

Glossary

- Absorption spectrum.** The fraction of electromagnetic wavelength that is absorbed by a given material from a range of frequencies. The absorption spectrum of → *photo-voltaic* cells indicates the wavelength fraction of incident radiation that is converted into electrical energy.
- Adaptation.** Adjustments in natural or human systems in response to actual or expected climatic changes. They are intended to decrease negative effects or exploit potentially beneficial opportunities.
- Additionality.** Projects approved under the → *Clean Development Mechanism* need to show that their planned → *greenhouse gas* reductions would not be implemented without the extra incentive provided by → *carbon credits*; i.e., that they are additional to existing or planned → *mitigation* efforts.
- Afforestation.*** Direct human-induced conversion of originally forested land that has not been forested for more than 50 years through planting, seeding, and/or human-induced promotion of natural seed sources.
- Agent-based modelling.** Numerical simulations of actions and interactions of autonomous individuals with the aim of better understanding the functioning of a complex system as a whole.
- Agro-ecological zone.** A land unit that is defined based on its soils, land form, climate, and ecosystems. Based on these characteristics, each unit has specific potential or constraint for land use.
- Annex I countries.** The group of countries listed in Annex I of the → *United Nations Framework Convention on Climate Change*, including all of the OECD countries and economies in transition; all other countries are referred to as Non-Annex I countries. Annex I countries have committed themselves to the target of reducing their → *greenhouse gas emissions* individually or jointly to 1990 levels by the year 2000. In support of this commitment, most Annex I countries agreed to legally binding emission reduction targets through the → *Kyoto Protocol*.
- Anthropogenic.** Caused by or produced by human beings.
- Anthropogenic emissions.** Emissions of → *greenhouse gases*, greenhouse-gas precursors, and airborne particles (aerosols) that are associated with human activities such as burning of fossil fuels, → *deforestation*, land-use changes, livestock, and fertilization.
- Asymptotic stable state.** Term used in the mathematical theory of dynamic systems. It describes a state (e.g., in the simplest case the value of one variable) that a system approaches after some time (asymptotic) and that it returns to if perturbed (stable).
- Bali roadmap.** A series of steps designed to help reach an effective post- → *Kyoto* treaty at the UN climate conference in Copenhagen in December 2009. These steps were agreed upon at the UN climate conference in Bali, Indonesia, in December 2007.
- Baseline.** A reference point from which one can determine if observed patterns are changing with time. In the context of → *mitigation* efforts, the baseline is the amount of → *greenhouse gas* emissions at a certain point in time against which efforts of countries to decrease emissions are measured.

Bidirectional grid. Grid with connections that allow electricity to move in both directions. It constitutes the basic infrastructure required for distributed electricity generation from a diverse mix of → *renewable energy* sources.

Biofuel. Any liquid, gaseous, or solid fuel produced from plant or animal → *biomass* (e.g., ethanol and biodiesel). First-generation biofuels are mostly produced from food crops such as soy and sugar cane using conventional technologies. Second-generation biofuels are derived from ligno-cellulosic material (i.e., the non-food material of crops, such as wood, stems, or leaves) through chemical or biological processes. Third-generation biofuels are made from algae.

Biogeochemical cycles. The cycling of chemical elements or molecules through the biotic (living organisms) and abiotic (water, land and air) compartments of an ecosystem. In effect, these cycles represent closed loops although they may take from a few days to millions of years to complete.

Biomass. Organic matter consisting of or derived from living organisms, including products, by-products, and waste derived from these organisms (e.g., wood or straw). Biomass counts as a → *renewable energy* resource.

Biopiracy. The practice by some corporations, especially within the pharmaceutical industry, of appropriating the traditional knowledge and genetic resources of others (e.g., developing nations and indigenous peoples) without sharing the benefits.

Bretton Woods System. Agreement among the world's major industrialized countries on how to manage the world's commercial and financial relations, organized by the International Monetary Fund (IMF) and the World Bank. Established in the mid-twentieth century, it was the first example of a single monetary order among independent nations.

Business as usual (BAU). Scenario which assumes different demographic, social, economic, technological and environmental developments but in which no additional → *mitigation* initiatives, such as implementation of the → *United Nations Framework Convention on Climate Change* or the emissions targets of the → *Kyoto Protocol*, are included.

Cap and trade. Market-based approach for reducing emissions of pollutants. A central authority (such as a government or international body) defines a maximum permissible amount of pollutant that can be emitted. Based on this cap, companies or other groups receive emission permits/allowances (see → *carbon permits*). Should companies need to increase their allowances, they can buy these from those who pollute less. In theory, trading can occur between companies, at national and international levels, and enable emission reductions to take place where they are cheapest.

Carbon budget. Concept that refers to the total cumulative amount of → *carbon dioxide* emissions that are admissible over a given period of time to attain a specific → *mitigation* target (e.g., limiting global warming to below 2°C above preindustrial levels). This concept is applicable since, due to the long lifetime of carbon dioxide in the atmosphere, the temperature increase is largely independent of the temporal pathways of emissions (see → *stock-pollutant*). Once a global carbon budget is determined it can be distributed among nations (e.g., based on criteria of equity that aim to achieve equal per capita → *emission rights*).

Carbon capture and sequestration/storage (CCS). → *Mitigation* technique that captures → *carbon dioxide* emissions from major sources such as coal-fired power plants and stores it underground in geological formations or in the oceans. This process is currently being tested worldwide and is not yet available on a large scale.

- Carbon credit.** Credit for a reduction of → *greenhouse gas* emissions. Each carbon credit is equal to the reduction of one metric tonne of → *carbon dioxide* or → *carbon dioxide equivalent*. These credits can be obtained by investing in projects belonging to the → *Clean Development Mechanism* or other certified carbon reduction schemes.
- Carbon dioxide (CO₂).** Molecule composed of one carbon and two oxygen atoms, and one of the main → *greenhouse gases* in the Earth's atmosphere. CO₂ concentration is measured in parts per million (ppm); i.e., the current concentration of 389 ppm (June 2009) indicates that there are 389 molecules of CO₂ in our atmosphere per 1 million molecules. During the last 800 000 years, CO₂ concentration has never exceeded 300 ppm. The recent increase is known to be largely → *anthropogenic*.
- Carbon dioxide equivalent.** The concentration of → *carbon dioxide* that has the same global warming potential as a given mixture of carbon dioxide and other → *greenhouse gases*.
- Carbon footprint.** The total amount of → *greenhouse gas* emissions produced directly and indirectly by an individual, organization, event, or product. It is mostly expressed in tonnes or kilograms of → *carbon dioxide* or → *carbon dioxide equivalents*.
- Carbon intensity.** The amount of carbon emitted per unit of energy produced, often measured in grams of → *carbon dioxide* emitted per megajoule of energy, or per Gross Domestic Product (GDP).
- Carbon leakage.** The increase in → *carbon dioxide* emissions outside a country or region, occurring as a direct consequence of a climate policy that caps emissions within this country or region. Companies operating under the umbrella of an → *emissions trading scheme* may, for example, relocate their production sites abroad to avoid costs incurred for emitting → *greenhouse gases*.
- Carbon offset.** Compensation for carbon emissions that are impossible or too costly to be avoided at a certain location or from a certain emitter. Such compensation can be achieved through the purchase of → *carbon credits* that certify emission reduction or → *carbon sequestration* elsewhere (see also → *Clean Development Mechanism*).
- Carbon permit.** Emission entitlements allocated by a government to individual companies, allowing them to emit a specific amount of carbon. If actual emissions are greater than the permitted amount, the company has to offset its emissions by purchasing surplus carbon permits from other companies or by obtaining → *carbon credits*.
- Carbon permit auctioning.** A method of distributing → *carbon permits* among carbon emitters, allowing the market to set the price for carbon.
- Carbon sequestration.** Biological or → *anthropogenic* removal of gaseous → *carbon dioxide* from the atmosphere and its long-term storage in terrestrial or marine reservoirs. Biological carbon sequestration can be enhanced through protection of ecosystems and improvements in agricultural techniques. Anthropogenic sequestration can be achieved through technologies such as → *carbon capture and storage*. Carbon sequestration, especially in forests, is an important component of → *mitigation* policies (see → *Reducing Emissions from Deforestation and Degradation*).
- Carbon sink.** A medium – such as oceans, soils, and ecosystems – that removes carbon from the atmosphere and stores it for a prolonged period of time.
- Carbon tax.** An environmental tax on → *carbon dioxide* emissions with the goal to reducing these. This method is often suggested as an alternative to → *cap and trade*.

Carbon trading. See → *cap and trade*.

Cellular automata. Class of models that consist of a regular grid of cells. The models are based on rules that define the characteristics of the cells (e.g., taking the state ‘on’ or ‘off’) and the interaction among single cells (e.g., switching the state of a neighbouring cell). These models are particularly well fit to study the dynamic behaviour of complex systems consisting of many interacting, spatially well-ordered parts.

Cellulosic ethanol. See → *biofuels*.

Certified Emission Reduction (CER). → *Carbon credits* given out for emission reductions that are achieved through the → *Clean Development Mechanism*. Certified Emission Reductions count towards the emission reduction goals agreed upon under the → *Kyoto Protocol*.

Clean Development Mechanism (CDM). An agreement allowing → *Annex I countries* to achieve part of their → *greenhouse gas* limitation and reduction commitments in developing (i.e., Non-Annex I) countries. By investing in carbon reduction projects that support → *sustainable development*, Annex I countries can obtain → *carbon credits* that count towards their reduction commitments, while avoiding more expensive emission reductions in their own countries. An important aspect of CDM is → *additionality*.

Climate justice. Climate justice requires a reduction in the inequality between rich countries that have emitted most of the → *greenhouse gases* and poor countries that have contributed very little to climate change but suffer most from it. It also acknowledges the priority of poor countries to develop economically and to overcome poverty. The suggested means of achieving climate justice include transfer of technology and finances, greater efforts at → *mitigation* in industrialized countries, and equal carbon → *emission rights* for all people on Earth.

Complete sectoral coverage. Inclusion of all relevant sectors, such as transport, industry, and households, in regulations that limit → *greenhouse gas* emissions.

Compressed air system. → *Energy storage system* in which, during periods of low demand, surplus energy is used to compress air; during periods of high demand decompressing air supplies energy.

Concentrating solar power (CSP). Concentrating solar rays through mirrors or lenses into smaller beams. These concentrated light beams are then used as a heat source for a conventional power plant or focused on → *photovoltaic* surfaces to produce electricity.

Decarbonization. Changing the economy, industry or any other part of society in such a way that less and ultimately no → *carbon dioxide* is emitted. Decarbonization mainly refers to a reduction in the burning of fossil fuels through increased → *energy efficiency* and expansion of renewable energies.

Demand-side action. → *Mitigation* measures that address the consumers, aiming at, for example, lowered energy demand through, for example, increased → *energy efficiency* and energy-saving behaviour of individuals (see also → *supply-side action*).

Deforestation. The natural or → *anthropogenic* process that converts forested to non-forested land (see → *afforestation* and → *reforestation*).

Digital rights management. Access control technologies that limit the usage of digital contents and devices. May be used by hardware providers, publishers, copyright holders and individuals to inhibit the unforeseen or undesired use of digital content.

- Direct solar insolation.** Solar energy received at a surface perpendicular to the sun's rays, without the energy received from scattering or reflection of solar radiation by particles in the atmosphere. It is measured in watts per square metre or in kilowatt hours per square metre per day.
- Discount rate.** The discount rate describes how future assets (bonds, capital stocks, investments, etc.) are devalued just because their pay-off lies in the future. A high discount rate implies a high devaluation of future consumption; a discount rate of zero reflects that present and future consumption are equally valued.
- Dispatchable electricity generation.** Power generation facilities that can be turned on or off at any time depending on demand (powered, for example, by fossil fuels, → *hydroenergy*, or → *biomass*).
- Emission reduction pathways.** Patterns of decrease in → *greenhouse gas* emissions over time. They can be modelled under various scenarios of economic growth, population growth, and changes in → *energy efficiency* and energy systems.
- Emission rights.** See → *carbon permit*.
- Emissions trading scheme.** See → *cap and trade* and → *European Union Emissions Trading System*.
- Energy efficiency.** Using less energy to provide the same level of energy service. It is formally expressed as the ratio of useful output of a system, conversion process or activity to its energy input.
- Energy flux.** Transfer rate of energy through a medium. This rate varies for different energy sources; for example, solar and wind energy fluxes are determined by the time of day and the prevailing meteorological conditions.
- Energy storage system.** A system that stores energy for later use. At relatively small scales, batteries can be used as storage systems. At larger scales, energy can be stored by, for example, pumping water uphill or by using → *compressed air systems*.
- European Union Emissions Trading System (EU ETS).** Established in 2005, this system is so far the largest multi-sector and multi-country emission trading scheme in the world. Its aim is to reduce emissions from large installations in the energy and industrial sectors (see also → *cap and trade*).
- Exothermic.** A type of chemical reaction that releases energy, usually in the form of heat.
- Externality.** A market externality is the impact (positive or negative) of a market transaction on a third party that is not directly involved in the transaction. In terms of climate change, this means that the price paid for energy does not reflect the costs associated with damages resulting from global warming caused by energy production.
- Forest degradation.** Reduction in the quality of forested habitat without direct reduction in forest areas.
- Fullerene.** Molecule that is entirely composed of carbon, and arranged in spheres, ellipsoids or tubes. They are important in many technological applications, from electronics to nanotechnology.
- Game theory.** Description of behaviour in which one's own success depends on the behaviour of others, with each player trying to maximize his or her personal success (in contrast to → *social planner*). Game theoretic principles apply to economics, sociology, computer science, politics, and biology.
- General Circulation Model (GCM).*** 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. GCMs are applied as a research tool to study and simulate the climate, and for operational purposes, including monthly, seasonal and inter-annual climate forecasts.

Geoengineering. In the context of climate change, the concept of geoengineering usually refers to proposals that envisage a large-scale engineering of the environment to combat or counteract the effects of rising → *greenhouse gas* concentrations. Examples include the injection of sulphate particles into the atmosphere to increase reflection of incident solar radiation as a means of cooling the climate; or the iron fertilization of phytoplankton to strengthen → *carbon sequestration* in the oceans.

Geothermal energy. A → *renewable energy* source derived from the Earth's internal heat that originates from the formation of the planet, radioactive decay of minerals, and solar energy absorbed at the Earth's surface.

Global Earth Observation System of Systems (GEOSS). Initiative that aims to improve the relevance of Earth observations for addressing global environmental challenges. The envisaged result is a global public infrastructure generating comprehensive, near-real-time environmental data, information and analyses for a wide range of users.

Global environmental space. Concept in → *sustainability* studies that looks at each resource – such as water, air, forest and agricultural land – separately and tries to assess which level of human activity can be supported by the ecosystem without causing irreversible damage. In the context of climate change, the remaining global environmental space refers to the maximum admissible amount of → *greenhouse gas* emissions if unmanageable climate change is to be avoided.

Greenhouse gases (GHGs). Molecules in our atmosphere – mainly water vapour, → *carbon dioxide*, methane, nitrous oxide, and ozone – that absorb and re-radiate infrared (heat) radiation. The → *anthropogenic* increase of these gases causes a rise in global mean temperature with associated changes in the functioning of the climate and entire Earth system.

High-voltage direct current (HVDC). Technology to transmit electricity over long distances. The advantage of using HVDC power lines compared to the usual alternating current (AC) transmission is a smaller loss of electricity and thus cheaper transmission over large distances.

'Hockey-stick' pattern. Recent sharp increase in the concentration of → *greenhouse gases*, especially → *carbon dioxide*, in the atmosphere following a long period of relative stagnation during the past thousands of years. The resulting graph resembles the form of a hockey stick.

Hybrid vehicle. Vehicle that uses two different power sources, most commonly a combustion engine and an electric motor. Fuel usage, and thus → *carbon dioxide* emissions, of such vehicles are lower than those of standard vehicles.

Hydroenergy. A → *renewable energy* source derived from flowing water, such as rivers or oceans (see → *ocean energy*).

Hydrological regime. Patterns and amount of water flowing through a system, from input (e.g., through precipitation or groundwater inflow) to outflow (e.g., through evaporation, photosynthesis or rivers). Changing conditions (floods or droughts) can severely impact the hydrological regime of ecosystems and the survival of species, including humans.

- Increasing returns (to scale).** Economic term referring to circumstances in which each unit of variable input added to a system leads to a disproportionate increase in output. Increasing returns can be a result of learning effects (see → *learning curves*).
- Industrial metabolism.** Constitutes the totality of human-controlled processes that convert raw materials through energy and labour into finished products and wastes. By studying the flow of materials through society, the understanding of the sources and causes of → *greenhouse gas* emissions can be improved.
- Intellectual property rights.** The right of ownership of intellectual or artistic inventions, such as trademarks, copyright, and patents. It is protected by the World Intellectual Property Organization.
- Intergovernmental Panel on Climate Change (IPCC).** An international body of scientists, established in 1988 by the United Nations and the World Meteorological Organization. Its task is to publish reports that summarize the most recent scientific findings on all aspects of climate change. These reports serve as a major resource for political decisions on climate change policies.
- Kyoto Protocol.** An international treaty, established as a protocol to the → *United Nations Framework Convention on Climate Change*, with the goal of ‘stabilization of → *greenhouse gas* concentrations in the atmosphere at a level that would prevent dangerous → *anthropogenic* interference with the climate system’. It came into full force in 2005, and has been ratified by 183 nations. Currently, negotiations focus on a post-Kyoto treaty, intended to take effect after the first commitment period of the Kyoto Protocol, which is due to expire at the end of 2012.
- Leapfrog.*** The ability of developing countries to bypass intermediate technologies and jump straight to advanced clean technologies. Leapfrogging can enable developing countries to move to a low emissions development trajectory.
- Learning curve.** The learning curve describes how the average production costs in a specific industrial sector decrease as a function of total installed capacity. For example, average production costs of a solar panel have decreased as the number of panels installed worldwide has risen rapidly over recent decades.
- Lumped load pattern.** Increased → *energy flux* into an electricity grid at specific times of the day. For example, an expansion of → *photovoltaics* would increase the energy load at noon-time. To smooth this energy ‘lump’, a → *smart grid* is needed, which activates energy-demanding procedures at times of high load.
- Marginal cost.** Additional cost of producing one more unit of a good. If the quantity increases greatly, marginal costs may include the cost of building a new factory or power plant.
- Marginal damage.** Additional damage that is caused by a unit increase in → *greenhouse gas* emissions (often measured in dollars per additional ton of → *carbon dioxide equivalent* emitted). Assessing the marginal damage of emissions forms part of an economic cost-benefit analysis of climate change.
- Microcredit.** A small loan with particular terms and conditions, most often extended to people in poverty, helping them to start a business. These people often lack steady employment or a verifiable credit history and therefore cannot meet even the most minimal qualifications to gain access to traditional credits.
- Mitigation.** Implementation of policies to reduce → *greenhouse gas* emissions and enhance → *carbon sinks* with the aim to reducing the extent of climate change.
- Near-surface temperature.** To estimate global near-surface temperature, air temperature

data, measured over land at the standard height of 1.5 metres above ground and recorded at various weather stations across the globe, are merged with water temperature measurements in the upper metres of the oceans.

Nonlinear behaviour. Attribute of a system, in which the change of one component induces a more (or less) than proportionate change of another component. It can make the system dynamics difficult to predict because simple changes in one part of the system can have complex effects throughout.

No-regrets policy.* Such a policy would generate net social benefits whether or not there is climate change associated with → *anthropogenic* emissions of → *greenhouse gases*. In the context of emissions reductions, no-regrets policies refer to options whose benefits equal or exceed their costs to society, excluding the benefits of avoided climate change (e.g., reduced energy costs and reduced emissions of local/regional pollutants).

Nuclear fission. Reaction in which the nucleus of an atom splits into smaller parts, often free neutrons and lighter nuclei, giving off large amounts of energy. This energy is captured in nuclear power plants or released in nuclear bombs.

Nuclear fusion. Reaction in which several nuclei merge to form one nucleus. This reaction releases or absorbs energy depending on the weight of the nuclei. It occurs naturally in stars and is currently explored as a means to create electricity through ‘controlled fusion’.

Ocean acidification.* Increased concentrations of → *carbon dioxide* in sea water causing a measurable increase in acidity (i.e., a reduction in ocean pH). This may lead to reduced calcium sequestration rates of calcifying organisms such as corals, molluscs, algae and crustaceans.

Ocean energy. A → *renewable energy* source acquired from ocean waves, tides, currents, and temperature and salinity gradients.

Opportunity cost. The difference between the potential gains of one choice versus those of an alternative that was rejected. Opportunity costs may arise for emitters of → *greenhouse gases* in a → *cap and trade* system because → *carbon permits* cannot be sold to obtain money for other investments.

Peak oil. The time at which the rate of the world’s (or a nation’s) oil production is at its maximum and after which oil supply decreases, reflecting diminishing exploitable reserves.

Peak shaving. Providing additional electricity from generators at times of high demand to avoid shortage of supply and dampen cost increases.

Photon. The basic unit of electromagnetic radiation such as light.

Photothermal/photovoltaic energy. A → *renewable energy* source derived from the sun’s energy. This energy is either converted into heat (photothermal energy) or directly into electricity (photovoltaic energy).

Primary energy. The energy that is contained in raw fuels (such as coal, gas, oil, nuclear or renewables) before it is converted into secondary energy (electricity or heat).

Redox system. A chemical system in which both reduction and oxidation (i.e., transfer of electrons) occur. Batteries used as → *energy storage systems* often operate on the principles of redox reactions.

Reducing Emissions from Deforestation and Degradation (REDD). Recognizing that forests are an important → *carbon sink*, parties at the thirteenth meeting of the

→ *United Nations Framework Convention on Climate Change* in 2007 accepted that forest protection is an important contribution to → *mitigation*.

- Reforestation.*** Direct human-induced conversion of non-forested to forested land through planting, seeding and/or the human-induced promotion of natural seed sources on land that was previously forested.
- Remote sensing technologies.** Equipment and software that permit the measurement of characteristics of the environment from a distance, such as satellite use to measure vegetation cover.
- Renewable energy.** Energy derived from resources that are not depleted through their use, such as for solar, wind, water, → *ocean* and → *geothermal* energy, or resources that can be re-grown, such as → *biomass*.
- Renormalization group.** A mathematical method of viewing a physical system at various scales, like a microscope with different magnifying lenses, thus allowing scientists to investigate different components of a system and their interactions.
- Research and Development (R&D).** The process of revising old ideas, techniques and products and developing new ones to improve future performance and returns. International collaboration and investments in R&D are specifically encouraged by the → *United Nations Framework Convention on Climate Change* to help developing nations to → *leapfrog* to a low-carbon society and to better adapt to the changing climate.
- Salination ingress.** Salt water flowing into areas that previously contained only freshwater.
- Savannization.** Process in which forested areas turn into savannah, a grassland ecosystem with interspersed trees and shrubs, due to fire, → *deforestation*, or a drying climate.
- Secondary energy.** See → *primary energy*.
- Semiconductor.** Substance that partially acts as a conductor of electricity, and partially as an insulator. Silicon is one of the most widely used materials to produce semiconductors, for example in the construction of → *photovoltaic* cells.
- Smart grid.** Electricity network that uses digital technology (e.g., → *smart meters*) to efficiently match intermittent and decentralized renewable power production with varying energy demands (e.g., by turning on washing machines during times of peak energy load or switching off refrigerators during times of electricity undersupply).
- Smart meter.** Advanced electrical meter that enables a two-way communication between the supply and demand side. The aim is to match energy generation with consumption patterns by informing consumers about the differences in market prices over the course of the day (see → *smart grid*).
- Spillover effects.*** The effects of domestic or sector-specific → *mitigation* measures on other countries or sectors. Spillover effects can be positive or negative and include effects on trade, → *carbon leakage*, transfer of innovations, and diffusion of environmentally sound technology. They represent a type of market → *externality*.
- Stock-pollutant.** Waste material that is absorbed very slowly by the environment and thus accumulates in air, water, soils, and ecosystems over time (such as heavy metals, non-biodegradable plastic, and → *carbon dioxide*).
- Supercapacitor.** Electric double-layer capacitors, exhibiting an unusually high energy density compared to common capacitors (or condensers). Their electricity storage potential lies between that of capacitors and batteries, while their quick charging rates make them superior to batteries.

Supply-side action. → *Mitigation* measures that address the production side, aiming, for example, at a switch from → *carbon intensive* forms of energy generation to zero-carbon technologies and → *renewable energies* (see also → *demand-side action*).

Sustainable development.* Concept that defines a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development and institutional change are all in harmony and enhance both current and future potential to meet human needs and aspirations. Sustainable development integrates political, social, economic and environmental dimensions.

Sustainability. See → *sustainable development*.

Tipping point. The point in time or level of external forcing at which a system undergoes an abrupt and/or irreversible change in response to a relatively small perturbation. Global warming may have the potential to trigger this type of change in a number of regional-scale features of the Earth system (so called tipping elements). Examples include the melting of the Arctic sea-ice, of the Greenland ice-sheet, or of permafrost soils.

United Nations Framework Convention on Climate Change (UNFCCC). An international treaty to develop strategies for climate change → *mitigation* and → *adaptation* which was ratified in 1994 by 192 countries. An extension of this treaty is the → *Kyoto Protocol*.

United Nations Millennium Development Goals (UN MDGs). An eight-point road map on how to end poverty in the world, with measurable targets and a clear deadline in 2015.

* Definition adapted from glossary of IPCC 2007 Fourth Assessment Report working group III; available at <http://www.ipcc.ch/pdf/assessment-report/ar4/wg3/ar4-wg3-annex1.pdf>.