Global Warming Guaranteed
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Glossary

A **acclimatization** – the gradual adjustment of the body to new climatic or other environmental conditions, for example, the adjustment to low levels of oxygen at high altitudes.

air pressure – the cumulative force exerted on any surface by the molecules composing air.

albedo – the percentage of solar radiation that is reflected relative to the total incoming radiation.

altimeter – an instrument that indicates the altitude of an object above a fixed level. Pressure altimeters use an aneroid barometer with a scale graduated in altitude instead of pressure.

alkaline – a substance which, when added to water, decreases the hydrogen-ion concentration; a solution containing a base, a substance that combines with a hydrogen ion in solution.

anemometer – an instrument designed to measure wind speed.

anomalies – departures of temperature, precipitation, or other weather elements from long-term averages at a given location.

anthropogenic – generated by the actions of humans.

atmosphere – entire mass of gases surrounding the earth or other celestial bodies. Today's atmosphere is made up primarily of nitrogen (78%), free oxygen (21%) and greenhouse gases which can capture solar radiation: water vapor, which ranges from less than 1% in arid regions to over 3% in moist areas, carbon dioxide (0.035%) and methane (0.00018%).

B **baseline** – measurable quantities form which an alternative outcome can be measured.

C **calcium carbonate ($CaCO_3$)** – molecule consisting of calcium, carbon and oxygen; secreted by corals, forming their skeleton; it also secreted by mollusks (clams, oysters, etc.), forming their protective shells.

carbon cycle – the flow of carbon through the atmosphere, ocean, terrestrial and lithosphere.

carbon dioxide (CO_2) – naturally occurring gas; also by-product of burning fossil fuels. The principal anthropogenic greenhouse gas effecting climate change. Is essential for photosynthesis.

climate – accumulation of daily and seasonal weather events over a long period of time. A description of aggregate weather conditions; the sum of all statistical weather information that helps describe a region.

climate change – refers to the variation in the Earth's global climate or in regional climates over time. It describes changes in the variability of average state of the atmosphere (or average weather) over time scales ranging from decades to millions of years.

climatic feedback mechanisms – an enhancement (positive feedback) or a damping (negative feedback) of an initial change, in this case in the climate system. For example, when less energy reaches the earth, temperature decreases and the area covered by snow increases. The albedo of the planet increases, reflecting more solar energy back into space. Consequently less energy is absorbed at the surface, and temperature further decreases. The whole "cycle" from the initial cooling to the further cooling is a feedback. It is a positive feedback in this example.

climatology – quantitative description of climate showing the characteristic values of climate variables over a region. Climate refers to the statistical collection of weather conditions over a specified period of time. Note that the climate taken over different periods of time (30 years, 1000 years) may be different.

cloud cover – amount of the sky obscured by clouds when observed at a particular location.

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condensation – process by which water changes phase from a vapor to a liquid.

convection – motions in a fluid that result in the transport and mixing of the fluid's properties. In meteorology, convection usually refers to atmospheric motions that are predominantly vertical, such as rising air currents due to surface heating.

Coriolis effect – deflective force arising from the rotation of the earth on its axis; affects principally synoptic-scale and global-scale winds. Winds are deflected to the right of the initial direction in the Northern Hemisphere, and to the left in the Southern Hemisphere. The Coriolis effect, caused by the rotation of the Earth; is responsible for the direction of rotation of cyclones and ocean currents.

cryosphere - the component of he climate system consisting of all snow, ice and frozen ground on and beneath the surface of the Earth and ocean.

D **density** – the quantity of something per unit measure; mass per unit volume of a substance under specified conditions of pressure and temperature.

E **ecosystem** – relationships between and among living organisms and their non-living environment.

eddy – small volume of air (or any fluid) that behaves differently from the larger flow in which it exists.

emissions – pollutants released into the air or waterways from industrial processes, households or transportation vehicles. *Air emissions* pertain to atmospheric air pollution; *water emissions* refer to pollutants released into waterways.

El Niño – appearance of unusually warm waters in the eastern Pacific; termed the "Christ child," because of the time of year it effects the South American coastline. **ENSO** - acronym for El Niño Southern Oscillation. ENSO occurs when the easterly equatorial surface winds weaken, or reverse and the warm water in the western equatorial Pacific Ocean moves to the central and eastern Pacific Ocean. This flow is accompanied by heavy rainfall along the coast of Peru, California and Mexico.

evaporation – process by which a liquid changes into a gas.

evapotranspiration – vaporization of water through direct evaporation from wet surfaces and the release of water vapor by vegetation.

F **fossil fuels –** include coal, petroleum and natural gas.

G **general circulation models** – complex computer simulations of climate and its various components used by researchers and policy analysts to predict climate change. Typically run on “super computers,” these models can approximate future climates and give some clues to how climate has changed or might change over time.

glacier – river of ice (on land) that under pressure can deform and flow plastically. When glaciers melt, the water that results contributes to sea level rise (as opposed to icebergs, see below).

geologic time scale – relative time scale based on stratigraphic position and correlation, and many different types of chronologic evidence. Geologic time is broken down into eons, eras, periods and epochs.

global warming – an increase in the average temperature of the Earth’s atmosphere, great enough to cause changes in the global climate. This change occurs globally such as the interglacial warming period the earth experienced after the last Ice Age. The current increase is brought about by increased levels of greenhouse gases due to effects

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of human industry and agriculture. Expected long-term effects ae sea level rise, flooding, melting of polar ice and glaciers, fluctuations in temperature and precipitation, drought, heat waves and forest fires.

greenhouse effect – the progressive, gradual warming of the earth's atmospheric temperature, caused by the insulating effect of carbon dioxide and other greenhouse gases that have proportionately increased in the atmosphere. The sun's energy, mostly in the form of short-wavelength visible radiation, penetrates the atmosphere and is absorbed by the Earth's surface. The heated surface then radiates some to of the energy into the atmosphere in the form of longer-wavelength infrared radiation. Much of the radiation is absorbed by greenhouse gases in the lower atmosphere, which in turn radiates some of it back to earth. The greenhouse effect is essential to life on Earth; however, its intensification due to increased levels of greenhouse gases in the atmosphere is considered to be the main contributing factor to global warming.

greenhouse gases (GHG) – include the common gases of carbon dioxide and water vapor, but also rarer gases such as methane and chlorofluorocarbons (CFCs) whose properties relate to the transmission or reflection of different types of radiation. The increase in such gases in the atmosphere, which contributes to global warming, is a result of the burning of fossil fuels, the emissions of pollutants into the atmosphere, and deforestation. The greenhouse gases found in the atmosphere (including CO_2, H_2O, CH_4) that act to allow short wave radiation from the sun to reach the earth, but which absorbs outgoing long wave radiation from the earth surface.

H **haze** – fine dry or wet dust or salt particles dispersed through a portion of the atmosphere. Individually these are not visible, but cumulatively they will diminish visibility.

hydrologic cycle – movement of water between the oceans, ground surface and atmosphere by evaporation, precipitation and the activity of living organisms, as one of the mayor biogeochemical cycles.

I **iceberg** - a large floating mass of ice, detached from a glacier and carried out to sea. When an iceberg melts, it does not contribute to sea level rise (as opposed to glaciers, see above).

industrialized countries – characterized by relative political stability and long-term industrial success; they have achieved a higher level of economic and environmental sustainability than developing countries because of higher levels of capital and natural resources.

IPCC – the International Panel on Climate Change is a scientific intergovernmental body set up by the World Meteorological Organization (WMO) and by the United Nations Environment Programme (UNEP) to to provide the decision-makers and others interested in climate change with an objective source of information about climate change.

J **jet stream** – strong winds concentrated within a narrow zone in the atmosphere. Often used in reference to the axis of maximum mid-latitude westerlies located in the high troposphere.

Joint Implementation (JI), or *activities implemented jointly*, is a concept where industrialized countries meet their obligations for reducing their greenhouse gas emissions by receiving credits for investing in emissions reductions in developing countries. Proponents of joint implementation argue that such an international trade in emissions credits would achieve greenhouse gas reductions in industrialized countries at much lower costs while providing foreign investment benefits to developing countries.

K **The Kyoto Protocol** – an international agreement struck by 159 nations attending the Third Conference of Parties (COP-3) to the United Nations Framework Convention on Climate Change (held in December 1997 in Kyoto, Japan) to reduce worldwide emissions of greenhouse gases. Delegates to COP-3 agreed to the following specific provisions:

- *Developed Countries* -- Thirty-eight developed countries agreed to reduce their emissions of six greenhouse gases. Collectively, developed countries agreed to cut back their emissions by a total of 5.2 percent between 2008

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and 2012 from 1990 levels. The six gases include carbon dioxide, methane, nitrous oxide, and three ozone-damaging fluorocarbons not covered by the Montreal Protocol that banned global chlorofluorocarbons (hydrofluorocarbons, perfluorocarbons and sulfur hexafluoride). The European Union agreed to reduce their emissions by 8 percent below 1990 levels; the United States signed on to a 7 percent reduction; and Japan agreed to a 6 percent reduction. Some countries, including Russia and Ukraine, are not bound to make any reductions while countries with smaller economies such as Iceland, Norway and New Zealand are allowed to actually increase their emissions. Australia was also allowed to increase greenhouse gas emissions.
• *Countries with Economies in Transition* -- Countries undergoing the process of transition to a market economy but that are also classified along with the EU, Japan and the U.S. as Annex I parties to the Convention – including the Czech Republic, Hungary, and Poland, among others - face smaller reductions.
• *Developing Countries* -- Countries which are in the process of becoming industrialized but have constrained resources with which to combat their environmental problems -- which include China and India -- have no formal binding targets, but have the option to set voluntary reduction targets.

L **longwave radiation** – term most often used to describe the infrared energy emitted by the earth and the atmosphere.

loess – wind-deposited sediment consisting mostly of silt, the silt commonly derived from finely ground rock washed out of continental glaciers.

M **marine climate** – climate dominated by the ocean, because of the moderating effect of water, sites having this climate are considered relatively mild.

meltwater plume - fresh water derived from the melting of glacial ice that floats in large bodies of salt water.

meteorology – the study of the atmosphere and atmospheric phenomena as well as the atmosphere's interaction with the earth's surface, oceans, and life in general.

N **natural climate record** – record of climatic events found by examining the natural environment (tree rings, coral growth bands, layers of ice in glaciers).

nitrogen dioxide (NO_2) – a form of air pollution that is a brownish gas produced when nitric oxide emitted from power plants combines with oxygen already in the atmosphere. It can damage trees and lead to acid rain, which can harm lakes and streams and also corrode exposed materials. In the presence of sunlight and volatile organic compounds, NO_2 can contribute to the formation of ground-level ozone, or smog.

O **oxidation** – relative loss of electrons in a chemical reaction; usually associated with the liberation of energy.

Ozone (O_3)- at the ground level is a form of air pollution that is produced when nitrogen oxides and hydrocarbons react in sunlight. It is not to be confused with stratospheric ozone, which is found 9 to 18 miles high in the Earth's atmosphere and protects people from harmful radiation from the sun. Ground-level ozone pollution, or smog, is mainly a problem during hot summer days.

P **Pacific Decadal Oscillation (PDO)** – a long lived El Niño like pattern of Pacific climate variability. In the 20th Century the PDO events persisted for 20 – 30 years while ENSO events last 6 – 18 month.

particulate matter (PM) – a form of air pollution that includes soot, dust, dirt and aerosols. It has readily apparent effects on visibility and exposed surfaces, and can create or intensify breathing and heart problems and lead to cancer and premature death.

paleoclimate – past or ancient (paleo-) climates.

paleoenvironmental proxy – environmental remnant of the past (pollen grains, tree rings, lake sediments, pack rat

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middens, ice cores, coral skeletons) that assist researchers in deciphering past climate conditions through the use of scientifically proven dating techniques.

permafrost – layer of soil beneath the earth's surface that remains frozen throughout the year.

pH – measure of acidity of any solution. Water has a pH of 7. Acidic solutions <7, basic solutions >7. pH is measured in a logarithmic scale with a 10 fold increase for each unit.

precipitation – any form of water particles-liquid or solid-that falls from the atmosphere and reaches the ground.

prevailing wind – wind direction most frequently observed during a given period.

proxy signals – A general term for paleoclimate evidence that can be used to indirectly infer or estimate some aspect of the environment such as precipitation or temperature.

R

radar – an instrument useful for remote sensing of meteorological phenomena; operates by sending radio waves and monitoring returning wave by such reflecting objects as raindrops within clouds.

reflection – process whereby a surface turns back a portion of the radiation that strikes it.

refraction - bending of light as it passes from one medium to another.

relative dating – dating methods that determine time with respect to stratigraphic position, for example deeper layers being older, or with respect to some changing quantity or property, such as magnetic polarity.

relative humidity – the ratio of the amount of water vapor actually in the air compared to the amount of water vapor the air can hold at the particular temperature and pressure. The ratio of the air's actual vapor pressure to its saturation vapor pressure.

renewable resources – energy sources that do not use exhaustible fuels. Sources of renewable energy include water, wind, solar energy and geothermal energy, as well as some combustible materials, such as landfill gas, biomass, and municipal solid waste.

S

salinity – a measure of the quantity of dissolved salts in ocean water. About 90% of that salt is sodium chloride. The other major dissolved salts in sea water are chlorine, sodium, magnesium sulfur and potassium. Ocean water is about 3.5% or 35 ppt salt.

satellite – remote sensing is the collection of data on land use, industrial activity, weather, climate, geology and other processes through Earth observations from satellites in outer space.

sea level rise – is the long term increase in the mean sea level resulting from a combination of local or regional geological movements and global climate change, such as sinking of the land, increased volume of the ocean due to thermal expansion, or addition of water to the ocean from melting glaciers.

sea surface temperature (sst) – temperature of the ocean's surface used in collaboration with other data to predict an El Nino occurrence.

sink - process, activity or mechanism which removes greenhouse gas from the atmosphere.

smog – originally meant a mixture of smoke and fog. Today, smog means air that has restricted visibility due to pollution, or pollution formed in the presence of sunlight-photochemical smog.

solar variability – changes in the sun's radiation due to the sun's internal dynamics.

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Southern Oscillation (ENSO) – shifting of pressure zones in the Pacific during an El Nino event. (see **El Nino**)

stakeholder – person or organization that has a legitimate interest in a project or policy.

storm surge – abnormal rise of the sea along a shore; primarily due to the winds of a storm, especially a hurricane.

sublimation – process whereby ice changes directly into water vapor without melting. In meteorology, sublimation can also mean the transformation of water vapor into ice.

sulfur dioxide (SO2) – a form of air pollution that is a gas. It results from the combustion of fuels that contain sulfur. SO2 is most prevalent in the combustion of coal.

symbiosis – relationship between two organisms in which one or both of the organisms benefit from the other.

T **teleconnection** – ripples of change that occur far away from the source; wildfires in the Australian Outback and flooding in the Peruvian Andes are teleconnections caused by El Niño.

thermal – small, rising parcel of warm air produced when the earth's surface is heated unevenly.

thermal expansion – refers to the increase in volume that results from the warming of water.

thermocline – a layer within a body of water or air where the temperature changes rapidly with depth.

thermohaline circulation (THC) – density-driven circulation system for the world's oceans. Seawater density depends on both temperature and salinity. The salinity and temperature difference arise from heating/cooling at the sea surface and from surface freshwater fluxes (evaporation and sea ice formation increase salinity; precipitation, runoff and ice-melt decrease salinity). Once dense enough, the water sinks into the deep ocean, forming a downward limb of a giant conveyor-like circulation that extends around the world's oceans.

trade winds – winds that occupy most of the tropics and blow from the subtropical highs to the equatorial low; blow from the northeast to the equator in the Northern Hemisphere and from the southeast to the equator in the Southern Hemisphere.

transpiration – release of water vapor to the atmosphere by plants.

U **ultraviolet radiation** – electromagnetic radiation with wave-lengths longer than X-rays but shorter than visible light.

upwelling – the upward motion of sub-surface seawater toward the surface of the ocean. This is often a source of cold, nutrient-rich water. Strong upwelling occurs along the equator where easterly winds are present. Upwelling also can occur along coastlines, and is important to fisheries in California and Peru.

V **visibility** – greatest distance an observer can see and identify prominent objects.

visible light – visible portion of the electromagnetic spectrum from 0.4 to 0.7 μm wavelengths.

W **weather** – specific condition of the atmosphere at a particular place and time. It is measured in terms of temperature, barometric pressure, precipitation and wind speed and direction. Weather can change from hour to hour, day to day and season to season.

wind shear – difference in wind speed or direction between two wind currents in the atmosphere.