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Working Group III – Mitigation of Climate Change

Annex I

Glossary

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Annex 1: 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.

[TSU: Please note that Glossary Annex is not formally reviewed; however, it is an important component of the WGIII AR5 and needs to be considered when reviewing the Chapters. If there is any amendment that you deem necessary, please include it in your comments on the chapter you encountered the term.]

Abrupt climate change

A large-scale change in the climate system that takes place over a few decades or less, persists (or is anticipated to persist) for at least a few decades, and has the potential to cause substantial disruptions in human and/or natural systems.

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.

Incremental adaptation

Adaptation actions where the central aim is to maintain the essence and integrity of an incumbent system or process at a given scale .

Transformational adaptation

Adaptation that changes the fundamental attributes of a system in response to actual or expected climate and its effects. See also Transformation.

Adaptation Fund

The Adaptation Fund is a Fund established under the Kyoto Protocol in 2001 and officially launched in 2007. The fund finances adaptation projects and programmes in developing countries that are parties to the Kyoto Protocol. Financing comes mainly from sales of Certified Emissions Reductions and a share of proceeds amounting to 2 percent of the value of CERs issued each year for CDM projects. The Adaptation Fund can also receive funds from government, private sector and individuals.

Adaptability

See Adaptive capacity.

Adaptive capacity

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

Additionality

Mitigation projects (e.g., under the Kyoto Mechanisms), mitigation policies or climate finance are additional if they go beyond a business-as-usual level, or baseline. Additionality is required to

guarantee the environmental integrity of project-based offset mechanisms, but difficult to establish in practice due to the counterfactual nature of the baseline.

Adverse side-effect

The negative effects that a policy or measure aimed at one objective might have on other objectives, without yet evaluating the net effect on overall social welfare. Adverse side-effects are often subject to uncertainty and depend among others on local circumstances and implementation practices. See also Co-benefit, Risk, and Risk trade-off.

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. Afforestation projects are eligible under a number of schemes under the climate change regime including, among others, Joint Implementation and the Clean Development Mechanism under the Kyoto Protocol for which particular criteria apply (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). See also Clean Development Mechanism, Joint Implementation, Kyoto Mechanisms, and Kyoto Protocol.

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).

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 44 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 acts as an ad-hoc lobby and negotiating voice for small island development states (SIDS) within the United Nations including the UNFCCC climate change negotiations.

Ancillary benefits[1]

See Co-benefits.

[1] Despite the fact that previous IPCC WGIII Assessment Reports have distinguished between the terms 'ancillary benefits' and 'co-benefits', the literature has not consistently followed this distinction and has hence not been used for this report.

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 countries 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 countries. See also Annex B countries, 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 of the Framework Convention, these countries have a special obligation to provide financial resources to meet the agreed full incremental costs of implementing measures mentioned under paragraph 1 of the Convention 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 countries 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 countries that have accepted greenhouse gas emission reduction targets for the period 2008-2012 under Article 3 of the Kyoto Protocol. By default, the other countries are referred to as Non-Annex I countries. See also UNFCCC, Kyoto Protocol.

Anthropogenic emissions

Emissions of greenhouse gases, greenhouse gas precursors, and aerosols caused by human activities. These activities include the burning of fossil fuels, deforestation, land use changes, livestock production, fertilization, waste management, and industrial processes.

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 five years 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).

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 and divided into five layers – the troposphere which contains half of the earth's atmosphere, the stratosphere, the mesosphere, the thermosphere, and the exosphere, the outer limit of the atmosphere. The 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 make use of an arbitrary carbon-free technology (often for power generation) that might become 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.

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).

Baseline

The baseline (or reference) is the state against which change is measured. It might be a current baseline, in which case it represents observable, present-day conditions. It might also 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 the reference conditions can give rise to multiple baselines. See also Business as Usual, Climate scenario, Emission scenario, Representative concentration pathways, Scenario, Shared socio-economic pathways, Socio-economic scenarios, SRES scenarios, and Storyline.

Behaviour

In the context of this report, behaviour refers to human decisions and actions (and the perceptions and judgments on which they are based) that directly or indirectly influence the emission of greenhouse gases (mitigation) or the effects of potential climate change impacts (adaptation). Human decisions and actions are relevant at different levels, from international, national, and subnational actors, to NGO, tribe, or firm-level decision makers, to communities, households, and individual citizens and consumers.

Behaviour Change

In this report, behaviour change refers to alteration of human decisions and actions in ways that mitigate GHG emissions and/or reduce negative consequences of climate change impacts.

Biochar

Biomass stabilisation can be an alternative or enhancement to bioenergy in a land-based mitigation strategy. Heating biomass with exclusion of air produces a stable C-rich co-product (char). Added to soil a system is created that has greater abatement potential than typical bioenergy. The relative benefit of biochar systems is increased if changes in crop yield and soil emissions of Methane and Nitrous oxide are taken into account. See also Bioenergy, Methane and Nitrous oxide.

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

The variability among living organisms from terrestrial, marine, and other ecosystems. Biodiversity includes variability at the genetic, species, and ecosystem levels.(Global Biodiversity Assessment, 1995).

Bioenergy

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

Bio-energy and carbon dioxide capture and storage (BECCS)

The application of carbon dioxide capture and storage (CCS) technology to bioenergy conversion processes. Depending on the total life-cycle emissions, including total marginal consequential effects (from iLUC and other processes) BECCS has the potential for net CO2 removal from the atmosphere. See also Carbon dioxide capture and storage (CCS), CCS-ready, and Sequestration.

Bioethanol

Ethanol produced from biomass (e.g. sugar cane or corn). See also Biofuel.

Biofuel

A fuel, generally in liquid form, produced from organic matter or combustible oils produced by living or recently living plants. Examples of biofuel include alcohol (bioethanol), 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 or dead organisms, or both, in a given area or volume. In the context of this report, 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 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.

Biomass burning

Biomass burning is the burning of living and dead vegetation.

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). Black carbon is mostly formed by the incomplete combustion of fossil fuels, biofuels, and biomass but it also occurs naturally. It stays in the atmosphere only for days or weeks. It consists of soot, charcoal and/or possible light-absorbing refractory organic matter and is the most strongly light-absorbing component of particulate matter (PM). Black carbon has an earth warming effect by absorbing heat into the atmosphere and reducing the albido when deposited on ice or snow.

Burden sharing, climate mitigation

Burden sharing in the context of mitigation refers to sharing the effort of reducing GHG emissions from historical or projected levels, usually allocated by some criteria. Burden-sharing includes both reducing emissions and sharing the cost burden across countries.

Business as usual (BAU)

Business as usual projections are based on the assumption that operating practices and policies remain as they are at present. Although baseline scenarios could incorporate some specific features of BAU scenarios (e.g., a ban on a specific technology), BAU scenarios imply that no practices or policies other than the current ones are in place. See also Baseline, Climate scenario, Emission scenario, Representative concentration pathways, Scenario, Shared socio-economic pathways, Socio-economic scenarios, SRES scenarios, and Storyline.

Cancún Agreements

The Cancún Agreements are a set of decisions adopted at COP16/CMP6of the UNFCCC, including the following, among others: establishment of the Green Climate Fund, the establishment of a new technology mechanism, a process for advancing discussions on adaptation, a formal process for reporting mitigation commitments, a goal of limiting global temperature increase to 2°C, agreement on monitoring, reporting and verification for those countries that receive international support for their mitigation efforts.

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.

Carbon budget

A carbon budget is the area under a GHG emissions trajectory, and is based on assumptions about total emissions permissible to avoid a certain level of temperature rise. Carbon budgets may be defined at the global level, national or sub-national levels.

Carbon credit

See Emission allowance.

Carbon cycle

The flow of carbon (in various forms, e.g., as carbon dioxide) through the atmosphere, ocean, terrestrial biosphere and lithosphere. In this report, the reference unit for the global carbon cycle is GtC or equivalently PgC (10^{15}g). Carbon is the major chemical constituent of most organic matter and is stored in the following major sinks: organic molecules in the biosphere, carbon dioxide in the atmosphere, organic matter in the soils, in the lithosphere, and it the oceans.

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 of industrial processes (e.g., cement production). 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 process in which a relatively pure stream of CO2 from industrial and energy-related sources is separated (captured) from industrial or energy-related processes, conditioned, compressed and transported to a storage location for long-term isolation from the atmosphere. See also Bio-energy and carbon capture and storage (BECCS), CCS-ready, and Sequestration.

Carbon dioxide fertilization

The enhancement of the growth of plants as a result of increased atmospheric carbon dioxide (CO2) concentration.

Carbon Dioxide Removal (CDR)

Carbon Dioxide Removal refers to several methods that have been proposed to accelerate the removal of atmospheric carbon dioxide and enhance its storage in the land, ocean and geological reservoirs. See also Geoengineering and Solar radiation management (SRM).

Carbon footprint

Measure of the exclusive total amount of carbon dioxide emissions that is directly and indirectly caused by an activity or is accumulated over the life stages of a product.

Carbon intensity

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

Carbon leakage

Phenomena whereby the reduction in emissions (relative to a benchmark) are offset by an increase outside the jurisdiction. Leakage can occur at a number of levels albeit a project, state, province, nation or world region. This can occur through:

1. Changes in the relative prices and international trade whereby national climate regulation reduces demand for fossil fuels, thereby causing a fall in world prices resulting in an increase in demand outside the jurisdiction.

2. Relocation of industry where a firm relocates their operation to another nation due to less favourable financial benefits in the original jurisdiction brought about by the reduction measures.

3. Nested regulation where, for example, the EU imposes an aggregate cap on emissions meaning that the efforts of individual countries exceed the cap freeing up allowances in other country under the scheme.

4. Weak consumption leakage being the unintentional consequence of an increase in consumption of one country resulting in emission increases in another country.

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 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.

Carbon tax

A carbon tax is a levy on the carbon content of fossil fuels. Because virtually all of the carbon in fossil fuels is ultimately emitted as CO2, a carbon tax is equivalent to an emission tax on CO2 emissions.

CCS-ready

New large-scale, stationary CO_2 point sources intended to be retrofitted with CCS 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 locations. See also Bio-energy and carbon capture and storage (BECCS), Carbon dioxide capture and storage (CCS), and Sequestration.

Certified Emission Reduction Unit (CER)

Equal to one metric tonne of CO2-equivalent emissions reduced or of CO2 removed from the atmosphere through the Clean Development Mechanism (defined in Article 12 of the Kyoto Protocol) project, calculated using Global Warming Potentials. 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 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. It is one of the greenhouse gases covered under the 1987 Montreal Protocol as a result of which, 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 countries. 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

An interaction in which a perturbation in one climate quantity causes a change in a second, and the change in the second quantity ultimately leads to an additional change in the first. A negative feedback is one in which the initial perturbation is weakened by the changes it causes; a positive feedback is one in which the initial perturbation is enhanced. In this Assessment Report, a somewhat narrower definition is often used in which the climate quantity that is perturbed is the global mean surface temperature, which in turn causes changes in the global radiation budget. In either case, the initial perturbation can either be externally forced or arise as part of internal variability.

Climate engineering

See Geo-engineering.

Climate finance

Climate finance consists of all financial flows whose intended effect is to reduce greenhouse gas emissions or to enhance resilience to the impacts of the current and projected climate.

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 Baseline, Business as Usual, Emission scenario, Representative concentration pathways, Scenario, Shared socio-economic pathways, Socio-economic scenarios, SRES scenarios, and Storyline.

Climate sensitivity

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 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 forcing components. Those values may consider only greenhouse gases, or a combination of greenhouse gases and aerosols.

CO2-equivalent emission

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[2]

The positive effects that a policy or measure aimed at one objective might have on other objectives, without yet evaluating the net effect on overall social welfare. Co-benefits are often subject to uncertainty and depend among others on local circumstances and implementation practices. See also Adverse side-effect, Risk, Risk trade-off and Spill-over effect.

Cogeneration

Cogeneration (also referred to as Combined Heat and Power, or CHP) is the simultaneous generation and useful application of electricity and useful heat.

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 are used to heat water to drive a steam turbine.

Conference of the Parties (COP)

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

Confidence

The validity of a finding based on the type, amount, quality, and consistency of evidence (e.g., mechanistic understanding, theory, data, models, expert judgment) and on the degree of agreement. In this report, confidence is expressed qualitatively. See also Likelihood and Uncertainty.

Consumption-based accounting

Consumption-based accounting provides a measure of emissions released to the atmosphere in order to generate the goods and services consumed by a certain entity (e.g. person, firm, country, or region). See Production-based accounting.

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

[2] Despite the fact that previous IPCC WGIII Assessment Reports have distinguished between the terms 'ancillary benefits' and 'co-benefits', the literature has not consistently followed this distinction and has hence not been used for this report.

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.

Conventional fuels

See Fossil fuels.

Copenhagen Accord

The Copenhagen Accord is the political (as opposed to legal) agreement that emerged at the 15th session of the COP and which delegates "agreed to take note" due to a lack of consensus that an agreement would require. The Copenhagen Accord is the political agreement that emerged at the 15th session of the COP but which did not reach full consensus. Some of the key elements include: recognition of the importance of the scientific view on the need to limit the increase in global temperature to 2° Celcius, commitment by Annex I countries to implement economy-wide emissions targets by 2020 and non-Annex I developing countries to implement mitigation actions, agreement to have emission targets of Annex I countries and their delivery of finance for developing countries subject to MRV and actions by developing countries to be subject to domestic MRV, calls for scaled up financing including a fast track financing of USD 30 billion and USD 100 billion by 2020, the establishment of a new Green Climate Fund, and the establishment of a new technology mechanism. Some of these elements were later adopted in the Cancun Agreements. See also Cancun Agreements.

Cost

See Cost-benefits analysis, Cost-effectiveness analysis, Externality/external cost/external benefit, and Marginal abatement cost.

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

Cost-effectiveness analysis (CEA) is a tool based on constrained optimization for comparing policies designed to meet a prespecified target.

Crediting period, CDM

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

Cropland management

[AUTHORS: A definition will be supplied.]

Decarbonization

The process by which countries or other entities aim to achieve a low-carbon economy, or by which individuals aim to reduce their consumption of carbon.

Decomposition approach

[AUTHORS: A definition will be supplied.]

WGII AR5 FOD: 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.

Decomposition approach

[AUTHORS: A definition will be supplied.]

Deforestation

Conversion of forest to non-forest is one of the major sources of GHG emissions. Under Article 3.3 of the Kyoto Protocol, "the net changes in greenhouse gas emissions by sources and removals by sinks resulting from direct human-induced land-use change and forestry activities, limited to afforestation, reforestation and deforestation since 1990, measured as verifiable changes in carbon stocks in each commitment period, shall be sued to meet the commitments under this Article of each Party included in Annex I". Reducing emissions from deforestation is not eligible for JI or CDM projects but has been introduced in the program of work under REDD (Reducing Emissions from Deforestation and Forest Degradation) under the UNFCCC. See also Kyoto Protocol and Reduced emissions from deforestation and forest degradation (REDD).

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).

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.

Designated national authority (DNA)

A designated national authority is a national institution that authorizes and approves CDM projects in that country. In CDM host countries, it assesses whether proposed projects assist the host country in achieving its sustainable development goals, certification of which is a prerequisite for registration of the project by the CDM Executive Board.

Developed countries

See Industrialized/developing countries

Developing countries

See Industrialized/developing countries

Discounting

A mathematical operation making monetary (or other) amounts received or expended at different times (years) comparable across time. The discounter uses a fixed or possibly time-varying discount rate (>0) from year to year that makes future value worth less today.

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 of behaviour

Determinants of human decisions and actions, including people's values and goals and the factors that constrain action, including economic factors and incentives, information access, regulatory and technological constraints, and cognitive and emotional processing capacity, and social norms.

Drivers of emissions

Drivers refer to the processes, mechanisms and properties that influence emissions through factors. Factors comprise the terms in a decomposition of emissions. Factors and drivers may in return affect policies, measures and other drivers.

Economic efficiency

Economic Efficiency refers to an economy's allocation of resources (goods, services, inputs, productive activities). An allocation is efficient if it is not possible to reallocate resources so as to make at least one person better off without making someone else worse off. An allocation is inefficient if such a reallocation is possible. This is also known as the Pareto Criterion for efficiency.

Economies in Transition (EITs)

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

Ecosystem

An ecosystem is a functional unit consisting of living organisms, their non-living environment, and the interactions within and between them. The components included in a given ecosystem and its spatial boundaries depend on the purpose for which the ecosystem is defined: in some cases they are relatively sharp, while in others they are diffuse. Ecosystem boundaries can change over time. Ecosystems are nested within other ecosystems, and their scale can range from very small to the entire *biosphere*. In the current era, most ecosystems either contain people as key organisms, or show the effects of human activities in their environment.

Ecosystem services

Ecological processes or functions having monetary or non-monetary value to individuals or society at large. These are frequently classified as (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.

Agricultural emissions

See Methane (CH4) and Nitrous oxide (N2O).

Direct emissions

Those emissions that physically arise from activities within an economic sector or company, e.g. a boiler in which fuel is combusted or a chemical process.

Embodied emissions

Indicates the emissions associated with the production of a product.

Indirect emissions

Emissions that are a consequence of the activities of an economic sector or company, but which occur at sources outside that sector or company. For example, CO2 emissions related to electricity consumption or emissions related to the use of purchased heat or steam or transport-related activities in vehicles outside the sector/company considered.

Emission allowance

See Emission permit.

Emission factor/intensity

The emissions released per unit of activity. 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.

Emission scenario

A representation of the future development of emissions of substances that are potentially radiatively active (e.g., *greenhouse gases*, *aerosols*), based on an internally consistent set of assumptions about driving forces (such as demographic and socioeconomic development, technological change, energy and land use) 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* (RCPs) were developed for, but independently of, the present IPCC assessment. See also *Climate scenario* and *scenario*. See also Baseline, Business as Usual, Climate scenario, Representative concentration pathways, Scenario, Shared socio-economic pathways, Socio-economic scenarios, SRES scenarios, and Storyline.

Emission trajectories

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

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 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.

Energy

The power of 'doing work' possessed at any instant by a body or system of bodies. 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.

Primary energy

Primary energy (also referred to as energy sources) is the energy stored 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 or product (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 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. In economics, the term may describe the ratio of economic output to energy input.

Energy intensity

The ratio of energy use to economic or physical output.

Energy poverty

A lack of access to modern energy services. These services are defined as household access to electricity and clean cooking facilities (e.g. fuels and stoves that do not cause air pollution in houses).

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.

Energy system

The energy system comprises all components related to the production, conversion, delivery and use of energy.

Environmental effectiveness

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

Environmental input-output analysis

An analytical method used to allocate environmental impacts arising in production to categories of final consumption, by means of the Leontief inverse of a country's economic input-output tables.

Environmental Kuznets Curve

The hypothesis that various environmental impacts first increase and then eventually decrease as income per capita increases.

Evidence

Information indicating the degree to which 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 the impact is positive they are 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.

Flexibility Mechanisms

See Kyoto Mechanisms.

Food security

A state that prevails when people have secure access to sufficient amounts of safe and nutritious food for normal growth, development, and an active and healthy life. See also Access to food.

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 2005 UNFCCC definition 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. See also Afforestation, Deforestation, and Reforestation.

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).

Forest management

[AUTHORS: A definition will be supplied.]

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.

General circulation (climate) model (GCM)

See Climate model.

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). Scale and intent are of central importance. Two key characteristics of geoengineering methods of particular international concern are that they usually use or affect the global climate system (e.g. atmosphere or ocean) and/or could have substantive unintended effects that cross national boundaries.

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.

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 times 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.

Grazing land management

[AUTHORS: A definition will be supplied.]

Green Climate Fund (GCF)

At COP 16, and as one of the outcomes of the Cancun Agreements, the Parties decided to establish the Green Climate Fund as an operating entity of the financial mechanism of the UNFCCC to support projects, programs and policies and other activities in developing country Parties . As such, the GCF becomes the mechanism thorough which a significant share of the longer-term pledge of $100 billion annually by 2020 should flow.

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 CO_2, N_2O and CH_4, the Kyoto Protocol deals with the greenhouse gases sulphur hexafluoride (SF_6), hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs).

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.

Heat island

The relative warmth of a city compared with surrounding areas.

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.

Indigenous people

Indigenous communities, peoples, and nations are those which, having a historical continuity with pre-invasion and pre-colonial societies that developed on their territories, consider themselves distinct from other sectors of the societies now prevailing on those territories, or parts of them. They form at present non-dominant sectors of society and are determined to preserve, develop, and transmit to future generations their ancestral territories, and their ethnic identity, as the basis of their continued existence as peoples, in accordance with their own cultural patterns, social institutions, and legal system.

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.

Institution

Institutions are rules and norms held in common by social actors that guide, constrain and shape human interaction. Institutions 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 guide, 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 among 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 in recent years to help its members to engage in the global dialogue on energy, and to provide research, analysis and statistics.

IPAT identity

IPAT is the lettering of a formula put forward to describe the impact of human activity on the environment. Impact (I) is viewed as the product of population size (P), affluence (A=GDP/person) and technology (T= impact per GDP unit). In this conceptualization, population growth by definition leads to greater environmental impact if A and T are constant, and likewise higher income leads to more impact (Ehrlich and J Holdren, 1971; Kaya, 1990).

Iron fertilization

Deliberate introduction of iron to the upper ocean intended to enhance biological productivity which can sequester additional atmospheric *carbon dioxide* into the oceans. See Geoengineering and Carbon Dioxide Removal.

Jevon's paradox

See Rebound effect.

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. See also Kyoto Mechanisms.

Kaya identity

In this identity global emissions are equal to the population size, multiplied by per capita output (Gross World Product), multiplied by the energy-intensity of production, multiplied by the carbon-intensity of energy.

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 refers to the total of arrangements, activities and inputs undertaken by humans in a certain land cover type . 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). In urban settlements it is related to land uses within cities and their hinterlands. Urban land use has implications on city management, structure and form and thus on energy demand, greenhouse gas emissions, and mobility, among other aspects.

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 11.

Indirect land use change

Indirect land use change refers to shifts in land use induced by a change in the production level of an agricultural product elsewhere, often mediated by markets or driven by policies. 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.

Leakage

See Carbon leakage.

Learning curve/rate

Decreasing cost-prices of technologies shown as a function of increasing (total or yearly) supplies. The learning rate is the percent decrease of the cost-price for every doubling of the cumulative supplies (also called progress ratio).

Least developed countries

A list of countries designated by the Economic and Social Council of the UN as meeting three criteria: a low income criterion below a certain threshold of gross national income per capita of between US $750 and $900, a human resource weakness based on indicators of health, education, adult literacy,

and an economic vulnerability weakness based on indicators on instability of agricultural production, instability of export of goods and services, economic importance of non-traditional activities, merchandise export concentration, the handicap of economic smallness. Countries in this category are eligible for a number of programs focused on assisting countries most in need. These privileges include certain benefits under the articles of the UNFCCC. See also Industrialized/developing countries

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 chance of a specific outcome occurring, where this might be estimated probabilistically.This 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.

Lock-in

Technology lock-in occurs when a market is stuck with a standard even though participants would be better off with an alternative.

Marginal abatement costs

The cost of one unit of additional mitigation.

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.

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 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, they do not generate an efficient allocation of

resources but cause welfare losses. 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.

Material flow analysis

A systematic assessment of the flows and stocks of materials within a system defined in space and time.

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 – with a global warming potential about 20 times greater than carbon dioxide over a 100-year period. It is the major component of natural gas and associated with all hydrocarbon fuels. Significant emissions occur as a result of animal husbandry and agriculture. It is one of the six greenhouse gases to be mitigated under the Kyoto Protocol.

Methane recovery

Any process by which 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.

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. See also General equilibrium analysis.

General equilibrium model

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.

[AUTHORS: Definitions for the terms 'Partial-equilibrium model', 'Intertemporal optimization model', 'Dynamic recursive model', 'Top-down or "integrated" model', 'Bottom-up or "sectoral" model' will be supplied.]

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. Also referred to as multi-criteria analysis.

Multi-gas

Next to CO2 also other forcing components are taken into account in e.g. achieving reduction for a basket of greenhouse gas emissions (CO_2, methane, nitrous oxide and fluorinated gases) or stabilization of CO_2-eq concentrations (multi-gas stabilization, including greenhouse gases and aerosols).

Nationally appropriate mitigation action (NAMA)

NAMAs are a concept for recognizing and financing emission reductions by developing countries in a post-2012 climate regime achieved through action considered appropriate in a given national context. The concept was first introduced in the Bali Action Plan in 2007 and is contained in the Cancun Agreement.

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. Nitrous oxide is a potent greenhouse gas – with a global warming potential about 310 times greater than carbon dioxide over a 100-year period. Significant emissions occur as a result of agriculture.

Non-Annex I Parties

Non-Annex I Parties are mostly developing countries. Certain groups of developing countries are recognized by the Convention as being especially vulnerable to the adverse impacts of climate change, including countries with low-lying coastal areas and those prone to desertification and drought. Others (such as countries that rely heavily on income from fossil fuel production and commerce) feel more vulnerable to the potential economic impacts of climate change response measures. The Convention emphasizes activities that promise to answer the special needs and concerns of these vulnerable countries, such as investment, insurance and technology transfer. See also Annex I Parties.

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. See also Unconventional fuels.

Overshoot pathways

[AUTHORS: A definition will be supplied.]

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.

Paratransit

Denotes flexible passenger transportation, often but not only in areas with low population density, that does not follow fixed routes or schedules. Options include minibuses (matatus, marshrutka), shared taxis and jitneys. Sometimes paratransit is also called community transit.

Pareto optimum

Pareto optimum is a state in which no one's welfare can be increased without reducing someone else's welfare.

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 diameter less than or equal to 10 nm , usually designated as PM10.

Path dependence

The generic situation where decisions, events or outcomes at one point in time constrain adaptation, mitigation, or other options at a later point in time.

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-fired ones. 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 a course of action taken and/or mandated by a government, e.g., to enhance mitigation and adaptation. Examples of policies aimed at mitigation are support mechanisms for renewable energy supplies, carbon or energy taxes, fuel efficiency standards for automobiles, etc. See Measures.

Polluter pays principle

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

Potential

The possibility of something happening or of someone doing something in the future. Different metrics are used throughout this report for the quantification of different types of potentials, including the following:

Technical potential

Technical potential is the amount by which it is possible to pursue a specific objective through an increase in deployment of technologies or implementation of practices that were not used or implemented before. Quantification of technical potentials may take into

account other than technical considerations, including social, economic and/or environmental considerations.

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.

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.

Primary production

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

Production-based accounting

Production-based accounting provides a measure of emissions released to the atmosphere for the production of goods and services by a certain entity (e.g. person, firm, country, or region). See Consumption-based accounting.

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).

Radiation management

See Solar radiation management.

Radiative forcing

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).

Reduced emissions from deforestation and forest degradation (REDD)

An effort to create financial value for the carbon stored in forests, offering incentives for developing countries to reduce emissions from forested lands and invest in low-carbon paths to sustainable development. It is therefore a mechanism for mitigation resulting from avoidance of deforestation REDD+ goes beyond reforestation and forest degradation, and includes the role of conservation, sustainable management of forests and enhancement of forest carbon stocks. The concept was first introduced in 2005 in the eleventh session of the COP in Montreal and later given greater recognition in the thirteenth session of the COP in 2007 at Bali and inclusion in the Bali Action Plan which called for “policy approaches and positive incentives on issues relating to reducing emissions to deforestation and forest degradation in developing countries (REDD) and the role of conservation, sustainable management of forests and enhancement of forest carbon stock in developing countries”. Since then, support for REDD has increased and has slowly become a framework for action supported by a number of countries.

Reforestation

Planting of forests on lands that have previously sustained forests but that have been converted to some other use. Under the UNFCCC and the Kyoto Protocol, 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. See also Kyoto Protocol.

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).

Renewable energy

See Energy.

Representative concentration pathways (RCPs)

Scenarios that include time series of 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.

RCPs usually refer to the portion of the concentration pathway extending up to 2100, for which Integrated Assessment Models produced corresponding emission scenarios. ECPs describe the RCPs extension beyond 2100 (up to 2500) that were calculated using simple rules generated by stakeholder consultations, and do not represent fully consistent scenarios.

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 (the corresponding ECP assuming constant emissions after 2100 and constant concentrations after 2250);

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 (the corresponding ECPs assuming constant concentrations after 2150);

RCP2.6 One pathway where radiative forcing peaks at approximately 3 W m–2 before 2100 and then declines (the corresponding ECP assuming constant emissions after 2100).

See also Baseline, Business as Usual, Climate scenario, Emission scenario, Scenario, Shared socio-economic pathways, Socio-economic scenarios, SRES scenarios, and Storyline.

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. In the context of carbon capture dioxide capture and storage (CCS), this term is sometimes used to refer to a geological carbon storage location. See also Carbon dioxide capture and storage (CCS) and Sequestration.

Resilience

The ability of a social, ecological, or socio-ecological system and its components to anticipate, reduce, accommodate, or recover from the effects of a hazardous event in a timely and efficient manner.

Revegetation

[AUTHORS: A definition will be supplied.]

Risk

The potential for adverse (side-)effects on lives, livelihoods, health status, economic, social and cultural assets, services (including environmental), and infrastructure due to uncertain states of the world.

Risk assessment

The qualitative and/or quantitative scientific estimation of risks.

Risk management

The plans, actions, or policies implemented to deal with risk.

Risk Perception

The subjective judgment that people make about the characteristics and severity of a risk.

Risk tradeoff

The change in the portfolio of risks that occurs when a countervailing risk is generated (knowingly or inadvertently) by an intervention to reduce the target risk. See also Adverse side-effect, Co-benefit and Risk.

Risk transfer

The practice of sharing with other parties the burden of loss.

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 Baseline, Business as Usual, Climate scenario, Emission scenario, Representative Concentration Pathways, Shared socio-economic pathways, Socioeconomic scenarios, SRES scenarios, and Storyline.

Scope 1, scope 2, and scope 3 emissions

Emissions responsibility as defined by the GHG Protocol, a private sector initiative. “Scope 1” indicates direct GHG emissions that are from sources owned or controlled by the reporting entity. “Scope 2” indicates indirect GHG emissions associated with the production of electricity, heat or steam purchased by the reporting entity. “Scope 3” indicates all other indirect emissions, i.e., emissions associated with the extraction and production of purchased materials, fuels, and services, including transport in vehicles not owned or controlled by the reporting entity, outsourced activities, waste disposal, etc.

Sectoral mechanism

A mechanism to limit greenhouse gas emissions designed to operate at the scale of a sector. These mechanisms may be market based, such as a cap and trade scheme, or operate on the basis of regulatory mechanisms such as technology standards in the context of a sector.

Sensitivity analysis

Sensitivity analysis with respect to quantitative analysis assesses how changing assumptions alters the outcomes. For example, one chooses different values for specific parameters and re-runs a given model to assess the impact of these changes on model output.

Sequestration

The uptake (i.e. the addition of a substance of concern to a reservoir) of carbon containing substances, in particular carbon dioxide, in terrestrial or marine reservoirs. Biological sequestration includes direct removal of CO2 from the atmosphere through land-use change, afforestation, reforestation, revegetation, carbon storage in landfills and practices that enhance soil carbon in agriculture (cropland management, grazing land management). In parts of the literature, but not in this report, (carbon) sequestration is used to refer to carbon dioxide capture and storage. See also

Bio-energy and carbon dioxide capture and storage (BECCS), Carbon dioxide capture and storage (CCS), and Reservoir.

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.

Shared socio-economic pathways

Currently, the idea of shared socio-economic pathways (SSPs) is developed as a basis for new emissions and socio-economic scenarios. An SSP is one of a collection of pathways that describe alternative futures of socio-economic development in the absence of climate policy intervention. The combination of SSP-based socio-economic scenarios and RCP-based climate projections should provide a useful integrative frame for climate impact and policy analysis. See also Baseline, Business as Usual, Climate scenario, Emission scenario, Representative Concentration Pathways, Scenario, Socio-economic scenarios, SRES scenarios, and Storyline.

Short-lived climate pollutant (SLCP)

Short-lived climate pollutants (SLCPs) emissions that have a warming influence on climate and have a relatively short lifetime in the atmosphere (a few days to a few decades). By contrast, carbon dioxide has an atmospheric lifetime of a century or more. The main short lived climate pollutants are black carbon ("soot"), methane and some hydroflurorcarbons (HFCs). Some pollutants of this type, including methane, are also precursors to the formation of tropospheric ozone, a strong warming agent. These pollutants are of interest for at least two reasons. First, because they are short-lived efforts to control them will have prompt effects on climate climate--unlike long-lived pollutants that build up in the atmosphere and respond to changes in emissions at a more sluggish pace. Second, many of these pollutants--notably soot--also have dangerous local impacts such as on human health. Thus countries that might be wary about spending their own national resources to help manage global climate change might nonetheless be keen to limit these emissions to help ameliorate their local effects.

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 grids

A smart grid uses information and communications technology to gather data on the behaviors of suppliers and consumers in the production, distribution and use of electricity. Through automated responses or the provision of price signals, this information can then be used to improve the efficiency, reliability, economics, and sustainability of the electricity network.

Smart meter

A meter that communicates consumption of electricity or gas back to the utility provider.

Social cost of carbon (SCC)

Two definitions of social cost of carbon are found in the literature:

(1) The net present value of climate damages from one more tonne of carbon in the form of CO2.

(2) The net welfare effects of one more tonne of carbon (including avoided mitigation costs and damages).

Which definition is used depends on the application to which the concept is intended.

Socio-economic scenarios

A scenario that describes a possible future in terms of population, gross domestic product and other socio-economic factors relevant to understanding the implications of climate change. See also Baseline, Business as Usual, Climate scenario, Emission scenario, Representative Concentration Pathways, Scenario, Shared socio-economic pathways, SRES scenarios, and Storyline.

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. Often the phrase is used to mean energy that is captured from solar radiation 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.

Solar radiation management (SRM)

SRM refers to the intentional modification of the Earth's shortwave radiative budget with the aim of reducing climate change according to a given metric (e.g., surface temperature, precipitation, regional impacts). Artificial injection of stratospheric aerosols and boundary layer cloud brightening are two examples of SRM techniques. The more general term radiation management would also include methods that seek to modify some fast-responding elements of the infrared radiation budget, for example by altering cirrus cloud cover. See also Carbon dioxide removal (CDR) and Geoengineering.

Spill-over effect

The positive and negative, unintentional side-effects of economic activities by private agents (such as positive spillovers from one firm's R&D activity to other firms). See also Adverse side-effect and Co-benefit.

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.

See also Baseline, Business as Usual, Climate scenario, Emission scenario, Representative Concentration Pathways, Scenario, Shared socio-economic pathways, Socio-economic scenarios, and Storyline.

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.

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.

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. See also Baseline, Business as Usual, Climate scenario, Emission scenario, Representative Concentration Pathways, Scenario, Shared socio-economic pathways, Socio-economic scenarios, and SRES scenarios.

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.

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, that is, 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, but merely counsels against the unnecessary assumption of responsibilities at a higher level.

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 times greater than carbon dioxide.

Sustainability

A dynamic process that guarantees the persistence of natural and human systems in an equitable manner.

Sustainable development (SD)

Development that meets the needs of the present without compromising the ability of future generations to meet their own needs (WCED, 1987).

Technological change

Economic models distinguish autonomous (exogenous), endogenous and induced technological change.

Autonomous (exogenous) technological change

Autonomous (exogenous) technological change is imposed from outside the model (i.e., as a parameter), usually in the form of a time trend affecting factor or/and energy productivity and therefore energy demand or output growth.

Endogenous technological change

Endogenous technological change is the outcome of economic activity within the model (i.e., as a variable) so that factor productivity or the choice of technologies is included within the model and affects energy demand and/or economic growth.

Induced technological change

Induced technological change implies endogenous technological change but adds further changes induced by policies and measures, such as carbon taxes triggering research and development efforts.

Technological learning

See Learning curve/rate.

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.

Transaction costs

Transaction costs are the costs that arise from initiating and completing transactions, like finding partners, holding negotiations, consulting with lawyers or other experts, monitoring agreements, or opportunity costs, like lost time or resources.

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, local action plans, 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

A cognitive state of incomplete knowledge that can result from a lack of information or from disagreement about what is known or even knowable. It may have many types of sources, from imprecision 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 also Confidence and Likelihood.

Unconventional resources

A loose term to describe fossil fuel reserves that cannot be extracted by the well-established drilling and mining processes that dominated extraction of coal, gas and oil throughout the 20th Century. The boundary between conventional and unconventional resources is not clearly defined. Unconventional oils include oil shales, tar sands/bitumen, heavy and extraheavy crude oils, and deep-sea oil occurrences. Unconventional natural gas includes gas in Devonian shales, tight sandstone formations, geopressured aquifers, coal-bed gas, and methane in clathrate structures (gas hydrates).

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 Convention, parties included in Annex I aimed to return greenhouse gas emissions not controlled by the Montreal Protocol to 1990 levels by the year 2000. 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.

Verified Emissions Reductions

Emission reductions that are verified by an independent third party outside the framework of the UNFCCC and its Kyoto Protocol. Also called Voluntary Emission Reductions.

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.

Wind energy

Kinetic energy from air currents arising from uneven heating of the Earth's surface. A wind turbine is a rotating machine for converting the kinetic energy of the wind 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.