
Annex 1: Glossary

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Active layer The layer of ground above permafrost subject to annual thawing and freezing (ACGR 1998; Washburn 1979).

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

Adaptation limit The point at which an actor's objectives (or system needs) cannot be secured from intolerable risks through adaptive actions.

Adaptation needs The circumstances requiring action to ensure safety of populations and security of assets in response to climate impacts.

Adaptive capacity The ability of systems, institutions, humans, and other organisms to adjust to potential damage, to take advantage of opportunities, or to respond to consequences.

Autonomous adaptation Adaptation in response to experienced climate and its effects, without planning explicitly or consciously focused on addressing climate change. Also referred to as spontaneous adaptation.

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

Transformational adaptation Adaptation that changes the fundamental attributes of a system in response to climate and its effects.

Afforestation Planting of new forests on lands that historically have not contained forests. 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 2000a). See also information provided by the United Nations Framework Convention on Climate Change (UNFCCC 2013) and 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, 2014a, b).

Air pollution Air pollution occurs when harmful substances including particulates, biological molecules and trace gases are introduced into Earth's atmosphere. Human activity and natural processes can both generate air pollution.

Air pollution episode An air pollution episode is a period of abnormally high levels of air pollutants. Usually, it is formed by the combination of emissions and meteorological conditions.

Air quality Air quality describes the concentration and composition of air pollutants in the air. It is closely related to the visibility, public health, and environment impacts (such as crop yield, ecosystems and biodiversity).

Air quality management Air quality management is a set of actions to regulate and work toward the accomplishment of air quality goals and objectives. It requires actions by government, business, industry, NGO's and the population.

Albedo The fraction of solar radiation reflected by a surface or object, often expressed as a percentage. Snow-covered surfaces have a high albedo, the albedo of soils ranges from high to low and vegetation-covered surfaces and oceans have a low albedo. The Earth's planetary albedo varies mainly through varying cloudiness, snow, ice, leaf area and land cover changes.

Baseline/reference The baseline (or reference) is the state against which change is measured. A baseline period is the period relative to which anomalies are computed. In the context of transformation pathways, the term baseline scenarios refers to scenarios that are based on the assumption that no mitigation policies or measures will be implemented beyond those that are already in force and/or are legislated or planned to be adopted. Baseline scenarios are not intended to be predictions of the future, but rather counterfactual constructions that can serve to highlight the level of emissions that would occur without further policy effort. Typically, baseline scenarios are then compared to mitigation scenarios that are constructed to meet different goals for greenhouse gas (GHG) emissions, atmospheric concentrations or temperature change. The term baseline scenario is used interchangeably with reference scenario and no policy scenario. In much of the literature the term is also synonymous with the term business-as-usual (BAU) scenario, although the term BAU has fallen out of favour because the idea of business as usual in century-long socio-economic projections is hard to fathom. See also Emission scenario, Representative Concentration Pathways (RCPs) and SRES scenarios.

Baseline The reference scenario for measurable quantities from which an alternative outcome can be measured, for example, a non-intervention scenario is used as a reference in the analysis of intervention scenarios. A baseline may be an extrapolation of recent trends, or it may assume frozen technology or costs. See also business as usual, models, scenario (Verbruggen et al. 2011).

Benchmark A measurable variable used as a baseline or reference in evaluating the performance of a technology, a system or an organization. Benchmarks may be drawn from internal experience, from external correspondences or from legal requirements and are often used to gauge changes in performance over time (Verbruggen et al. 2011).

Biodiversity The variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part this includes diversity within species, between species and of ecosystems (CBD 1992).

Biofuels Fuels derived directly or indirectly from biomass. Biofuels can be split up into three categories: solid biofuels; liquid biofuels; and biogases. Solid biofuels comprise mainly fuelwood, wood residues, wood pellets, animal waste, vegetal material. Liquid biofuels are mainly biodiesel and bioethanol used as transport fuels. Biogas is composed principally of methane and carbon dioxide produced by anaerobic digestion of biomass, comprising: landfill gas, formed by the digestion of landfilled wastes; sewage sludge gas, produced from the anaerobic fermentation of sewage sludge; and other biogas, such as biogas produced from the anaerobic fermentation of animal slurries and of wastes in abattoirs, breweries and other agro-food industries (OECD/IEA 2005).

Biomass Organic, non-fossil material of biological origin (plants and animals) used as a raw material for production of biofuels. It includes wide range of materials harvested from nature or biological portion of waste. The most typical example is wood (firewood, wood residues, wood waste, tree branches, stump, wood pellets), which is the largest biomass energy source. Other examples of biomass are grass, bamboo, corn, sugarcane, animal waste, sewage sludge and algae. Using biomass as a fuel is deemed carbon neutral as carbon was trapped from the atmosphere during the biomass life cycle (Eurostat).¹ In the World Energy Outlook, the International Energy Agency (2010) defines traditional biomass as biomass consumption in the residential sector in developing countries that refers to the often-unustainable use of wood, charcoal, agricultural residues and animal dung for cooking and heating. All other biomass use is defined as modern biomass differentiated further by IPCC report into modern bioenergy (which encompasses electricity generation and combined heat and power from biomass and municipal solid waste, biogas, residential space and hot water in buildings and commercial applications from biomass, municipal solid waste, and biogas, and liquid transport fuels) and industrial bioenergy applications (which include heating through steam generation and self-generation of electricity and combined heat and power in the pulp and paper industry, forest products, food and related industries) (Verbruggen et al. 2011).

Biotechnology Biological processes or organisms used for the production of materials and services that are of benefit to humankind, including techniques for the improvement of the characteristics of economically important plants and animals and for the development of micro-organisms to act on the environment (Zaid et al. 1999).

Black carbon Black carbon (BC) is a major component of light-absorbing refractory carbonaceous matter, produced by incomplete combustion of fossil fuels, biofuel, and biomass. The measurement of BC is usually based on the optical light absorption. BC can strongly absorb solar radiation at visible wavelengths causing warming effects in the atmosphere. Once deposited on a glacier and snow cover, it can reduce the albedo.

Burden sharing/effort sharing In the context of mitigation, burden sharing refers to sharing the effort of reducing the sources or enhancing the sinks of greenhouse gases (GHGs) from historical or projected levels, usually allocated by some criteria, as well as sharing the cost burden across countries.

Business-As-Usual (BAU) See Baseline/reference.

Business As Usual (BAU) The future is projected or predicted on the assumption that operating conditions and applied policies remain what they are at present. See also baseline, models, scenario (Verbruggen et al. 2011).

Cancún agreements A set of decisions adopted at the 16th Session of the Conference of the Parties (COP) to the United Nations Framework Convention on Climate Change (UNFCCC), including the following, among others: the newly established Green Climate Fund (GCF), a newly established technology mechanism, a process for advancing discussions on adaptation, a formal process for reporting mitigation commitments, a goal of limiting global mean surface temperature increase to 2 °C and an agreement on MRV—Measurement, Reporting and Verification for those countries that receive international support for their mitigation efforts.

Cancún pledges During 2010, many countries submitted their existing plans for controlling greenhouse gas (GHG) emissions to the Climate Change Secretariat and these proposals have now been formally acknowledged under the United Nations Framework Convention on

¹<http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Biomass>.

Climate Change (UNFCCC). Developed countries presented their plans in the shape of economy-wide targets to reduce emissions, mainly up to 2020, while developing countries proposed ways to limit their growth of emissions in the shape of plans of action.

Carbon cycle The term used to describe the flow of carbon (in various forms, e.g., as carbon dioxide (CO₂) through the atmosphere, ocean, terrestrial and marine biosphere and lithosphere. In this report, the reference unit for the global carbon cycle is GtCO₂ or GtC (Gigatonne of carbon = 1 GtC = 10¹⁵ grams of carbon. This corresponds to 3.667 GtCO₂).

Carbon dioxide Carbon dioxide (CO₂) is a colorless gas with a density about 60% higher than that of air that is odorless at normally encountered concentrations. It occurs naturally in Earth's atmosphere as a trace gas at a concentration of about 0.04% (400 ppm) by volume. It is mainly formed during respiration, biomass/fossil fuel combustion, and organic decomposition (especially caused by land-use change). Carbon dioxide could regulate the temperature of the earth. Nowadays, CO₂ is a dominant greenhouse gas which causes global warming.

Carbon intensity (or an emission intensity) The emission rate of a given pollutant relative to the intensity of a specific activity, or an industrial production process; for example grams of carbon dioxide released per megajoule of energy produced, or the ratio of greenhouse gas emissions produced to gross domestic product (GDP).

Carbon market The set of organised and bilateral transactions by which countries trade credits received for greenhouse-gas emission reductions. The market is used to comply with emission goals, or to voluntarily offset a country's own emissions. The carbon market was launched by the creation of three mechanisms under the Kyoto Protocol: emissions trading, across developed countries; the Clean Development Mechanism, based on projects in developing countries; and Joint Implementation, based on projects in developed countries (OECD/IEA 2018).

Carbon monoxide Carbon monoxide (CO) is a colorless, odorless, and tasteless gas that is slightly less dense than air. It results from the incomplete combustion of carbon-containing fuels such as natural gas, gasoline, or wood, and is emitted by a wide variety of combustion sources, including motor vehicles, power plants, wildfires, and incinerators. Carbon monoxide is harmful for health because it binds to hemoglobin in the blood, reducing the ability of blood to carry oxygen.

Carbon sequestration The process involved in carbon capture and the long-term storage of atmospheric carbon dioxide (CO₂) and may refer specifically to: (1) the process of removing carbon from the atmosphere and depositing it in a reservoir. When carried out deliberately, this may also be referred to as carbon dioxide removal, which is a form of geoengineering; (2) carbon capture and storage, where carbon dioxide is removed from flue gases (e.g., at power stations) before being stored in underground reservoirs; (3) natural biogeochemical cycling of carbon between the atmosphere and reservoirs, such as by chemical weathering of rocks (Sedjo and Sohngen 2012).

Circular migration It is repeated movement of persons between a place of origin and the place of destination. It may involve single destination or multiple before returning to the place of origin.

Clean Development Mechanism (CDM) A mechanism under the Kyoto Protocol through which developed (Annex B) countries may finance greenhouse gas emission reduction or removal projects in developing (Non-Annex B) countries and receive credits for doing so which they may apply for meeting mandatory limits on their own emissions (Verbruggen et al. 2011).

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 Detection and Attribution.

Climate extreme (extreme weather or climate event) See Extreme weather event.

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

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

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

Climate finance There is no agreed definition of climate finance. The term climate finance is applied both to the financial resources devoted to addressing climate change globally and to financial flows to developing countries to assist them in addressing climate change. The literature includes several concepts in these categories, among which the most commonly used include:

Incremental costs The cost of capital of the incremental investment and the change of operating and maintenance costs for a mitigation or adaptation project in comparison to a reference project. It can be calculated as the difference of the net present values of the two projects.

Incremental investment The extra capital required for the initial investment for a mitigation or adaptation project in comparison to a reference project.

Total climate finance All financial flows whose expected effect is to reduce net greenhouse gas (GHG) emissions and/or to enhance resilience to the impacts of climate variability and the projected climate change. This covers private and public funds, domestic and international flows and expenditures for mitigation and adaptation to current climate variability as well as future climate change.

Total climate finance flowing to developing countries The amount of the total climate finance invested in developing countries that comes from developed countries. This covers private and public funds.

Private climate finance flowing to developing countries Finance and investment by private actors in/from developed countries for mitigation and adaptation activities in developing countries.

Public climate finance flowing to developing countries Finance provided by developed countries' governments and bilateral institutions as well as by multilateral institutions for mitigation and adaptation activities in developing countries. Most of the funds provided are concessional loans and grants.

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 projection A climate projection is the simulated response of the climate system to a scenario of future emission or concentration of greenhouse gases (GHGs) and aerosols, generally derived using climate models. Climate projections are distinguished from climate predictions by their dependence on the emission/concentration/radiative forcing scenario used, which is in turn based on assumptions concerning, for example, future socio-economic and technological developments that may or may not be realized.

Climate-resilient pathways Iterative processes for managing change within complex systems in order to reduce disruptions and enhance opportunities associated with climate change.

Climate response See Climate sensitivity.

Climate sensitivity In IPCC reports, equilibrium climate sensitivity (units: °C) refers to the equilibrium (steady state) change in the annual global mean surface temperature following a doubling of the atmospheric equivalent carbon dioxide (CO₂) concentration. Owing to computational constraints, the equilibrium climate sensitivity in a climate model is sometimes 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 climate sensitivity parameter (units: $^{\circ}\text{C} (\text{W m}^{-2})^{-1}$) refers to the equilibrium change in the annual global mean surface temperature following a unit change in radiative forcing.

The effective climate sensitivity (units: $^{\circ}\text{C}$) is an estimate of the global mean surface temperature response to doubled CO_2 concentration that is evaluated from model output or observations 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 and therefore may differ from equilibrium climate sensitivity.

The transient climate response (units: $^{\circ}\text{C}$) is the change in the global mean surface temperature, averaged over a 20-year period, centered at the time of atmospheric CO_2 doubling, in a climate model simulation in which CO_2 increases at 1%/yr. It is a measure of the strength and rapidity of the surface temperature response to greenhouse gas (GHG) 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 variability Climate variability refers to variations in the mean state and other statistics (such as standard deviations, the occurrence of extremes, etc.) of the climate on all spatial and temporal scales beyond that of individual weather events. Variability may be due to natural internal processes within the climate system (internal variability), or to variations in natural or anthropogenic external forcing (external variability). See also Climate change.

Co-benefits The positive effects that a policy or measure aimed at one objective might have on other objectives, irrespective of the net effect on overall social welfare. Co-benefits are often subject to uncertainty and depend on local circumstances and implementation practices, among other factors. Co-benefits are also referred to as ancillary benefits. Appropriate consideration of co-benefits of greenhouse gas mitigation can greatly influence policy decisions concerning the timing and level of mitigation action, and there can be significant advantages to the national economy and technical innovation.

Confidence

Well established: comprehensive meta-analysis or other synthesis or multiple independent studies that agree.

Established but incomplete: general agreement although only a limited number of studies exist; no comprehensive synthesis and/or the studies that exist address the question imprecisely.

Unresolved: multiple independent studies exist but conclusions do not agree.

Inconclusive: limited evidence, recognizing major knowledge gaps.

Cost-effectiveness A policy is more cost-effective if it achieves a given policy goal at lower cost. Integrated models approximate cost-effective solutions, unless they are specifically constrained to behave otherwise. Cost-effective mitigation scenarios are those based on a stylized implementation approach in which a single price on carbon dioxide (CO_2) and other greenhouse gases (GHGs) is applied across the globe in every sector of every country and that rises over time in a way that achieves lowest global discounted costs.

Cryosphere The cryosphere is the part of the Earth system that contains ice, for example snow on the ground, glaciers, ice sheets, lake ice, river ice, sea ice, seasonally and perennially frozen ground (GCW 2016).

Debris-covered glacier A glacier that is covered at its tongue with supra-glacial debris across its full width (Kirkbride 2011).

Decentralized energy/distributed energy Energy systems are considered to be distributed if (1) the systems of production are relatively small and dispersed (such as small-scale solar PV on rooftops), rather than relatively large and centralized; or (2) generation and distribution occur independently from a centralized network (Cleanleap 2016).²

Deforestation Conversion of forest to non-forest. 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 2000a). See also information provided by the United Nations Framework Convention on Climate Change (UNFCCC 2013) and 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, 2014a, b).

Detection and attribution Detection of change is defined as the process of demonstrating that climate or a system affected by climate has changed in some defined statistical sense, without providing a reason for that change. An identified change is detected in observations if its likelihood of occurrence by chance due to internal variability alone is determined to be small, for example, <10%. Attribution is defined as the process of evaluating the relative contributions of multiple causal factors to a change or event with an assignment of statistical confidence (Hegerl et al. 2010).

Diaspora Diaspora is broadly defined as individuals and members of networks, associations and communities who have left their country of origin, and maintain links with their homelands. This concept covers not only emigrants but also erstwhile emigrants with the citizenship of the host country, dual citizens, and second-/third-generation born persons in the host countries.

Disabled Adjusted Life Year (DALYS) DALYs for a disease or health condition are calculated as the sum of the Years of Life Lost (YLL) due to premature mortality in the population and the Years Lost due to Disability (YLD) for people living with the health condition or its consequences. One DALY can be thought of as one lost year of “healthy” life. The sum of these DALYs across the population, or the burden of disease, can be thought of as a measurement of the gap between current health status and an ideal health situation where the entire population lives to an advanced age, free of disease and disability (WHO 2018).³

Disaster A serious disruption of the functioning of a community or a society at any scale due to hazardous events interacting with conditions of exposure, vulnerability and capacity, leading to one or more of the following: human, material, economic and environmental losses and impacts (UNISDR 2017).

Disaster risk The potential loss of life, injury, or destroyed or damaged assets which could occur to a system, society or a community in a specific period of time, determined probabilistically as a function of hazard, exposure, vulnerability and capacity (UNISDR 2017).

²<http://cleanleap.com/where-are-we-renewable-energy/05-distributed-renewable-energy-developing-countries>.

³http://www.who.int/healthinfo/global_burden_disease/metrics_daly/en/.

Disaster risk governance The system of institutions, mechanisms, policy and legal frameworks and other arrangements to guide, coordinate and oversee disaster risk reduction and related areas of policy (UNISDR 2017).

Disaster risk management Disaster risk management is the application of disaster risk reduction policies and strategies to prevent new disaster risk, reduce existing disaster risk and manage residual risk, contributing to the strengthening of resilience and reduction of disaster losses (UNISDR 2017).

Disaster risk reduction Disaster risk reduction is aimed at preventing new and reducing existing disaster risk and managing residual risk, all of which contribute to strengthening resilience and therefore to the achievement of sustainable development (UNISDR 2017).

Dispersion model Atmospheric dispersion models are computer programs that use mathematical algorithms to simulate how pollutants in the ambient atmosphere disperse and, in some cases, how they react in the atmosphere.

Downhill scenario Downhill scenario represents strong climate change, a socially economically and politically unstable region and strong ecosystem degradation. In the downhill scenario, regional conflicts over resource sharing persist—and even multiply as scarcity increases. People and institutions do not benefit from emerging opportunities for efficient resource use. Communities remain isolated from the larger market systems. Mountain livelihoods do not enjoy inclusive growth through new, scientifically proven skills and practices. Ecosystems are degraded, mitigation efforts fail, and fossil fuels remain the dominant energy source. Climate change impacts reflect the Intergovernmental Panel on Climate Change (IPCC)'s worst case scenario—global temperature rising by substantially more than 2.0 °C.

Downscaling Downscaling is a method that derives local- to regional-scale (10–100 km) information from larger-scale models or data analyses. Two main methods are distinguished: dynamical downscaling and empirical/statistical downscaling. The dynamical method uses the output of regional climate models, global models with variable spatial resolution or high-resolution global models. The empirical/statistical methods develop statistical relationships that link the large-scale atmospheric variables with local/regional climate variables. In all cases, the quality of the downscaled product depends on the quality of the driving model.

Drivers In a policy context, drivers provide an impetus and direction for initiating and supporting policy actions. The deployment of renewable energy is, for example, driven by concerns about climate change or energy security. In a more general sense, a driver is the leverage to bring about a reaction, for example, emissions are caused by fossil fuel consumption and/or economic growth. See also opportunities (Verbruggen et al. 2011).

Drought A period of abnormally dry weather long enough to cause a serious hydrological imbalance. Drought is a relative term; therefore any discussion in terms of precipitation deficit must refer to the particular precipitation-related activity that is under discussion. For example, shortage of precipitation during the growing season impinges on crop production or ecosystem function in general (due to soil moisture drought, also termed agricultural drought) and during the runoff and percolation season primarily affects water supplies (hydrological drought). Storage changes in soil moisture and groundwater are also affected by increases in actual evapotranspiration in addition to reductions in precipitation. A period with an abnormal precipitation deficit is defined as a meteorological drought. A megadrought is a very lengthy and pervasive drought, lasting much longer than normal, usually a decade or more.

Drivers of change Natural or human-induced factors that directly or indirectly cause changes in the system. A direct driver of change unequivocally influences ecosystem processes and/or sociocultural and economic characteristics, and can be identified and measured to differing degrees of accuracy; an indirect driver of change operates by altering the level or rate of change of other, more direct drivers (MA 2005).

Early warning system The set of capacities needed to generate and disseminate timely and meaningful warning information to enable individuals, communities and organizations threatened by a hazard to prepare to act promptly and appropriately to reduce the possibility of harm or loss.

Early warning systems (Chap. 11) An integrated system of hazard monitoring, forecasting and prediction, disaster risk assessment, communication and preparedness activities systems and processes that enables individuals, communities, governments, businesses and others to take timely action to reduce disaster risks in advance of hazardous events (UNISDR 2017).

Economic loss Total economic impact that consists of direct economic loss and indirect economic loss.

Direct economic loss: the monetary value of total or partial destruction of physical assets existing in the affected area. Direct economic loss is nearly equivalent to physical damage.

Indirect economic loss: a decline in economic value added as a consequence of direct economic loss and/or human and environmental impacts (UNISDR 2017).

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 are influenced by the effects of human activities in their environment.

Ecosystem approach The ecosystem approach is a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way (CBD 1992).

Ecosystem services The benefits people obtain from ecosystems. These include provisioning services such as food and water; regulating services such as flood and disease control; cultural services such as spiritual, recreational, and cultural benefits; and supporting services such as nutrient cycling that maintain the conditions for life on Earth. The concept “ecosystem goods and services” is synonymous with ecosystem services (MEA 2005).

Electricity The flow of passing charge through a conductor, driven by a difference in voltage between the ends of the conductor. Electrical power is generated by work from heat in a gas or steam turbine or from wind, oceans or falling water, or produced directly from sunlight using a photovoltaic device or chemically in a fuel cell. Being a current, electricity cannot be stored and requires wires and cables for its transmission (see grid). Because electric current flows immediately, the demand for electricity must be matched by production in real time (Verbruggen et al. 2011).

Electricity generation The total amount of electricity generated by power only or combined heat and power plants including generation required for own use (also referred to as gross generation). Electricity production on the other hand is the total amount of electricity generated by a power plant which includes own-use electricity, as well as transmission and distribution losses (OECD/IEA 2018).

Elemental carbon Elemental carbon (EC), similar to black carbon, also refers to the major component of light-absorbing refractory carbonaceous matter. In most cases, these two terms are interchangeable. The measurement of EC is usually through thermal evolution and chemical determinations.

Emigration The act of leaving from one country with a view to settling in another. The person who emigrates is called an emigrant.

Emissions Direct emissions are released and attributed at points in a specific renewable energy chain, whether a sector, a technology or an activity. For example, methane emissions from decomposing submerged organic materials in hydropower reservoirs, or the release of CO₂ dissolved in hot water from geothermal plants, or CO₂ from biomass combustion. Indirect emissions are due to activities outside the considered renewable energy chain but which are required to realize the renewable energy deployment. For example, emissions from increased production of fertilizers used in the cultivation of biofuel crops or emissions from displaced crop production or deforestation as the result of biofuel crops. Avoided emissions are emission reductions arising from mitigation measures like renewable energy deployment (Verbruggen et al. 2011).

Emission control technology In order to reduce emissions of different pollutants, various technologies have been adopted, which are termed as emission control technologies. For example, catalysis technology was developed to reduce and detoxify the gasoline and diesel vehicle exhaust. In the industrial sectors, emission control technologies were also used to constrain emissions (SO₂ or VOCs) from coal fuel combustion.

Energy The amount of work or heat delivered. Energy is classified in a variety of types and becomes available to human ends when it flows from one place to another or is converted from one type into another. Daily, the sun supplies large flows of radiation energy. Part of that energy is used directly, while part undergoes several conversions creating water evaporation, winds, etc. Some share is stored in biomass or rivers that can be harvested. Some share is directly usable such as daylight, ventilation or ambient heat. Primary energy (also referred to as energy sources) is the energy embodied in natural resources (e.g., coal, crude oil, natural gas, uranium, and renewable sources). 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) (Verbruggen et al. 2011).

Energy access People are provided the ability to benefit from affordable, clean and reliable energy services for basic human needs (cooking and heating, lighting, communication, mobility) and productive uses (Verbruggen et al. 2011).

Energy efficiency The ratio of useful energy or other useful physical outputs obtained from a system, conversion process, transmission or storage activity to the input of energy (measured as kWh/kWh, tonnes/kWh or any other physical measure of useful output like tonne-km transported, etc.). Energy efficiency is a component of energy intensity (Verbruggen et al. 2011).

Energy intensity The ratio of energy inputs (in Joules) to the economic output (in dollars) that absorbed the energy input. Energy intensity is the reciprocal of energy productivity. At the national level, energy intensity is the ratio of total domestic primary (or final) energy use to gross domestic product (GDP). Energy intensity is also used as a name for the ratio of energy inputs to output or performance in physical terms (e.g., tonnes of steel output, tonne-km transported, etc.) and in such cases, is the reciprocal of energy efficiency (Verbruggen et al. 2011).

EnergyPlus EnergyPlus refers to projects, programmes and interventions that promote basic, social (community) and productive uses of energy. The EnergyPlus approach promotes the productive use of energy: for generation of equitable employment and additional income; for meeting needs of existing and new enterprises; for community needs such as strengthened security and better access to education and health care, including through electricity for street

lighting, clinics and schools; and for lifestyle needs to improve living standards. In turn, the formula of EnergyPlus = Energy Access + Empowerment can be seen as contributing to overall sustainable human development and poverty reduction (UNDP 2015).

Energy poverty It is defined in its broadest terms as the absence of sufficient choice in accessing adequate, affordable, reliable, high quality, safe and environmentally benign energy services to support economic and human development (Reddy 2000). There are several different approaches to define and measure energy poverty ranging from simple access based (lack of access to modern energy services) to more complex quantity based approach (minimum amount of physical energy necessary for basic needs such as cooking and lighting) including expenditure based (households that spend more than a certain percent—generally above 10%—of their expenditure on energy) and consensual based perceived deprivation (households facing difficulties in order to meet basic energy services) with each having strengths and weakness. For the sake of simplicity, the Energy Outlook 2015 defines energy poverty as a lack of access to modern energy services using two indicators at household level: lack of access to electricity and reliance on the traditional use of biomass for cooking. 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) (OECD/IEA 2018).⁴

Energy savings Decreasing energy intensity by changing the activities that demand energy inputs. Energy savings can be realized by technical, organizational, institutional and structural actions and by changed behavior (Verbruggen et al. 2011).

Energy security The goal of a given country, or the global community as a whole, to maintain an adequate 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 (Verbruggen et al. 2011).

Energy services Energy services are the tasks to be performed using energy. A specific energy service such as lighting may be supplied by a number of different means from daylighting to oil lamps to incandescent, fluorescent or light-emitting diode devices. The amount of energy used to provide a service may vary over a factor of 10 or more, and the corresponding greenhouse gas emissions may vary from zero to a very high value depending on the source of energy and the type of end-use device (Verbruggen et al. 2011).

Energy transition It refers to the shift from current energy production and consumption systems, which rely primarily on non-renewable energy sources such as oil, natural gas and coal, to a more efficient, lower-carbon energy mix. According to the energy trilemma concept, the energy transitional challenges basically involves balancing three interwoven objectives: energy security (the reliability of energy supply must be ensured to meet current and future demand); energy equity (energy must be accessible around the world, particularly in emerging markets, at an affordable cost) and environmental sustainability (global warming calls for improved energy efficiency and the development of renewable and low-greenhouse gas (GHGs) energy sources (WEC 2016).

Exposure The situation of people, infrastructure, housing, production capacities and other tangible human assets located in hazard-prone areas (UNISDR 2017).

El Niño-Southern Oscillation (ENSO) The term El Niño was initially used to describe a warm-water current that periodically flows along the coast of Ecuador and Peru, disrupting the local fishery. It has since become identified with a basin-wide warming of the tropical Pacific Ocean east of the dateline. This oceanic event is associated with a fluctuation of a global-scale

⁴<http://www.iea.org/topics/energy-poverty/>.

tropical and subtropical surface pressure pattern called the Southern Oscillation. This coupled atmosphere–ocean phenomenon, with preferred time scales of two to about seven years, is known as the El Niño–Southern Oscillation (ENSO). It is often measured by the surface pressure anomaly difference between Tahiti and Darwin or the sea surface temperatures in the central and eastern equatorial Pacific. During an ENSO event, the prevailing trade winds weaken, reducing upwelling and altering ocean currents such that the sea surface temperatures warm, further weakening the trade winds. This event has a great impact on the wind, sea surface temperature and precipitation patterns in the tropical Pacific. It has climatic effects throughout the Pacific region and in many other parts of the world, through global teleconnections. The cold phase of ENSO is called La Niña.

Emission scenario A plausible representation of the future development of emissions of substances that are potentially radiatively active (e.g., greenhouse gases (GHGs), aerosols) based on a coherent and internally consistent set of assumptions about driving forces (such as demographic and socio-economic 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 Emissions Scenarios (IPCC 2000b) 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 Chaps. 9–11 of IPCC WGI TAR (IPCC 2001) and Chaps. 10 and 11 of IPCC WGI AR4 (IPCC 2007) as well as in the IPCC WGI AR5 (IPCC 2013). New emission scenarios for climate change, the four Representative Concentration Pathways, were developed for, but independently of, the present IPCC assessment. See also Baseline/reference, Mitigation scenario and Transformation pathway (IPCC 2014a, b).

Energy access Access to clean, reliable and affordable energy services for cooking and heating, lighting, communications and productive uses (AGECC 2010).

Energy intensity The ratio of energy use to economic or physical output.

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 the sufficiency of energy resources to meet national energy demand at competitive and stable prices and the resilience of the energy supply; enabling development and deployment of technologies; building sufficient infrastructure to generate, store and transmit energy supplies and ensuring enforceable contracts of delivery.

Ensemble A collection of model simulations characterizing a climate prediction or projection. Differences in initial conditions and model formulation result in different evolutions of the modeled system and may give information on uncertainty associated with model error and error in initial conditions in the case of climate forecasts and on uncertainty associated with model error and with internally generated climate variability in the case of climate projections.

Equilibrium Line Altitude (ELA) The spatially averaged altitude of the equilibrium line. The equilibrium line is a set of points on the surface of the glacier where the climatic mass balance is zero at a given moment. The equilibrium line separates the accumulation zone (where the glacier is gaining mass) from the ablation zone (where the glacier is losing mass): (modified after Cogley et al. 2011).

Eutrophication Over-enrichment of water by nutrients such as nitrogen and phosphorus. It is one of the leading causes of water quality impairment. The two most acute symptoms of eutrophication are hypoxia (or oxygen depletion) and harmful algal blooms.

Exposure The presence of people, livelihoods, species or ecosystems, environmental functions, services, and resources, infrastructure, or economic, social, or cultural assets in places and settings that could be adversely affected.

External forcing External forcing refers to a forcing agent outside the climate system causing a change in the climate system. Volcanic eruptions, solar variations and anthropogenic changes in the composition of the atmosphere and land-use change are external forcings. Orbital forcing is also an external forcing as the insolation changes with orbital parameters eccentricity, tilt and precession of the equinox.

Extreme weather event An extreme weather event is an event that is rare at a particular place and time of year. Definitions of rare vary, but an extreme weather event would normally be as rare as or rarer than the 10th or 90th percentile of a probability density function estimated from observations. By definition, the characteristics of what is called extreme weather may vary from place to place in an absolute sense. When a pattern of extreme weather persists for some time, such as a season, it may be classed as an extreme climate event, especially if it yields an average or total that is itself extreme (e.g., drought or heavy rainfall over a season).

Feedback See Climate feedback.

Flood The overflowing of the normal confines of a stream or other body of water, or the accumulation of water over areas not normally submerged. Floods include river (fluvial) floods, flash floods, urban floods, pluvial floods, sewer floods, coastal floods and glacial lake outburst floods.

Food accessibility It is defined as the access by individuals to adequate resources (entitlements) for acquiring appropriate foods for a nutritious diet. Entitlements are defined as the set of all commodity bundles over which a person can establish command given the legal, political, economic and social arrangements of the community in which they live (including traditional rights such as access to common resources) (FAO 2006).

Food and nutrition security In 2012, Committee on World Food Security defined ‘food and nutrition security’ as the state that exists when all people, at all times, have physical, social and economic access to food which is consumed in sufficient quantity and quality to meet their dietary needs and food preferences, and is supported by an environment of adequate sanitation, health services and care, allowing for a healthy and active life (FAO 2012a, b).

Food availability Food availability addresses the “supply side” of food security and is determined by the level of food production, stock levels and net trade (FAO 2008).

Food security Food security exists when all people, at all times, have physical and economic access to sufficient safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life (FAO 1996).

Food stability To be food secure, a population, household or individual must have access to adequate food at all times. They should not risk losing access to food as a consequence of sudden shocks (e.g. an economic or climatic crisis) or cyclical events (e.g. seasonal food insecurity). The concept of stability can therefore refer to both the availability and access dimensions of food security (FAO 2006).

Food utilization Utilization of food through adequate diet, clean water, sanitation and health care to reach a state of nutritional well-being where all physiological needs are met. This brings out the importance of non-food inputs in food security (FAO 2006).

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. 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 2000a). See also information provided by the United Nations Framework Convention on Climate Change (UNFCCC 2013) and 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, 2014a, b).

Fossil fuel It is a generic term for non-renewable energy sources such as coal, coal products, natural gas, derived gas, crude oil, petroleum products and non-renewable wastes. These fuels originate from plants and animals that existed in the geological past (for example, millions of years ago). Fossil fuels can be also made by industrial processes from other fossil fuels (for example in the oil refinery, crude oil is transformed into motor gasoline) (OECD/IEA 2018).⁵

Gender analysis The systematic gathering and examination of information on gender differences and social relations in order to identify, understand and redress inequities based on gender.

Gender mainstreaming An organisational strategy to bring a gender perspective to all aspects of an institution's policy and activities, through building gender capacity and accountability.

General circulation model See *Climate model*.

Glacier A perennial mass of ice, and possibly firn and snow, originating on the land surface by therecrystallization of snow or other forms of solid precipitation and showing evidence of past or present flow (Cogley et al. 2011).

Glacierized Region or terrain, containing glaciers or covered by glacier ice today (Cogley et al. 2011).

Glacier mass balance The change in the mass of a glacier over a stated span of time. The span of time is often a year or a season. The annual mass balance is the sum of accumulation and ablation over the mass-balance year, equivalent to the sum of annual accumulation and annual ablation (modified after Cogley et al. 2011).

Global climate model (also referred to as general circulation model both abbreviated as GCM) See *Climate model*.

Geothermal energy Accessible thermal energy stored in the Earth's interior, in both rock and trapped steam or liquid water (hydrothermal resources), which may be used to generate electric energy in a thermal power plant, or to supply heat to any process requiring it. The main sources of geothermal energy are the residual energy available from planet formation and the energy continuously generated from radionuclide decay (Verbruggen et al. 2011).

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 (Verbruggen et al. 2011).

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 thermal infrared radiation emitted by the Earth's surface, the atmosphere and clouds. This property causes the greenhouse effect. Water vapour (H₂O), carbon dioxide (CO₂), nitrous oxide (N₂O), methane (CH₄) and ozone (O₃) are the primary greenhouse gases in the Earth's atmosphere. Moreover, there are a number of entirely human-made

⁵<http://www.iea.org/about/glossary>.

greenhouse gases in the atmosphere, such as the halocarbons and other chlorine- and bromine-containing substances, dealt with under the Montreal Protocol. Besides CO₂, N₂O and CH₄, the Kyoto Protocol deals with the greenhouse gases sulphur hexafluoride (SF₆), hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs) (Verbruggen et al. 2011).

Grid (electric grid electricity grid, power grid) A network consisting of wires, switches and transformers to transmit electricity from power sources to power users. A large network is layered from low-voltage (110–240 V) distribution, over intermediate voltage (1–50 kV) to high-voltage (above 50 kV to MV) transport subsystems. Interconnected grids cover large areas up to continents. The grid is a power exchange platform enhancing supply reliability and economies of scale (Verbruggen et al. 2011).

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 (Verbruggen et al. 2011).

Hard infrastructure Hard infrastructure is defined as transportation, energy, water and sanitation, and telecommunication as opposed to soft infrastructure (the institutional facilities used to deliver hard infrastructure through market and non-market economic, social, and political interactions) (Khan and Weiss 2006).

Hazard The potential occurrence of a natural or human-induced physical event or trend or physical impact that may cause loss of life, injury, or other health impacts, as well as damage and loss to property, infrastructure, livelihoods, service provision, ecosystems and environmental resources. In this report, the term hazard usually refers to climate-related physical events or trends or their physical impacts.

Heat wave A period of abnormally and uncomfortably hot weather.

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 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 (Verbruggen et al. 2011).

Hydrological cycle The cycle in which water evaporates from the oceans and the land surface, is carried over the Earth in atmospheric circulation as water vapour, condenses to form clouds, precipitates over ocean and land as rain or snow, which on land can be intercepted by trees and vegetation, provides runoff on the land surface, infiltrates into soils, recharges groundwater, discharges into streams and ultimately flows out into the oceans, from which it will eventually evaporate again. The various systems involved in the hydrological cycle are usually referred to as hydrological systems.

Hydropower The energy of water moving from higher to lower elevations that is converted into mechanical energy through a turbine or other device that is either used directly for mechanical work or more commonly to operate a generator that produces electricity. The term is also used to describe the kinetic energy of stream flow that may also be converted into mechanical energy of a generator through an in-stream turbine to produce electricity (Verbruggen et al. 2011).

Immigration The act by which residents of a country move into another country for the purpose of settlement. The person who immigrates is called an immigrant.

Impacts (consequences, outcomes) Effects on natural and human systems. In this report, the term impacts is used primarily to refer to the effects on natural and human systems of extreme weather and climate events and of climate change. Impacts generally refer to effects on lives, livelihoods, health, ecosystems, economies, societies, cultures, services and infrastructure due to the interaction of climate changes or hazardous climate events occurring within a specific time period and the vulnerability of an exposed society or system. Impacts are also referred to as consequences and outcomes. The impacts of climate change on geophysical systems, including floods, droughts and sea level rise, are a subset of impacts called physical impacts.

Indigenous people Indigenous people are variously known in different countries as ethnic minorities, minority populations, and tribal groups. The terms refer to social groups with a cultural identity distinct from the dominant groups, which makes them vulnerable to disadvantage in the development process (IFAD 2002).

Indo-Gangetic plains The Indo-Gangetic Plains is a 255 million hectare (630 million acres) plain region in the Indian subcontinent, stretching westward from (and including) the combined delta of the Brahmaputra River valley and the Ganges (Ganga) River to the Indus River valley.

Industrial revolution A period of rapid industrial growth with far-reaching social and economic consequences, beginning in Britain during the second half of the 18th century and spreading to Europe and later to other countries including the United States. The invention of the steam engine was an important trigger of this development. The industrial revolution marks the beginning of a strong increase in the use of fossil fuels and emission of, in particular, fossil carbon dioxide (CO₂). In this report the terms pre-industrial and industrial refer, somewhat arbitrarily, to the periods before and after 1750, respectively.

In-migration Migration of a person who enters into a geographically defined area from another within a country.

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.

Intensive agriculture Intensive agriculture involves various types of agriculture with higher levels of input and output per unit of agricultural land area. It is characterized by a low fallow ratio, higher use of inputs such as capital and labor, and higher crop yields per unit land area. Source: https://en.wikipedia.org/wiki/Intensive_farming.

Internal migration Migration that occurs within the political boundaries of a country.

Internally displaced persons “Internally displaced persons are persons or groups of persons who have been forced or obliged to flee or to leave their homes or places of habitual residence, particularly as a result, or in order to avoid the effects, of armed conflict, situations of generalized violence, violations of human rights, or natural/human-made disasters, and who have not crossed an internationally recognized State border” (UN 1998).

International migration Migration that occurs across the political countries of a country. It is a movement from one to another country.

In-migrant A migrant person defined in relation to the place of destination.

Internal variability See Climate variability.

Intersectionality This is the term used to define the intersecting of social differentiations and identities based on class, caste, ethnicity, age, and other factors with gender.

Irregular migration International migration that takes place in violation of rules and laws of the origin, transit and destination countries.

Karez Underground aqueduct that passively taps groundwater in the piedmont of the arid and semi-arid highlands.

Kyoto protocol The Kyoto Protocol to the UNFCCC was adopted at the Third Session of the Conference of the Parties in 1997 in Kyoto. It contains legally binding commitments, in addition to those included in the UNFCCC. Annex B countries agreed to reduce their anthropogenic greenhouse gas emissions (CO₂, 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 came into force on 16 February 2005 (Verbruggen et al. 2011).

Labour migration Migration of persons from one administrative area to another for the purpose of employment.

Landscape approach Dealing with large-scale processes in an integrated and multidisciplinary manner, combining natural resources management with environmental and livelihood considerations (FAO 2012a, b).

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

Land-Use Change (LUC) 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 (GHGs), 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 Special Report on Land Use, Land-Use Change, and Forestry (IPCC 2000a).

Last Glacial Maximum (LGM) The Last Glacial Maximum refers to the time of maximum extent of the ice sheets during the last glaciation, approximately 21 ka. This period has been widely studied because the radiative forcings and boundary conditions are relatively well known and because the global cooling during that period is comparable with the projected warming over the 21st century.

Leakage Phenomena whereby the reduction in emissions (relative to a baseline) in a jurisdiction/sector associated with the implementation of mitigation policy is offset to some degree by an increase outside the jurisdiction/sector through induced changes in consumption, production, prices, land use and/or trade across the jurisdictions/sectors. Leakage can occur at a number of levels, be it a project, state, province, nation or world region.

In the context of Carbon Dioxide Capture and Storage (CCS), CO₂ leakage refers to the escape of injected carbon dioxide (CO₂) from the storage location and eventual release to the atmosphere. In the context of other substances, the term is used more generically, such as for methane (CH₄) leakage (e.g., from fossil fuel extraction activities) and hydrofluorocarbon (HFC) leakage (e.g., from refrigeration and air-conditioning systems).

Likelihood The chance of a specific outcome occurring, where this might be estimated probabilistically. Likelihood is expressed in this report using a standard terminology (Masstrandrea et al. 2010). See also Confidence and Uncertainty.

Little Ice Age (LIA) An interval between approximately AD 1400 and 1900 when temperatures in the Northern Hemisphere were generally colder than today's, especially in Europe.

Lock-in Lock-in occurs when a market is stuck with a standard even though participants would be better off with an alternative. In this report, lock-in is used more broadly as path dependence, which is the generic situation where decisions, events or outcomes at one point in time constrain adaptation, mitigation or other actions or options at a later point in time.

Low regrets policy A policy that would generate net social and/or economic benefits under current climate and a range of future climate change scenarios.

Maladaptive actions (or maladaptation) Actions that may lead to increased risk of adverse climate-related outcomes, increased vulnerability to climate change, or diminished welfare, now or in the future.

Methane Methane is a chemical compound with the chemical formula CH₄. It is a group-14 hydride and the simplest alkane, and is the main constituent of natural gas. It could be produced from the decomposition of organic matter. It is one of the major greenhouse gases in the atmosphere, causing the global warming.

Migration Migration is a change in the usual place of residence from one geographically defined territory to another either on permanent or semi-permanent basis. While migration is a move, migrant is a person who undertakes the move.

Mitigation (of climate change) A human intervention to reduce the sources or enhance the sinks of greenhouse gases (GHGs). This report also assesses human interventions to reduce the sources of other substances which may contribute directly or indirectly to limiting climate change, including, for example, the reduction of particulate matter emissions that can directly alter the radiation balance (e.g., black carbon) or measures that control emissions of carbon monoxide, nitrogen oxides, Volatile Organic Compounds and other pollutants that can alter the concentration of tropospheric ozone which has an indirect effect on the climate.

Mitigation scenario A plausible description of the future that describes how the (studied) system responds to the implementation of mitigation policies and measures. See also Baseline/reference, Emission scenario, Representative Concentration Pathways (RCPs), SRES scenarios and Transformation pathway.

Monsoon A monsoon is a tropical and subtropical seasonal reversal in both the surface winds and associated precipitation, caused by differential heating between a continental-scale land mass and the adjacent ocean. Monsoon rains occur mainly over land in summer.

Mountain specificities The concept of mountain specificities is tailored to capture the particular challenges of mountain ecosystems (Jodha 1992). These specificities are classified as either constraining features, such as accessibility, marginality, and fragility; or enabling features such as diversity, niche, and human adaptation capacity. Within the mountain specificity framework, the term accessibility captures elements of distance, mobility, and availability of risk management options. Marginality refers to the relative endowments of a system. In a mountain system, marginality is created by slope/altitude, low resource productivity and reinforced by lack of social and political capital. Fragility can best be understood as the diminished capacity of a social or ecological system to buffer shocks. Diversity, niche, and adaptation capacity capture different coping abilities and strategies that emerge from NRM patterns, livelihood endowments, and cultural practices.

Multidimensional Poverty Index (MPI) The multidimensional poverty index (MPI) is an index of acute multidimensional poverty (Alkire and Santos 2010). It reflects deprivations in education to health outcomes to assets and services. It reveals a different pattern of poverty than income poverty, as it highlights deprivations directly. The MPI has three dimensions: health, education, and standard of living. These are measured using different indicators.

Multi-hazard The selection of multiple major hazards that the country faces, and (2) the specific contexts where hazardous events may occur simultaneously, cascadingly or cumulatively over time, and taking into account the potential interrelated effects (UNISDR 2017).

Neglected and Underutilized Food Crops (NUFCs) These are food crops which are part of a larger diversity portfolio, were once more popular but today are neglected by the people (Adhikari et al. 2017). These crops continue to be grown, managed and collected in marginal locations because of their usefulness for local populations. The NUFCs in the HKH are mainly millets, sorghum, buckwheat, barley, beans, black gram, horse crop, taro, yam, amala and mammon.

Off-grid Off-the-grid is a system and lifestyle designed to help people function without the support of remote infrastructure, such as an electrical grid (Vanini 2014).

Organic carbon Organic carbon is the amount of carbon found in complex mixture of chemical compounds containing carbon-carbon bonds produced from fossil fuel and biofuel burning and natural biogenic emissions.

Out-migrant A migrant person defined in relation to the place of origin.

Out-migration Migration of a person who leaves a geographically defined area to another within a country.

Ozone Ozone is an inorganic molecule with the chemical formula O_3 and is a pale blue gas with a distinctively pungent smell. It is formed from dioxygen by the action of ultraviolet light and also atmospheric electrical discharges. Ozone is a powerful oxidant, making it a potent respiratory hazard and pollutant near ground level. On the other hand, the ozone layer (a portion of the stratosphere with a higher concentration of ozone) could prevent damaging ultraviolet light from reaching the Earth's surface, to be beneficial for both plants and animals.

Particulate matter Particulate matter, also known as atmospheric particulate matter or particulates, or suspended particulate matter, are microscopic solid or liquid matter suspended in Earth's atmosphere.

Permafrost Ground (soil or rock and included ice and organic material) that remains at or below 0°C for at least two consecutive years.

PM_{2.5} PM_{2.5} are fine particles with an aerodynamic diameter of $2.5\ \mu\text{m}$ or less. It is also known as fine particulate matter. PM_{2.5} particles are small enough to be penetrated deep into the lungs.

PM₁₀ PM₁₀ are particulate matters with an aerodynamic diameter of $10\ \mu\text{m}$ or less.

Potential pathways Potential pathways constitute a set of actions and combinations of actions that a decision maker (individual, country, business, policy maker) can take. Pathways usually differ in terms of trade-offs, opportunities and challenges, but still lead to the same outcome.

Poverty Poverty is a complex concept with several definitions stemming from different schools of thought. It can refer to material circumstances (such as need, pattern of deprivation or limited resources), economic conditions (such as standard of living, inequality or economic position) and/or social relationships (such as social class, dependency, exclusion, lack of basic security or lack of entitlement).

Practical Gender Needs (PGNs) The immediate needs identified by women to assist their survival in their socially accepted roles, within existing power structures. PGNs do not directly challenge gender inequalities.

Pre-industrial See Industrial Revolution.

Preparedness The knowledge and capacities developed by governments, response and recovery organizations, communities and individuals to effectively anticipate, respond to and recover from the impacts of likely, imminent or current disasters (UNISDR 2017).

Prevention Activities and measures to avoid existing and new disaster risks (UNISDR 2017).

Primary pollutants Primary pollutants are usually produced from a process directly, such as carbon monoxide gas from motor vehicle exhaust, or the sulfur dioxide released directly from factories.

Private costs Private costs are carried by individuals, companies or other private entities that undertake an action, whereas social costs include additionally the external costs on the environment and on society as a whole. Quantitative estimates of both private and social costs may be incomplete, because of difficulties in measuring all relevant effects.

Productive role/work The productive role/work relates to work performed by women and men for pay in cash or kind (market production, informal production, home production, subsistence production).

Projection A projection is a potential future evolution of a quantity or set of quantities, often computed with the aid of a model. Unlike predictions, projections are conditional on assumptions concerning, for example, future socio-economic and technological developments that may or may not be realized. See also Climate projection.

Prosperous scenario Prosperous scenario represents HKH facing weak climate change, a socially, economically and politically stable region, and low ecosystem degradation. In the prosperous scenario, regional cooperation across sectors and across governing institutions enables mountain and downstream people to utilize a full range of ecosystem services people to enjoy sustainable livelihoods and economic growth. The diversity and uniqueness of the region's natural resource assets, political life, and collaborative capacities are embraced. Biodiversity flourishes and the health of ecosystems improves. Climate change mitigation efforts largely succeed, as the regional economy shifts to clean and renewable sources for most of its energy needs. The impact of climate change reflects the IPCC's moderate scenario.

Purchasing Power Parity (PPP) The rate of currency conversion that equalizes the purchasing power of different currencies. It makes allowance for the differences in price levels and spending patterns between different countries (OECD/IEA 2018).

Radiative forcing The strength of drivers is quantified as Radiative Forcing (RF) in units watts per square meter (W/m^2) as in previous IPCC assessments. RF is the change in energy flux caused by a driver and is calculated at the tropopause or at the top of the atmosphere.

Receptor model Atmospheric receptor model is multivariate statistical method to understand the nature of the source/receptor relationship, thereby identifying and apportioning sources of contaminants. The fundamental principle of receptor modeling is that mass conservation (balance) can be assumed. Currently, the Chemical Mass Balance (CMB), Principal Component Analysis (PCA) and Positive Matrix Factorization (PMF) methods are the most widely used receptor models.

Reducing 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 (SD). It is therefore a mechanism for mitigation that results from avoiding 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 11th Session of the Conference of the Parties (COP) in Montreal and later given greater recognition in the 13th 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 from 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 contained forests but that have been converted to some other use. For a discussion of the term forest and related terms such as afforestation, reforestation and deforestation, see the IPCC Special Report on Land Use, Land-Use Change, and Forestry (IPCC 2000a). See also information provided by the United Nations Framework Convention on Climate Change (UNFCCC 2013). 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, 2014a, b).

Renewable energy 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. Renewable energy is obtained from the continuing or repetitive flows of energy occurring in the natural environment and includes low-carbon technologies such as solar energy, hydropower, wind, tide and waves and ocean thermal energy, as well as renewable fuels such as biomass. For a more detailed description see specific renewable energy types in this glossary, for example, biomass, solar, hydropower, ocean, geothermal and wind (Verbruggen et al. 2011).

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

RCPs usually refer to the portion of the concentration pathway extending up to 2100, for which Integrated Assessment Models produced corresponding emission scenarios. Extended Concentration Pathways (ECPs) describe extensions of the RCPs from 2100 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 predictions and projections presented in WGI AR5 Chaps. 11–14 (IPCC 2013):

RCP2.6 One pathway where radiative forcing peaks at approximately 3 W/m² before 2100 and then declines (the corresponding ECP assuming constant emissions after 2100).

RCP4.5 and RCP6.0 Two intermediate stabilization pathways in which radiative forcing is stabilized at approximately 4.5 W/m² and 6.0 W/m² after 2100 (the corresponding ECPs assuming constant concentrations after 2150).

RCP8.5 One high pathway for which radiative forcing reaches >8.5 W/m² by 2100 and continues to rise for some amount of time (the corresponding ECP assuming constant emissions after 2100 and constant concentrations after 2250) (IPCC 2014a, b).

Reproductive role/work The reproductive role/work includes the care and maintenance of the actual and future workforce of the family (childbearing responsibilities and domestic tasks), which is mostly assigned to women (EIGE 2018).

Remittances The earnings acquired by migrants/emigrants that are transferred back to the households at place of origin. It includes transfers from both domestic as well as abroad.

Refugees A person who, “owing to a well-founded fear of persecution for reasons of race, religion, nationality, membership of a particular social group or political opinions, is outside the country of his nationality and is unable or, owing to such fear, is unwilling to avail himself of the protection of that country or who, not having a nationality and being outside the country of his former habitual residence as a result of such events, is unable or, owing to such fear, is unwilling to return to it.” (UNHCR 2010).

Resilience The capacity of social, economic and environmental systems to cope with a hazardous event or trend or disturbance, responding or reorganizing in ways that maintain their essential function, identity and structure, while also maintaining the capacity for adaptation, learning and transformation.

Return migration It denotes the movement of a migrant returning to his/her place of origin. The return may or may not be voluntary.

Risk The potential for consequences where something of value is at stake and where the outcome is uncertain, recognizing the diversity of values. Risk is often represented as probability or likelihood of occurrence of hazardous events or trends multiplied by the impacts if these events or trends occur. In this report, the term risk is often used to refer to the potential, when the outcome is uncertain, for adverse consequences on lives, livelihoods, health, ecosystems and species, economic, social and cultural assets, services (including environmental services) and infrastructure.

Risk management The plans, actions or policies to reduce the likelihood and/or consequences of risks or to respond to consequences.

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 (TC), 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.

Seasonal migration Seasonal migration is a movement which is undertaken during the part of a year depending upon seasonal requirement of work and conditions in the place of origin.

Secondary pollutants Secondary pollutants are not emitted directly. Rather, they form in the air when primary pollutants react or interact.

Sequestration The uptake (i.e., the addition of a substance of concern to a reservoir) of carbon containing substances, in particular carbon dioxide (CO₂), in terrestrial or marine reservoirs. Biological sequestration includes direct removal of CO₂ from the atmosphere through land-use change (LUC), afforestation, reforestation, revegetation, carbon storage in landfill 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 (CCS).

Shared Socio-Economic Pathways (SSPs) Currently, the idea of 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 Representative Concentration Pathway (RCP)-based climate projections should provide a useful integrative frame for climate impact and policy analysis.

Short-lived climate pollutants SLCPs are defined as gases and particles that contribute to warming and that have a lifetime of a few days to approximately 10 years. These include black carbon (BC), tropospheric ozone (O₃) and its precursors CO, nmVOC and NO_x, methane (CH₄), and some hydrofluorocarbons (HFCs). A characteristic of the climate effects of the short-lived climate pollutants, with the exception of the HFCs and to a certain extent CH₄, is that it matters where in the world the emissions are released. They also significantly impact food, water and economic security for large populations throughout the world, both directly through their negative effects on public health, agriculture and ecosystems, and indirectly through their impact on the climate.

Snow Water Equivalent (SWE) A measurement of the amount of water contained in a snowpack. It can be considered as the depth of water that would theoretically result if the entire snowpack was melted instantly. SWE is the product of snow depth and snow density.

Social costs See Private costs.

Socio ecological systems Social-ecological systems are complex, integrated systems in which humans are part of nature (Berkes and Folke 1994).

Solar energy Energy from the Sun that is captured either as heat, as light that is converted into chemical energy by natural or artificial photosynthesis, or by photovoltaic panels and converted directly into electricity. Concentrating solar power (CSP) systems use either lenses or mirrors to capture large amounts of solar energy and focus it down to a smaller region of space. The higher temperatures produced can operate a thermal steam turbine or be used in high-temperature industrial processes. Direct solar energy refers to the use of solar energy as it arrives at the Earth's surface before it is stored in water or soils. Solar thermal is the use of direct solar energy for heat end-uses, excluding CSP. Active solar needs equipment like panels, pumps and fans to collect and distribute the energy. Passive solar is based on structural design and construction techniques that enable buildings to utilize solar energy for heating, cooling and lighting by non-mechanical means (Verbruggen et al. 2011).

Solar Home System (SHS) A stand-alone system composed of a relatively low-power photovoltaic module, a battery and sometimes a charge controller that can power small electric devices and provide modest amounts of electricity to homes for lighting and radios, usually in rural or remote regions that are not connected to the electricity grid. A SHS typically includes one or more PV modules consisting of solar cells, a charge controller which distributes power and protects the batteries and appliances from damage and at least one battery to store energy for use when the sun is not shining.

Springshed Land area that contributes flow to a spring via recharge.

SRES scenarios SRES scenarios are emission scenarios developed by IPCC (2000a) and used, among others, as a basis for some of the climate projections shown in Chaps. 9–11 of IPCC WGI TAR (IPCC 2001), Chaps. 10 and 11 of IPCC WGI AR4 (IPCC 2007), as well as in the IPCC WGI AR5 (IPCC 2013, 2014a, b).

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

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.

Strategic Gender Needs (SGNs) Chap. 14 The needs identified by women that require strategies for challenging male dominance and privilege. These needs may relate to inequalities in the gender division of labour, in ownership and control of resources, in participation in decision-making, or to experiences of domestic and other sexual violence.

Structural change Changes, for example, in the relative share of gross domestic product (GDP) 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 components.

Sustainable energy Sustainable energy is a form of energy that meet our today's demand of energy without putting them in danger of getting expired or depleted and can be used over and over again.⁶

Sustainability Sustainability is generally defined as a system's overall ability to meet present human needs without compromising the ability of future generations to meet their needs. Sustainability has three main pillars: social, environmental, and economic. These three pillars are often informally referred to as people, planet and profits (Beattie 2017).

Sustainable development Development that meets the needs of the present without compromising the ability of future generations to meet their own needs (WCED 1987). Sustainable development is characterized by social/sociocultural equity, environmental protection, and economic viability. Sustainable development is the pathway to sustainability.

Sustainable development goals The Sustainable Development Goals (SDGs), also known as Global Goals, constitute a universal call to action to end poverty, protect the planet, and ensure that all people enjoy peace and prosperity. These 17 Goals build on the successes of the Millennium Development Goals, while also including new areas such as climate change, economic inequality, innovation, sustainable consumption, peace, justice, and other priorities. The SDGs are interconnected—often, key to success for one involves tackling issues more commonly associated with another (UNDP 2018).

Temporary migration Temporary migration is a short-term migration including seasonal migration. While all seasonal migrations are temporary migration, all temporary migrations are not seasonal in nature.

⁶<https://sustainabledevelopment.un.org/>.

Transformation A change in the fundamental attributes of natural and human systems.

Transformation pathway The trajectory taken over time to meet different goals for greenhouse gas (GHG) emissions, atmospheric concentrations, or global mean surface temperature change that implies a set of economic, technological and behavioural changes. This can encompass changes in the way energy and infrastructure are used and produced, natural resources are managed and institutions are set up and in the pace and direction of technological change (TC). See also Baseline/reference, Emission scenario, Mitigation scenario, Representative Concentration Pathways (RCPs) and SRES scenarios.

Tree rings Concentric rings of secondary wood evident in a cross section of the stem of a woody plant. The difference between the dense, small-celled late wood of one season and the wide-celled early wood of the following spring enables the age of a tree to be estimated, and the ring widths or density can be related to climate parameters such as temperature and precipitation.

Tropospheric ozone Tropospheric (or ground-level) ozone (O₃) is the ozone present in the lowest portion of the atmosphere (up to 10–15 km above the ground) that is harmful to the people and the ecosystem.

Uncertainty A 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 Moss and Schneider 2000; Manning et al. 2004; Mastrandrea et al. 2010). See also Confidence and Likelihood (IPCC 2014a, b).

Vulnerability The propensity or predisposition to be adversely affected. Vulnerability encompasses a variety of concepts and elements including sensitivity or susceptibility to harm and lack of capacity to cope and adapt.

Water-energy-food nexus Inter-relation among water, energy, and food as resources, institutions for their management, and security.

Water security The capacity of HKH populations to safeguard sustainable access to adequate quantities of acceptable quality water for resilient societies and ecosystems, to ensure protection against water-borne pollution and water-related disasters, and to adapt to uncertain global change—in a regional climate of peace and political stability.

Wind energy Kinetic energy from air currents arising from uneven heating of the Earth's surface. A wind turbine is a rotating machine including its support structure for converting the kinetic energy to mechanical shaft energy to generate electricity. A windmill has oblique vanes or sails and the mechanical power obtained is mostly used directly, for example, for water pumping. A wind farm, wind project or wind power plant is a group of wind turbines interconnected to a common utility system through a system of transformers, distribution lines, and (usually) one substation (Verbruggen et al. 2011).

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Annex 2: List of Acronyms

AAB	Action Aid Bangladesh
AAGR	Average Annual Growth Rate
ABC	Atmospheric brown cloud
ACAM	Atmospheric Composition and the Asian Monsoon
ACRE	Atmospheric Circulation Reconstructions over the Earth
ADB	Asian Development Bank
ADP	Annual Development Plan
AEPC	Alternate Energy Promotion Centre
AIRD	Adaptation and Impacts Research Division
AJK	Azad Jammu and Kashmir
AKAH	Aga Khan Agency for Habitat
AKF	Aga Khan Foundation
AKRSP	Aga Khan Rural Support Programme
AMP	Aid Management Policy
AMS	Accelerator Mass Spectrometry
ANBSAP	Afghanistan's National Biodiversity Strategy and Action Plan
AOD	Aerosol optical depth
AOGCM	Atmosphere-Ocean General Circulation Models
APCAP	Asia Pacific Clean Air Partnership
APHCA	Animal Production and Health Commission for Asia and the Pacific
AR5	Assessment Report 5
ARCAB	Action Research for Community Adaptation in Bangladesh
ARI	Acute respiratory infections
ATP	Annual total precipitation
ATREE	Ashoka Trust for Research in Ecology and Environment
AWDO	Asian Water Development Outlook
BAU	Business as Usual
BBIN	Bhutan, Bangladesh, India, and Nepal
BBS	Bangladesh Bureau of Statistics
BC	Black carbon
BCAS	Bangladesh Centre for Advanced Studies
BCCRF	Bangladesh Climate Change Resilience Fund
BCCSAP	Bangladesh Climate Change Strategy and Action Plan
BCCTF	Bangladesh Climate Change Trust Fund
BEOE	Bureau of Emigration and Overseas Employment
BIMSTEC	Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation
BLSS	Bhutan Living Standard Survey
BMC	Biodiversity Management Committee
BMET	Bureau of Manpower Employment and Training

BMZ	Federal Ministry for Economic Cooperation and Development (Germany)
BOD	Biochemical Oxygen Demand
BOM	Bureau of Meteorology
BP	Before Present
BRACED	Building Resilience and Adaptation to Climate Extremes and Disasters
BrC	Brown carbon
BRICS	Association of Brazil, Russia, India, China and South Africa
BTEX	Benzene, toluene, ethylbenzene, xylenes
BWSI	Bhutan Water Security Index
CAM	Climate Anomaly Method
CAPA	Community Adaptation Plans of Action
CARE	Cooperative for Assistance and Relief Everywhere
CAS	Chinese Academy of Sciences
CBA	Community Based Adaptation
CBD	Convention on Biological Diversity
CBFEWS	Community-based flood early warning system
CBOs	Community Based Organizations
CBNRM	Community-based Natural Resources Management
CBS	Central Bureau of Statistics
CCA	Community Conserved Areas
CCAC	Climate and Clean Air Coalition
CCAF	Climate Change, Agriculture and Food Security
CCAP	Centre for Chinese Agriculture Policy
CCCma	Canadian Centre for Climate Modelling and Analysis
CCCR	Centre for Climate Change Research
CCD	Climate Change Division
CCN	Cloud condensation nuclei
CCSAP	Climate Change Strategy and Action Plan
CDKN	Climate Development Knowledge Network
CDM	Clean Development Mechanism
CEA	Central Electricity Authority, Government of India
CEDAW	Convention on All Forms of Discrimination on Women
CEMORD	Center for Mountain Research Development
CERFACS	Centre Européen de Recherche et de Formation Avancée en Calcul Scientifique
CERN	Chinese Ecosystem Research Network
CF	Community Forestry
CFIs	Community Forestry Instructions
CFP	Community Forestry Programme
CFUGs	Community Forest User Groups
CGC	Centre for Global Change
CGIAR	Consultative Group for International Agricultural Research
CHEA	Central Himalayan Environment Association
CHT	Chittagong Hill Tracts
CIA	Central Intelligence Agency
CICERO	Center for International Climate and Environmental Research—Oslo
CIFOR	Center for International Forestry Research
CII	Confederation of Indian Industry
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CLA	Crop-livestock Agriculture
CLRTAP	Convention on Long-Range Transboundary Air Pollution
CMA	China Meteorological Administration

CMIP	Couple Model Intercomparison Project
CMIP5	Coupled Model Intercomparison Project, Version 5
CNG	Compressed natural gas
CNRM	Centre National de Recherches Météorologiques
CNY	Chinese currency
CO ₂	Carbon Dioxide
CO	Carbon monoxide
COP	Conference of the Parties
COP21	UNFCCC Conference of Parties 21
COPD	Chronic obstructive pulmonary disease
CORDEX	Coordinated Regional Downscaling Experiment
COSMO	Consortium for Small-scale Modeling
CP	Current Policies
CPCB	Central Pollution Control Board
CPEIR	Climate Public Expenditure and Institutional Reviews
CPRs	Common Pool Resources
CR	Critically endangered
CRED	Centre for Research on the Epidemiology of Disasters
CREP	Community Rural Electrification Programme
CRISPR	Clustered Regularly Interspaced Short Palindromic Repeats
CRU	Climate Research Unit
CSA	Climate Smart Agriculture
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CSOs	Civil Society Organizations
CSR	Corporate Social Responsibility
CUTS	Consumer Unity & Trust Society
CVCA	Climate Vulnerability and Capacity Analysis
CVI	Climate Vulnerability Index
CWC	Central Water Commission, Government of India
DABS	Da Afghanistan Breshna Sherkat
DALYs	Disability-Adjusted Life Years
DEM	Digital Elevation Model
DFID	United Kingdom Department for International Development
DFOs	District Forest Offices
DHPS	Department of Hydropower and Power Systems
DHS	Demographic and Health Survey
DLSOs	District Livestock Service Offices
DNV GL	Det Norske Veritas Germanischer Lloyd
DoE	Department of Energy
DoE	Department of Environment
DoFE	Department of Foreign Employment
DOI	Digital Object Identifier
DoP	Department of Population
DPF	Diesel particulate filter
DPIA	Daily Precipitation Intensity Anomalies
DRD	Department of Rural Development
DRR	Disaster Risk Reduction
DTR	Diurnal Temperature range
EANET	Acid Deposition Monitoring Network in East Asia
EBA	Ecosystem Based Adaptation
EBHR	European Bulletin of Himalayan Research
EC	Elemental carbon
EC	European Consortium

EC	Ecosystems
ECA	European Climate Assessment
EDGAR	Emissions Database for Global Atmospheric Research
EDW	Elevation Dependent Warming
EF	Environmental Flows
EFLG	Environment-Friendly Local Governance
EHP	Elevated Heat Pump
EM-DAT	The Emergency Events Database
EN	Endangered
ENSO	El Niño-Southern Oscillation
ERD	Economics and Research Department
ES	Ecosystem Services
ESAP	Energy Sector Assistance Program
ESCAP	Economic and Social Commission for Asia and the Pacific
ESCO	Energy Service Company
ESGF	Earth System Grid Federation
ESV	Ecosystem Services Value
ET	Evapotranspiration
ETCCDI	Expert Team on Climate Change Detection and Indices
EU	European Union
FAO	Food and Agriculture Organization
FATA	Federally Administered Tribal Areas
FCBTK	Fixed Chimney Bull's Trench Kiln
FECOFUN	Federation of Community Forest Users-Nepal
FD	Frost Days
FD	Forest Department
FFC	Federal Flood Commission
FIT	Feed-in Tariffs
FMIS	Farmer Managed Irrigation Systems
FPE	Feminist Political Ecology
FS	Food Security
FSF	Future Smart Food
FW	Fortress World
FYPs	Five Year Plans
GAINS	Greenhouse Gas—Air Pollution Interactions and Synergies
GB	Gilgit-Baltistan
GBPNIHESD	GB Pant National Institute of Himalayan Environment and Sustainable Development
GCC	Gulf Coast Countries
GCESS	Global Change and Earth System Science
GCM	General Circulation Models
GCM	Global Climate Model
GCOS	Global Climate Observing System
GDP	Gross Domestic Product
GEA	Global Energy Assessment
GEF	Global Environmental Facility
GEH	Gross Enrolment Ratio in Higher Education
GEoS	Global Environmental Stratification
GEO	Global Environmental Outlooks
GFDL	Geophysical Fluid Dynamics Laboratory
GFDRR	Global Facility for Disaster Reduction and Recovery
GGCA	Global Gender and Climate Alliance
GHCND	Global Historical Climatology Network-Daily

GHCM	Global Historical Climatology Network
GHG	Green House Gas
GII	Gender Inequality Index
GIS	Geographic Information System
GIRoA	Government of the Islamic Republic of Afghanistan
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GLDP	Global Land Daily Precipitation
GLIMS	Global Land Ice Measurements from Space
GLMP	Global Land Monthly Precipitation
GLOFs	Glacial Lake Outburst Floods
GLSAT	Global Land Surface Air Temperature
GM	Genetically Modified Organisms
GMS	Greater Mekong Sub-Region
GNH	Gross National Happiness
GoB	Government of Bangladesh
GoI	Government of India
GoN	Government of Nepal
GoP	Government of Pakistan
GPS	Global Positioning System
GSOD	Global Surface Summary of the Day
GT	Great Transitions
GTN-G	Global Terrestrial Network for Glaciers
GTN-P	Global Terrestrial Network for Permafrost
GTOS	Global Terrestrial Observing System
GW	Gigawatts
GWh	Gigawatt hours
HAP	Household Air Pollution
Hb	Hemoglobin
HCl	Hydrogen Chloride
HDI	Human Development Index
HF	Hydrogen Fluoride
HFCs	Hydrofluorocarbons
HH	Household
HIES	Household Integrated Economic Survey
HIMAP	Hindu Kush Himalayan Monitoring and Assessment Programme
HKH	Hindu Kush Himalaya
HKH-TP	Hindu Kush-Himalaya-Tibetan Plateau-Pamir
HMA	High Mountain Asia
HSE	High School Education
HVDC	High-Voltage Direct Current
HYCOS	Hydrological Cycle Observing System
I&M	Inspection and Maintenance
IAS	Invasive Alien Species
ICARDA	International Center for Agricultural Research in the Dry Areas
ICCCAD	International Centre for Climate Change and Development
ICDP	Integrated Conservation and Development Programme
ICHEC	Irish Centre for High-End Computing
ICIMOD	International Centre for Integrated Mountain Development
ICRAF	International Centre for Research in Agroforestry
ICRMW	International Convention on the Protection of the Rights of all Migrant Workers and the Members of their Families
ICS	Improved Cook Stoves
ICSU	International Council for Science

ICT	Information and Communication Technology
ICTP	International Centre for Theoretical Physics
IDCOL	Infrastructure Development Company Ltd.
IDEC	International Development and Cooperation
IDP	Internally Displaced Population
IDRC	International Development Research Centre
IEA	International Energy Agency
IEMP	International Ecosystem Management Partnership
IFAD	International Fund for Agricultural Development
IFC	International Finance Corporation
IFSD	Institute for Studies and Development Worldwide
IGP	Indo-Gangetic Plains
IGSNRR	Institute of Geographic Sciences and Natural Resources Research
IHCLA	Integrated Household Living Condition Assessment
IIED	International Institute for Environment and Development
IIMA	Indian Institute of Management Ahmedabad
IITM	Indian Institute of Tropical Meteorology
ILO	International Labour Organization
ILRI	International Livestock Research Institute
IMF	International Monetary Fund
INCCA	Indian Network for Climate Change Assessment
INDC	Intended Nationally Determined Contributions
INDOEX	Indian Ocean Experiment
I/NGOs	International/Non-Government Organizations
INM	Institute of Numerical Mathematics
INR	Indian Rupee
IOD	Indian Ocean Dipole
IOM	International Organization for Migration
IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
IPCC	Intergovernmental Panel on Climate Change
IPGRI	International Plant Genetic Resources Institute
IPSL	Institut Pierre-Simon Laplace
IR	Intense Rain
ISDR	International Strategy for Disaster Reduction
ISET	Institute for Social and Environmental Transition
ISMWRA	Inter-state Migrant Workmen Regulation Act
ISO	International Organization for Standardization
IT	Information Technology
IUCN	International Union for Conservation of Nature
IWRM	Integrated Water Resources Management
JETC	Joint Expert Technical Committee
JFM	Joint Forest Management
JFMCs	Joint Forest Management Committees
JICA	Japan International Cooperation Agency
JRC	Joint Rivers Commission
KBA	Key Biodiversity Areas
KES	Kenyan Shilling
KPK	Khyber Pakhtunkhwa
KSLCDI	Kailash Sacred Landscape Conservation and Development Initiative
ktoe	kiloton of oil equivalent
kV	kilovolt
kWh	kilowatt hour

L&D	Loss and Damage
LAPA	Local Adaptation Plan of Action
LC	Least Concern
LDCs	Least Developed Countries
LDRRF	Local Disaster Risk Reduction Fund
LEAD	Leadership for Environment & Development
LED	Light-Emitting Diode
LFP	Livelihoods and Forestry Programme
LGM	Last Glacial Maximum
LH	Livelihoods
LHF	Leasehold Forestry
LIA	Little Ice Age
LI-BIRD	Local Initiatives for Biodiversity, Research and Development
LLOF	Landslide Lake Outburst Flood
LoCAL	Local Climate Adaptive Living Facility
LPG	Liquefied Petroleum Gas
LR	Light rain
LULC	Land Use and Land Cover
LULCC	Land Use and Land Cover Change
m ²	square meter
MA	Millennium Ecosystem Assessment
MACH	Management of Aquatic Resources through Community Husbandry
MAPDRR	Myanmar Action Plan on Disaster Risk Reduction
masl	meters above sea level
MC	Mekong Committee
MCBTK	Moveable Chimney Bull's Trench Kiln
MCMC	Markov Chain Monte Carlo
MDGs	Millennium Development Goals
MEs	Medium scale Enterprise
MEP	Ministry of Environmental Protection
MEW	Ministry of Energy and Water
MF	Market Forces
MICS	Multiple Indicator Cluster Survey
MIROC	Model for Interdisciplinary Research on Climate
MJO	Madden–Julian Oscillation
MLD	Million Litres per Day
MLE	Mass-loss Equivalent
MLVI	Multidimensional Livelihood Vulnerability Index
MNRE	Ministry of New and Renewable Energy
MoA	Ministry of Agriculture
MoAF	Ministry of Agriculture and Forests
MoCC	Ministry of Climate Change
MODIS	Moderate Resolution Remote Sensing Imagery
MoE	Ministry of Environment
MoEA	Ministry of Economic Affairs
MoECF	Ministry of Environmental Conservation and Forestry
MoEF	Ministry of Environment and Forests
MoEF	Ministry of Environment Forests & Climate
MoEPC	Ministry of Environmental Protection of China
MoFSC	Ministry of Forests and Soil Conservation
MOHC	Met Office Hadley Centre
MoEWOE	Ministry of Expatriates' Welfare and Overseas Employment
MoHRSS	Ministry of Human Resources and Social Security

MoI	Ministry of Industry
MOIA	Ministry of Overseas Indians
MoL	Ministry of Labour
MoLE	Ministry of Labour and Employment
MoLES	Ministry of Labour, Employment and National Security
MoLHR	Ministry of Labour & Human Resources
MoLIP	Ministry of Labour, Immigration and Population
MoLSAMD	Ministry of Labour, Social Affairs, Martyrs and Disabled
MoNREC	Ministry of Natural Resources and Environmental Conservation
MoPE	Ministry of Population and Environment
MoPIT	Ministry of Physical Infrastructure & Transport
MoSTE	Ministry of Science, Technology and Environment
MoSWRR	Ministry of Social Welfare Relief and Resettlement
MoU	Memorandum of Understanding
MoUD	Ministry of Urban Development
MPI	Multidimensional Poverty Index
MPIM	Max Planck Institute for Meteorology
MPM-HKH	Multidimensional Poverty Measure for the Hindu Kush Himalaya
MR	Moderate rain
MRC	Mekong River Commission
MRRD	Ministry of Reconstruction and Rural Development
MtCO ₂	Million ton of carbon dioxide
MW	Megawatt
N ₂ O	Nitrous oxide
NA	Not Available
NAFCC	National Adaptation Fund for Climate Change
NAMaSTE	Nepal Ambient Monitoring and Source Testing Experiment
NAO	North Atlantic Oscillation
NAP	National Adaptation Plan
NAPA	National Adaptation Programme of Action
NAPCC	National Action Plan on Climate Change
NARC	National Agricultural Research Council
NBCI	National Biomass Cookstove Initiative
NBI	Nile Basin Initiative
NBSC	National Bureau of Statistics of China
NCAR	National Center for Atmospheric Research
NCC	Norwegian Climate Centre
NCD	Nature Conservation Division
NCEP	National Centers for Environmental Prediction
NCO-P	Nepal Climate Observatory—Pyramid
NCSA	National Capacity Needs Self-assessment for Global Environmental Management
NDCs	Nationally Determined Contributions
NDMA	National Disaster Management Authority
NDRC	National Development and Reform Commission
NDVI	Normalized Difference Vegetation Index
NE	Not Evaluated
NEA	Nepal Electricity Authority
NEC	National Environment Commission
NEPA	Nepal Environmental Protection Agency
NER	Net Enrolment Ratio
NFCP	Natural Forest Conservation Program
NFSA	National Food Security Act (India)

NGOs	Non-governmental organizations
NIDS	Nepal Institute of Development Studies
NISP	National Improved Stove Programme
NIWE	National Institute of Wind Energy
NIWRMP	National Integrated Water Resource Management Plan
NLG	National Leading Group
NLSS	Nepal Living Standards Survey
NMHS	National Mission for Himalayan Studies
NMI	Normalized Melt Index
NMSHE	National Mission for Sustaining the Himalayan Ecosystem
NMVOCs	Non-methane Volatile Organic Compounds
NO	Nitric oxide
NO ₂	Nitrogen dioxide
NOAA	National Oceanic and Atmospheric Administration
NO _x	Nitrogen oxides
NP	New Policies
NPC	National Planning Commission, Nepal
NPC	National People's Congress
NPIC	National Programme for Improved Chulhas
NPS	Non-Point Source
NPR	Nepalese Rupee
NRDCL	Natural Resource Development Corporation Limited
NRM	Natural Resource Management
NRVA	National Risk and Vulnerability Assessment
NS	National Surveys
NSF	National Science Foundation
NSS	National Sample Survey
NSSO	National Sample Survey Organization
NT	Near Threatened
NTFPs	Non-Timber Forest Products
NUFCs	Neglected and Underutilized Food Crops
NUS	Neglected and underutilized species
O&M cost	Organization and management cost
O ₃	Ozone
OC	Organic Carbon
ODI	Overseas Development Institute
OECD	Organization for Economic Co-operation and Development
OIFC	Overseas Indian Facilitation Centre
OPHI	Oxford Poverty and Human Development Initiative
PA	Precipitation Anomaly
PA	Protected Area
PAHs	Polycyclic Aromatic Hydrocarbons
PCFV	Partnership for Clean Fuels and Vehicles
PCR-VCA	Participatory Climate Risk Vulnerability and Capacity Assessment
PCW	Protection of Children and Women
PDMA	Provincial Disaster Management Authority
PES	Payment for Environmental Services
PFM	Participatory Forest Management
PHE	Public Health Engineering
PJ	petajoule
PKR	Pakistani Rupee
PM	Particulate Matter
PM ₁₀	Particulate Matter with a diameter of 10 µm or less

PM _{2.5}	Particulate Matter with a diameter of 2.5 µm or less
PMUY	Pradhan Mantri Ujjwala Yojana
POE	Protectorate of Emigrants
PPA	Precipitation Percent Anomaly
PPA's	Power Purchase Agreements
PPB	Participatory Plant Breeding
PPCR	Pilot Program for Climate Resilience
PPP	Purchasing Power Parity
PRC	Pew Research Center
PRECIS	Providing Regional Climates for Impact Studies
PSA	Precipitation Standardized Anomalies
PSLM	Pakistan Social and Living Standards Measurement
PTR-ToF-MS	Proton-Transfer-Reaction-Time-of-Flight-Mass-Spectrometry
PV	Photovoltaic
PVA	Poverty and Vulnerability Assessment
QCCCE	Queensland Climate Change Centre of Excellence
QOMS	Qomolangma Station
R&D	Research and Development
RCM	Regional Climate Models
RCP	Representative Concentration Pathway
RE	Renewable Energy
REAS	Regional Emissions inventory in Asia
RECAST	Research Center for Applied Sciences & Technology
REDD+	Reduce Emission from Deforestation and Forest Degradation, and foster conservation, sustainable management of forests, and enhancement of forest carbon stocks
REDP	Rural Energy Development Program
RETs	Renewable Energy Technologies
RGI	Randolph Glacier Inventory
RGOB	Royal Government of Bhutan
RHRP	Rural Housing Reconstruction Program
RMMRU	Refugee and Migratory Movements Research Unit
ROSCA	Rotating Savings and Credit Association
RVCC	Reducing Vulnerability to Climate Change
SAARC	South Asian Association for Regional Cooperation
SACEP	South Asia Cooperative Environment Program
SAFTA	South Asian Free Trade Area
SAPCC	State Action Plans on Climate Change
SAPP	Southern African Power Pool
SASEC	South Asia Subregional Economic Cooperation Program
SAWTEE	South Asia Watch on Trade, Economics, and Environment
SCA	Snow-Covered Area
SCCF	Special Climate Change Fund
SCF	Snow-Covered Fraction
SCD	snow cover duration
SDC	Swiss Development Cooperation
SDG	Sustainable Development Goal
SDGs	Sustainable Development Goals
SDG 2	Sustainable Development Goal 2
SDG 7	Sustainable Development Goal 7
SDII	Simple Daily Intensity Index
SDMC	SAARC Disaster Management Centre
SE4All	Sustainable Energy for All

SF	Social Forestry
SHS	Solar Home Systems
SIDA	Swedish International Development Cooperation Agency
SLA	Snow Line Altitude
SLA	Sustainable Livelihoods Approach
SLCP	Sloping Land Conversion Program
SLCPs	Short-lived Climate Pollutants
SMC	Scalabrini Migration Centre
SMEs	Small and Medium scale Enterprise
SMHI	Swedish Meteorological and Hydrological Institute
SMS	Short Message Service
SO ₂	Sulphur Dioxide
SO _x	Sulphur Oxides
SPARC	Stratosphere-troposphere Processes and their Role in Climate
SPDC	Social Policy and Development Centre
SPI	Social Protection Index
SPIP	Solar-powered Irrigation Pumps
SRA	Social Relations Approach
SRES	Special Report on Emissions Scenarios
SREX	Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation
SRTM	Shuttle Radar Topographic Mission
SSPs	Shared Socio-Economic Pathways
SSR	Surface Solar Radiation
STEM	Sulfur Transport and Deposition Model
SU	Summer Day
SusKat-ABC	Sustainable Atmosphere for the Kathmandu Valley—Atmospheric Brown Cloud
SWE	Snow Water Equivalent
T&D	Transmission and Distribution
TAR	Tibet Autonomous Region
TCFD	Task Force on Climate-related Financial Disclosures
TEPC	Trade and Export Promotion Centre
TERI	The Energy and Resources Institute
TFEC	Total Final Energy consumption
toe	tonnes of oil equivalent
TP	Tibetan Plateau
TPES	Total Primary Energy Supply
TRMM	Tropical Rainfall Measurement Mission
TSP	Total Suspended Particle
UAE	United Arab Emirates
UAV	Unmanned Aerial Vehicle
UIB	Upper Indus basin
UN	United Nations
UNCDF	United Nations Capital Development Fund
UNCED	United Nations Conference on Environment and Development
UNDESA	United Nations, Department of Economic and Social Affairs
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
UNHCR	United Nations High Commissioner for Refugees
UNICEF	United Nations Children's Emergency Fund

UNISDR	United Nations International Strategy for Disaster Reduction
UNU	United Nations University
U.S.	United States
USAID	United States Agency for International Development
USD	United States Dollar
VACA	Vulnerability and Adaptive Capacity Assessment
VAT	Value-Added Tax
VCi	Vulnerability and Capacities Index
VIC	Variable Infiltration Capacity
VOCs	Volatile Organic Compounds
VRA	Vulnerability and Risk Assessment
VSBK	Vertical Shaft Brick Kiln
VU	Vulnerable
W	Watt
WAPDA	Water & Power Development Authority
WB	World Bank
WCD	Wildlife Conservation Division
WCMC	World Conservation Monitoring Centre
WCRP	World Climate Research Programme
WD	Wet Day
WDA	Wet-Day Anomaly
WECS	Water and Energy Commission Secretariat
WEF	Water-Energy-Food
WFD	Water Framework Directive
WGMS	World Glacier Monitoring Service
WHO	World Health Organization
WHYCOS	World Hydrological Cycle Observing System
WIDER	World Institute for Development Economics Research
WPSC	Women's Protection Technical Working group transitioned into a sub-cluster
WR	Water Resources
WRF	Weather Research and Forecasting
WRI-India	World Resources Institute, India
WUAs	Water Users' Associations
WWF	World Wildlife Fund for Nature

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Annex 4: Permissions to Publish

Fig. 2.1 A framework of three pillars of mountain sustainability and the interactive network of drivers

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Fig. 3.1 RegCM4 elevation (in km) with three regions of interest defined by grid cells in each box above 2,500 m a.s.l.

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Fig. 3.2 Annual mean temperature anomaly series ($^{\circ}\text{C}$) relative to 1961–90 mean values for Tmean (a), Tmax, Tmin, and DTR

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Fig. 3.3 The grid-averaged trends of annual mean temperature in the Hindu Kush Himalaya (HKH) since 1901

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Fig. 3.4 The regional average annual PSA and PPA over 113 years (1901–2013) in the Hindu Kush Himalaya

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Fig. 3.6 The change trends in annual precipitation percentage anomaly (PPA, unit: % decade $^{-1}$) (a), wet day anomaly (WDA, unit: mm decade $^{-1}$) (b); and daily precipitation intensity anomaly (DPIA, unit: mm/day decade $^{-1}$) (c) in the Hindu Kush Himalaya over 53 years (1961–2013). Filled symbols represent statistically significant data at 0.05 confidence level (*Data source* CMA GLMP; Zhan et al. 2017)

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Fig. 3.7 Annual mean anomaly series of extreme temperature indices of the Hindu Kush Himalaya (HKH) for 1961–2014 for a cold nights (TN10p); b cold days (TX10p); c warm nights (TN90p); d warm days (TX90p); e monthly maximum value of daily maximum temperature (TXx); f monthly minimum value of daily minimum temperature (TNn); g frost days (FD); h summer days (SU); and i diurnal temperature range (DTR) (relative to 1961–90 mean values). The trends are calculated only for the grid boxes with sufficient data, as explained in the text (*Data source* CMA GLASAT; Sun et al. 2017a)

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Fig. 3.8 The change trends of extreme temperature indices of the Hindu Kush Himalaya for 1961–2014 for a cold nights, b cold days, c warm nights, d warm days, e frost day, f summer day, g monthly maximum value of daily maximum temperature, h monthly minimum value of daily minimum temperature, and i diurnal temperature range (relative to 1961–90 mean values) (*Data source* CMA GLSAT; Sun et al. 2017a)

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Fig. 3.9 The regional average anomaly time series of extreme precipitation indices for annual amount (unit: mm) (left); days (unit: day) (central); and intensity (unit: mm/day) (right) of light (above), moderate (middle), and intense (below) precipitation over the last 53 years (1961–

2013) in the Hindu Kush Himalaya. Dashed lines represent linear trends (*Data source* CMA GLDP; Zhan et al. 2017)

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Fig. 3.10 The change trends of annual precipitation amount percent anomaly (PPA) (1/left) and annual precipitation day anomaly (WDA) (2/right) for light (a), moderate (b), and intense (c) precipitation over the last 53 years (1961–2013) in the Hindu Kush Himalaya. Filled symbols represent statistically significant trends at the 0.05 confidence level (*Data source* CMA GLDP; Zhan et al. 2017)

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Fig. 3.12 Seasonal ensemble mean climate change in the Hindu Kush Himalaya (HKH) in the near future ([2036–65] with respect to [1976–2005]) for (top panels) surface air temperature (°C) and (bottom panels) total precipitation (%), with scenarios (first and third column) RCP4.5 and (second and fourth column) RCP8.5, during (a–d) summer monsoon (JJAS) and (e–h) winter (DJF) seasons. Ensemble mean of downscaling CMIP5 GCM with CORDEX South Asia RCM (listed in Table 3.5). Striping in bottom panels indicates where at least 10 of the 13 realizations concur on an increase (vertical) or decrease (horizontal) in RCPs. The HKH boundary is shown with dashed line. The boxes represent the three HKH sub-regions used for detailed analysis (see text)

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Fig. 3.13 Seasonal ensemble mean climate change in the Hindu Kush Himalaya (HKH) in the far future ([2066–2095]–[1976–2005]) for (top panels) surface air temperature (°C) and (bottom panels) total precipitation (%), with scenarios (first and third column) RCP4.5 and (second and fourth column) RCP8.5, during (a–d) summer monsoon (JJAS) and (e–h) winter (DJF) seasons. Ensemble mean of downscaling CMIP5 GCM with CORDEX South Asia RCM (listed in Annex “Permissions to Publish” and Table 3.5). Striping in bottom panels indicates where at least 10 of the 13 realizations concur on an increase (vertical) or decrease (horizontal) in RCPs. The HKH boundary is shown by a dashed line. The boxes represent three HKH sub-regions used for detailed analysis (see text)

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Fig. 5.2 Linkages between ecosystems, biodiversity, and human wellbeing

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Fig. 5.4 Vegetation zones and dominant forest types in the HKH (Chettri et al. 2010)

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Fig. 5.5 Climatic records, radiocarbon dates, and charred cereal grain records from 53 investigated sites on the north east Tibetan Plateau (NETP)

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Fig. 5.12 Trend in number and area coverage of protected areas in the HKH from 1918 to 2007

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Fig. 6.1 Framework for Addressing Sustainable Energy Transition

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Box 7.2 Schematic diagrams of five mechanisms of elevation dependent warming. dT/dt is the change in temperature over time (adapted from Mountain Research Initiative EDW Working Group 2015)

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Fig. 7.3 Snow cover fraction trends (%/yr) over the HKH-TP from 2000 to 2014 from (*Source* Li et al. 2017)

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Fig. 7.9 Mass change projections and prevalence of debris cover for all RGI sub-regions (a–o) that are encompassed by the RGI regions 13 (Central Asia), 14 (South Asia West), and 15 (South Asia East)

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Fig. 8.2 Contribution to total flow by glacial melt, snowmelt, and rainfall-runoff for major streams

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Fig. 8.3 NDVI changes in the growing season across TP over past three decades

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Fig. 9.1 Food security framework (*Source* adapted from Jones et al. 2013)

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Fig. 9.9 Post-harvest losses in Gilgit-Baltistan, Pakistan (*Source* Rasul et al. 2014)

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Fig. 10.4 CO in the Kathmandu Valley in October (a) and January (b) 2005. Weekends are marked in light shading and festival days in medium shading. *Source* Panday and Prinn (2009)

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Fig. 10.5 a Diurnal concentrations of BC during each season at Pantnagar, Uttarakhand, India (left, *Source* Joshi et al. 2016) and at Paknajol, Kathmandu, Nepal (right, *Source* Putero et al. 2015)

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Fig. 10.6 Diurnal variations for aerosol particle number concentration (N_p), surface O_3 , and CO_2 at Askole in northern Pakistan (3,015 masl). *Source* Putero et al. (2014)

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Fig. 10.7 Diurnal cycle of aerosol number concentrations at Manora Peak, Nainital, India

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Fig. 10.8 Mean MODIS AOD during pre-monsoon season between 2003 and 2006, projected as a function of surface topography (left) and CALIPSO back-scatter profile from southern India to the Himalaya (right). *Source* Gautam et al. (2009a)

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Fig. 10.11 Fog frequency from 82 stations over India and Pakistan from 1976 to 2010 (Syed et al. 2012)

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Fig. 10.13 Multiple pollutants and their multiple adverse effects. (Cao et al. 2013, adapted by Clean Air Asia 2016)

Permission granted by Dr. Hsi-Hsien Yang, Production Center of Aerosol and Air Quality Research

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Fig. 12.4 Percentage of multidimensional poor and consumption poor in Shan and Chin in 2013 (*Source* Gerlitz et al. 2014)

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Fig. 12.7 Conceptual framework for vulnerability (Macchi 2011, adapted from Füssel and Klein 2006)

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Fig. 12.8 Sustainable livelihoods approach (Macchi 2011, adapted from DFID 1999)

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Fig. 12.9 Vulnerability in three sub-basins of the HKH: absolute and relative contribution of vulnerability dimensions by district (Gerlitz et al. 2017)

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Fig. 12.10 Vulnerability in three sub-basins of the HKH: relative contribution of vulnerability components by district in percentage (Gerlitz et al. 2017)

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