Glossary of Climate Change Terms

Bruce Parker – November 22, 2013

Selected terms taken from http://www.epa.gov/climatechange/glossary.html. Additional terms have been added, and these are in *italics* and footnoted where appropriate

2°C (3.6°F)

The globally agreed upon temperature increase target beyond which the risks of "dangerous" consequences of global warming escalate. It is very likely that this "target" will be exceeded this century

If climate change exceeds the temperature target, scientists warn, there is a greater risk that the world's ice sheets will be destabilized, leading to sharply rising seas, and increasing climate extremes such as droughts, heat waves and floods, which could pose daunting challenges for food and water availability for growing populations. In less likely worst-case scenarios, feedback loops within the climate system could disrupt ocean currents.[6]

350PPM

Accelerating arctic warming and other early climate impacts have led scientists to conclude that we are already above the safe zone at our current 400ppm, and that unless we are able to rapidly return to below 350 ppm this century, we risk reaching tipping points and irreversible impacts such as the melting of the Greenland ice sheet and major methane releases from increased permafrost melt.[7]

Adaptation

Adjustment or preparation of natural or human systems to a new or changing environment which moderates harm or exploits beneficial opportunities.

Aerosols

Small particles or liquid droplets in the atmosphere that can absorb or reflect sunlight depending on their composition.

Albedo

Albedo is the fraction of solar energy (shortwave radiation) reflected from the Earth back into space. It is a measure of the reflectivity of the earth's surface. Ice, especially with snow on top of it, has a high albedo: most sunlight hitting the surface bounces back towards space. Water is much more absorbent and less reflective. So, if there is a lot of water, more solar radiation is absorbed by the ocean than when ice dominates. Albedo is not important at high latitudes in winter: there is hardly any incoming sunlight to worry about. It becomes important in spring and summer when the radiation entering through leads can greatly increase the melt rate of the sea ice. [4]

Earth's overall average albedo is about 0.31. Oceans and forests are quite dark, while deserts are lighter, and clouds, snow, and ice are very bright. Without clouds our planet's albedo would be around 0.15, so clouds roughly double Earth's albedo.[5]

Black Carbon

Carbon Budget
The amount of CO2 that the atmosphere can hold to provide a 66% chance that the increase of the Earth's average temperature can be kept below 2°C (3.6°F). An estimate for this budget is 800 million tons of carbon. As we have emitted about 530 billion tons so far, we would ideally limit remaining emissions to 270 billion tons of carbon.

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 of years. The classical period is 3 decades, as defined by the World Meteorological Organization (WMO). 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.

Climate Change
Climate change refers to any significant change in the measures of climate lasting for an extended period of time. In other words, climate change includes major changes in temperature, precipitation, or wind patterns, among others, that occur over several decades or longer. *In a broader sense, sea level rise and ocean acidification are often included when considering "climate change" effects on the Earth.*

Climate Feedback
A process that acts to amplify or reduce direct warming or cooling effects.

Climate Sensitivity
Climate scientists generally use the metric "climate sensitivity" to specify how much the Earth would likely warm if the atmospheric CO2 were doubled instantaneously. In general use, "climate sensitivity" includes only "fast feedbacks" such as that caused by water vapor. The term "earth system climate sensitivity" includes slower feed backs such albedo changes (due to the heat absorbed by ice-free oceans, the retreating snowline, and darkening of the tundra, release of greenhouse gases from melting permafrost, etc.)

Without any CO2 in the atmosphere the Earth will freeze over ("snowball Earth") and the Earth's average temperature would be about 60°F colder than today. And with a very large concentration of CO2 the temperature would be high enough to melt all of the ice.

Decarbonization[1]

Decarbonization denotes the declining average carbon intensity of primary energy over time. Although decarbonization of the world's energy system is comparatively slow (0.3% per year), the trend has persisted throughout the past two centuries (Nakicenovic, 1996).

Energy imbalance
The difference between the energy received from the sun and the energy reflected and emitted by the earth. The imbalance must be zero over geologic time but can be significant when greenhouse gases are being added to the atmosphere

Forcing Mechanism
A process that alters the energy balance of the climate system, i.e. changes the relative balance between incoming solar radiation and outgoing infrared radiation from Earth. Such mechanisms include changes in solar irradiance, volcanic eruptions, and enhancement of the natural greenhouse effect by emissions of greenhouse gases

Geoengineering
Geoengineering is the application of planetary engineering techniques to Earth. Recent geoengineering proposals have principally been methods to tackle human-induced climate change by either removing carbon dioxide from the atmosphere (e.g. using ocean iron fertilization) or by managing solar radiation (e.g. by using mirrors in space) in order to negate the net warming effect of climate change. [2]

Global Warming
The recent and ongoing global average increase in temperature near the Earth's surface.

Global Warming Potential
A measure of the total energy that a gas absorbs over a particular period of time (usually 100 years), compared to carbon dioxide.

Greenhouse Effect
Trapping and build-up of heat in the atmosphere (troposphere) near the Earth's surface. Some of the heat flowing back toward space from the Earth's surface is absorbed by water vapor, carbon dioxide, ozone, and several other gases in the atmosphere and then reradiated back toward the Earth's surface. If the atmospheric concentrations of these greenhouse gases rise, the average temperature of the lower atmosphere will gradually increase.

Greenhouse Gas (GHG)
Any gas that absorbs infrared radiation in the atmosphere. Greenhouse gases include: carbon dioxide, methane, nitrous oxide, ozone, chlorofluorocarbons, hydrochlorofluorocarbons, hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride.

Mitigation
A human intervention to reduce the human impact on the climate system; it includes strategies to reduce greenhouse gas sources and emissions and enhancing greenhouse gas sinks.

Ocean Acidification
Increased concentrations of carbon dioxide in sea water causing a measurable increase in acidity (i.e., a reduction in ocean pH). This may lead to reduced calcification rates of calcifying organisms such as corals, mollusks, algae and crustaceans.

Radiative Forcing
A measure of the influence of a particular factor (e.g. greenhouse gas (GHG), aerosol, or land use change) on the net change in the Earths energy balance.

Residence Time
The average time spent in a reservoir by an individual atom or molecule. With respect to greenhouse gases, residence time refers to how long on average a particular molecule remains in the atmosphere.

Sea Level Rise
Sea levels have been rising for three reasons – thermal expansion of the water, the melting of glaciers, and land subsidence.

Social Cost of Carbon
The social cost of carbon (SCC) is the marginal cost of emitting one extra tonne of carbon (as carbon dioxide) at any point in time. To calculate the SCC, the atmospheric residence time of carbon dioxide must be estimated, along with an estimate of the impacts of climate change. The impact of the extra tonne of carbon dioxide in the atmosphere must then be converted to the equivalent impacts when the tonne of carbon dioxide was emitted. In economics, comparing impacts over time requires a discount rate. This rate determines the weight placed on impacts occurring at different times. [B]

Sulfate Aerosols
Particulate matter that consists of compounds of sulfur formed by the interaction of sulfur dioxide and sulfur trioxide with other compounds in the atmosphere.. Sulfate aerosols are injected into the atmosphere from the combustion of fossil fuels and the eruption of volcanoes like Mt. Pinatubo. Sulfate aerosols can lower the Earth's temperature by reflecting away solar radiation (negative radiative forcing).

Weather
Atmospheric condition at any given time or place. It is measured in terms of such things as wind, temperature, humidity, atmospheric pressure, cloudiness, and precipitation. 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.

Footnotes - sources

1. http://www.ipcc.ch/publications_and_data/ar4/wg3/en/ch3s3-4-1.html
2. *Geoengineering the Climate: Science, Governance, and Uncertainty*. London: The Royal Society. 2009. ISBN 978-0-85403-773-5.
3. http://encyclopedia.thefreedictionary.com/Social+cost+of+carbon
4. http://www.esr.org/outreach/glossary/albedo.html
5. http://www.windows2universe.org/earth/climate/sun_radiation_at_earth.html
6. http://www.huffingtonpost.com/2013/10/04/carbon-budget-ipcc_n_4045946.html
7. http://350.org/about/science