate pollution from a power station affect the health of people in the vicinity, but this is not often considered, or is given inadequate weight, in private decision making and there is no market for such impacts. Such a phenomenon is referred to as an “externality,” and the costs it imposes are referred to as the external costs.

Extreme weather event

An extreme weather event is an event that is rare within its statistical reference distribution at a particular place. Definitions of “rare” vary, but an extreme weather event would normally be as rare as or rarer than the 10th or 90th percentile. By definition, the characteristics of what is called extreme weather may vary from place to place. An extreme climate event is an average of a number of weather events over a certain period of time, an average which is itself extreme (e.g., rainfall over a season).

Final energy

Energy supplied that is available to the consumer to be converted into usable energy (e.g., electricity at the wall outlet).

Food insecurity

A situation that exists when people lack secure access to sufficient amounts of safe and nutritious food for normal growth and development and an active and healthy life. It may be caused by the unavailability of food, insufficient purchasing power, inappropriate distribution, or inadequate use of food at the household level. Food insecurity may be chronic, seasonal, or transitory.

Forest

A vegetation type dominated by trees. Many definitions of the term forest are in use throughout the world, reflecting wide differences in bio-geophysical conditions, social structure, and economics. For a discussion of the term forest and related terms such as afforestation, reforestation, and deforestation.

Fossil CO₂ (carbon dioxide) emissions

Emissions of carbon dioxide resulting from the combustion of fuels from fossil carbon deposits such as oil, natural gas, and coal.

Fossil fuels

Carbon-based fuels from fossil carbon deposits, including coal, oil, and natural gas.

Fuel switching

Policy designed to reduce carbon dioxide emissions by switching to lower carbon-content fuels, such as from coal to natural gas.

General circulation

The large scale motions of the atmosphere and the ocean as a consequence of differential heating on a rotating Earth, aiming to restore the energy balance of the system through transport of heat and momentum.

Geo-engineering

Efforts to stabilize the climate system by directly managing the energy balance of the Earth, thereby overcoming the enhanced greenhouse effect.

Glacier

A mass of land ice flowing downhill (by internal deformation and sliding at the base) and constrained by the surrounding topography (e.g., the sides of a valley or surrounding peaks); the bedrock topography is the major influence on the dynamics and surface slope of a glacier. A glacier is maintained by accumulation of snow at high altitudes, balanced by melting at low altitudes or discharge into the sea.

Global surface temperature

The global surface temperature is the area-weighted global average of (i) the sea surface temperature over the oceans (i.e., the sub-surface bulk temperature in the first few meters of the ocean), and (ii) the surface air temperature over land at 1.5 m above the ground.

Global Warming Potential (GWP)

An index, describing the radiative characteristics of well-mixed greenhouse gases, that represents the combined effect of the differing times these gases remain in the atmosphere and their relative effectiveness in absorbing outgoing infrared radiation. This index approximates the time-integrated warming effect of a unit mass of a given greenhouse gas in today's atmosphere, relative to that of carbon dioxide.

Greenhouse effect

Greenhouse gases effectively absorb infrared radiation, emitted by the Earth's surface, by the atmosphere itself due to the same gases, and by clouds. Atmospheric radiation is emitted to all sides, including downward to the Earth's surface. Thus greenhouse gases trap heat within the surface-troposphere system. This is called the "natural greenhouse effect." Atmospheric radiation is strongly coupled to the temperature of the level at which it is emitted. In the troposphere, the temperature generally decreases with height. Effectively, infrared radiation emitted to space originates from an altitude with a temperature of, on average, -19°C , in balance with the net incoming solar radiation, whereas the Earth's surface is kept at a much higher temperature of, on average, $+14^{\circ}\text{C}$. An increase in the concentration of greenhouse gases leads to an increased infrared opacity of the atmosphere, and therefore to an effective radiation into space from a higher altitude at a lower temperature. This causes a radiative forcing, an imbalance that can

only be compensated for by an increase of the temperature of the surface-troposphere system. This is the “enhanced greenhouse effect.”

Greenhouse gas

Greenhouse gases are those gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and emit radiation at specific wavelengths within the spectrum of infrared radiation emitted by the Earth’s surface, the atmosphere, and clouds. This property causes the greenhouse effect. Water vapor (H₂O), carbon dioxide (CO₂), nitrous oxide (N₂O), methane (CH₄), and ozone (O₃) are the primary greenhouse gases in the Earth’s atmosphere. Moreover there are a number of entirely human-made greenhouse gases in the atmosphere, such as the halocarbons and other chlorine- and bromine-containing substances, dealt with under the Montreal Protocol. Besides CO₂, N₂O, and CH₄, the Kyoto Protocol deals with the greenhouse gases sulfur hexafluoride (SF₆), hydrofluorocarbons (HFCs), and perfluorocarbons (PFCs).

Groundwater recharge

The process by which external water is added to the zone of saturation of an aquifer, either directly into a formation or indirectly by way of another formation.

Habitat

The particular environment or place where an organism or species tend to live; a more locally circumscribed portion of the total environment.

Heat island

An area within an urban area characterized by ambient temperatures higher than those of the surrounding area because of the absorption of solar energy by materials like asphalt.

Heterotrophic respiration

The conversion of organic matter to CO₂ by organisms other than plants.

Hydrofluorocarbons (HFCs)

Among the six greenhouse gases to be curbed under the Kyoto Protocol. They are produced commercially as a substitute for chlorofluorocarbons. HFCs largely are used in refrigeration and semiconductor manufacturing. Their Global Warming Potentials range from 1,300 to 11,700.

Hydrosphere

The component of the climate system composed of liquid surface and subterranean water, such as oceans, seas, rivers, freshwater lakes, underground water, etc.

Ice cap

A dome shaped ice mass covering a highland area that is considerably smaller in extent than an ice sheet.

Ice sheet

A mass of land ice that is sufficiently deep to cover most of the underlying bedrock topography, so that its shape is mainly determined by its internal dynamics (the flow of the ice as it deforms internally and slides at its base). An ice sheet flows outward from a high central plateau with a small average surface slope. The margins slope steeply, and the ice is discharged through fast-flowing ice streams or outlet glaciers, in some cases into the sea or into ice shelves floating on the sea. There are only two large ice sheets in the modern world, on Greenland and Antarctica, the Antarctic ice sheet being divided into East and West by the Transantarctic Mountains; during glacial periods there were others.

Ice shelf

A floating ice sheet of considerable thickness attached to a coast (usually of great horizontal extent with a level or gently undulating surface); often a seaward extension of ice sheets.

(Climate) Impact assessment

The practice of identifying and evaluating the detrimental and beneficial consequences of climate change on natural and human systems.

(Climate) Impacts

Consequences of climate change on natural and human systems. Depending on the consideration of adaptation, one can distinguish between potential impacts and residual impacts. Potential impacts: All impacts that may occur given a projected change in climate, without considering adaptation. Residual impacts: The impacts of climate change that would occur after adaptation. See also aggregate impacts, market impacts, and non-market impacts.

Implementation

Implementation refers to the actions (legislation or regulations, judicial decrees, or other actions) that governments take to translate international accords into domestic law and policy. It includes those events and activities that occur after the issuing of authoritative public policy directives, which include the effort to administer and the substantive impacts on people and events. It is important to distinguish between the legal implementation of international commitments (in national law) and the effective implementation (measures that induce changes in the behavior of target groups). Compliance is a matter of whether and to what extent countries do adhere to the provisions of the accord. Compliance focuses on not only whether implementing measures are in effect, but also on whether there is compliance with the implementing actions. Compliance measures the degree to which the actors whose behavior is targeted by the agreement, whether they are local government units, corporations, organizations, or individuals, conform to the implementing measures and obligations.

Introduced species

A species occurring in an area outside its historically known natural range as a result of accidental dispersal by humans (also referred to as “exotic species” or “alien species”).

Invasive species

An introduced species that invades natural habitats.

Isostatic land movements

Isostasy refers to the way in which the lithosphere and mantle respond to changes in surface loads. When the loading of the lithosphere is changed by alterations in land ice mass, ocean mass, sedimentation, erosion, or mountain building, vertical isostatic adjustment results, in order to balance the new load.

La Niña

See El Niño Southern Oscillation.

Land use

The total of arrangements, activities, and inputs undertaken in a certain land cover type (a set of human actions). The social and economic purposes for which land is managed (e.g., grazing, timber extraction, and conservation).

Land-use change

A change in the use or management of land by humans, which may lead to a change in land cover. Land cover and land-use change may have an impact on the albedo, evapotranspiration, sources, and sinks of greenhouse gases, or other properties of the climate system, and may thus have an impact on climate, locally or globally.

Landslide

A mass of material that has slipped downhill by gravity, often assisted by water when the material is saturated; rapid movement of a mass of soil, rock, or debris down a slope.

Leapfrogging

Leapfrogging (or technological leapfrogging) refers to the opportunities in developing countries to bypass several stages of technology development, historically observed in industrialized countries, and apply the most advanced presently available technologies in the energy and other economic sectors, through investments in technological development and capacity building.

Lithosphere

The upper layer of the solid Earth, both continental and oceanic, which is composed of all crustal rocks and the cold, mainly elastic, part of the uppermost mantle. Volcanic activity, although part of the lithosphere, is not considered as part of the climate system, but acts as an external forcing factor.

Mean Sea Level (MSL)

Mean Sea Level is normally defined as the average relative sea level over a period, such as a month or a year, long enough to average out transients such as waves. See also sea-level rise.

Methane (CH₄)

A hydrocarbon that is a greenhouse gas produced through anaerobic (without oxygen) decomposition of waste in landfills, animal digestion, decomposition of animal wastes, production and distribution of natural gas and oil, coal production, and incomplete fossil-fuel combustion. Methane is one of the six greenhouse gases to be mitigated under the Kyoto Protocol.

Methane recovery

Method by which methane emissions (e.g., from coal mines or waste sites) are captured and then reused either as a fuel or for some other economic purpose (e.g., reinjection in oil or gas reserves).

Mitigation

An anthropogenic intervention to reduce the sources or enhance the sinks of greenhouse gases.

Mitigative capacity

The social, political, and economic structures and conditions that are required for effective mitigation.

Mixed layer

The upper region of the ocean well-mixed by interaction with the overlying atmosphere.

Net carbon dioxide emissions

Difference between sources and sinks of carbon dioxide in a given period and specific area or region.

Nitrogen fertilization

Enhancement of plant growth through the addition of nitrogen compounds.

Nitrogen oxides (NO_x)

Any of several oxides of nitrogen.

Nitrous oxide (N₂O)

A powerful greenhouse gas emitted through soil cultivation practices, especially the use of commercial and organic fertilizers, fossil-fuel combustion, nitric acid production, and biomass burning. One of the six greenhouse gases to be curbed under the Kyoto Protocol.

Non-point-source pollution

Pollution from sources that cannot be defined as discrete points, such as areas of crop production, timber, surface mining, disposal of refuse, and construction. See also pointsource pollution.

North Atlantic Oscillation (NAO)

The North Atlantic Oscillation consists of opposing variations of barometric pressure near Iceland and near the Azores. On average, a westerly current, between the Icelandic low pressure area and the Azores high pressure area, carries cyclones with their associated frontal systems towards Europe. However, the pressure difference between Iceland and the Azores fluctuates on time scales of days to decades, and can be reversed at times. It is the dominant mode of winter climate variability in the North Atlantic region, ranging from central North America to Europe.

Ocean conveyor belt

The theoretical route by which water circulates around the entire global ocean, driven by wind and the thermohaline circulation.

Organic aerosol

Aerosol particles consisting predominantly of organic compounds, mainly C, H, and O, and lesser amounts of other elements.

Ozone (O₃)

Ozone, the triatomic form of oxygen (O₃), is a gaseous atmospheric constituent. In the troposphere it is created both naturally and by photochemical reactions involving gases resulting from human activities (photochemical “smog”). In high concentrations, tropospheric ozone can be harmful to a wide-range of living organisms. Tropospheric ozone acts as a greenhouse gas. In the stratosphere, ozone is created by the interaction between solar ultraviolet radiation and molecular oxygen (O₂). Stratospheric ozone plays a decisive role in the stratospheric radiative balance. Its concentration is highest in the ozone layer. Depletion of stratospheric ozone, due to chemical reactions that may be enhanced by climate change, results in an increased ground-level flux of ultraviolet-B radiation. See also Montreal Protocol and ozone layer.

Ozone layer

The stratosphere contains a layer in which the concentration of ozone is greatest, the so-called ozone layer. The layer extends from about 12 to 40 km. The ozone concentration reaches a maximum between about 20 and 25 km. This layer is being depleted by human emissions of chlorine and bromine compounds. Every year, during the Southern Hemisphere spring, a very strong depletion of the ozone layer takes place over the Antarctic region, also caused by human-made chlorine and bromine compounds in combination with the specific meteorological conditions of that region. This phenomenon is called the ozone hole.

Permafrost

Perennially frozen ground that occurs wherever the temperature remains below 0°C for several years.

Photosynthesis

The process by which plants take carbon dioxide (CO₂) from the air (or bicarbonate in water) to build carbohydrates, releasing oxygen (O₂) in the process. There are several pathways of photosynthesis with different responses to atmospheric CO₂ concentrations. See also carbon dioxide fertilization.

Phytoplankton

The plant forms of plankton (e.g., diatoms). Phytoplankton are the dominant plants in the sea, and are the base of the entire marine food web. These single-celled organisms are the principal agents for photosynthetic carbon fixation in the ocean. See also zooplankton.

Plankton

Aquatic organisms that drift or swim weakly. See also phytoplankton and zooplankton.

Point-source pollution

Pollution resulting from any confined, discrete source, such as a pipe, ditch, tunnel, well, container, concentrated animalfeeding operation, or floating craft. See also non-point-source pollution.

Positive Feedback

A process that results in an amplification of the response of a system to an external influence. For example, increased atmospheric water vapor in response to global warming would be a positive feedback on warming, because water vapor is a GHG.

Post-glacial rebound

The vertical movement of the continents and sea floor following the disappearance and shrinking of ice sheets—for example, since the Last Glacial Maximum (21 thousand years before the present). The rebound is an isostatic land movement.

Primary energy

Energy embodied in natural resources (e.g., coal, crude oil, sunlight, uranium) that has not undergone any anthropogenic conversion or transformation.

Private cost

Categories of costs influencing an individual's decision making are referred to as private costs. See also social cost and total cost.

Radiative Forcing

The term radiative forcing refers to changes in the energy balance of the earth-atmosphere system in response to a change in factors such as greenhouse gases, land-use change, or solar radiation. The climate system inherently attempts to balance incoming (e.g., light) and outgoing (e.g. heat) radiation. Positive radiative forcings increase the temperature of the lower atmosphere, which in turn increases temperatures at the Earth's surface. Negative radiative forcings cool the lower atmosphere. Radiative forcing is most commonly measured in units of watts per square meter (W/m²).

Rangeland

Unimproved grasslands, shrublands, savannas, and tundra.

Regeneration

The renewal of a stand of trees through either natural means (seeded onsite or adjacent stands or deposited by wind, birds, or animals) or artificial means (by planting seedlings or direct seeding).

Rapid climate change

The non-linearity of the climate system may lead to rapid climate change, sometimes called abrupt events or even surprises. Some such abrupt events may be imaginable, such as a dramatic reorganization of the thermohaline circulation, rapid deglaciation, or massive melting of permafrost leading to fast changes in the carbon cycle. Others may be truly unexpected, as a consequence of a strong, rapidly changing, forcing of a non-linear system.

Rebound effect

Occurs because, for example, an improvement in motor efficiency lowers the cost per kilometer driven; it has the perverse effect of encouraging more trips.

Reforestation

Planting of forests on lands that have previously contained forests but that have been converted to some other use. For a discussion of the term forest and related terms such as afforestation, reforestation, and deforestation.

Relative sea level

Sea level measured by a tide gauge with respect to the land upon which it is situated. See also Mean Sea Level.

(Relative) Sea level secular change

Long-term changes in relative sea level caused by either eustatic changes (e.g., brought about by thermal expansion) or changes in vertical land movements.

Renewables

Energy sources that are, within a short time frame relative to the Earth's natural cycles, sustainable, and include non-carbon technologies such as solar energy, hydropower, and wind, as well as carbon-neutral technologies such as biomass.

Renewable Energy

Energy obtained from sources such as geothermal, wind, photovoltaic, solar, and biomass.

Revenue Recycling

If permits are auctioned, this gives considerable sums of money to be recycled back into the economy, either through a lump sum payment of offsetting other taxes. If the existing taxes that are correspondingly reduced were very inefficient, this allows this allows the

possibility of both environmental and economic benefits from the trading system, commonly called the 'double dividend.'

Research, development, and demonstration

Scientific and/or technical research and development of new production processes or products, coupled with analysis and measures that provide information to potential users regarding the application of the new product or process; demonstration tests; and feasibility of applying these products processes via pilot plants and other pre-commercial applications.

Reserves

Refer to those occurrences that are identified and measured as economically and technically recoverable with current technologies and prices. See also resources.

Reservoir

A component of the climate system, other than the atmosphere, which has the capacity to store, accumulate, or release a substance of concern (e.g., carbon, a greenhouse gas, or a precursor). Oceans, soils, and forests are examples of reservoirs of carbon. Pool is an equivalent term (note that the definition of pool often includes the atmosphere). The absolute quantity of substance of concerns, held within a reservoir at a specified time, is called the stock. The term also means an artificial or natural storage place for water, such as a lake, pond, or aquifer, from which the water may be withdrawn for such purposes as irrigation, water supply, or irrigation.

Resilience

Amount of change a system can undergo without changing state.

Resource base

Resource base includes both reserves and resources.

Resources

Resources are those occurrences with less certain geological and/or economic characteristics, but which are considered potentially recoverable with foreseeable technological and economic developments.

Respiration

The process whereby living organisms converts organic matter to carbon dioxide, releasing energy and consuming oxygen.

Response time

The response time or adjustment time is the time needed for the climate system or its components to re-equilibrate to a new state, following a forcing resulting from external and internal processes or feedbacks. It is very different for various components of the climate system. The response time of the troposphere is relatively short, from days to weeks, whereas the stratosphere comes into equilibrium on a time scale of typically a few months. Due to their large heat capacity, the oceans have a much longer response time,

typically decades, but up to centuries or millennia. The response time of the strongly coupled surface-troposphere system is, therefore, slow compared to that of the stratosphere, and mainly determined by the oceans. The biosphere may respond fast (e.g., to droughts), but also very slowly to imposed changes. See lifetime for a different definition of response time pertinent to the rate of processes affecting the concentration of trace gases.

Runoff

That part of precipitation that does not evaporate. In some countries, runoff implies surface runoff only.

Salinization

The accumulation of salts in soils.

Saltwater intrusion/encroachment

Displacement of fresh surfacewater or groundwater by the advance of saltwater due to its greater density, usually in coastal and estuarine areas.

Sea-level rise

An increase in the mean level of the ocean. Eustatic sea-level rise is a change in global average sea level brought about by an alteration to the volume of the world ocean. Relative sea level rise occurs where there is a net increase in the level of the ocean relative to local land movements. Climate modelers largely concentrate on estimating eustatic sea-level change. Impact researchers focus on relative sea-level change.

Seawall

A human-made wall or embankment along a shore to prevent wave erosion.

Semi-arid regions

Ecosystems that have more than 250 mm precipitation per year but are not highly productive; usually classified as rangelands.

Sequestration

The process of increasing the carbon content of a carbon reservoir other than the atmosphere. Biological approaches to sequestration include direct removal of carbon dioxide from the atmosphere through land-use change, afforestation, reforestation, and practices that enhance soil carbon in agriculture. Physical approaches include separation and disposal of carbon dioxide from flue gases or from processing fossil fuels to produce hydrogen- and carbon dioxide-rich fractions and long term storage in underground in depleted oil and gas reservoirs, coal seams, and saline aquifers. See also uptake.

Silt

Unconsolidated or loose sedimentary material whose constituent rock particles are finer than grains of sand and larger than clay particles.

Silviculture

Development and care of forests.

Sink

Any process, activity or mechanism that removes a greenhouse gas, an aerosol, or a precursor of a greenhouse gas or aerosol from the atmosphere.

Snowpacks

A seasonal accumulation of slow-melting snow.

Social cost

The social cost of an activity includes the value of all the resources used in its provision. Some of these are priced and others are not. Non-priced resources are referred to as externalities. It is the sum of the costs of these externalities and the priced resources that makes up the social cost. See also private cost and total cost.

Soil moisture

Water stored in or at the land surface and available for evaporation.

Solar activity

The Sun exhibits periods of high activity observed in numbers of sunspots, as well as radiative output, magnetic activity, and emission of high energy particles. These variations take place on a range of time scales from millions of years to minutes. See also solar cycle.

Solar (“11 year”) cycle

A quasi-regular modulation of solar activity with varying amplitude and a period of between 9 and 13 years.

Solar radiation

Radiation emitted by the Sun. It is also referred to as shortwave radiation. Solar radiation has a distinctive range of wavelengths (spectrum) determined by the temperature of the Sun.

Soot particles

Particles formed during the quenching of gases at the outer edge of flames of organic vapors, consisting predominantly of carbon, with lesser amounts of oxygen and hydrogen present as carboxyl and phenolic groups and exhibiting an imperfect graphitic structure (Charlson and Heintzenberg, 1995). See also black carbon.

Source

Any process, activity, or mechanism that releases a greenhouse gas, an aerosol, or a precursor of a greenhouse gas or aerosol into the atmosphere.

Southern Oscillation

See El Niño Southern Oscillation.

Spill-over effect

The economic effects of domestic or sectoral mitigation measures on other countries or sectors. In this report, no assessment is made on environmental spillover effects. Spillover effects can be positive or negative and include effects on trade, carbon leakage, transfer, and diffusion of environmentally sound technology and other issues.

Stabilization

The achievement of stabilization of atmospheric concentrations of one or more greenhouse gases (e.g., carbon dioxide or a CO₂-equivalent basket of greenhouse gases).

Stabilization analysis

In this report, this refers to analyses or scenarios that address the stabilization of the concentration of greenhouse gases.

Stakeholders

Person or entity holding grants, concessions, or any other type of value that would be affected by a particular action or policy.

Standards

Set of rules or codes mandating or defining product performance (e.g., grades, dimensions, characteristics, test methods, and rules for use). International product and/or technology or performance standards establish minimum requirements for affected products and/or technologies in countries where they are adopted. The standards reduce greenhouse gas emissions associated with the manufacture or use of the products and/or application of the technology. See also regulatory measures.

Stimuli (climate-related)

All the elements of climate change, including mean climate characteristics, climate variability, and the frequency and magnitude of extremes.

Storm surge

The temporary increase, at a particular locality, in the height of the sea due to extreme meteorological conditions (low atmospheric pressure and/or strong winds). The storm surge is defined as being the excess above the level expected from the tidal variation alone at that time and place.

Streamflow

Water within a river channel, usually expressed in m³ sec⁻¹.

Stratosphere

The highly stratified region of the atmosphere above the troposphere extending from about 10 km (ranging from 9 km in high latitudes to 16 km in the tropics on average) to about 50 km.

Structural change

Changes, for example, in the relative share of Gross Domestic Product produced by the industrial, agricultural, or services sectors of an economy; or more generally, systems transformations whereby some components are either replaced or potentially substituted by other ones.

Submergence

A rise in the water level in relation to the land, so that areas of formerly dry land become inundated; it results either from a sinking of the land or from a rise of the water level.

Subsidence

The sudden sinking or gradual downward settling of the Earth's surface with little or no horizontal motion.

Subsidy

Direct payment from the government to an entity, or a tax reduction to that entity, for implementing a practice the government wishes to encourage. Greenhouse gas emissions can be reduced by lowering existing subsidies that have the effect of raising emissions, such as subsidies to fossil-fuel use, or by providing subsidies for practices that reduce emissions or enhance sinks (e.g., for insulation of buildings or planting trees).

Sunspots

Small dark areas on the Sun. The number of sunspots is higher during periods of high solar activity, and varies in particular with the solar cycle.

Surface runoff

The water that travels over the soil surface to the nearest surface stream; runoff of a drainage basin that has not passed beneath the surface since precipitation.

Sustainable development

Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

Technology transfer

The broad set of processes that cover the exchange of knowledge, money, and goods among different stakeholders that lead to the spreading of technology for adapting to or mitigating climate change. As a generic concept, the term is used to encompass both diffusion of technologies and technological cooperation across and within countries.

Thermal erosion

The erosion of ice-rich permafrost by the combined thermal and mechanical action of moving water.

Thermal expansion

In connection with sea level, this refers to the increase in volume (and decrease in density) that results from warming water. A warming of the ocean leads to an expansion of the ocean volume and hence an increase in sea level.

Thermohaline circulation

Large-scale density-driven circulation in the ocean, caused by differences in temperature and salinity. In the North Atlantic, the thermohaline circulation consists of warm surface water flowing northward and cold deepwater flowing southward, resulting in a net poleward transport of heat. The surface water sinks in highly restricted sinking regions located in high latitudes.

Time scale

Characteristic time for a process to be expressed.

Top-down models

The terms “top” and “bottom” are shorthand for aggregate and disaggregated models. The top-down label derives from how modelers applied macro-economic theory and econometric techniques to historical data on consumption, prices, incomes, and factor costs to model final demand for goods and services, and supply from main sectors, like the energy sector, transportation, agriculture, and industry. Therefore, top-down models evaluate the system from aggregate economic variables, as compared to bottom-up models that consider technological options or project specific climate change mitigation policies. Some technology data were, however, integrated into top-down analysis and so the distinction is not that clear-cut.

Tropopause

The boundary between the troposphere and the stratosphere.

Troposphere

The lowest part of the atmosphere from the surface to about 10 km in altitude in mid-latitudes (ranging from 9 km in high latitudes to 16 km in the tropics on average) where clouds and “weather” phenomena occur. In the troposphere, temperatures generally decrease with height.

Tundra

A treeless, level, or gently undulating plain characteristic of arctic and subarctic regions.

Ultraviolet (UV)-B radiation

Solar radiation within a wavelength range of 280-320 nm, the greater part of which is absorbed by stratospheric ozone. Enhanced UV-B radiation suppresses the immune system and can have other adverse effects on living organisms.

Uncertainty

An expression of the degree to which a value (e.g., the future state of the climate system) is unknown. Uncertainty can result from lack of information or from disagreement about what is known or even knowable.

Uptake

The addition of a substance of concern to a reservoir. The uptake of carbon-containing substances, in particular carbon dioxide, is often called (carbon) sequestration. See also sequestration.

Upwelling

Transport of deeper water to the surface, usually caused by horizontal movements of surface water.

Urbanization

The conversion of land from a natural state or managed natural state (such as agriculture) to cities; a process driven by net rural-to-urban migration through which an increasing percentage of the population in any nation or region come to live in settlements that are defined as “urban centres.”

Value added

The net output of a sector after adding up all outputs and subtracting intermediate inputs.

Values

Worth, desirability, or utility based on individual preferences. The total value of any resource is the sum of the values of the different individuals involved in the use of the resource. The values, which are the foundation of the estimation of costs, are measured in terms of the willingness to pay (WTP) by individuals to receive the resource or by the willingness of individuals to accept payment (WTA) to part with the resource.

Vector

An organism, such as an insect, that transmits a pathogen from one host to another.

Vulnerability

The degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is exposed, its sensitivity, and its adaptive capacity.

Water stress

A country is water-stressed if the available freshwater supply relative to water withdrawals acts as an important constraint on development. Withdrawals exceeding 20% of renewable water supply has been used as an indicator of water stress.

Water-use efficiency

Carbon gain in photosynthesis per unit water lost in evapotranspiration. It can be expressed on a short-term basis as the ratio of photosynthetic carbon gain per unit transpirational water loss, or on a seasonal basis as the ratio of net primary production or agricultural yield to the amount of available water.

Water withdrawal

Amount of water extracted from water bodies.

Zooplankton

The animal forms of plankton. They consume phytoplankton or other zooplankton. See also phytoplankton.