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Annex I: Glossary

Glossary entries (highlighted in **bold**) are by preference subjects; a main entry can contain *subentries*, in italic, for example, *Final Energy* is defined under the entry **Energy**. The Glossary is followed by a list of acronyms/abbreviations, a list of chemical compounds, and a list of SI prefixes. Some definitions are adapted from C.J. Cleveland and C. Morris, 2006: *Dictionary of Energy*, Elsevier, Amsterdam.

Abrupt climate change

The *nonlinearity* of the *climate system* may lead to abrupt climate change, sometimes called *rapid climate change*, *abrupt events* or even *surprises*. The term *abrupt* often refers to time scales faster than the typical time scale of the responsible forcing. Some possible abrupt events that have been proposed include a dramatic reorganisation of the *thermohaline circulation*, rapid deglaciation and massive melting of *permafrost*.

Adaptability

See Adaptive capacity.

Adaptation

In human systems, the process of adjustment to actual or expected climate and its effects, which seeks to moderate harm or exploit beneficial opportunities. In natural systems, the process of adjustment to actual climate and its effects; human intervention may facilitate adjustment to expected climate.

> Various types of adaptation can be distinguished, including anticipatory, autonomous and planned adaptation:
>
> Anticipatory adaptation – Adaptation that takes place before specific impacts of climate change are observed. Also referred to as proactive adaptation.
>
> Autonomous adaptation – Adaptation that is unplanned and takes place in response to observed and experienced changes in climate, or resultant changes in human or natural systems. Often considered adaptation that occurs as a result of inherent capacities. Also referred to as spontaneous or reactive adaptation.
>
> Planned adaptation – Adaptation that is the result of a deliberate policy decision, strategy, or plan (formal or informal) based on an awareness that conditions have changed or are about to change and that action is required to return to, maintain, or achieve a desired state.

Adaptive capacity

The general ability of institutions, systems, and individuals to adjust to potential damage, to take advantage of opportunities, or to respond to the consequences. (Source: Millennium Ecosystem Assessment).

Aerosols

A collection of airborne solid or liquid particles, with a typical size between a few nm and 10 µm that reside in the *atmosphere* for at least several hours. Aerosols may be of either natural or *anthropogenic* origin. Aerosols may influence *climate* in several ways: directly through scattering and absorbing radiation, and indirectly by acting as *cloud condensation nuclei* or *ice nuclei*, modifying the optical properties and *lifetime* of clouds. The bulk of aerosols are of natural origin. Some scientists

use group labels that refer to the chemical composition, namely: sulphates, organic carbon, black carbon, nitrates, mineral dust, and sea salt. These labels are, however, imperfect as aerosols combine particles to create complex mixtures.

Afforestation

Planting of new forests on lands that historically have not contained forests. Particular criteria apply for the Clean Development Mechanism under the Kyoto Protocol (e.g., proof must be given that the land was not forested for at least 50 years or converted to alternative uses before 31 December 1989).

For a discussion of the term forest and related terms such as afforestation, reforestation and deforestation, see the IPCC Special Report on Land Use, Land-Use Change and Forestry (IPCC, 2000). See also the report on Definitions and Methodological Options to Inventory Emissions from Direct Human-induced Degradation of Forests and Devegetation of Other Vegetation Types (IPCC, 2003).

Aggregate impacts

Total impacts integrated across sectors and/or regions. The aggregation of impacts requires knowledge of (or assumptions about) the relative importance of impacts in different sectors and regions. Measures of aggregate impacts include, for example, the total number of people affected, or the total economic costs. They are usually time, place, and /or sector bound.

Agreement

In this Report, the degree of agreement is the level of concurrence in the literature on a particular finding as assessed by the authors.

Alliance of Small Island States (AOSIS)

The Alliance of Small Island States (AOSIS) is a coalition of small islands and low-lying costal countries with a membership of 42 Stares and observers that share and are active in global debates and negotiations on the environment, especially those related to their vulnerability to the adverse effects of climate change. Established in 1990, AOSIS has been active in the international climate negotiations from their start.

Ancillary benefits

See Co-benefits.

Annex I Parties

The group of countries listed in Annex I to the UNFCCC, including the 24 original OECD countries, the European Union plus 14 countries with economies in transition (EITs). Under Articles 4.2 (a) and 4.2 (b) of the UNFCCC, Annex I Parties were committed to adopting national policies and measures with the non-legally binding aim to return their greenhouse gas emissions to 1990 levels by 2000. The group is largely similar to the Annex B Parties to the Kyoto Protocol that also adopted emissions reduction targets for 2008-2012. By default, the other countries are referred to as Non-Annex I Parties. See also Annex B Parties, UNFCCC, Kyoto Protocol.

Annex II Parties

The group of countries listed in Annex II to the UNFCCC, including the 24 original OECD countries and the European Union. Under Article 4.2 (g) of the Convention, these countries have a special obligation to provide financial resources and facilitate technology transfer to assist developing countries in their efforts to tackle climate change and to comply with their obligations, such as preparing national reports. Annex II Parties are also expected to promote the transfer of environmentally sound technologies to developing countries and EITs.

Annex B Parties

This is the subset of Annex I Parties that have accepted greenhouse gas emission reduction targets for the period 2008-2012 under the Article 3 of the Kyoto Protocol. By default, the other countries are referred to as Non-Annex I Parties. See also UNFCCC, Kyoto Protocol.

Anthropogenic emissions

Emissions of greenhouse gases, greenhouse gas precursors, and aerosols associated with human activities. These activities include the burning of fossil fuels, deforestation, land use changes, livestock, fertilization, etc. that result in a net increase in emissions.

Aquifer

A stratum of permeable rock that bears water. An unconfined aquifer is recharged directly by local rainfall, rivers.

Assigned Amount (AA)

Under the Kyoto Protocol, the assigned amount is the quantity of greenhouse-gas emissions that an Annex B country has agreed to as its cap on its emissions in the first commitment period (2008 to 2012). The AA is the country's total greenhouse-gas emissions in 1990 multiplied by five (for the five-year commitment period) and by the percentage it agreed to as listed in Annex B of the Kyoto Protocol (e.g. 92% for the EU; 93% for the USA).

Assigned Amount Unit (AAU)

An AAU equals 1 tonne (metric ton) of CO2-equivalent emissions calculated using the Global Warming Potential.

Atmosphere

The gaseous envelope 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 the greenhouse gas water vapour, whose amounts are highly variable but typically around 1% volume mixing ratio. The atmosphere also contains clouds and *aerosols*.

Backstop technology

Models estimating mitigation often characterize an arbitrary carbon-free technology (often for power generation) that becomes available in the future in unlimited supply over the horizon of the model. This allows models to explore the consequences and importance of a generic solution technology without becoming enmeshed in picking the technology. This "backstop" technology might be a nuclear technology, fossil technology with carbon capture and storage, solar, or something as yet unimagined. The backstop technology is typically assumed either not to currently exist, or to exist only at higher costs relative to conventional alternatives.

Balancing power/reserves

Due to instantaneous and short-term fluctuations in electric loads and uncertain availability of power plants there is a constant need for spinning and quick-start generators that balance demand and supply at the imposed quality levels for frequency and voltage.

Banking (of Assigned Amount Units)

Any transfer of Assigned Amount Units from an existing into a future commitment period. According to the Kyoto Protocol [Article 3 (13)], parties included in Annex I to the UNFCCC may save excess

AAUs from the first commitment period for compliance with their respective cap in subsequent commitment periods (post-2012).

Barrier

Any obstacle to reaching a goal, adaptation or mitigation potential that can be overcome or attenuated by a policy, programme, or measure. Barrier removal includes correcting market failures directly or reducing the transactions costs in the public and private sectors by e.g. improving institutional capacity, reducing risk and uncertainty, facilitating market transactions, and enforcing regulatory policies.

Baseline

A baseline (or reference) is a state against which change due to a particular driving force (e.g., a climate policy) is evaluated. It could be a current baseline, in which case it represents observable, present-day conditions. Alternatively, it could be a future baseline, which is a projected future set of conditions that would be obtained by excluding the driving factor of interest. Alternative interpretations of other drivers can give rise to multiple baselines.

Benchmark

A measurable variable used as a baseline or reference in evaluating the performance of a technology, a system or an organization. Benchmarks may be drawn from internal experience, from external correspondences or from legal requirements and are often used to gauge changes in performance over time.

Biochemical Oxygen Demand (BOD)

The amount of dissolved oxygen consumed by micro-organisms (bacteria) in the bio-chemical oxidation of organic and inorganic matter in waste water.

Biodiversity

Biodiversity is the variability among living organisms from all sources, including terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are part. (From the Millennium Ecosystem Assessment)

Bioenergy

Energy derived from any form of biomass such as recently living organisms or their metabolic byproducts.

Bioethanol

[Note from TSU: Definition to be drafted.]

Biofuel

A fuel, generally in liquid form, produced from organic matter or combustible oils produced by plants. Examples of biofuel include alcohol, black liquor from the paper-manufacturing process, and soybean oil.

First-generation manufactured biofuel

First-generation manufactured biofuel is derived from grains, oilseeds, animal fats and waste vegetable oils with mature conversion technologies.

Second-generation biofuel

Second-generation biofuel uses non-traditional biochemical and thermochemical conversion processes and feedstock mostly derived from the lignocellulosic fractions of, for example, agricultural and forestry residues, municipal solid waste, etc.

Third-generation biofuel

Third-generation biofuel would be derived from feedstocks like algae and energy crops by advanced processes still under development. These second- and third-generation biofuels produced through new processes are also referred to as next-generation or advanced biofuels or advanced biofuel technologies.

Biomass

The total mass of living organisms in a given area or volume; dead plant material can be included as dead biomass. Biomass burning is the burning of living and dead vegetation. In a WGIII context, biomass includes products, by-products and waste of biological origin (plants or animal matter), excluding material embedded in geological formations and transformed to fossil fuels or peat. The International Energy Agency (World Energy Outlook 2010) defines traditional biomass as biomass consumption in the residential sector in developing countries that refers to the use of wood, charcoal, agricultural residues and animal dung for cooking and heating. All other biomass use is defined as modern biomass.

Biosphere (terrestrial or marine)

The part of the Earth system comprising all *ecosystems* and living organisms, in the *atmosphere*, on land (*terrestrial biosphere*) or in the oceans (*marine biosphere*), including derived dead organic matter, such as litter, soil organic matter and oceanic detritus.

Black carbon

Operationally defined aerosol 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 (Charlson and Heintzenberg, 1995, p. 401).

Business as usual (BAU)

Business as usual conditions are based on the assumption that operating conditions and applied policies remain as they are at present. Although baseline or reference scenarios could incorporate some specific features of BAU scenarios (e.g., a ban on a specific technology), BAU scenarios imply that no policies other than the current ones are in place. See also Baseline/reference, Models, Scenario.

Cap, on emissions

Mandated restraint as an upper limit on emissions within a given period. For example, the Kyoto Protocol mandates emissions caps in a scheduled timeframe on the anthropogenic GHG emissions released by Annex B countries.

Capacity building

Enhancing strengths, attributes, and resources available to an individual, community, society, or organization to respond to change.

Carbon cycle

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

Carbon dioxide (CO2)

A naturally occurring gas, also a by-product of burning fossil fuels from fossil carbon deposits, such as oil, gas and coal, of burning biomass, of land use changes and ofindustrial 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 capture and storage (CCS)

A proposed mitigation option in which a relatively pure stream of CO2 from industrial and energy-related sources is separated from the exhaust gases, compressed and transported to a storage location for long-term isolation from the atmosphere.

Carbon dioxide fertilization

The enhancement of the growth of plants as a result of increased atmospheric carbon dioxide (CO2) concentration. Depending on their mechanism of photosynthesis, certain types of plants are more sensitive to changes in atmospheric CO2 concentration. In particular, C3 plants generally show a larger response to CO2 than C4 plants.

Carbon intensity

The amount of emissions of CO2 released per unit of another variable such as GDP, output energy use, or transport.

Carbon leakage

The part of emissions reductions in a country or group of countries that may be offset by an increase of the emissions in the non-constrained countries above their baseline levels. This can occur through (1) relocation of energy-intensive production to non-constrained regions; (2) induced structural change towards energy-intensive production within non-constrained regions; (3) increased consumption of fossil fuels in these regions through decline in the international price of oil and gas triggered by lower demand for these energies; and (4) changes in incomes (thus in energy demand) because of better terms of trade. Leakage also refers to GHG-related effects of GHG-emission reduction or CO2-sequestration project activities that occur outside the project boundaries and that are measurable and attributable to the activity. On most occasions, leakage is understood as counteracting the initial activity. Nevertheless, there may be situations where effects attributable to the activity outside the project area lead to GHG-emission reductions. While (negative) leakage leads to a discount of emission reductions as verified, positive leakage may not in all cases be accounted for.

Carbon price

What has to be paid (to some public authority as a tax rate, or on some emission permit exchange) for the emission of 1 tonne of CO2 into the atmosphere. In the models and this Report, the carbon price is the social cost of avoiding an additional unit of CO2 equivalent emission. In some models it is represented by the shadow price of an additional unit of CO2 emitted, in others by the rate of carbon tax, or the price of emission-permit allowances.

[Note from TSU: This definition from AR4 is subject to a cross-chapter review.]

CCS-ready

If rapid deployment of CCS is desired, new power plants could be designed and located to be 'CCS-ready' by reserving space for the capture installation, designing the unit for optimal performance when capture is added and siting the plant to enable access to storage reservoirs.

Certified Emission Reduction Unit (CER)

Equal to one metric tonne of CO2-equivalent emissions reduced or of CO2 removed from the atmosphere through a Clean Development Mechanism (defined in Article 12 of the Kyoto Protocol) project, calculated using Global Warming Potentials. In order to reflect potential non-permanence of afforestation and reforestation project activities, the use of temporary certificates for Net

Anthropogenic Greenhouse Gas Removal was decided by COP 9. See also Emissions Reduction Units and Emissions trading.

Chemical oxygen demand (COD)

The quantity of oxygen required for the complete oxidation of organic chemical compounds in water; used as a measure of the level of organic pollutants in natural and waste waters.

Chlorofluorocarbons (CFCs)

A chlorofluorocarbon is an organic compound that contains chlorine, carbon, hydrogen, and fluorine; it is one of the greenhouse gases covered under the 1987 Montreal Protocol and used for refrigeration, air conditioning, packaging, plastic foam, insulation, solvents, or aerosol propellants. Because they are not destroyed in the lower atmosphere, CFCs drift into the upper atmosphere where, given suitable conditions, they break down ozone. Because of this, manufacturing of these gases has been phased out and they are being replaced by other compounds, including hydrochlorofluorocarbons and hydrofluorocarbons, which are greenhouse gases covered under the Kyoto Protocol.

Clean Development Mechanism (CDM)

A mechanism defined under Article 12 of the Kyoto Protocol through which investors (governments or companies) from developed (Annex B) countries may finance greenhouse gas emission reduction or removal projects in developing (Non-Annex B) countries, and receive Certified Emission Reduction Units for doing so which can be credited towards the commitments of the respective developed country. The CDM is intended to facilitate the two objectives of promoting sustainable development in developing countries and of helping industrialized countries to reach their emissions commitments in a cost-effective way. See also Kyoto Mechanisms.

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 for averaging these variables is 30 years, as defined by the World Meteorological Organization. The 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 change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forcings such as modulations of the solar cycles, volcanic eruptions and persistent anthropogenic changes in the composition of the atmosphere or in land use. Note that the 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 change commitment.

Climate change commitment

Due to the thermal inertia of the ocean and slow processes in the *cryosphere* and land surfaces, the *climate* would continue to change even if the atmospheric composition were held fixed at today's values. Past change in atmospheric composition leads to a *committed climate change*, which

continues for as long as a radiative imbalance persists and until all components of the *climate system* have adjusted to a new state. The further change in temperature after the composition of the *atmosphere* is held constant is referred to as the *constant composition temperature commitment* or simply *committed warming* or *warming commitment*. Climate change commitment includes other future changes, for example in the *hydrological cycle*, in *extreme weather* and *climate events*, and in *sea level change*. The *constant emission commitment* is the *committed climate change* that would result from keeping *anthropogenic* emissions constant and the *zero emission commitment* is the climate change commitment when emissions are set to zero. See also *Climate change*.

Climate (change) feedback

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 (spectrum or 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 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 *spectrum* or *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 General Circulation Models (AOGCMs)* provide a representation of the climate system that is near or at the most comprehensive end of the spectrum currently available. There is an evolution towards more complex models with interactive chemistry and biology. Climate models are applied as a research tool to study and simulate the climate, and for operational purposes, including monthly, seasonal and interannual *climate predictions*.

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 the observed current climate. A *climate change scenario* is the difference between a climate scenario and the current climate. See also *Emission scenario*, *scenario*.

Climate sensitivity (initial WGI responsibility)

In IPCC reports, equilibrium climate sensitivity refers to the equilibrium change in the annual mean global surface temperature following a doubling of the atmospheric equivalent carbon dioxide concentration. Due to computational constraints, the equilibrium climate sensitivity in a climate model is usually estimated by running an atmospheric general circulation model coupled to a mixed-layer ocean model, because equilibrium climate sensitivity is largely determined by atmospheric processes. Efficient models can be run to equilibrium with a dynamic ocean.

The effective climate sensitivity is a related measure that circumvents the requirement of equilibrium. It is evaluated from model output for evolving non-equilibrium conditions. It is a measure of the strengths of the climate feedbacks at a particular time and may vary with forcing history and climate state. The climate sensitivity parameter (units: °C (W m–2)–1) refers to the equilibrium change in the annual mean global surface temperature following a unit change in radiative forcing.

The transient climate response is the change in the global surface temperature, averaged over a 20-year period, centred at the time of atmospheric carbon dioxide doubling, that is, at year 70 in a 1% yr–1 compound carbon dioxide increase experiment with a global coupled climate model. It is a measure of the strength and rapidity of the surface temperature response to greenhouse gas forcing.

Climate system

The climate system is the highly complex system consisting of five major components: the *atmosphere*, the *hydrosphere*, the *cryosphere*, the *lithosphere* 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 *anthropogenic* forcings such as the changing composition of the atmosphere and *land use change*.

Climate threshold

A critical limit within the climate system that, when crossed, induces a non-linear response to a given forcing. See also Abrupt climate change.

CO2-equivalent concentration

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.

CO2-equivalent emission (CO2eq)

The amount of *carbon dioxide* emission that would cause the same integrated *radiative forcing*, over a given time horizon, as an emitted amount of a well mixed *greenhouse gas* or a mixture of well mixed greenhouse gases. The *equivalent carbon dioxide emission* is obtained by multiplying the emission of a well mixed greenhouse gas by its *Global Warming Potential* for the given time horizon. For a mix of greenhouse gases it is obtained by summing the *equivalent carbon dioxide emissions* of each gas. Equivalent carbon dioxide emission is a standard and useful *metric* for comparing emissions of different greenhouse gases but does not imply exact equivalence of the corresponding *climate change* responses.

Co-benefits

The positive co-effects of a policy aimed at one objective on additional objectives, if the additional objectives are subject to positive externalities that are not (fully) internalized by policies already in place (second-best setting). Co-benefits may be the additional welfare gains from climate mitigation and adaptation policies that accrue to other objectives (such as economic and social development, energy security, employment, and public health), or the additional welfare gains in terms of climate mitigation and adaptation outcomes from development and related policies and actions. Where positive complementarities across policy objectives are feasible, co-benefits based policies can be intentionally designed to achieve multiple objectives – often within the jurisdiction in question. Co-benefits are also referred to as ancillary benefits – among other, less commonly used terms.

Cogeneration

The use of heat (and pressure) in an exhaust gas either directly to substitute other heat, or for generating electricity which is also known as Combined Heat and Power (CHP) generation.

Combined-cycle gas turbine (CCGT)

A power plant that combines two processes for generating electricity. First, fuel combustion drives a gas turbine. Second, exhaust gases from the turbine heat water drive a steam turbine.

Computable General Equilibrium Model

Computable general equilibrium (CGE) models are a class of economic models that use actual economic data (i.e. input/output data), simplify the characterization of economic behavior and solve the whole system numerically. CGE models specify all their economic relationships in mathematical terms and put them together in a form that allows the model to predict the change in variables such as prices, output and economic welfare resulting from a change in economic policies, given information about technology (the inputs required to produce a unit of output), policies and consumer preferences.

Conference of the Parties (COP)

The supreme body of the UNFCCC, comprising countries with right to vote that have ratified or acceded to the convention. See also Meeting of the Parties (MOP).

Confidence

The *level of confidence* in the correctness of a result is expressed in this report, using a standard terminology. See also *Likelihood* and *Uncertainty*.

Contingent Valuation Method (CVM)

CVM is an approach to quantitatively assess values assigned by people in monetary (willingness to pay) and non-monetary (willingness to contribute with time, resources etc.) terms. It is a direct method to estimate economic values for ecosystem and environmental services. A survey of people are asked their willingness to pay for access to, or their willingness to accept compensation for removal of, a specific environmental service, based on a hypothetical scenario and description of the environmental service. See also values.

Conventional fuels

See Fossil fuels.

Cost

[Note from TSU: Definition under consideration.] See Cost-benefits analysis, Cost-effectiveness analysis, and Externality/external cost/external benefit.

Cost–benefit analysis

Monetary measurement of all negative and positive impacts associated with a given action. Costs and benefits are compared in terms of their difference and/or ratio as an indicator of how a given investment or other policy effort pays off seen from the society's point of view.

Cost effectiveness

A policy is more cost-effective if it achieves a given pollution abatement at lower cost. A critical condition for cost-effectiveness is that marginal compliance costs be equal among obliged parties.

Cost-effectiveness analysis

A special case of cost-benefit analysis in which all the costs of a portfolio of projects are assessed in relation to a fixed policy goal. The policy goal in this case represents the benefits of the projects and all the other impacts are measured as costs or as negative costs. The policy goal can be, for example, a specified goal of emissions reductions of greenhouse gases.

[Note from TSU: This definition from AR4 is subject to a cross-chapter review.]

Crediting period

The CDM crediting period is the time during which a project activity is able to generate Certified Emission Reduction Units. Under certain conditions, the crediting period can be renewed up to two times.

Decarbonization

Decarbonization is the term used to describe the process by which countries/nation states aim to achieve a low-carbon economy. It also refers to individual efforts to reduce carbon footprints.

Deforestation

Conversion of forest to non-forest. Reducing emissions from deforestation is not eligible for CDM projects but has been introduced in the program of work under REDD (Reducing Emissions from Deforestation and Forest Degradation) under the UNFCCC.

For a discussion of the term forest and related terms such as afforestation, reforestation, and deforestation see the IPCC Special Report on Land Use, Land-Use Change and Forestry (IPCC, 2000). See also the report on Definitions and Methodological Options to Inventory Emissions from Direct Human-induced Degradation of Forests and Devegetation of Other Vegetation Types (IPCC, 2003).

Demand-side management

Policies and programmes for influencing the demand for goods and/or services. In the energy sector, demand-side management aims at reducing the demand for electricity and other forms of energy required to deliver energy services.

Desertification

Land degradation in arid, semi-arid, and dry sub-humid areas resulting from various factors, including climatic variations and human activities. 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.

Development path

An evolution based on an array of technological, economic, social, institutional, cultural and biophysical characteristics that determine the interactions between human and natural systems, including production and consumption patterns in all countries, over time at a particular scale. Alternative development paths refer to different possible trajectories of development, the continuation of current trends being just one of the many paths.

Discounting

A mathematical operation making monetary (or other) amounts received or expended at different points in time (years) comparable across time. The operator uses a fixed or possibly time-varying discount rate (>0) from year to year that makes future value worth less today. In a descriptive discounting approach one accepts the discount rates people (savers and investors) actually apply in their day-to-day decisions (private discount rate). In a prescriptive (ethical or normative) discounting approach the discount rate is fixed from a social perspective, e.g. based on an ethical judgement about the interests of future generations (social discount rate).

District heating (DH)

Any system for heating many buildings from one heat source.

Double dividend

The extent to which revenue-generating instruments, such as carbon taxes or auctioned (tradable) carbon emission permits can (1) limit or reduce GHG emissions and (2) offset at least part of the potential welfare losses of climate policies through recycling the revenue in the economy to reduce other taxes likely to cause distortions.

Drivers

In a policy context, drivers provide an impetus and direction for initiating and supporting policy actions. The deployment of renewable energy is, for example, driven by concerns about climate change or energy security. In a more general sense, a driver is the leverage to bring about a reaction, for example, emissions are caused by fossil fuel consumption and/or economic growth. See also opportunities.

Economic efficiency

A reallocation of resources improves economic efficiency if the sum of the gains outweighs the sum of the losses (see the Potential Pareto Criterion discussed in Chapter 3.4.3).

Economies in Transition (EITs)

Countries with their economies changing from a planned economic system to a market economy.

Economies of scale (scale economies)

The unit cost of an activity declines when the activity is extended (e.g., more units are produced).

Ecosystem

A system of living organisms interacting with each other and 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 having monetary or non-monetary value to individuals or society at large. There are (i) supporting services such as productivity or biodiversity maintenance, (ii) provisioning services such as food, fibre, or fish, (iii) regulating services such as climate regulation or carbon sequestration, and (iv) cultural services such as tourism or spiritual and aesthetic appreciation.

Emissions (Direct / Indirect)

The release of greenhouse gases into the atmosphere. The responsibility for these emissions may be attributed “directly” to the operator of an emitting process, or “indirectly” to the beneficiary of the process.

Emission factor/intensity

The amount of emissions per unit of another activity/variable. See also Carbon intensity.

Emission permit

An emission permit is an entitlement allocated by a government to a legal entity (company or other emitter) to emit a specified amount of a substance. Emission permits are often used as part of emissions trading schemes. See Emissions trading.

Emission quota

The portion of total allowable emissions assigned to a country or group of countries within a framework of maximum total emissions.

Emissions Reduction Unit (ERU)

Equal to one metric tonne of CO2-equivalent emissions reduced or of CO2 removed from the atmosphere through a Joint Implementation (defined in Article 6 of the Kyoto Protocol) project, calculated using Global Warming Potentials. See also Certified Emission Reduction Unit and Emissions trading.

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. *Concentration scenarios*, derived from emission scenarios, are used as input to a *climate model* to compute *climate projections*. In IPCC (1992) a set of emission scenarios was presented which were used as a basis for the climate projections in IPCC (1996). These emission scenarios are referred to as the IS92 scenarios. In the IPCC Special Report on Emission Scenarios (Nakićenović and Swart, 2000) emission scenarios, the so-called *SRES scenarios*, were published, some of which were used, among others, as a basis for the climate projections presented in Chapters 9 to 11 of IPCC (2001) and Chapters 10 and 11 of IPCC (2007). New emission scenarios for climate change, the four *Representative Concentration Pathways*, were developed for, but independently of, the present IPCC assessment. See also *Climate scenario* and *scenario*.

[Note from TSU: An addition with respect to Shared Socio-economic Pathways (SSPs) will be drafted.]

Emissions standard

A level of emission that, by law or by voluntary agreement, may not be exceeded. Many standards use emission factors in their prescription and therefore do not impose absolute limits on the emissions.

Emissions trading

A market-based instrument used to limit emissions. The environmental objective or sum of total allowed emissions is expressed as an emissions cap. The cap is divided in tradable emission permits that are allocated—either by auctioning or handing out for free (grandfathering)—to entities within the jurisdiction of the trading scheme. Entities need to surrender emission permits equal to the amount of their emissions (e.g., tonnes of CO2). An entity may sell excess permits. Trading schemes may occur at the intra-company, domestic or international level and may apply to CO2, other greenhouse gases or other substances. Emissions trading is also one of the mechanisms under the Kyoto Protocol. See Kyoto Mechanisms.

Emission trajectories

A projected development in time of the emission of a greenhouse gas or group of greenhouse gases, aerosols and greenhouse gas precursors.

Energy

The amount of work or heat delivered. Energy is classified in a variety of types and becomes available to human ends when it flows from one place to another or is converted from one type into another. Daily, the sun supplies large flows of radiation energy. Part of that energy is used directly, while part undergoes several conversions creating water evaporation, winds, etc. Some share is

stored in biomass or rivers that can be harvested. Some share is directly usable such as daylight, ventilation or ambient heat.

Primary energy

Primary energy (also referred to as energy sources) is the energy embodied in natural resources (e.g., coal, crude oil, natural gas, uranium, and renewable sources). It is defined in several alternative ways. The International Energy Agency utilizes the physical energy content method, which defines primary energy as energy that has not undergone any anthropogenic conversion. The method used in this report is the direct equivalent method (see Annex II), which counts one unit of secondary energy provided from non-combustible sources as one unit of primary energy, but treats combustion energy as the energy potential contained in fuels prior to treatment or combustion. Primary energy is transformed into secondary energy by cleaning (natural gas), refining (crude oil to oil products) or by conversion into electricity or heat. When the secondary energy is delivered at the end-use facilities it is called final energy (e.g., electricity at the wall outlet), where it becomes usable energy in supplying services (e.g., light).

Embodied energy

Embodied energy is the energy used to produce a material substance (such as processed metals or building materials), taking into account energy used at the manufacturing facility, energy used in producing the materials that are used in the manufacturing facility, and so on.

Renewable energy

Renewable energy (RE) is any form of energy from solar, geophysical or biological sources that is replenished by natural processes at a rate that equals or exceeds its rate of use. For a more detailed description see Bioenergy, Solar energy, Hydropower, Ocean, Geothermal and Wind energy.

Energy carrier

A substance for delivering mechanical work or transfer of heat. Examples of energy carriers include: solid, liquid or gaseous fuels (e.g., biomass, coal, oil, natural gas, hydrogen); pressurized/heated/ cooled fluids (air, water, steam); and electric current.

Energy efficiency

The ratio of useful energy output of a system, conversion process or activity to its energy input.

Energy intensity

The ratio of energy use to economic or physical output.

Energy savings

Decreasing energy intensity by changing the activities that demand energy inputs. Energy savings can be realized by technical organizational, institutional and structural actions and by changed behavior.

Energy security

The goal of a given country, or the global community as a whole, to maintain an adequate, stable and predictable energy supply. Measures encompass safeguarding access to energy resources; enabling development and deployment of technologies; building sufficient infrastructure to generate, store and transmit energy supplies; ensuring enforceable contracts of delivery; and access to energy at affordable prices for a specific society or groups in society.

Energy services

An energy service is the benefit received as a result of energy use.

Environmental effectiveness

A policy is environmentally effective to the extent it achieves its expected environmental target (e.g. GHG emission reduction).

Evidence

Information or signs indicating whether a belief or proposition is true or valid. In this Report, the degree of evidence reflects the amount of scientific/technical information on which the Lead Authors are basing their findings.

Externality / external cost / external benefit

Externalities arise from a human activity, when agents responsible for the activity do not take full account of the activity's impact on others' production and consumption possibilities, and no compensation exists for such impacts. When the impact is negative, they are external costs. When positive they are referred to as external benefits.

Feed-in tariff

The price per unit of electricity (heat) that a utility or power (heat) supplier has to pay for distributed or renewable electricity (heat) fed into the power grid (heat supply system) by non-utility generators. A public authority regulates the tariff.

Flaring

Open air burning of waste gases and volatile liquids, through a chimney, at oil wells or rigs, in refineries or chemical plants and at landfills.

Food security

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

Forecast

Projected outcome from established physical, technological, economic, social, behavioral, etc. patterns.

Forest

A vegetation type dominated by trees. Many definitions of the term forest are in use throughout the world, reflecting wide differences in biogeophysical conditions, social structure and economics. According to the current definition of UNFCCC adopted in 2005 a forest is an area of land of at least 0.05 – 1 hectare in size, of which more than 10-30% is covered by tree canopy. Trees must have a potential to reach a minimum of 2-5 meters at maturity in situ. Parties to the Convention can choose to define a forest from within those ranges. Currently, the definition does not recognize different biomes, nor do they distinguish natural forests form plantations, an anomaly being pointed out by many as in need of rectification.

For a discussion of the term forest and related terms such as afforestation, reforestation and deforestation see the IPCC Report on Land Use, Land-Use Change and Forestry (IPCC, 2000). See also the Report on Definitions and Methodological Options to Inventory Emissions from Direct Human-induced Degradation of Forests and Devegetation of Other Vegetation Types (IPCC, 2003).

Fossil fuels

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

Free Rider

One who benefits from a common good without contributing to its creation or preservation.

Fuel cell

A fuel cell generates electricity in a direct and continuous way from the controlled electrochemical reaction of hydrogen or another fuel and oxygen. With hydrogen as fuel it emits only water and heat (no CO2) and the heat can be utilized (see cogeneration).

Fuel switching

In general, this is substituting fuel A for fuel B. In the climate-change discussion it is implicit that fuel A has lower carbon content than fuel B, e.g., natural gas for coal.

Full-cost pricing

Setting the final prices of goods and services to include both the private costs of inputs and the external costs created by their production and use.

G77/China

See Group of 77 and China.

General circulation (climate) model (GCM)

See Climate model.

General equilibrium analysis

General equilibrium analysis considers simultaneously all the markets and feedback effects among these markets in an economy leading to market clearance. General equilibrium models are the operational tool used to perform this type of analysis. See also market equilibrium.

General equilibrium models

See General equilibrium analysis.

Geo-engineering

A set of proposed methods and technologies that aim to deliberately alter the climate system in order to alleviate the overall impacts of climate change. Most methods, but not all, seek to either a) reduce the amount of solar energy absorbed by the climate system (solar radiation management) or b) increase net carbon dioxide removal from the atmosphere at a scale sufficient to mitigate climate change (carbon dioxide removal).

Geothermal energy

Accessible thermal energy stored in the Earth's interior.

Global Environment Facility (GEF)

The Global Environment Facility (GEF), established in 1991, helps developing countries fund projects and programmes that protect the global environment. GEF grants support projects related to biodiversity, climate change, international waters, land degradation, the ozone layer, and persistent organic pollutants.

Globalization

The term 'globalization' is a term used to refer to a broad range of political, economic, and cultural trends which has become commonly used mostly during the last two to three decades. There is no agreed definition on the term. On the contrary, it is used by many to refer to different trends. In general, it is often used to refer to the growing integration and interdependence of countries worldwide through the increasing volume and variety of cross-border transactions in goods and services, free international capital flows, and the more rapid and widespread diffusion of technology, information and culture.

Global warming

Global warming refers to the gradual increase, observed or projected, in global surface temperature, as one of the consequences of radiative forcing caused by anthropogenic emissions.

Global warming potential (GWP)

An index, based upon radiative properties of well-mixed greenhouse gases, measuring the radiative forcing following a pulse emission of a unit mass of a given well-mixed greenhouse gas in the present-day atmosphere integrated over a chosen time horizon, relative to that of carbon dioxide. The GWP represents the combined effect of the differing lengths of time these gases remain in the atmosphere and their relative effectiveness in absorbing outgoing terrestrial radiation. The Kyoto Protocol is based on GWPs from pulse emissions over a 100-year time frame.

Governance

Governance is a comprehensive and inclusive concept of the full range of means for deciding, managing and implementing policies and measures. Whereas government is defined strictly in terms of the nation-state, the more inclusive concept of governance recognizes the contributions of various levels of government (global, international, regional, local) and the contributing roles of the private sector, of nongovernmental actors and of civil society to addressing the many types of issues facing the global community.

Greenhouse effect

The infrared radiative effect of all infrared-absorbing constituents in the atmosphere. Greenhouse gases, clouds, and (to a small extent) aerosols absorb terrestrial radiation emitted by the Earth's surface and elsewhere in the atmosphere. These substances emit infrared radiation in all directions, but, everything else being equal, the net amount emitted to space is normally less than would have been emitted in the absence of these absorbers because of the decline of temperature with altitude in the troposphere and the consequent weakening of emission. An increase in the concentration of greenhouse gases increases the magnitude of this effect; the difference is sometimes called the enhanced greenhouse effect. The change in a greenhouse gas concentration because of anthropogenic emissions contributes to an instantaneous radiative forcing. Surface temperature and troposphere warm in response to this forcing, gradually restoring the radiative balance at the top of the atmosphere.

Greenhouse gases (GHGs)

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 terrestrial radiation emitted by the Earth's surface, the atmosphere itself, and by clouds. This property causes the greenhouse effect. Water vapour (H_2O), carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4) and ozone (O_3) 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. Beside CO2, N2O and CH4, the Kyoto Protocol deals with the greenhouse gases sulphur hexafluoride (SF6), hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs).

Grid (electric grid, electricity grid, power grid)

The network by which electricity is transmitted from power stations to users.

Gross Domestic Product (GDP)

The sum of gross value added, at purchasers' prices, by all resident and non-resident producers in the economy, plus any taxes and minus any subsidies not included in the value of the products in a country or a geographic region for a given period, normally one year. It is calculated without deducting for depreciation of fabricated assets or depletion and degradation of natural resources.

Gross National Product (GNP)

GNP is a measure of national income. It measures value added from domestic and foreign sources claimed by residents. GNP comprises Gross Domestic Product plus net receipts of primary income from non-resident income.

Gross World Product

An aggregation of the individual country's Gross Domestic Products to obtain the world or global GDP.

Group of 77 and China (G77/China)

The Group of 77 was established in June of 1964. The aim is to provide the means for a group of countries comprising the group of 77 (originally 77, now more than 130) to promote their collective interest and facilitate their negotiation in global debates including the UNFCCC process.

Heat island

An area with higher temperatures than its surroundings due to retention of heat in construction materials.

Human Development Index (HDI)

The HDI allows the assessment of countries' progress regarding social and economic development as a composite index of three indicators: 1) health measured by life expectancy at birth; 2) knowledge as measured by a combination of the adult literacy rate and the combined primary, secondary and tertiary school enrolment ratio; and 3) standard of living as gross domestic product per capita (in purchasing power parity). The HDI sets a minimum and a maximum for each dimension, called goalposts, and then shows where each country stands in relation to these goalposts, expressed as a value between 0 and 1. The HDI only acts as a broad proxy for some of the key issues of human development; for instance, it does not reflect issues such as political participation or gender inequalities.

Hybrid vehicle

Any vehicle that employs two sources of propulsion, especially a vehicle that combines an internal combustion engine with an electric motor.

Hydrofluorocarbons (HFCs)

One of the six types of greenhouse gases or groups of greenhouse gases to be mitigated 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. See Chlorofluorocarbons.

Hydropower

Power harnessed from the flow of water

Impacts

Effects on natural and human systems. In this report, the term 'impacts' is used to refer to the effects on natural and human systems of physical events, of disasters, and of climate change.

Implementation

Implementation describes the actions taken to meet commitments or actions under a treaty. Implementation actions typically include formal measures such as legislation, regulation, policy formulation and judicial decisions aimed at inducing, monitoring and enforcing behavioural change, consistent with translating international accords into domestic law and policy. Translating formal action into effective implementation often involves further measures such as creation of new institutions, changing incentives, and shifting norms through a variety of market, regulatory and information based policy instruments.

Income elasticity (of demand)

Income elasticity of demand measures the responsiveness of the demand for a good or service to a change in the income of the people demanding the good/service, ceteris paribus. It is calculated as the ratio of the percentage change in the quantity of demand to the percentage change in income. For most goods and services, demand goes up when income grows, making income elasticity positive. When the elasticity is less than one, goods and services are called necessities.

Indigenous people

No internationally accepted definition of indigenous peoples exists. Common characteristics often applied under international law, and by United Nations agencies to distinguish indigenous peoples include: residence within or attachment to geographically distinct traditional habitats, ancestral territories, and their natural resources; maintenance of cultural and social identities, and social, economic, cultural and political institutions separate from mainstream or dominant societies and cultures; descent from population groups present in a given area, most frequently before modern states or territories were created and current borders defined; and self-identification as being part of a distinct indigenous cultural group, and the desire to preserve that cultural identity.

Industrial Revolution

A period of rapid industrial growth with far-reaching social and economic consequences, beginning in Britain during the second half of the eighteenth century and spreading to Europe and later to other countries including the United States. The invention of the steam engine was an important trigger of this development. The industrial revolution marks the beginning of a strong increase in the use of fossil fuels and emission of, in particular, fossil carbon dioxide. In this report the terms pre-industrial and industrial refer, somewhat arbitrarily, to the periods before and after 1750, respectively.

Industrialized countries/developing countries

There is no established or agreed convention, methodology or consensus for the definition of industrialized, developed or developing countries. Categorizing countries on the basis of their level of development would require a clearly articulated and agreed view and an agreed definition of what constitutes development and this does not exist. The origins of the terms date back to the 1960s where it became common practice to refer to countries in the context of policy discussions and the dynamics of the relationship between richer and poorer countries. What exists now are new common practices and uses by institutions where such definition is critical for establishing rights, benefits and/or obligations. The UNITED Nations Statistics divides countries into developed regions,

developing regions, least developed countries, land-locked developing countries, small-island developing states, transition economies. Many countries in each of these lists appear in more than one category. In the case of the World Bank, the main criterion for classifying countries is by income – low, middle and high income. These categories are relevant for their lending and operational categories such as IDA eligibility, civil works and infrastructure preferences, etc. In the case of the UNDP Human Development Index, the categories are not developed/industrialized nor developing but four categories as follows: very high human development, high human development, medium human development, and low human development based on an index that compares factors such as life expectancy, literacy, education and standards of living, and measures of well-being. See Human Development Index.

Inequality

[Note from TSU: Definition to be drafted.]

Inertia

In the context of climate-change mitigation, inertia relates to the difficulty of change resulting from pre-existing conditions within society such as physical man-made capital, natural capital and social non-physical capital, including institutions, regulations and norms. Existing structures lock in societies, making change more difficult.

Infrastructure

Construction other than buildings to provide transport, communication and utility services

Institution

Institutions are the rules of the game held in common by social actors that constrain and shape human interaction. These constraints can be formal, such as laws and policies, or informal, such as norms and conventions. Organizations – such as parliaments, regulatory agencies, private firms, and community bodies – develop and act in response to institutional frameworks and the incentives they frame. Institutions can constrain and shape human interaction through direct control, through incentives, and through processes of socialization.

Institutional feasibility

Part of institutional feasibility is the extent of administrative workload, both for public authorities and for regulated entities. Another part of institutional feasibility is the extent to which the policy is viewed as legitimate, gain acceptance, adopted and implemented.

Integrated assessment

A method of analysis that combines results and models from the physical, biological, economic and social sciences, and the interactions between these components in a consistent framework to evaluate the status and the consequences of environmental change and the policy responses to it.

International Energy Agency (IEA)

Established in 1973/4 in response to the oil crisis, its initial role was to help countries coordinating a collective response and strategy on energy security. Its members are from the OECD. Its role has evolved and expanded to help its members to engage in the global dialogue on energy, and to provide research, analysis and statistics.

Joint Implementation (JI)

A mechanism defined in Article 6 of the Kyoto Protocol, through which investors (governments or companies) from developed (Annex B) countries may implement projects jointly that limit or reduce

emissions or enhance sinks, and to share the Emissions Reduction Units. JI activity is also permitted in Article 4.2(a) of the UNFCCC. See also Kyoto Mechanisms.

Kyoto Mechanisms (also called Flexibility Mechanisms)

Market-based mechanisms that parties to the Kyoto Protocol can use in an attempt to lessen the potential economic impacts of their commitment to limit or reduce greenhouse gas emissions. They include Joint Implementation (Article 6), Clean Development Mechanism (Article 12), and Emissions trading (Article 17).

Kyoto Protocol

The Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCCC) was adopted in 1997 in Kyoto, Japan, at the Third Session of the Conference of the Parties (COP) to the UNFCCC. It contains legally binding commitments, in addition to those included in the UNFCCC. Countries included in Annex B of the Protocol (most Organisation for Economic Cooperation and Development countries and countries with economies in transition) agreed to reduce their anthropogenic greenhouse gas emissions (carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulphur hexafluoride) by at least 5% below 1990 levels in the commitment period 2008 to 2012. The Kyoto Protocol entered into force on 16 February 2005.

Land use (change; direct and indirect)

Land use and land use change: Land use refers to the total of arrangements, activities and inputs undertaken in a certain land cover type (a set of human actions). The term land use is also used in the sense of the social and economic purposes for which land is managed (e.g., grazing, timber extraction and conservation).

Land use change

Land use change refers to 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 surface albedo, evapotranspiration, sources and sinks of greenhouse gases, or other properties of the climate system and may thus give rise to radiative forcing and/or other impacts on climate, locally or globally. See also the IPCC Report on Land Use, Land-Use Change, and Forestry (IPCC, 2000) and the Bioenergy Annex to Chapter 7.

Indirect land use change

Indirect land use change refers to market-mediated or policy driven shifts in land use that cannot be directly attributed to land use management decisions of individuals or groups. For example, if agricultural land is diverted to fuel production, forest clearance may occur elsewhere to replace the former agricultural production. See also afforestation, deforestation and reforestation.

Leaching

The removal of soil elements or applied chemicals by water movement through the soil.

Leapfrogging

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.

[Note from TSU: Definition subject to cross-chapter review.]

Learning by doing

As researchers and firms gain familiarity with a new technological process, or acquire experience through expanded production they can discover ways to improve processes and reduce cost. Learning by doing is a type of experience-based technological change.

Learning curve / rate

Decreasing cost-prices of technologies shown as a function of increasing (total or yearly) supplies. Learning improves technologies and processes over time due to experience, as production increases and/or with increasing research and development. The learning rate is the percent decrease of the cost-price for every doubling of the cumulative supplies (also called progress ratio).

Levelized cost of energy

See Cost.

Lifecycle assessment (LCA)

A widely used technique defined by ISO 14040 as a "compilation and evaluation of the inputs, outputs and the potential environmental impacts of a product system throughout its life cycle". The results of LCA studies are very strongly dependent on the system boundaries within which they are conducted. The technique is intended for relative comparison of two similar means to complete a product, but often mis-used.

Likelihood

The likelihood of an occurrence, an outcome or a result, where this can be estimated probabilistically, is expressed in this report using a standard terminology: Particular, or a range of, occurrences/outcomes of an uncertain event owning a probability of >99% are said to be Virtually certain, >90% are said to be Very likely, >66% are said to be Likely, 33 to 66% are said to be About as likely as not, <33% are said to be Unlikely, <10% are said to be Very unlikely, <1% are said to be Exceptionally unlikely.

Load (electrical)

The instantaneous demand for electrical power

Loans

Loans are money that public or private lenders provide to borrowers mandated to pay back the nominal sum increased with interest payments.

Soft loans

Soft loans (also called soft financing or concessional funding) offer flexible or lenient terms for repayment, usually at lower than market interest rates or no interest. Soft loans are provided customarily by government agencies and not by financial institutions.

Convertible loans

Convertible loans entitle the lender to convert the loan to common or preferred stock (ordinary or preference shares) at a specified conversion rate and within a specified time frame.

Lock-in

Technologies that cover large market shares continue to be used due to factors such as sunk investment costs, related infrastructure development, use of complementary technologies and associated social and institutional habits, capabilities and structures.

Low-carbon technology

A technology that over its lifecycle causes very low to zero CO2eq emissions. See emissions.

Macroeconomic costs

These costs are usually measured as changes in Gross Domestic Product or changes in the growth of Gross Domestic Product, or as loss of welfare or consumption.

Marginal cost pricing

The pricing of goods and services such that the price equals the additional cost arising when production is expanded by one unit. Economic theory shows that this way of pricing maximizes social welfare in a first-best economy.

Market barriers

In the context of climate change mitigation, market barriers are conditions that prevent or impede the diffusion of cost-effective technologies or practices that would mitigate GHG emissions.

Market-based mechanisms

Regulatory approaches using price mechanisms (e.g., taxes and auctioned tradable permits), among other instruments, to reduce GHG emissions.

Market distortions and imperfections

A market distortion is any event in which a market reaches a market clearing price that is substantially different from the price that a market would achieve while operating under conditions of perfect competition and state enforcement of legal contracts and the ownership of private property. Examples of factors causing market prices to deviate from real economic scarcity are environmental externalities, public goods, monopoly power, information asymmetry, transaction costs, non-rational behaviour and many others. See also Market failure.

Market equilibrium

The point at which the demand for goods and services equals the supply; often described in terms of price levels, determined in a competitive market, 'clearing' the market.

Market Exchange Rate (MER)

This is the rate at which foreign currencies are exchanged. Most economies post such rates daily and they vary little across all the exchanges. For some developing economies official rates and black-market rates may differ significantly and the MER is difficult to pin down.

Market failure

When private decisions are based on market prices that do not reflect the real scarcity of goods and services but rather reflect market distortions and imperfections, they do not generate an efficient allocation of resources but cause welfare losses. See Market distortions and imperfections.

Measures

In climate policy, measures are technologies, processes or practices that reduce greenhouse gas emissions or impacts below anticipated future levels, for example renewable energy technologies, waste minimization processes, public transport commuting practices, etc. See also policies.

Meeting of the Parties (MOP)

The Conference of the Parties (COP) of the UNFCCC serves as the Meeting of the Parties (MOP), the supreme body of the Kyoto Protocol, since the latter entered into force on 16 February 2005. Only parties to the Kyoto Protocol may participate in deliberations and make decisions.

Methane (CH4)

Methane is a relatively potent greenhouse gas – about 20 times more effective in trapping heat in the atmosphere than carbon dioxide over a 100-year period and is emitted from a variety of natural and human-influenced sources. It is one of the six greenhouse gases to be mitigated under the Kyoto Protocol. It is the major component of natural gas and associated with all hydrocarbon fuels, animal husbandry and agriculture.

Methane recovery

Methane emissions, e.g., from oil or gas wells, coal beds, peat bogs, gas transmission pipelines, landfills, or anaerobic digesters, are captured and used as a fuel or for some other economic purpose (e.g., chemical feedstock).

Millennium Development Goals (MDG)

A set of eight time-bound and measurable goals for combating poverty, hunger, disease, illiteracy, discrimination against women and environmental degradation. These were agreed to at the UN Millennium Summit in 2000 together with an action plan to reach these goals.

Mitigation

A human intervention to reduce the sources or enhance the sinks of greenhouse gases.

Mitigation capacity

This is a country's ability to reduce anthropogenic GHG emissions or to enhance natural sinks, where ability refers to skills, competencies, fitness and proficiencies that a country has attained and depends on technology, institutions, wealth, equity, infrastructure and information. Mitigative capacity is rooted in a country's sustainable development path.

Models

Models are structured imitations of a system's attributes and mechanisms to mimic appearance or functioning of systems, for example, the climate, the economy of a country, or a crop. Mathematical models assemble (many) variables and relations (often in a computer code) to simulate system functioning and performance for variations in parameters and inputs. See General Equilibrium Models.

[Note from TSU: Definitions for integrated assessment models and partial equilibrium models are currently being developed.]

Montreal Protocol

The Montreal Protocol on Substances that Deplete the Ozone Layer was adopted in Montreal in 1987, and subsequently adjusted and amended in London (1990), Copenhagen (1992), Vienna (1995), Montreal (1997) and Beijing (1999). It controls the consumption and production of chlorine- and bromine- containing chemicals that destroy stratospheric ozone, such as chlorofluorocarbons, methyl chloroform, carbon tetrachloride and many others.

Multi-attribute analysis

Integrates different decision parameters and values without assigning monetary values to all parameters. Multi-attribute analysis can combine quantitative and qualitative information.

Multi-gas

Next to CO2 also the other greenhouse gases (methane, nitrous oxide and fluorinated gases) are taken into account in e.g. achieving reduction of emissions (multi-gas reduction) or stabilization of concentrations (multi-gas stabilization).

Nitrogen oxides (NOx)

Any of several oxides of nitrogen.

Nitrous oxide (N2O)

One of the six types of greenhouse gases to be mitigated under the Kyoto Protocol.

Non-Annex I Parties

See Annex I Parties.

Non-Annex B Parties

See Annex B Parties.

Nonlinearity

A process is called *nonlinear* when there is no simple proportional relation between cause and effect. The *climate system* contains many such nonlinear processes, resulting in a system with potentially very complex behaviour. Such complexity may lead to *abrupt climate change*.

Non-market impacts

Impacts that affect ecosystems or human welfare, but that are not easily expressed in monetary terms, e.g., an increased risk of premature death, or increases in the number of people at risk of hunger.

No-regret policy (options / potential)

Such policy would generate net social benefits whether or not there is climate change associated with anthropogenic emissions of greenhouse gases. No-regret options for GHG emissions reduction refer to options whose benefits (such as reduced energy costs and reduced emissions of local/regional pollutants) equal or exceed their costs to society, excluding the benefits of avoided climate change.

Normative analysis

Analysis in which judgments about the desirability of various policies are made. The conclusions rest on value judgments as well as on facts and theories.

Ocean energy

Energy obtained from the ocean via waves, tidal ranges, tidal and ocean currents, and thermal and saline gradients.

Offset (in climate policy)

A unit of CO2-equivalent (CO2eq) emissions that is reduced, avoided or sequestered to compensate for emissions occurring elsewhere.

Oil sands and oil shale

Unconsolidated porous sands, sandstone rock and shales containing bituminous material that can be mined and converted to a liquid fuel.

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 (*smog*). Tropospheric ozone acts as a *greenhouse gas*. In the *stratosphere*, it is created by the interaction between solar ultraviolet radiation and molecular oxygen (O2). Stratospheric ozone

plays a dominant role in the stratospheric radiative balance. Its concentration is highest in the *ozone layer*.

Pareto optimality

Pareto optimality is reached when no one's welfare can be increased without making the welfare of the rest of society worse off, given a particular distribution of income. Different income distributions lead to different Pareto optima.

Particulates

Very small solid particles emitted during the combustion of fossil and biomass fuels. Particulates may consist of a wide variety of substances. Of greatest concern for health are particulates of less than or equal to 10 nm in diameter, usually designated as PM10.

Path dependence

Outcomes of a process are conditioned by previous decisions, events and outcomes, rather than only by current actions. Choices based on transitory conditions can exert a persistent impact long after those conditions have changed.

Payback period

Mostly used in investment appraisal as financial payback, which is the time needed to repay the initial investment by the returns of a project. A payback gap exists when, for example, private investors and micro-financing schemes require higher profitability rates from renewable energy projects than from fossil-fi red ones. Imposing an x-times higher financial return on renewable energy investments is equivalent to imposing an x-times higher technical performance hurdle on delivery by novel renewable solutions compared to incumbent energy expansion. Energy payback is the time an energy project needs to deliver as much energy as had been used for setting the project online. Carbon payback is the time a renewable energy project needs to deliver as much net greenhouse gas savings (with respect to the fossil reference energy system) as its realization has caused greenhouse gas emissions from a perspective of lifecycle analysis (including land use changes and loss of terrestrial carbon stocks).

Perfluorocarbons (PFCs)

One of the six types of greenhouse gases to be mitigated under the Kyoto Protocol. These are by-products of aluminium smelting and uranium enrichment. They also replace chlorofluorocarbons in manufacturing semiconductors. The Global Warming Potential of PFCs is 6500–9200.

Photovoltaic cells (PV)

Electronic devices which generate electricity from light energy. See Solar energy.

Policies (for mitigation of or adaptation to climate change)

Policies are taken and/or mandated by a government – often in conjunction with business and industry within a single country, or collectively with other countries – to accelerate mitigation and adaptation measures. Examples of policies are support mechanisms for renewable energy supplies, carbon or energy taxes, fuel efficiency standards for automobiles, etc.

Polluter pays principle

The party causing the pollution is responsible for paying for remediation or for compensating the damage.

Portfolio analysis

Examination of a collection of assets or policies that are characterized by different risks and payoffs. The objective function is built up around the variability of returns and their risks, leading up to the decision rule to choose the portfolio with highest expected return.

Potential

[Note from TSU: Definition under consideration.]

Precautionary Principle

A provision under Article 3 of the UNFCCC, stipulating that the parties should take precautionary measures to anticipate, prevent or minimize the causes of climate change and mitigate its adverse effects. Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason to postpone such measures, taking into account that policies and measures to deal with climate change should be cost-effective in order to ensure global benefits at the lowest possible cost.

Precursors

Atmospheric compounds that are not greenhouse gases or aerosols, but that have an effect on greenhouse gas or aerosol concentrations by taking part in physical or chemical processes regulating their production or destruction rates.

Pre-industrial

The era before the industrial revolution of the late 18th and 19th centuries, after which the use of fossil fuel for mechanization started to increase. See Industrial Revolution.

Present value

Amounts of money available at different dates in the future are discounted back to a present value, and summed to get the present value of a series of future cash flows. See also discounting.

Price elasticity of demand

Price elasticity of demand measures the responsiveness of the demand for a good or service to a change in its price, ceteris paribus. It is calculated as the ratio of the percentage change in the quantity of demand for a good or service to the percentage change in the price of that good or service. When the absolute value of the elasticity is between 0 and 1, demand is called inelastic; when it is greater than one, demand is called elastic.

Primary production

All forms of production accomplished by plants, also called primary producers.

Production frontier

The maximum outputs attainable with the optimal uses of available inputs (natural resources, labour, capital, information).

Projection

A projection is a potential future evolution of a quantity or set of quantities, often computed with the aid of a model. Unlike predictions, projections are conditional on assumptions concerning, for example, future socioeconomic and technological developments that may or may not be realised, and are therefore subject to substantial uncertainty.

Public acceptance/acceptability/perception

The term refers to the public attitudes towards an event or a decision. It is particularly relevant when the introduction of a new modus operandi, as for example policies or technologies, are proposed or when events change the perspective on a pre-existing modus operandi. Personal as well as sociological reasons can explain public attitudes, although the context can also have a strong influence (as for example the scale of the proposed change).

Public good

Public goods are non-rivalrous (goods whose consumption by one consumer does not prevent simultaneous consumption by other consumers) and non-excludable (goods for which it is not possible to prevent people who have not paid for it from having access to it).

Purchasing Power Parity (PPP)

The purchasing power of a currency is expressed using a basket of goods and services that can be bought with a given amount in the home country. International comparison of, e.g., Gross Domestic Products of countries can be based on the purchasing power of currencies rather than on current exchange rates. PPP estimates tend to lower per capita GDPs in industrialized countries and raise per capita GDPs in developing countries. (PPP is also an acronym for polluter-pays-principle).

Pure rate of time preference

The degree to which consumption now is preferred to consumption one year later, with prices and incomes held constant, which is one component of the discount rate. See discount rate.

Radiative forcing (initial WGI responsibility)

Radiative forcing is the change in the net, downward minus upward, irradiance (expressed in W m–2) at the tropopause due to a change in an external driver of climate change, such as, for example, a change in the concentration of carbon dioxide or the output of the Sun. Sometimes internal drivers are still treated as forcings even though they result from the alteration in climate, for example aerosol or greenhouse gas changes in paleoclimates. The traditional radiative forcing is computed with all tropospheric properties held fixed at their unperturbed values, and after allowing for stratospheric temperatures, if perturbed, to readjust to radiative-dynamical equilibrium. Radiative forcing is called instantaneous if no change in stratospheric temperature is accounted for. The radiative forcing once rapid adjustments are accounted for is termed the adjusted forcing. For the purposes of this report, radiative forcing is further defined as the change relative to the year 1750 and, unless otherwise noted, refers to a global and annual average value. Radiative forcing is not to be confused with cloud radiative forcing, a similar terminology for describing an unrelated measure of the impact of clouds on the irradiance at the top of the atmosphere.

Rebound effect

After implementation of more efficient technologies and practices, part of the expected energy savings are not realized when the accompanying savings in energy bills are used to acquire more energy services. For example, improvements in car engine efficiency lower the cost per kilometre driven, encouraging consumers to drive more often or longer distances, or to spend the saved money on other energy-consuming activities. Part of the rebound effect can occur through price adjustment. Successful energy efficiency policies reduce the economy-wide energy demand and this in turn lowers the energy prices, which pushes demand up. To calculate the rebound effect, one first determines the energy and/or resource savings from a policy in case consumption of the final service does not adjust. One then compares this potential savings with actual savings after adjustment of final demand. The gap between the two savings levels is the rebound effect. For climate change, the main concern about rebound effects is their impact on CO2 emissions (carbon rebound).

Reforestation

Planting of forests on lands that have previously contained forests but that have been converted to some other use. Under the UNFCCC and related CDM methodologies, reforestation is the direct human-induced conversion of non-forested land to forested land through planting, seeding and/or the human-induced promotion of natural seed sources, on land that was previously forested but converted to non-forested land. For the first commitment period of the Kyoto Protocol, reforestation activities will be limited to reforestation occurring on those lands that did not contain forest on 31 December 1989.

For a discussion of the term forest and related terms such as afforestation, reforestation and deforestation, see the IPCC Report on Land Use, Land-Use Change and Forestry (IPCC, 2000). See also the Report on Definitions and Methodological Options to Inventory Emissions from Direct Human-induced Degradation of Forests and Devegetation of Other Vegetation Types (IPCC, 2003).

Regulation

A rule or order issued by governmental executive authorities or regulatory agencies and having the force of law. Regulations implement policies and are mostly specific for particular groups of people, legal entities or targeted activities. Regulation is also the act of designing and imposing rules or orders. Informational, transactional, administrative and political constraints in practice limit the regulator's capability for implementing preferred policies.

Renewable energy

See Energy.

Representative concentration pathways (RCPs)

Scenarios that include time paths for emissions and concentrations of the full suite of *greenhouse gases* and *aerosols* and chemically active gases, as well as *land use*/land cover (Moss et al., 2008). The word 'representative' signifies that each RCP provides only one of many possible scenarios that would lead to the specific radiative forcing characteristics. The term 'pathway' emphasizes that not only the long-term concentration levels are of interest, but also the trajectory taken over time to reach that outcome (Moss et al., 2010).

Four RCPs produced from Integrated Assessment Models were selected from the published literature and are used in the present IPCC Assessment as a basis for the climate *climate predictions* and *projections* presented in Chapters 11 to 14:

RCP8.5 One high pathway for which *radiative forcing* reaches >8.5 W m–2 by 2100 and continues to rise for some amount of time;

RCP6.0 and RCP4.5 Two intermediate "stabilization pathways" in which radiative forcing is stabilized at approximately 6 W m–2 and 4.5 W m–2 after 2100;

RCP2.6 One pathway where radiative forcing peaks at approximately 3 W m–2 before 2100 and then declines.

Reservoir

A component of the climate system, other than the atmosphere, which has the capacity to store, accumulate or release a substance of concern, for example, 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 the substance of concern held within a reservoir at a specified time is called the stock.

Resilience

The ability of a social, ecological, or socio-ecological system and its component parts to anticipate, absorb, accommodate, or recover from the effects of a hazardous event in a timely and efficient manner, including through ensuring the preservation, restoration, or improvement of its essential basic structures and functions, its capacity for self-organization, and the capacity to adapt to stress and change.

Risk

The potential for adverse effects on lives, livelihoods, health status, economic, social and cultural assets, services (including environmental), and infrastructure due to particular hazardous events occurring within some specified time period.

Risk assessment

The qualitative and quantitative scientific analysis of risks posed by climate change.

Risk management

The plans, actions, or policies implemented to reduce, avoid or respond to climate change impacts or to extreme weather events.

Risk transfer

The process of formally or informally shifting the risk of financial consequences for particular negative events from one party to another whereby a household, community, enterprise, or state authority will obtain resources from the other party after a disaster occurs, in exchange for ongoing or compensatory social or financial benefits provided to that other party.

Scenario

A plausible description of how the future may develop based on a coherent and internally consistent set of assumptions about key driving forces (e.g., rate of technological change, prices) and relationships. Note that scenarios are neither predictions nor forecasts, but are useful to provide a view of the implications of developments and actions. See also Baselines, Business as Usual, Climate scenario, Emission scenario, Models, Representative Concentration Pathways, Socioeconomic scenarios and SRES scenarios.

Sensitivity analysis

Sensitivity analysis with respect to a mathematical model assesses how changing assumptions impacts on the outcomes. More specifically, one chooses different values for specific parameters and re-runs the model to assess the impact of these changes on model output.

Sequestration

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. In the context of this report, sequestration also refers to carbon dioxide capture and: storage in terrestrial or marine reservoirs. Biological sequestration includes direct removal of CO2 from the atmosphere through land-use change, afforestation, reforestation, carbon storage in landfills and practices that enhance soil carbon in agriculture. See also Carbon capture and storage.

Shadow pricing

Setting prices of goods and services that are not, or incompletely, priced by market forces or by administrative regulation, at the height of their social marginal value. This technique is used in cost-benefit analysis.

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.

Smart meter

A meter that communicates consumption back to the utility provider.

Social cost of carbon (SCC)

The value of the climate change impacts from 1 tonne of carbon emitted today as CO2, aggregated over time and discounted back to the present day; sometimes also expressed as value per tonne of carbon dioxide.

Socio-economic scenarios

Scenarios concerning future conditions in terms of population, Gross Domestic Product and other socio-economic factors relevant to understanding the implications of climate change.

[Note from TSU: An addition with respect to Shared Socio-economic Pathways will be drafted.]

Social unit costs of mitigation

Carbon prices, in value/tCO2 or value/tCO2-eq, required to achieve a particular level of mitigation of CO2 or GHG emissions. The reduction is usually associated with a policy target, such as a cap in an emissions trading scheme or a given level of stabilization of CO2 or GHG concentrations in the atmosphere.

Solar energy

Energy from the Sun that is captured either as heat, as light that is converted into chemical energy by natural or artificial photosynthesis, or by photovoltaic panels and converted directly into electricity.

Source (of greenhouse gases)

Any process, activity or mechanism that releases a greenhouse gas, an aerosol or a precursor of a greenhouse gas or aerosol into the atmosphere. Source can also refer to, e.g., an energy source.

SRES scenarios

SRES scenarios are *emission scenarios* developed by Nakićenović and Swart (2000) and used, among others, as a basis for some of the *climate projections* shown in Chapters 9 to 11 of IPCC (2001) and Chapters 10 and 11 of IPCC (2007). The following terms are relevant for a better understanding of the structure and use of the set of SRES scenarios:

Scenario family Scenarios that have a similar demographic, societal, economic and technical change storyline. Four scenario families comprise the SRES scenario set: A1, A2, B1 and B2.

Illustrative Scenario: A scenario that is illustrative for each of the six scenario groups reflected in the Summary for Policymakers of Nakićenović and Swart (2000). They include four revised *scenario markers* for the scenario groups A1B, A2, B1, B2, and two additional scenarios for the A1FI and A1T groups. All scenario groups are equally sound.

Marker Scenario: A scenario that was originally posted in draft form on the SRES website to represent a given scenario family. The choice of markers was based on which of the initial quantifications best reflected the storyline, and the features of specific models. Markers are no more likely than other scenarios, but are considered by the SRES writing team as illustrative of a particular storyline. They are included in revised form in Nakićenović and Swart (2000). These

scenarios received the closest scrutiny of the entire writing team and via the SRES open process. Scenarios were also selected to illustrate the other two scenario groups.

Storyline: A narrative description of a scenario (or family of scenarios), highlighting the main scenario characteristics, relationships between key driving forces and the dynamics of their evolution.

[Note from TSU: An addition with respect to Shared Socio-economic Pathways will be drafted.]

Stabilization of GHG concentration

A state in which the atmospheric concentrations of one or more GHG (e.g., CO2) or of a CO2-equivalent basket of GHG remains constant over time. Stabilization analyses or scenarios address the pathway from current conditions through stabilization of the concentration of GHG in the atmosphere.

Stakeholder

A person or an organisation that has a legitimate interest in a project or entity, or 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). Product, technology or performance standards establish minimum requirements for affected products or technologies. Standards impose reductions in GHG emissions associated with the manufacture or use of the products and/or application of the technology.

Stratosphere

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

Storyline

A narrative description of a scenario (or a family of scenarios) that highlights the scenario's main characteristics, relationships between key driving forces, and the dynamics of the scenarios.

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.

Subsidiarity

The principle that decisions of government (other things being equal) are best made and implemented, if possible, at the lowest most decentralized level closest to the citizen. Subsidiarity is designed to strengthen accountability and reduce the dangers of making decisions in places remote from their point of application. The principle does not necessarily limit or constrain the action of higher orders of government, it merely counsels against the unnecessary assumption of responsibilities at a higher level.

Subsidy

Direct payment from the government or a tax reduction to a private party for implementing a practice the government wishes to encourage. The reduction of greenhouse gas emissions is stimulated by lowering existing subsidies that have the effect of raising emissions (such as subsidies for fossil fuel use) or by providing subsidies for practices that reduce emissions or enhance sinks (e.g., renewable energy projects, insulation of buildings or planting trees).

Sulphur hexafluoride (SF6)

One of the six types of greenhouse gases to be mitigated under the Kyoto Protocol. It is largely used in heavy industry to insulate high-voltage equipment and to assist in the manufacturing of cable-cooling systems and semi-conductors. Its Global Warming Potential is 23,900.

Sustainability

Sustainability is a dynamic process that guarantees and protects the equitable endurance of natural and human systems in the present and in the future. As a dynamic process sustainability is the unifying characteristic of processes of production, consumption, responsible use management of natural resources use and waste and responsible protection of ecological and biological systems.

[Note from TSU: The definition may need to be specified in the context of WGIII.]

Sustainable development (SD)

Development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Sustainable development is the process towards sustainability; a dynamic process that guarantees and protects the equitable endurance of natural and human systems in the present and in the future.

[Note from TSU: The definition may need to be specified in the context of WGIII.]

Targets and timetables

In a climate change context, a target has typically been understood to be the reduction of a specific percentage of GHG emissions from a baseline date (e.g., below 1990 levels) to be achieved by a set date or timetable (e.g., 2008-2012). However, the term has begun to be used in a broader sense, to encompass specifications of national commitments or actions in terms of reduction of emissions from a baseline, or in terms of emission intensity rather than absolute emissions.

Technological change

[Note from TSU: Definition under consideration.]

Technology

The practical application of knowledge to achieve particular tasks that employs both technical artefacts (hardware, equipment) and (social) information ('software', know-how for production and use of artefacts).

Technology transfer

[Note from TSU: Definition under consideration.]

Trace gas

A minor constituent of the atmosphere, next to nitrogen and oxygen that together make up 99% of all volume. The most important trace gases contributing to the greenhouse effect are carbon dioxide, ozone, methane, nitrous oxide, perfluorocarbons, chlorofluorocarbons, hydrofluorocarbons, sulphur hexafluoride and water vapour.

Tradable certificates (tradable green certificates) scheme

A market-based mechanism to achieve an environmentally desirable outcome (renewable energy generation, energy efficiency requirements) in a cost-effective way by allowing purchase and sale of certificates representing under and over-compliance respectively with a quota.

Tradable (emission) permit

See emission permit.

Tradable quota system

See emissions trading.

Transformation pathway

A Transformation Pathway defines the set of economic, technological, and societal changes that are consistent with a long-term climate stabilization target. In particular they might encompass changes in the way energy is used and produced, natural resources are managed, and in the pace and direction of technological change. In the broadest sense, transformation pathways include all aspects of the transformations required to meet a long-term goal, including the global and national institutional requirements, international agreement structures, or socio political dynamics that would allow for the transformation pathway to occur.

Troposphere

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

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. It may have many types of sources, from quantifiable errors in the data to ambiguously defined concepts or terminology, or uncertain projections of human behaviour. Uncertainty can therefore be represented by quantitative measures (e.g., a probability density function) or by qualitative statements (e.g., reflecting the judgment of a team of experts) (see Moss and Schneider, 2000; Manning et al., 2004). See also Confidence and Likelihood.

United Nations Framework Convention on Climate Change (UNFCCC)

The Framework Convention was adopted on 9 May 1992 in New York and signed at the 1992 Earth Summit in Rio de Janeiro by more than 150 countries and the European Economic Community. Its ultimate objective is the "stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system". It contains commitments for all parties under the principle of "common but differentiated responsibilities". The Framework Convention came into force in March 1994. In 1997, the UNFCCC adopted the Kyoto Protocol. See also Annex I countries, Annex B countries and Kyoto Protocol.

Urban heat island

See Heat island.

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'.

Voluntary action

Informal programmes, self-commitments and declarations, where the parties (individual companies or groups of companies) entering into the action set their own targets and often do their own monitoring and reporting.

Voluntary agreement

An agreement between a government authority and one or more private parties to achieve environmental objectives or to improve environmental performance beyond compliance with regulated obligations. Not all voluntary agreements are truly voluntary; some include rewards and/or penalties associated with joining or achieving commitments.

Vulnerability

The propensity or predisposition to be adversely affected.

Welfare

An economic term used to describe the state of well-being of humans on an individual or collective basis. The constituents of well-being are commonly considered to include materials to satisfy basic needs, freedom and choice, health, good social relations, and security.

Wind energy

Kinetic energy from air currents arising from uneven heating of the Earth's surface. A wind turbine is a rotating machine including its support structure for converting the kinetic energy to mechanical shaft energy to generate electricity. A windmill has oblique vanes or sails and the mechanical power obtained is mostly used directly, for example, for water pumping. A wind farm, wind project or wind power plant is a group of wind turbines interconnected to a common utility system through a system of transformers, distribution lines, and (usually) one substation.