



Glossary of Terms for Greenhouse Gas Mitigation Opportunity Information Sheets (#s 1-7)

- Adaptation:** Management changes to reduce risk and/or realize opportunities presented by climate change.
- Additional/additionality:** Additionality is a concept from international greenhouse gas (GHG) project accounting principles that requires that a project activity would not have occurred in the absence of a market for GHG emission reductions. Projects are additional by setting a performance standard that project activities reduce GHGs significantly more than standard practice in an industry and are not driven by regulatory, profitability, or other requirements.
- Aerobic:** Having oxygen in the system (for example in the case of manure management, an actively mixed compost aerates the solids). See also Anaerobic.
- Afforestation:** Planting trees on land that hasn't been forested for at least 50 years (does not include tree growth after tree harvest of forest land). Afforestation is a subset of reforestation.
- Afforestation and reforestation:** Human-induced conversion of non-forest land through planting, seeding, or human promotion of natural seed sources. Afforestation differs from reforestation only in that the former applies to land that has not been forested for at least 50 years, whereas the latter applies to land that was not forested in 1990. (Afforestation is a subset of reforestation using these definitions.) Both could qualify for carbon offset credits in compliance and voluntary carbon markets.
- Aggregator:** Often a single farm or entity is unable to amass a sufficient quantity of carbon offsets (also called carbon credits) to merit a saleable trade. For example, on the Chicago Climate Exchange (CCX), carbon credits sell in 100-ton units. Often a middleman, or *aggregator*, is necessary to collect different farms' credits. An aggregator is a person, firm, or entity that collects credits from several individuals through contracts to sell in 100-ton units to a buyer.
- Ammonia Fiber Expansion (AFEX™):** Ammonia Fiber Expansion uses anhydrous ammonia in a controlled temperature and pressure reaction to break down plant cell walls, and then enzymes are added to break apart the sugars.
- Anaerobic:** Lacking free oxygen in the system in the system (like liquid manure storage that is not mixed or stirred regularly, not aerated). See also Aerobic.
- Anaerobic Digester Systems (ADS):** engineered systems that regulate temperature, pH, and retention time to promote a synergistic relationship between bacteria, including methanogens, to produce more methane from manure with the intention of producing renewable energy from the biogas.
- Anhydrous Ammonia:** A widely used but highly explosive form of nitrogen fertilizer composed of one part nitrogen and three parts hydrogen (NH₃) where anhydrous refers to 'without water'.
- Anthropogenic:** Derived from human activity.
- Avoided deforestation:** An action that results in forest not being cleared, when the absence of that action would have led to clearing. Note that if a forest is clear cut (completely harvested) but immediately regenerates as forest this is not considered deforestation. Deforestation means that forest land becomes some type of non-forest land.

Baseline: The emissions that would occur without policy intervention (in a business-as-usual scenario). Baseline estimates are needed to determine effectiveness of emissions reduction programs (often called mitigation strategies).

Best Management Practices (BMPs): Policies, practices, procedures, or structures implemented to control non-point source pollution.

Biomass Energy: Energy produced by combusting renewable biomass materials such as wood. The carbon dioxide emitted from burning biomass will not increase total atmospheric carbon dioxide if this consumption is done on a sustainable basis (i.e. if in a given period of time, regrowth of biomass takes up as much carbon dioxide as is released from biomass combustion).

Biochar: A solid dark-colored charcoal-like material produced by means of pyrolysis (a thermochemical process) in a low oxygen environment.

Cap and Trade: A Cap and Trade system is a market-based regulatory system in which a government entity caps the total emissions from a group of sources (typically of some type of air pollutant). Each source is given or allowed to purchase a number of allowances with the total number of allowances issued being equal to the cap. The number of allowances issued declines each regulatory period/year. The sources are permitted to trade among themselves. Those that have made deeper reductions can sell their allowances to other sources that have made fewer reductions. In some Cap and Trade systems, the sources are also allowed to purchase reductions that are made by projects in unregulated sources outside of the system (for example, see Carbon offset).

Carbon Credit: See **Carbon offset**.

Carbon Cycle: The global exchange of carbon among its reservoirs (also called pools or sinks) such as the atmosphere, oceans, vegetation, soils and geologic deposits.

Carbon Dioxide (CO₂): The dominant greenhouse gas (GHG). It is emitted primarily from fossil fuel combustion, but also occurs by other processes such as decomposition of soil organic matter, wildfires, and deforestation.

Carbon Dioxide Equivalents (CO₂e): The common unit of greenhouse gas accounting – the effect of other gases such as methane and nitrous oxide is expressed in terms of CO₂e (see also **Global Warming Potential**). CO₂e signifies the amount of CO₂ that would have the **equivalent** global warming impact.

Carbon Financial Instrument (CFI): a tradeable unit of carbon dioxide equivalents (CO₂e).

Carbon offset: A financial instrument, measured in units of CO₂ equivalents, that is used by an entity (individuals, companies, or governments) to meet required or voluntary greenhouse-gas (GHG) reductions through actions not directly linked with the actions of that entity. All offsets must meet five criteria: real, additional, verifiable, permanent, and enforceable. Some forest management activities qualify as carbon offset projects under various emission control agreements. See also **Offset**.

Carbon Online Estimator (COLE): A computer-based tool, developed by the USDA Forest Service that uses FIA data to estimate forest carbon stocks for a user-specified location.

Carbon sequestration means the storage of carbon in a biological or geological sink. Geological sinks include fossil fuels that haven't been mined or artificial sinks such as landfills and processes that inject compressed CO₂ into underground rock bodies. Biological sinks are soil, trees, wetlands, and the ocean. For carbon sequestration to have a meaningful impact on the atmosphere it is necessary to ensure that the carbon remains sequestered and is not

released back into the atmosphere. For example, years of carbon built up and stored in soils can be released back into the atmosphere from just one instance of tillage.

Climate Change: refers to all forms of climatic inconsistency but because the Earth's climate is never static, the term is more properly used to imply a significant change from one climatic condition to another. During recent decades, human-induced (anthropogenic) climate change has occurred much faster than most previous natural climate changes.

Comprehensive Nutrient Management Plans (CNMPs): Conservation plans unique to livestock operations. These plans document practices and strategies adopted by livestock operations to address natural resource concerns related to soil erosion, livestock manure and disposal of organic by-products.

Concentrated Animal Feeding Operation (CAFO): Animal feeding operation that (a) confines animals for more than 45 days during a growing season, (b) is in an area without vegetation, and (c) meets certain size thresholds.

Contract: A contract is a legal document that is defined as “an agreement between two or more competent parties in which an offer is made and accepted, and each party benefits.” While a contract can be as informal as an oral agreement or “meeting of the minds,” it is recommended that a formally written contract be used for carbon offsets and signed by all parties. Every contract has risks that must be evaluated carefully to protect the rights of each party.

Denitrification: The loss or removal of nitrogen or nitrogen compounds; specifically, reduction of nitrates or nitrites commonly by bacteria in soil that usually results in the volatilization of nitrogen gases into the air.

Direct energy: Fuel and electricity consumption are direct energy inputs to a farm, versus indirect energy consumed in the production and transport of feed and fertilizer used on the farm.

Exchange: An Exchange, like the New York Stock Exchange, is a business where commodities are bought, sold or traded.

Exclusivity: Arrangement in which the seller agrees with a purchaser not to market the commodity to any other party (to prevent double counting).

Externality: by-products (both positive and negative) of activities that affect the well-being of people or damage to the environment that are not reflected in market prices.

Forest inventory and analysis (FIA) of USDA Forest Service: Periodic census of all forest lands in the US (one plot represents 6000 acres), provides a broad-scale assessment of forest conditions. These census data cover several decades, varying among geographic regions.

Fossil Fuel Displacement: Engaging in an activity that reduces the amount of fossil fuel combusted for energy. Displacement of fossil fuels reduces the amount of buried (fossil) carbon released into the atmosphere either by the use of renewable carbon-neutral energy technologies or by increased efficiency. These absolute emission reductions are considered tradable on some markets.

Global Warming: An increase in the near surface temperature of the Earth. Global warming has occurred in the distant past as the result of natural influences, but the term is most often used to refer to the warming now occurring as a result of increased emissions of greenhouse gases due to human activity. See also Climate Change.

Global Warming Potential (GWP): The potency of a gas to contribute to global warming is referred to as a Global Warming Potential (GWP). The common unit is referred to as a

carbon dioxide equivalent or CO_{2e}. Methane and nitrous oxide are 34 and 298 times more potent than CO₂, respectively, over a 100-year period. To convert tons of methane to CO_{2e}, simply multiply by 34. To convert tons Nitrous Oxide to CO_{2e} multiply by 298.

Greenhouse Effect: The effect produced as greenhouse gases allow incoming solar radiation to pass through the Earth's atmosphere, but prevent most of the outgoing infra-red radiation from the surface and lower atmosphere from escaping into outer space. This process occurs naturally and has kept the Earth's temperature about 59 degrees F warmer than it would otherwise be. Current life on Earth could not be sustained without the natural greenhouse effect. Since the advent of the industrial revolution, humans have increased greenhouse gases in the atmosphere and increased the greenhouse effect, see global warming.

Greenhouse Gas (GHG): Any gas that causes atmospheric warming by absorbing infrared radiation in the atmosphere (common greenhouse gases include water vapor, carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), halogenated fluorocarbons (HCFCs), ozone (O₃), perfluorinated carbons (PFCs) and hydrofluorocarbons (HFCs).

Greenhouse Gas Destruction: refers to a situation where a greenhouse gas is chemically changed so that it no longer has the same impact on warming the atmosphere. Methane is a common agricultural gas with a global warming potential (GWP) that is 34 times more effective at retaining heat in the atmosphere than carbon dioxide. Combustion of methane (oxidizes CH₄ into CO₂ + H₂O), destroys the GWP associated with CH₄. Since CH₄ is an energy source, if this biogas is burned for energy, it can displace fossil fuels.

Haylage: Silage made from grass that has been partially dried.

Intergovernmental Panel on Climate Change (IPCC): The IPCC is an international body that was established by the [United Nations Environment Programme \(UNEP\)](#) and the [World Meteorological Organization \(WMO\)](#) in 1988 to provide decision-makers and others interested in climate change with an objective source of information about climate change. The US is a member of the IPCC. The IPCC does not conduct any research nor does it monitor climate related data or parameters. Its role is to assess on a comprehensive, objective, open and transparent basis the latest scientific, technical, and socio-economic literature produced worldwide relevant to the understanding of the risk of human-induced climate change. The IPCC summarizes the latest scientific, technical, and socio-economic information related to human-induced climate change, its observed and projected impacts, and options for adaptation and mitigation.

Kyoto Protocol: is an international protocol with the objective of reducing greenhouse gases that cause climate change. It was agreed on December 11, 1997 and entered into force on February 16, 2005. The United States has not ratified the treaty.

Leakage: When an emissions reduction strategy in one location creates an increase of emissions in another location. Leakage can occur across country borders, or across industry products but results in no net greenhouse gas mitigation benefit. For example, leakage can occur for avoided deforestation carbon offset projects if there has been no concurrent reduction in demand for wood products (A lumber company may place 1,000 acres of forest into conservation without harvest to sequester carbon, but another lumber company increases production by unsustainably harvesting a different 1,000 acres to meet the market demand for lumber.).

Lifetime (Atmospheric): The lifetime of a greenhouse gas refers to the average amount of time that a gas molecule stays in the atmosphere. The time depends on the gas's sources and sinks as well as its reactivity.

Market Based Incentives: Market-based instruments or incentives are policies that use markets, price, and other economic variables to provide incentives for polluters to reduce or eliminate negative environmental externalities. For example, they are intended to change the relative prices of different types of energy services to overcome market barriers for adopting renewable energy.

Methane (CH₄): A potent greenhouse gas that has a Global Warming Potential (GWP) of 34 on a 100-year time scale. It is formed in a variety of ways (cow rumen, liquid manure storage, wetlands, rice fields, etc.). When combusted, methane is oxidized to CO₂, a much less potent GHG.

Methane Destruction: Combustion destroys methane by turning it into CO₂ and water. Because methane has a GWP of 34, methane destruction decreases its GHG impact 34-fold. A covered earthen manure storage unit that flares biogas is an example of methane destruction.

Methanogen: bacteria that thrive in anaerobic conditions and produce methane.

Metric Ton: common international measurement for the quantity of greenhouse gas emissions. A metric ton is equal to 1 Megagram (Mg) or 2,205 lbs (1.1 short tons).

Mitigation: In general terms mitigation refers to the elimination or reduction of the severity of exposure to risks, or minimization of the potential impact of a threat or risk. Mitigation in the context of Climate Change refers to efforts that reduce the amount of greenhouse gases (GHG) in the atmosphere by reducing emissions (e.g. Increased energy efficiency, See IS#4), minimizing GHG potency (e.g. flare methane to reduce its GWP, See IS#2), or sequestering GHG (e.g. photosynthetic capture and storage of atmospheric CO₂ in long-lived wood products, See IS#7).

Nitrogen (N): an element essential to plant and animal growth. Nitrogen is found in many forms on the farm, including nitrate, ammonia, nitrous oxide (N₂O), and other N-species.

Nitrous oxide (N₂O): A potent greenhouse gas that has a global warming potential (GWP) of 298 on a 100-year time scale (meaning that it is 298 times more potent than CO₂ as a GHG). It is produced when N is present in wet agricultural fields or more aerobic manure storage systems (and inhibited in anaerobic conditions).

Offset: Offsets are **greenhouse gas** reductions achieved by non-regulated parties. Agricultural offsets are environmental attributes that may be monetized; offsets are commodities defined by rules and contracts according to adoption of practices that have been demonstrated to reduce greenhouse gas emissions.

Precursor: Something that comes before something else, usually related to each other. In chemistry, a precursor is a compound that participates in a chemical reaction that produces another compound. Nitrogen compounds are precursors for N₂O.

RECs or Renewable Energy Certificates: also called green tags, are tradable units of renewable electricity generated that can be used to fulfill an obligation to a renewable energy generation as required in Renewable Portfolio Standards (RPS).

Regional Greenhouse Gas Initiative (RGGI): An agreement made by 10 Northeastern States to cap emissions of greenhouse gases from electricity generation using a cap-and-trade program. This agreement offers very restricted opportunities for offsets that differ among States.

Registry: A Registry is an accounting system that registers projects, designates serial numbers to individual projects, tracks carbon-credit trading and ultimately retires the credits when they are used for emission reductions. A Registry may be affiliated with an exchange but it is not itself an exchange.

Retire: When offsets are used to meet caps or goals of greenhouse gas (GHG) mitigation, they are ‘retired’ and can no longer be traded because they have been used to offset some quantity of GHG emissions.

RPS/ Renewable Portfolio Standard: A regulation that requires the increased production of renewable energy sources such as wind, solar, biomass energies.

Sequestration: capture and storage of carbon in a biological (e.g. a forest) or geological sink (e.g. injecting or pumping CO₂ into an underground body of rock, or burying materials in a landfill).

Short Ton: common measurement for a ton in the United States. A short ton is equal to 2,000 lbs or 0.907 metric tons.

Soil Organic Carbon (SOC): Carbon occurs in many forms in soil, organic carbon is carbon that is not in a mineral form (such as limestone or calcium carbonate). See also **Soil Organic Matter.**

Soil Organic Matter (SOM): Organic matter in soil includes soil carbon along with other elements such as oxygen. SOM contains about 58% SOC i.e., roughly half of the organic matter is carbon, although the exact percentage varies among soils and among depths in the same soil.

Sustainable Forest Management: A management regime designed to maintain the productive and long-term health of a forest ecosystems for current and future generations.

Volatile Solids (VS): are a more biologically available form of carbon that methanogens can convert to methane.

Weather versus Climate: Weather describes atmospheric conditions for a specific place and time (often short-term, like a day), while climate is the average of those weather conditions over long periods of time.

Whole Farm Planning: Planning for the entire farm, as distinct from planning just one operation or aspect of the farm.