Glossary of Terms

Accretion

The process of soil buildup, generally through deposition.

Adaptation

Actions taken to reduce the vulnerability of natural and human systems against actual or expected climate change effects. Various types of adaptation can be distinguished, including anticipatory, autonomous, and planned adaptation.

- **Anticipatory Adaptation –** Adaptation that takes place before impacts of climate change are observed. Also referred to as proactive adaptation.

- **Autonomous Adaptation –** Adaptation that does not constitute a conscious response to climatic stimuli but is triggered by ecological changes in natural systems and by market or welfare changes in human systems. Also referred to as spontaneous adaptation.

- **Planned Adaptation –** Adaptation that is the result of a deliberate policy decision, based on an awareness that conditions have changed or are about to change and that action is required to return to, maintain, or achieve a desired state.

Adaptation Assessment

The practice of identifying options to adapt to climate change and evaluating them in terms of criteria such as availability, benefits, costs, effectiveness, efficiency, and feasibility.

Adaptation Benefits

The avoided damage costs or the accrued benefits following the adoption and implementation of *adaptation* measures.

Adaptation Costs

Costs of planning, preparing for, facilitating, and implementing *adaptation* measures, including transition costs.

Adaptive Capacity

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

Alluvium

Sand, gravel, and silt deposited by rivers and streams in a valley bottom.

Anthropogenic

Resulting from or produced by human beings.

Arterials

Major streets or highways, many with multilane or freeway design, serving high-volume traffic corridor movements that connect major generators of travel. While they may provide access to abutting land, their primary function is to serve traffic moving through the area.

Atmosphere

The gaseous envelope surrounding the earth. The dry atmosphere consists almost entirely of nitrogen and oxygen, together with trace gases, including carbon dioxide and ozone.

Baseline/Reference

The baseline (or reference) is the state against which change is measured. It might be a "current baseline," in which case it represents observable, present-day conditions. It might also be a "future baseline," which is a projected future set of conditions, excluding the driving factor of interest. Alternative interpretations of the reference conditions can give rise to multiple baselines.

Basin

The drainage area of a stream, river, or lake.

Bus Rapid Transit (BRT)

A rapid mode of bus transportation that can combine the quality of rail transit and the flexibility of buses. There are a broad range of features that can be considered elements of a BRT system, including a dedicated bus-only right-of-way, bus lane reserved for buses on a major arterial road or freeway, on-line stops or stations (like light rail stations), other forms of giving buses priority in traffic, faster passenger boarding, faster fare collection, and a system image that is uniquely identifiable.

Carbon Cycle

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

Carbon Dioxide (CO_2)

A naturally occurring gas fixed by photosynthesis into organic matter. A by-product of fossil fuel combustion and *biomass* burning, it is also emitted from land use changes and other industrial processes. It is the principal *anthropogenic greenhouse gas* that affects the earth's radiative balance. It is the reference gas against which other greenhouse gases are measured, thus having a Global Warming Potential of one.

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. These quantities are most often surface variables such as temperature, precipitation, and wind. Climate in a wider sense is the state, including a statistical description, of the *climate system*. The classical period of time is 30 years, as defined by the World Meteorological Organization (WMO).

Climate Change

A change in the mean state or variability of the climate, whether due to natural variability or as a result of human activity, that persists for an extended period, typically decades or longer. This usage differs from that in the *United Nations Framework Convention on Climate Change (UNFCCC)*, which defines "climate change" as: "a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods." Also see *climate variability*.

(Climate Change) Impact Assessment

The practice of identifying and evaluating, in monetary and/or nonmonetary terms, the effects of climate change on natural and human systems.

(Climate Change) Impacts

The effects of climate change on natural and human systems. Depending on the consideration of adaptation, one can distinguish between potential impacts and residual impacts.

- **Potential Impacts –** All impacts that may occur given a projected change in climate, without considering adaptation.

- **Residual Impacts –** The impacts of climate change that would occur after adaptation. Also see *aggregate impacts*, *market impacts*, and *nonmarket impacts*.

Climate Model

A numerical representation of the climate system based on the physical, chemical, and biological properties of its components, their interactions and feedback processes, and accounting for all or some of its known properties. The climate system can be represented by models of varying complexity (i.e., for any one component or combination of components a hierarchy of models can be identified, differing in such aspects as the number of spatial dimensions, the extent to which physical, chemical, or biological processes are explicitly represented, or the level at which empirical parameterisations are involved. Coupled atmosphere/ocean/sea-ice General Circulation Models (*AOGCM or GCM*) provide a comprehensive representation of the climate system. More complex models include active chemistry and biology. Climate models are applied, as a research tool, to study and simulate the climate, but also for operational purposes, including monthly, seasonal, and interannual climate predictions.

Climate Prediction

A climate prediction or climate forecast is the result of an attempt to produce an estimate of the actual evolution of the climate in the future, e.g., at seasonal, interannual, or long-term time scales. Also see *climate projection* and *climate scenario*.

Climate Projection

The calculated response of the climate system to *emission* or concentration scenarios of *greenhouse gases* and *aerosols*, or *radiative forcing* scenarios, often based on simulations by climate models. Climate projections are distinguished from *climate predictions*, in that the former critically depend on the emission/concentration/radiative forcing scenario used, and therefore on highly uncertain assumptions of future socioeconomic and technological development.

Climate Scenario

A plausible and often simplified representation of the future *climate*, based on an internally consistent set of climatological relationships and assumptions of *radiative forcing*, typically constructed for explicit use as input to climate change impact models. A "climate change scenario" is the difference between a climate scenario and the current climate.

Climate System

The climate system is defined by the dynamics and interactions of five major components: atmosphere, hydrosphere, cryosphere, land surface, and biosphere. Climate system dynamics are driven by both internal and external forcing, such as volcanic eruptions, solar variations, or human-induced modifications to the planetary radiative balance, for instance via anthropogenic emissions of greenhouse gases and/or land use changes.

Climate Variability

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

Collectors

In urban areas, streets providing direct access to neighborhoods as well as direct access to arterials. In rural areas, routes serving intracounty, rather than statewide travel.

Commercial Service Airport

Airport that primarily accommodates scheduled passenger airline service.

Convection

Generally, transport of heat and moisture by the movement of a fluid. In meteorology, the term is used specifically to describe vertical transport of heat and moisture in the atmosphere, especially by updrafts and downdrafts in an unstable atmosphere. The terms "convection" and "thunderstorms" often are used interchangeably, although thunderstorms are only one form of convection.

Datum

A reference point or surface against which position measurements are made. A vertical datum is used for measuring the elevations of points on the earth's surface, while a horizontal datum is used to measure positions on the earth.

Downscaling

A method that derives local- to regional-scale (10 to 100 km) information from larger-scale models or data analyses.

Drought

The phenomenon that exists when precipitation is significantly below normal recorded levels, causing serious hydrological imbalances that often adversely affect land resources and production systems.

El Niño-Southern Oscillation (ENSO)

El Niño, in its original sense, is a warmwater current that periodically flows along the coast of Ecuador and Peru, disrupting the local fishery. This oceanic event is associated with a fluctuation of the intertropical surface pressure pattern and circulation in the Indian and Pacific Oceans, called the Southern Oscillation. This coupled atmosphere-ocean phenomenon is collectively known as El Niño-Southern Oscillation. During an El Niño event, the prevailing trade winds weaken and the equatorial countercurrent strengthens, causing warm surface waters in the Indonesian area to flow eastward to overlie the cold waters of the Peru current. This event has 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. The opposite of an El Niño event is called La Niña.

Emissions Scenario

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

Enplanements

The total number of passengers boarding an aircraft, including both originating and connecting passengers.

Ensemble

A group of parallel model simulations used for *climate projections*. Variation of the results across the ensemble members gives an estimate of uncertainty. Ensembles made with the same model but different initial conditions only characterise the uncertainty associated with internal climate variability, whereas multimodel ensembles, including simulations by several models also include the impact of model differences.

Erosion

The process of removal and transport of soil and rock by weathering, mass wasting, and the action of streams, glaciers, waves, winds, and underground water.

Evaporation

The transition process from liquid to gaseous state.

Evapotranspiration

The combined process of water *evaporation* from the earth's surface and *transpiration* from vegetation.

Exposure

The combination of stress associated with climate-related change (sea-level rise, changes in temperature, frequency of severe storms) and the probability, or likelihood, that this stress will affect transportation infrastructure.

Extreme Weather Event

An event that is rare within its statistical reference distribution at a particular place. Definitions of "rare" vary, but an extreme weather event would normally be as rare as or rarer than the 10^{th} or 90^{th} percentile. By definition, the characteristics of what is called "extreme weather" may vary from place to place. Extreme weather events may typically include floods and droughts.

Fixed-Route Bus Service

Service provided on a repetitive, fixed-schedule basis along a specific route with vehicles stopping to pick up and deliver passengers to specific locations; each fixed-route trip serves the same origins and destinations, unlike demand response and taxicabs.

Fixed Transit Guideway

A system of vehicles that can operate only on its own guideway constructed for that purpose (e.g., rapid rail, light rail). Federal usage in funding legislation also includes exclusive right-of-way bus operations, trolley coaches, and ferryboats as "fixed guideway" transit.

Freight Handling Facility

Marine facilities or terminals that handle freight. A given port or port area may contain multiple freight-handling facilities.

General Aviation Airport

Airport that primarily accommodates aircraft owned by private individuals and businesses.

General Circulation Model (GCM)

See *climate model*.

Greenhouse Effect

The process in which the absorption of infrared radiation by the atmosphere warms the earth. In common parlance, the term 'greenhouse effect' may be used to refer either to the natural greenhouse effect, due to naturally occurring greenhouse gases, or to the enhanced (anthropogenic) greenhouse effect, which results from gases emitted as a result of human activities.

Greenhouse Gas

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 infrared radiation emitted by the earth's surface, the atmosphere, and clouds. This property causes the *greenhouse effect*. Water vapor (H_2O), carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4), and ozone (O_3) are the primary greenhouse gases in the earth's atmosphere. Beside CO_2, N_2O, and CH_4, the *Kyoto Protocol* deals with the greenhouse gases sulfur hexaflouride (SF_6), hydrofluorocarbons (HFC), and perfluorocarbons (PFC).

Gross-Ton Mile

One ton of equipment or freight moved one mile.

Hazardous Liquid

Petroleum, petroleum products, liquefied natural gas (LNG), anhydrous ammonia, or a liquid that is flammable or toxic.

Humidity

Generally, a measure of the water vapor content of the air. Popularly, it is used synonymously with relative humidity.

Hurricane

A tropical cyclone in the Atlantic, Caribbean Sea, Gulf of Mexico, or eastern Pacific, in which the maximum one-minute sustained surface wind is 64 knots (74 mph) or greater.

Industrial Airport

Airports which can accommodate both commercial and privately owned aircraft, and are typically used by aircraft service centers, manufactures, and cargo companies, as well as general aviation aircraft.

Infrastructure

The basic equipment, utilities, productive enterprises, installations, and services essential for the development, operation, and growth of an organization, city, or nation.

Integrated Assessment

An interdisciplinary process of combining, interpreting, and communicating knowledge from diverse scientific disciplines so that all relevant aspects of a complex societal issue can be evaluated and considered for the benefit of decision-making.

Intermodal Connector

Highway providing access to intermodal facilities and designated as a National Highway System (NHS) Intermodal Connector.

Intermodal Passenger Terminal

A passenger terminal which accommodates several modes of transportation, such as inter-city rail service, intercity bus, commuter rail, intracity rail transit and bus transportation, airport limousine service and airline ticket offices, rent-a-car facilities, taxis, private parking, and other transportation services.

Intermodal Transportation

Use of more than one type of transportation; e.g., transporting a commodity by barge to an intermediate point and by truck to destination. Often specifically refers to the use of cargo containers that can be interchanged between transport modes, i.e., motor, water, and air carriers, and where the equipment is compatible within the multiple systems.

Interstate Highways

Limited access divided facility of at least four lanes designated by the Federal Highway Administration as part of the Interstate System, a system of freeways connecting and serving the principal cities of the continental United States.

Invasive Species

An introduced species that invades natural habitats.

Land Use

The total of human activities implemented in a certain land-cover type (a set of human actions). The social and economic purposes for which land is managed (e.g., grazing, timber extraction, conservation).

LIDAR (Light Detection and Ranging)

A remote sensing technology which determines the distance to an object or surface using laser pulses.

Linguistically Isolated Household

A household in which no person aged 14 and over speaks English at least "very well."

Local Road

Roads that provide access to private property or low-volume public facilities.

Long-Range Transportation Plan (LRTP)

A 20- to 30-year plan that provides a long-range vision of the future of the surface transportation system, considering all passenger and freight modes and their interrelationships. LRTPs are developed by MPOs as part of the Federally mandated planning process.

Metropolitan Planning Organization (MPO)

The forum for cooperative transportation decision-making for a metropolitan planning area. Formed in cooperation with the state, it develops transportation plans and programs for the metropolitan area. For each urbanized area, a metropolitan planning organization (MPO) must be designated by agreement between the Governor and local units of government representing 75 percent of the affected population (in the metropolitan area), including the central cities or cities as defined by the Bureau of the Census or in accordance with procedures established by applicable state or local law (23 U.S.C. 134(b)(1)/Federal Transit Act of 1991 Section 8(b)(1)).

Mitigation

An anthropogenic intervention to reduce the anthropogenic forcing of the climate system; it includes strategies to reduce *greenhouse gas sources* and emissions and enhancing *greenhouse gas* sinks.

Morphology

The form and structure of an organism or land form, or any of its parts.

Nonfreight Marine Facility

Marine facilities not used for transporting or handling freight. Includes unused berths; commercial fishing facilities; vessel construction, repair, and servicing facilities; marine construction services; etc.

Nonlinearity

A process is called "nonlinear" when there is no simple proportional relation between cause and effect.

Paratransit

Comparable transportation service required by the American Disabilities Act (ADA) for individuals with disabilities who are unable to use fixed-route transportation systems. Usually involves the use of demand-response systems, in which passengers or their agents contact a transit operator, who then dispatches a cars, vans, or bus to pick up the passengers up and transport them to their destinations (also called "Dial-a-Ride").

Partial Duration Series (PDS)

A series composed of all events during the period of record that exceed some set criterion, for example, all floods above a selected base, or all daily rainfalls greater than a specified amount.

Probability Density Function

A statistical function that shows how the density of possible observations in a population is distributed.

Projection

The potential evolution of a quality or set of quantities, often computed with the aid of a model. Projections are distinguished from predictions in order to emphasize that projections involve assumptions – concerning, for example, future socioeconomic and technological developments, that may or may not be realized – and are, therefore, subject to substantial uncertainty. Also see *climate projection* and *climate prediction*.

Radiative Forcing

Radiative forcing is the change in the net vertical irradiance (expressed in Watts per square metre (Wm^{-2})) at the tropopause due to an internal or external change in the forcing of the climate system, such as a change in the concentration of CO_2 or the output of the sun.

Relative Humidity

A dimensionless ratio, expressed in percent, of the amount of atmospheric moisture present relative to the amount that would be present if the air were saturated. Since the latter amount is dependent on temperature, relative humidity is a function of both moisture content and temperature. As such, relative humidity by itself does not directly indicate the actual amount of atmospheric moisture present.

Resilience

The capacity of a system to absorb disturbances and retain essential processes.

Runoff

That part of precipitation that does not evaporate and is not transpired.

Saffir-Simpson Scale

A scale from 1 to 5 that describes a hurricane's strength, where Category 1 is the weakest and Category 5 is the strongest hurricane. The categories are defined by wind speed. The scale of numbers is based on actual conditions at some time during the life of the storm; as the hurricane intensifies or weakens, the scale number is reassessed accordingly.

Scenario

A plausible and often simplified description of how the future may develop based on a coherent and internally consistent set of assumptions about driving forces and key relationships. Scenarios may be derived from projections, but are often based on additional information from other sources, sometimes combined with a "narrative storyline." Also see *climate scenario* and *emissions scenario* and *SRES.*

Sea-Level Rise

An increase in the mean level of the ocean. Eustatic sea-level rise is a change in global average sea level brought about by an increase in the volume of the world ocean. Relative sea-level rise occurs where there is a local increase in the level of the ocean relative to the land, which might be due to ocean rise and/or land-level subsidence. In areas subject to rapid land level uplift, relative sea-level can fall.

Sea Surface Temperature

The mean temperature of the ocean in the upper few meters.

Socioeconomic Scenarios

Scenarios concerning future conditions in terms of population, Gross Domestic Product, and other socioeconomic factors relevant to understanding the implications of climate change. Also see *SRES.*

Specific Humidity

In a system of moist air, the ratio of the mass of water vapor to the total mass of the system.

SRES

The storylines and associated population, GDP and emissions scenarios associated with the Special Report on Emissions Scenarios (SRES) (Nakićenović, 2000), and the resulting climate change and sea-level rise scenarios. Four families of socioeconomic scenario (A1, A2, B1, and B2) represent different world futures in two distinct dimensions: a focus on economic versus environmental concerns and global versus regional development patterns.

Storm Surge

An abnormal rise in sea-level accompanying a hurricane or other intense storm, whose height is the difference between the observed level of the sea surface and the level that would have occurred in the absence of the cyclone. Storm surge is usually estimated by subtracting the normal or astronomic tide from the observed storm tide.

Subsidence

A sinking down of part of the earth's crust, generally due to natural compaction of sediments or from underground excavation (such as the removal of groundwater).

Surface Runoff

The water that travels over the soil surface to the nearest surface stream; *runoff* of a drainage basin that has not passed beneath the surface since precipitation.

Thermal Expansion

In connection with *sea-level rise*, this refers to the increase in volume (and decrease in density) that results from warming water. A warming of the ocean leads to an expansion of the ocean volume and hence an increase in sea level.

Threshold

The level of magnitude of a system process at which sudden or rapid change occurs. A point or level at which new properties emerge in an ecological, economic, or other system, invalidating predictions based on mathematical relationships that apply at lower levels.

Transpiration

The evaporation of water vapor from the surfaces of leaves through stomates.

Transportation Improvement Program (TIP)

A prioritized program of transportation projects to be implemented in appropriate stages over several years (i.e., three to five years). The projects are recommended from those in the transportation systems management element and the long-range element of the planning process. This program is required as a condition for a locality to receive Federal transit and highway grants.

Tropical Storm

A tropical cyclone in which the maximum one-minute sustained surface wind ranges from 34 to 63 knots (39 to 73 mph) inclusive.

Uncertainty

An expression of the degree to which a value (e.g., the future state of the climate system) is unknown. Uncertainty can result from lack of information or from disagreement about what is known or even knowable. It may have many types of sources, from quantifiable errors in the data to ambiguously defined concepts or terminology, or uncertain projections of human behavior. Uncertainty can therefore be represented by quantitative measures (e.g., a range of values calculated by various models) or by qualitative statements (e.g., reflecting the judgment of a team of experts).

United Nations Framework Convention on Climate Change (UNFCCC)

The UNFCCC was adopted on May 9, 1992, in New York, and signed at the 1992 Earth Summit in Rio de Janeiro by more than 150 countries and the European Community. Its ultimate objective is the "stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system." It contains commitments for all Parties. Under the Convention, Parties included in Annex I aim to return greenhouse gas emissions not controlled by the Montreal Protocol to 1990 levels by the year 2000. The Convention entered in force in March 1994. Also see *Kyoto Protocol*.

Urbanisation

The conversion of land from a natural state or managed natural state (such as agriculture) to cities; a process driven by net rural-to-urban migration through which an increasing percentage of the population in any nation or region come to live in settlements that are defined as "urban centers."

Vehicle Miles of Travel (VMT)

A unit to measure vehicle travel made by a private vehicle, such as an automobile, van, pickup truck, or motorcycle. Each mile traveled is counted as one vehicle mile, regardless of the number of persons in the vehicle. Generally, vehicle miles of travel are reported on an annual basis for a large area.

Vulnerability

The structural strength and integrity of key facilities or systems and the resulting potential for damage and disruption in transportation services from climate change stressors.

References

American Meteorological Society, accessed 2007: *American Meteorological Society Glossary of Meteorology*. Washington, D.C. Accessible at http://amsglossary.allenpress.com/glossary.

Bureau of Transportation Statistics (BTS), accessed 2007: *BTS Dictionary*. U.S. Department of Transportation, Washington, D.C. Accessible at http://www.bts.gov/dictionary/index.xml.

IPCC, 2007: *Climate Change 2007: The Physical Science Basis, Summary for Policy-Makers*. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Geneva, Switzerland, 21 pages.

National Weather Service, accessed 2007: *National Weather Service Glossary*. National Oceanic and Atmospheric Administration, Silver Spring, Maryland. Accessible at http://www.weather.gov/glossary/.

USGS, accessed 2007: *USGS Geologic Glossary*. Reston, Virginia. Accessible at http://wrgis.wr.usgs.gov/docs/parks/misc/glossaryAtoC.html.