

Abbreviations

- BMRC** – Bureau of Meteorology Research Centre
- CSIRO** – Commonwealth Scientific and Industrial Research Organisation
- CCHRA** – Climate Change Health Risk Assessment
- CRC** – Cooperative Research Centre
- EAC** – East Australian Current
- ENSO** – El Niño-Southern Oscillation
- GBR** – Great Barrier Reef
- GCM** – Global Circulation Model
- GIS** – Geographic Information System
- HDD** – Heating degree days
- IGBP** – International Geosphere-Biosphere Programme
- IOCI** – Indian Ocean Climate Initiative
- IPCC** – Intergovernmental Panel on Climate Change
- MDBC** – Murray Darling Basin Commission
- NAO** – North Atlantic Oscillation
- NPDO** – North Pacific Decadal Oscillation
- OECD** – Organisation for Economic Cooperation and Development
- PMSEIC** – Prime Minister’s Science and Engineering Innovation Council
- SAR** – Second Assessment Report (IPCC)
- SCOPE** – Scientific Committee on Problems of the Environment
- SRES** – Special Report on Emissions Scenarios (IPCC)
- SST** – sea surface temperature
- TAR** – Third Assessment Report (IPCC)
- UNFCCC** – United Nations Framework Convention on Climate Change
- WAIS** – West Antarctic Ice Sheet
- WGI** – Working Group I (IPCC TAR)
- WGII** – Working Group II (IPCC TAR)

Glossary

Note that many of these definitions are in a climate change context, and that more general definitions may apply in other fields.

Adaptation

Adjustment in natural or human systems in response to actual or expected climatic changes or their effects, which moderates harm or exploits beneficial opportunities. Various types of adaptation can be distinguished, including anticipatory or reactive adaptation, private or public adaptation, and autonomous or planned adaptation.

Adaptive capacity

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

Aerosols

A collection of airborne solid or liquid particles, with a typical size between 0.01 and 10 µm, which 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.

Algal bloom

The explosive growth of blue-green algae that deprives aquatic life of oxygen. Algal blooms can be toxic to animals and humans.

Antarctic Circumpolar Wave

A feature of the Antarctic Ocean circulation that affects the weather over the southern seas, as well as Australia, South America and southern Africa. The wave circles the globe every 8 to 9 years within the massive circumpolar current.

Antarctic vortex

See *Polar Vortex*.

Anthropogenic

Resulting from or produced by human activities, in particular, factors that affect the atmosphere due to the burning of fossil fuels, deforestation and other land use change.

Biodiversity

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

Carbon dioxide (CO₂)

A colourless, odourless gas that occurs naturally and is also emitted by fossil fuel combustion and land clearing. The atmospheric concentration of carbon dioxide has increased by about 31% since the Industrial Revolution (about 1750 AD). It is the main anthropogenic-influenced greenhouse gas affecting climate change.

Carbon dioxide (CO₂) fertilisation

Increasing plant growth or yield by elevated concentrations of atmospheric carbon dioxide.

A plant's photosynthesis mechanism determines its sensitivity to carbon dioxide fertilisation. Most trees, most agricultural crops such as wheat and rice, and most cold climate plants are more sensitive to changes in atmospheric carbon dioxide than other plants such as tropical grasses and crops including maize and sugar cane.

Carbon sequestration

See *sequestration*.

Carbon sink

Natural or human activity or mechanism that removes carbon dioxide from the atmosphere, such as the absorption of carbon dioxide by growing trees.

Catastrophic event

A climate-related event having sudden onset and widely distributed and large magnitude impacts on human or natural systems, such as historically rapid sea level rise or sudden shifts (over a decade or less) in atmospheric or oceanic circulation patterns. Such events have occurred in the past due to natural causes. See also *discontinuity*.

CFCs

Chlorofluorocarbons, greenhouse gases used for refrigeration, aerosol propellants and other purposes. Observations from ice cores show there were no CFCs in the atmosphere before the 1950s. CFC concentrations increased for 50 years before peaking in 2000 but are now declining, as a result of adherence to the Montreal Protocol for the protection of the ozone layer. They are being replaced by other greenhouse gases such as *perfluorocarbons* q.v. that are addressed by the *Kyoto protocol*, q.v..

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 of years. The classical period is 30 years, as defined by the World Meteorological Organization (WMO). These 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 any change in climate over time, whether due to natural variability or as a result of human activity. This usage differs from that in the United Nations Framework Convention on Climate Change (UNFCCC), which 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." See also *climate variability*.

Climate feedback

The influence of a climate-related process on another that in turn influences the original process. For example, a positive climate feedback is an increase in temperature leading to a decrease in ice cover, which in turn leads to a decrease of reflected radiation (resulting in an increase in temperature). An example of a negative climate feedback is an increase in the Earth's surface temperature, which may locally increase cloud cover, which may reduce the temperature of the surface.

Climate model

A mathematical 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 (i.e., 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 parameterisations 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*, *climate scenario* and *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 emphasise that climate projections depend upon the emission/ concentration/radiative forcing scenario used, which are based on assumptions, concerning, for example, future socioeconomic and technological developments that may or may not be realised 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* q.v., 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* q.v. such as volcanic eruptions, solar variations and human-induced forcings such as the changing composition of the atmosphere and land use.

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*.

Critical threshold

The point at which an activity faces an unacceptable level of harm, such as a change from profit to loss on a farm due to decreased water availability, or coastal flooding exceeding present planning limits. It occurs when a *threshold* q.v. is reached at which ecological or socioeconomic change is damaging and requires a policy response.

Cryosphere

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

Detection (and attribution)

Detection of climate change is the demonstration that climate has changed by identifying statistically significant trends or jumps in the long-term climate data. Attribution of such changes involves the identification to a defined level of confidence of the most likely causes.

Discontinuity

Relatively sudden and usually irreversible change in Earth systems caused by gradual changes in the climate system, such as a shutdown of the *thermohaline circulation* q.v. or the disintegration of the *West Antarctic Ice Sheet* (WAIS) q.v. Discontinuities occur when gradual changes to the climate system take it beyond some relevant point or *threshold* q.v., causing more rapid change.

Discount rate

This arises due to the need to compare present costs (or investments), e.g., for greenhouse gas mitigation, with future costs, e.g., of delayed impacts of climate change, in any cost/benefit analysis for greenhouse policy. In normal investments future gains due to investment now are discounted or reduced to allow for economic growth that might make it easier to deal with future costs. However, future economic growth rates are uncertain, especially over long timescales, and some climate change impacts (e.g., lives or species lost) cannot be readily assessed in purely monetary terms. Appropriate discount rates for use in regard to climate change are controversial, and IPCC (Metz et al., 2001) has suggested the use of multiple discount rates in assessments.

Diurnal temperature range

This is the difference between the daily maximum and minimum temperatures, which has been observed to be decreasing globally, especially in Australia.

Downscaling

Statistical or dynamical methods of deriving finer regional detail of climate parameters from global and regional climate models.

Drought

Droughts can be grouped into four types (Heim, 2002):

- Meteorological drought: a period of months to years when atmospheric conditions result in low rainfall. This can be exacerbated by high temperatures and evaporation, low humidity and desiccating winds.
- Agricultural drought: short-term dryness in the surface soil layers (root-zone) at a critical time in the growing season. The start and end may lag that of a meteorological drought, depending on the preceding soil moisture status.
- Hydrological drought: prolonged moisture deficits that affect surface or subsurface water supply, thereby reducing streamflow, groundwater, dam and lake levels. This may persist long after a meteorological drought has ended.
- Socioeconomic drought: the effect of elements of the above droughts on supply and demand of economic goods.

Drought exceptional circumstances (DEC)

If drought conditions are considered beyond the bounds of normal risk management practices a declaration can be made by the Federal government of 'drought exceptional circumstances' in particular regions. This involves six core criteria relating to the meteorology, farm conditions, water supplies, environment, economic impact and scale of the event. See <<http://www.affa.gov.au/>>

EC

A unit of salinity measured by electrical conductivity.

Emission Scenario

A plausible representation of the future development of emissions of substances that are potentially radiatively active (e.g., greenhouse gases, aerosols), based on a coherent and internally consistent set of assumptions about driving forces (such as demographic and socioeconomic development, technological change) and their key relationships. In 1992, the IPCC presented a set of emission scenarios that were used as a basis for the climate projections in the Second Assessment Report published in 1996. These emission scenarios are referred to as the IS92 scenarios. In the IPCC Special Report on Emission Scenarios (Nakicenovic et al., 2000), new emission scenarios—the so-called SRES scenarios—were published.

Endemic

Restricted to a particular region, people or country, such as a human disease prevalent in a population or locality.

Enhanced greenhouse effect

Increases in the concentration of greenhouse gases in the atmosphere leading to an increase in the amount of infrared or thermal radiation near the surface. Most scientists agree that the enhanced greenhouse effect is leading to rising temperatures, referred to as global warming, and other changes in the atmospheric environment, known as *climate change* (a term that in common usage also includes natural changes).

ENSO

El Niño – Southern Oscillation (ENSO) refers to widespread 2-7 year oscillations in atmospheric pressure, ocean temperatures and rainfall associated with El Niño (the warming of the oceans in the equatorial eastern and central Pacific) and its opposite, La Niña. Over much of Australia, La Niña brings above average rain, and El Niño brings drought. A common measure of ENSO is the Southern Oscillation Index (SOI) which is the normalised mean sea level pressure difference between Tahiti and Darwin. The SOI is positive during La Niña events and negative during El Niño events.

Epidemic

An outbreak, usually of an infectious disease, affecting an unusually large number of individuals within a population or region at the same time.

Equilibrium warming

The final amount of warming projected by a climate model once the oceans and atmosphere have fully adjusted to a change in radiative *forcing* q.v., for example a doubling of carbon dioxide. Equilibrium warming provides information about the magnitude of the change from current conditions. Equilibrium warming will be reached only decades to centuries after greenhouse gas concentrations in the atmosphere are stabilised, due to the large heat capacity of the oceans. See also *Transient warming*.

Equity

Equity is an ideal, grounded in philosophy, morality, or human nature, which corresponds closely to the Australian idea of a "fair go". While concepts may vary, equity relates to a fair or even distribution of goods or opportunities. In the climate change context, spatial (regional or international) inequities may arise due to the uneven distribution of impacts, or of costs of adaptation or mitigation. Inter-generational inequities arise similarly, but between generations over time, for example if the present generation enjoys a living standard boosted by large greenhouse gas emissions which may have adverse effects on future generations. Complex economic and social questions arise in assessing international and inter-generational equity.

Eutrophication

The increase in dissolved nutrients and decrease in dissolved oxygen in a (usually shallow) body of water, caused by either natural processes or pollution.

Evaporation

The process by which a liquid becomes a gas; especially in the climate context, evaporation of water. Actual evaporation is the amount of water that evaporates from an actual surface, whatever the properties (wetness or dryness, surface cover) of that surface. Potential evaporation is the amount of water that would evaporate from a wet surface in a given climate. Actual evaporation will usually be less than potential evaporation, and could in fact be zero from a dry surface.

Extreme event

An extreme weather event refers to meteorological conditions that are rare for a particular place and/or time, such as an intense storm or heat wave. An extreme climate event is an unusual average over time of a number of weather events, for example heavy rainfall over a season.

Forcing

Forcing, or radiative forcing, is a measure of how internal or external factors affect climate. Internal forcing is part of the natural chaos of the climate system, for example ENSO. External forcing may be natural (for example, volcanic eruptions or solar fluctuations) or anthropogenic (for example, increasing greenhouse gases or aerosols). External forcing can change the Earth's energy balance, and hence its climate patterns.

Global temperature

Usually referring to the surface temperature, this is an area-weighted average of temperatures recorded at ground- and sea-surface-based observation sites around the globe, supplemented by satellite-based or model-based records in remote regions.

Global warming

An increase in global average surface temperature due to natural or anthropogenic climate change. See *enhanced greenhouse effect* q.v..

Greenhouse effect

The natural greenhouse effect is the process where gases in the lower atmosphere such as carbon dioxide, methane and water vapour are warmed by radiation released by the Earth's surface after it has been warmed by solar energy. These gases then radiate heat back towards the ground—adding to the heat the ground receives from the Sun. Without the natural greenhouse effect the surface of the planet would be about 33 °C colder on average. See also *enhanced greenhouse effect*, q.v..

Greenhouse gases

Natural and anthropogenic gases in the atmosphere that absorb and emit infrared or heat radiation, causing the greenhouse effect. The main greenhouse gases are *water vapour* q.v., *carbon dioxide* q.v., *nitrous oxide* q.v. and *methane* q.v..

Greenhouse gas concentrations

A measure of the amount of each greenhouse gas in the atmosphere, usually the number of molecules of a chemical per million or billion molecules of the surrounding air, or the radiatively equivalent amount of carbon dioxide.

Greenhouse gas emissions

The release of greenhouse gases and aerosols into the atmosphere. Emissions are usually measured in tonnes. About 25% of carbon dioxide emissions are absorbed by the ocean and another 25% by the terrestrial biosphere, leaving about 50% in the atmosphere. Carbon dioxide emissions are mainly from the burning of fossil fuels and deforestation. These emissions have led to an increase in atmospheric greenhouse gas concentrations since the Industrial Revolution.

Hazard

A situation or condition with potential for loss or harm to the individual, community or environment.

Impact assessment

The analysis of positive and negative consequences of climate changes on natural systems and human societies, both with and without adaptation to such changes.

Integrated assessment

A consistent framework to analyse models that simulate climate (including physical and biological conditions) and socioeconomic conditions (including policy and behaviour) and the interactions and feedbacks between them. This integration can be performed over a range of spatial scales, increasing in complexity from farms or cities, to regions, to countries to global.

Interdecadal Pacific Oscillation (IPO)

An oscillation that reflects decadal changes in tropical Pacific Ocean temperatures, having an influence on ENSO behaviour and Australian rainfall patterns. When the IPO is negative, the correlation between the SOI and Australian rainfall is enhanced, and when the IPO is positive the correlation is reduced (see ENSO).

Intergenerational equity

See *equity*.

IOCI

The Indian Ocean Climate Initiative, a Western Australian State Government program that involves CSIRO and the Commonwealth Bureau of Meteorology. The IOCI aims to provide a greater understanding of the effects of the Indian and Southern Oceans on the climate of the south-west of Western Australia across seasons, years and decades to enhance climate predictability.

IPCC

The Intergovernmental Panel on Climate Change, set up in 1988 by the World Meteorological Organisation and the United Nations Environment Program to advise governments on the latest science of climate change, its impacts and possible adaptation and mitigation. It involves panels of climate and other relevant experts who write relevant reviews, which are then critically reviewed by many other researchers and governments from member countries around the world. Summaries for Policymakers are adopted in a plenary session of government delegates, typically from over 100 member countries including developed and developing countries. See <<http://www.unep.ch/ipcc>>.

Kyoto Protocol

A protocol adopted by the supreme body of the *UNFCCC* q.v. in Kyoto, Japan, in 1997, committing Annex B countries (most OECD and some others) to reduce anthropogenic greenhouse gas emissions relative to 1990 levels. The Kyoto protocol deals with carbon dioxide, nitrous oxide, methane, sulfur hexafluoride, hydrofluorocarbons and perfluorocarbons.

Methane (CH₄)

A greenhouse gas produced through processes including decomposition of landfill waste in the absence of oxygen, digestion in animals such as cattle, production of coal, natural gas and oil, and rice growing. Atmospheric methane concentrations have increased by 151% since the Industrial Revolution (about 1750 AD).

Mitigation

Mitigation of climate change refers to those response strategies that reduce the sources of greenhouse gases or enhance their sinks, to subsequently reduce the probability of reaching a given level of climate change. Mitigation reduces the likelihood of exceeding the adaptive capacity of natural systems and human societies.

Moisture balance

Atmospheric moisture balance is the difference between rainfall and potential *evaporation* q.v.. When the balance is negative, evaporation exceeds rainfall. As this is common over most of Australia, water storage and irrigation is important.

Montreal Protocol

An international agreement adopted in Montreal, Canada, in 1987 to regulate the production and use of chemicals containing chlorine and bromine, which deplete stratospheric ozone.

Murray-Darling Basin

Catchment for the Murray and Darling Rivers and their many tributaries, extending from Queensland through New South Wales and Victoria, to South Australia. It has a population of nearly two million people, with another million people outside the region depending heavily on its resources. The Murray-Darling Basin generates about 40% of the national

income derived from agriculture and grazing. It supports one-quarter of the nation's cattle herd, half of the sheep flock, half of the cropland and almost three-quarters of its irrigated land.

NAO

The North Atlantic Oscillation, a large-scale seesaw in atmospheric pressure and ocean temperatures, influencing weather and climate from central North America to Europe and much of Northern Asia.

Nitrous oxide (N₂O)

A greenhouse gas mainly produced by industrial processes, fertiliser use and other agricultural activities, including land clearing and biomass burning. Atmospheric nitrous oxide concentrations have increased by 17% since the Industrial Revolution (about 1750).

NPP

Net Primary Productivity is the increase in plant biomass or stored carbon in a unit area of land. It is equal to the amount of carbon absorbed from the atmosphere by photosynthesis minus the carbon lost through respiration.

Orbital variation

Three types of changes in the characteristics of the Earth's orbit have an effect on climate, particularly glacial cycles or "ice-ages" which occur every 100,000 years or so. These orbital variations are: the obliquity or tilt of the Earth's axis, which varies between 22° and 24.5° over a 41,000 year period and influences the latitudinal distribution of solar radiation; the eccentricity of the Earth's orbit around the Sun, which becomes more and less circular over two main periods of approximately 96,000 and 413,000 years and influences the amount of solar radiation received by the Earth; and the precession of the equinoxes over two periods of 19,000 and 23,000 years, which affects the hemispheric distribution of radiation and hence the intensity of the seasons.

Ozone depletion

The reduction of ozone (O₃) in the upper atmosphere as a result of human-produced chemicals, such as CFCs. Ozone depletion is especially severe over Antarctica in September to November each year, causing the ozone 'hole'. However, at all latitudes away from the equator, the layer of ozone that protects us from the Sun's harmful radiation is thinner than it was in the late 1970s. Recent evidence suggests that ozone depletion in the upper atmosphere may affect climatic patterns at the Earth's surface.

Paleoclimatology

The study of climate from past ages beyond the availability of thermometer measurements that provide a global temperature. Paleoclimate records are constructed from *proxy climate data* q.v..

Perfluorocarbons (PFCs)

Greenhouse gases that are used as replacements to CFCs in the manufacture of semiconductors and which are produced as a by-product of aluminium smelting and uranium enrichment. Their concentrations are increasing and they have a greater global warming potential and much longer atmospheric lifetime than carbon dioxide.

Photosynthesis

The production of chemical compounds in the chlorophyll-containing tissues of plants, in particular the formation of carbohydrates from the carbon in carbon dioxide and the hydrogen in water with the aid of sunlight, releasing oxygen in the process.

Polar vortex

The Antarctic and Arctic polar vortices are natural, continental-scale westerly wind circulations surrounding the poles especially in winter and spring. These circulations act like giant whirlpools and reach up to 200 km per hour in the upper atmosphere. In the upper atmosphere, these vortices largely confine *ozone depletion* q.v. to polar regions in late winter and spring but breakdown in late winter (Arctic) or spring (Antarctic). These strong westerly winds are due to the transport of westerly momentum polewards, driven by the temperature differences between the polar atmosphere and that at lower latitudes. The Antarctic polar vortex is associated with the mid-latitude westerlies that deliver rain to southern Australia in winter.

Pre-industrial

The Industrial Revolution was the rapid increase in industrial activity triggered by the invention of the steam engine in 18th century England. It marked the beginning of a large increase in the burning of fossil fuels around the world and consequent large increases in carbon dioxide emissions due to human activities. The pre-industrial period usually refers to years prior to 1750.

Proxy climate data

A localised substitute for thermometer-derived temperature measurements over the period prior to thermometer observations, usually from records of temperature-dependent indicators, such as tree rings, ice cores, corals, and marine sediments, as well as from historical documents. Proxy data can also provide information on past variations in other climate-related factors, including rainfall, aridity, glacial extent and river flows.

Radiative forcing

See *Forcing* q.v.

Reinsurance

Insurance for insurers. As with insurance, the basic function of reinsurance is to spread risks; that is, part of the liability accepted by an insurer is transferred to the reinsurance company.

Return period

A measure of risk used by engineers and insurers describing the average time between events of a given magnitude. For example, a one-in-100 year event has a 1% probability of occurring in any given year.

Riparian

Living or located on, or relating to, the bank of a natural watercourse such as a river.

Risk

Risk is the probability that a situation will produce harm under specified conditions. It is a combination of two factors: the probability that an adverse event will occur; and the consequences of the adverse event. Risk encompasses impacts on human and natural systems, and arises from exposure and hazard. Hazard is determined by whether a particular situation or event has the potential to cause harmful effects.

Risk management

The implementation of strategies to avoid unacceptable consequences. In the context of climate change adaptation and mitigation are the two broad categories of action that might be taken to avoid unacceptable consequences.

Ross River virus (RRV)

An arbovirus (a virus transmitted mainly by arthropods) widely distributed throughout Australia. The virus causes epidemic polyarthritis, which consists of arthritic symptoms that persist for several months and can be severe and debilitating.

Salinisation

The build up of salts in soils (dryland salinisation) or in water (riverine or groundwater salinisation).

Scenario

A climate scenario is a coherent, internally consistent and plausible description of a possible future state of the climate. Similarly, an *emissions scenario* is a possible storyline regarding future emissions of greenhouse gases. Scenarios are used to investigate the potential impacts of climate change: *emissions scenarios* q.v., serve as input to climate models; *climate scenarios* q.v., serve as input to impact assessments.

Sensitivity

The degree to which a system is affected, either adversely or beneficially, by climate related stimuli, including mean (i.e., average) climate characteristics, climate variability and the frequency and magnitude of extremes.

Sequestration

The uptake and storage of carbon. For example, trees and plants absorb carbon dioxide, release the oxygen and store the carbon in above ground organic matter or in the soil. In the context of climate change response strategies, sequestration usually refers to the process of increasing the storage of carbon, for example reforestation, increasing the carbon content of the soil, or removal of carbon dioxide from flue gases for storage below ground or in the deep ocean.

Sink

Any process, activity or mechanism that removes greenhouse gases or aerosols from the atmosphere, into a reservoir such as the ocean, a forest, soil or subterranean storage.

Solar output

Radiation emitted from the Sun in a range of wavelengths, exhibiting variation on time scales from minutes to millions of years.

SRES scenarios

A set of emissions scenarios from the IPCC Special Report on Emissions Scenarios, used as a basis for climate projections in the TAR. See *emissions scenarios* q.v.

Stochastic

Random. Having a probability distribution, usually with a finite variance, i.e., varying randomly within limits.

Storm surge

A region of elevated sea level at the coast caused by the combined influence of low pressure and high winds associated with a severe storm such as a tropical cyclone.

Stratospheric ozone (O₃)

A triatomic form of oxygen formed by the interaction between solar ultraviolet (UV) radiation and O₂ in the stratosphere, the region of the atmosphere extending from the troposphere (at a height of between 9 to 16 km) to about 50 km. Depletion of the ozone layer in the stratosphere (see *ozone depletion*, q.v.) leads to increased levels of UV

radiation at the ground, and cooling of the stratosphere (or upper atmosphere). Tropospheric (i.e., lower atmosphere) ozone, some of which is formed in photochemical smog, is a greenhouse gas (see also *ozone depletion*, q.v.).

Sulfur dioxide (SO₂)

A gas resulting largely from the burning of fossil fuels. It reacts in the atmosphere to form an *aerosol* q.v. that results in a localised cooling effect, taken into account in emissions scenarios and climate models.

Sustainability

Sustainable activities meet the needs of the present without having a negative impact on future generations. A concept associated with sustainability is triple bottom line accounting, taking into account environmental and social costs as well as economic costs.

TAR

The Third Assessment Report of the IPCC, published in 2001.

Thermohaline circulation

A global ocean circulation driven by differences in seawater density, which depends on temperature (thermo) and salinity (haline). A key feature of the thermohaline circulation is the Gulf Stream, which warms western Europe. There are also contributions to the global thermohaline circulation from deep-water formation associated with the formation of sea-ice around Antarctica. There are concerns the circulation may break down over several decades due to density changes resulting from warming and inflows of fresh water, particularly to the North Atlantic Ocean, and a decrease in sea-ice formation around Antarctica. Such a breakdown would lead to abrupt changes in the Earth's climate.

Threshold

Any level of a property of a natural or socioeconomic system beyond which a defined or marked change occurs. Gradual climate change may force a system beyond such a threshold. Biophysical thresholds represent a distinct change in conditions, such as the drying of a wetland, floods, breeding events. Climatic thresholds include frost, snow and monsoon onset. Ecological thresholds include breeding events, local to global extinction or the removal of specific conditions for survival. Socioeconomic thresholds are set by benchmarking a level of performance. Exceeding a socioeconomic threshold results in a change of legal, regulatory, economic or cultural behaviour. Examples of agricultural thresholds include the yield per unit area of a crop in weight, volume or gross income.

See also *critical thresholds* q.v.

Transient warming

The time-dependent response in temperature resulting from a change in greenhouse gas concentrations in the atmosphere, before a new equilibrium is reached. Compare *equilibrium warming*, q.v.. Transient warming may continue for centuries after greenhouse gas emissions, or even greenhouse gas concentrations, have been stabilised, due to delays or inertia in the climate system.

Uncertainty

The degree to which a value is unknown, expressed quantitatively (for example, a range of temperatures calculated by different models) or qualitatively (for example, the judgement by a team of experts on the likelihood of a collapse of the *West Antarctic Ice Sheet*, q.v.). Uncertainty in climate projections is primarily introduced by the range of projections of human behaviour which determine emissions of greenhouse gases, and the range of results from *climate models* for any given greenhouse gas *emission scenario*.

UNEP

The United Nations Environment Program, which encourages cooperation in caring for the environment while improving quality of life.

UNFCCC

The United Nations Framework Convention on Climate Change, signed by more than 150 countries, including Australia, at the 1992 Earth Summit in Rio de Janeiro, Brazil. Its aim is to stabilise atmospheric greenhouse gas concentrations at a level that would prevent dangerous levels of climate change.

Vulnerability

The extent to which a natural system or human society is unable to cope with the negative impacts of climate change, variability and extremes. It depends on changes in climate as well as the sensitivity and adaptive capacity of the system or society.

West Antarctic Ice Sheet (WAIS)

West Antarctic Ice Sheet, the world's largest ground-based body of ice. Located in western Antarctica, if melted, the WAIS could raise global sea level by six metres.

Water vapour

A gas formed by the evaporation of water or by combustion. It is a *greenhouse gas* q.v.. Its concentration in the atmosphere is part of the hydrological cycle of evaporation, condensation, rainfall and runoff. Its concentration is ultimately determined by the surface temperature of the Earth.

WMO

The United Nations World Meteorological Organisation, which coordinates global scientific activity in areas including weather prediction, air pollution, climate change and ozone layer depletion.

