NWL GHG INVENTORY DEFINITIONS

Note: Red text includes recommended additions by Stakeholder Advisory Committee; Blue text includes recommended additions by Technical Teams. Black text are definitions from California GHG inventory glossary – with some modifications. Other sources of definitions may be found here.[1]

Activity Data
Data on the magnitude of a human activity resulting in emissions or removals taking place during a given period of time. Data on energy use, land areas, management systems, lime and fertilizer use and waste arisings are examples of activity data. (IPCC)

Adaptation
The process of modifying and adjusting to a new or changing environment. (OWEB)

Additionality
Additionality represents the greenhouse gas (GHG) removals or reductions that occur in addition to what would otherwise occur in a business-as-usual (BAU) scenario. Additionality can mean adding a new practice that would not have occurred normally but may also mean discontinuing/excluding practices already implemented on the property.

Afforestation
Planting of new forests on lands that historically have not contained forests. (IPCC2)

Air Pollutant
Any man-made and/or natural substance occurring in the atmosphere that are likely to directly result in adverse human health outcomes, or to the degradation of natural ecosystems. (CARB)

Anthropogenic
The term "anthropogenic", in the context of greenhouse gas inventories, refers to greenhouse gas emissions and removals that are a direct result of human activities or are the result of natural processes that have been affected by human activities. (USEPA2)

Atmosphere
The gaseous envelope surrounding the Earth. The dry atmosphere consists almost entirely of nitrogen (78.1% volume mixing ratio) and oxygen (20.9% volume mixing ratio), together with a

[1] Glossary — IPCC; Glossary of Climate Change Terms | Climate Change | US EPA; Glossary | National Institute of Food and Agriculture (usda.gov)

number of trace gases, such as argon (0.93% volume mixing ratio), helium and radiatively active greenhouse gases such as carbon dioxide (0.035% volume mixing ratio) and ozone. In addition, the atmosphere contains the greenhouse gas water vapor, whose amounts are highly variable but typically around 1% volume mixing ratio. The atmosphere also contains clouds and aerosols. (IPCC2)

Acceptable Uncertainty

A determined interval around a measured value such that any repetition of the measurement will produce a new result that lies within this interval.

Baseline Scenario

A baseline is a measurement, calculation, or time used as a basis for comparison to current conditions. Baseline estimates are needed to determine the effectiveness of emission reduction programs (also called mitigation strategies). (See base year definition below.)

Base Year

The starting year for the inventory. Targets for reducing GHG emissions are often defined in relation to the base year.

Biomass

Either (1) the total mass of living organisms in a given area or of a given species usually expressed as dry weight; or (2) Organic matter consisting of or recently derived from living organisms (especially regarded as fuel) excluding peat. Includes products, by-products and waste derived from such material. (IPCC1)

Blue Carbon

Carbon stored in coastal and marine ecosystems including estuarine wetlands, such as scrub shrub and forested tidal wetlands, tidal marshes, submerged aquatic vegetation (eelgrass, kelp) and tidal mudflats (TNC).

Carbon Cycle

All parts (reservoirs) and fluxes of carbon. The cycle is usually thought of as four main reservoirs of natural carbon interconnected by pathways of exchange. The reservoirs are the atmosphere, terrestrial biosphere (usually includes freshwater systems), oceans, and sediments (includes fossil fuels). In addition, a fully closed-loop cycle included a fifth reservoir of natural carbon sequestered in biomass and stored in the built environment or landfilled. The annual movements of carbon, the carbon exchanges between reservoirs, occur because of various chemical, physical, geological, and biological processes. The ocean contains the largest pool of

carbon near the surface of the Earth, but most of that pool is not involved with rapid exchange with the atmosphere. (NASA)

Carbon Dioxide (CO_2)
A naturally occurring gas the principal anthropogenic greenhouse gas that affects the Earth's radiative balance. It is the reference gas against which other greenhouse gases are measured and therefore has a Global Warming Potential of 1. (IPCC2)

Carbon Dioxide Equivalent (CO_2e)
A metric used to compare emissions of various greenhouse gases. It is the mass of carbon dioxide that would produce the same estimated radiative forcing as a given mass of another greenhouse gas. Carbon dioxide equivalents are computed by multiplying the mass of the gas emitted by its global warming potential.

Carbon Equivalent (CE)
A metric measure used to compare the emissions of the different greenhouse gases based upon their global warming potential. Carbon equivalents can be calculated from to carbon dioxide equivalents by multiplying the carbon dioxide equivalents by 12/44 (the ratio of the molecular weight of carbon to that of carbon dioxide). The use of carbon equivalent is declining in GHG inventories.

Carbon Pool
A component of the climate system that has the capacity to store, accumulate, or release carbon.

Carbon Sequestration, Capture, and Storage
Carbon sequestration is the process of capturing and storing atmospheric carbon dioxide (USGS). Carbon capture is the process of trapping carbon dioxide produced by burning fossil fuels or other chemical or biological processes. Carbon storage is the storage of carbon in plants, soils, geological formations, and the ocean.

- **Biological Carbon Sequestration:** The removal of carbon from the atmosphere by plants and microorganisms and storage of carbon dioxide in vegetation such as grasslands or forests, as well as in soils and oceans.
- **Terrestrial Carbon Sequestration**
  The process through which carbon dioxide (CO_2) from the atmosphere is absorbed by trees, plants and crops through photosynthesis, and stored as carbon in biomass (tree trunks, branches, foliage and roots) and soils. The term "sinks" is also used to refer to forests, croplands, and grazing lands, and their ability to sequester carbon. Agriculture

and forestry activities can also release CO_2 to the atmosphere. Therefore, a carbon sink occurs when carbon sequestration is greater than carbon releases over some time period. (USEPA3)

- **Soil Carbon Sequestration** The storage of atmospheric carbon dioxide in soil pools.
- **Geological Carbon Capture:** The removal of carbon dioxide from the atmosphere and injected into porous rocks for long-term storage.
- **Technological Carbon Capture:** The removal of carbon dioxide from the atmosphere using other innovative technologies.

Carbon Stock

Total absolute mass of carbon in a sample of known volume. Typically reported as volume per unit area.

Climate smart[2]

The consideration of climate change in natural resource management, realized through adopting forward-looking goals and explicitly linking strategies to key climate impacts and vulnerabilities.[3] It entails anticipating and actively managing for uncertain yet plausible future climate conditions. The challenge is to manage for acceptable outcomes, with uncertainty clearly in mind, AND/OR the intentional consideration of climate change, and application of strategies that improve resilience, increase carbon sequestration, and/or reduce greenhouse gas emissions or otherwise confer a net climate benefit.[4]

- **Climate-smart agriculture and forestry (CSAF) practices**[5]**:**
  Activities that sequester (store) carbon, reduce greenhouse gas emissions, increase the net climate benefits of closed-loop carbon systems improve on-farm energy efficiency,

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[2] Sydoriak, C. 2022 Adapting to Climate Change: An Introduction to the Climate-Smart Conservation Approach. https://socan.eco/wp-content/uploads/2021/08/20220528_Intro-to-climate-smart-adaptation.pdf.

[3] Glick, P., B.A. Stein, and K.R. Hall. 2021. Toward a Shared Understanding of Climate-Smart. https://www.nwf.org/ClimateSmartRestoration.

Stein, B.A., P. Glick, N. Edelson, and A. Staudt (eds.) (2014). Climate-Smart Conservation: Putting Adaptation Principles into Practice. https://www.nwf.org/ClimateSmartGuide.

[4] OWEB's climate resolution

[5] Examples of practices from USDA NRCS: Full list of practices acknowledged by USDA as having GHG reduction benefit: Climate-Smart Agriculture and Forestry (CSAF) Mitigation Activities List [1] FY2023 (usda.gov), Landing page shows the following categories of practices: NRCS Climate-Smart Mitigation Activities | Natural Resources Conservation Service (usda.gov); Climate-smart agriculture: United Nations: Climate-Smart Agriculture | Food and Agriculture Organization of the United Nations (fao.org), World Bank: Climate-Smart Agriculture (worldbank.org), California: CDFA - Office of Environmental Farming & Innovation (OEFI) (ca.gov) CDFA's Climate Smart Agriculture (CSA) programs include the Healthy Soils Program (HSP), the State Water Efficiency and Enhancement Program (SWEEP) and the Alternative Manure Management Program (AMMP) and Dairy Digester Research and Development Program (DDRDP)

and/or improve agricultural and forest management to increase climate adaptation, resilience, and health AND/OR refers to agriculture that sustainably increases productivity, enhances resilience, reduces/removes greenhouse gasses where possible, and enhances achievement of national food security and development goals.[6]

Climate Mitigation

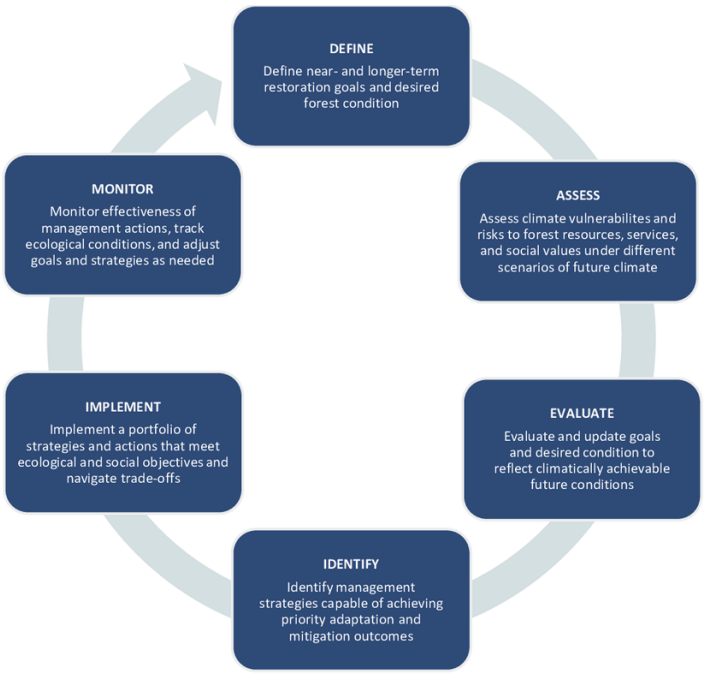
A human intervention to reduce or avoid emissions or enhance greenhouse gas sequestration and storage.[7]

Climate resilience

The capability to anticipate, prepare for, respond to and recover from significant climate-related threats with minimum damage to social well-being, the economy and the environment.[8]

Climate-smart planning cycle

An adaptive planning framework that emphasizes the need to clearly define and articulate restoration goals and objectives, to understand how current and future climatic conditions may affect resources and the services they provide, and to re-evaluate and update goals that may be climate-compromised and unachievable under projected future conditions.[9]



Consistency

Consistency means that an inventory should be internally consistent in all its elements over a period of years. An inventory is consistent if the same methodologies are used for the base and all subsequent years and if consistent data sets are used to estimate emissions or removals from sources or sinks. (IPCC)

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[6] Source: https://usnature4climate.org/term-categories/agricultural/

[7] Ibid.

[8] Legislative concept for Natural and Working Lands Bill Oregon 2023 legislative session

[9] Glick et al. 2021

Cover crop
A plant that is used primarily to slow erosion, improve soil health, enhance water availability, smother weeds, help control pests and diseases, and increase biodiversity.[10]

Deforestation
Those practices or processes that result in the change of forested lands to non-forest uses. This is often cited as one of the major causes of the enhanced greenhouse effect for two reasons: the burning or decomposition of the wood releases carbon dioxide; and trees that once removed carbon dioxide from the atmosphere in the process of photosynthesis are no longer present and contributing to carbon storage. (UNFCC)

Durability
The expected duration of carbon storage in a carbon pool; can also be expressed as the risk of reversal/loss of carbon storage due to anthropogenic or natural disturbances. Related to *Permanence*.

Emissions
The release of various gases, either from natural or anthropogenic sources, that results in increased atmospheric GHGs (e.g., carbon dioxide [CO2], methane [CH4], nitrous oxide [N2O]).

- **Scope one emissions:** A company's direct emissions from owned or controlled sources.
- **Scope two emissions:** A company's indirect emissions associated with purchase of power, heat, steam or cooling.
- **Scope three emissions:** A company's indirect emissions that occur in their value chain, including both upstream and downstream emissions.

Emission Factor
A coefficient that quantifies the emissions or removals of a gas per unit activity. Emission factors are often based on a sample of measurement data, averaged to develop a representative rate of emission for a given activity level under a given set of operating conditions. (IPCC)

Emission Inventory
An estimate of the amount of pollutants emitted into the atmosphere from major mobile, stationary, area-wide, and natural source categories over a specific period of time such as a day or a year. (CARB)

[10] https://www.sare.org/resources/cover-crops/

Emission Rate
The weight of a pollutant emitted per unit of time (e.g., tons / year). (CARB)

Environmental Justice
Equal protection from environmental and health hazards and meaningful public participation in decisions that affect the environment in which people live, work, learn, practice spirituality and play[11].

Environmental justice communities
Communities of color, communities experiencing lower incomes, tribal communities, rural communities, communities with limited infrastructure, and other communities traditionally underrepresented in public processes and adversely harmed by environmental and health hazards, including seniors, youth and persons with disabilities.[12]

Estimation
The assessment of the value of an unmeasurable quantity using available data and knowledge within stated computational formulas or mathematical models.

Flux
The rate of flow of any liquid or gas, across a given area; the amount of this crossing a given area in a given time. (IPCC)

Forest Regeneration
The act of renewing tree cover by establishing young trees, naturally or artificially. (CSU)

Global warming potential
The global warming potential of a gas refers to the total contribution to global warming over a defined time frame resulting from the emission of one unit of that gas relative to one unit of the reference gas, carbon dioxide, which is assigned a value of one.

Greenhouse Gas
Any gas that absorbs infrared radiation in the atmosphere. Greenhouse gases include, but are not limited to, water vapor, carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrochlorofluorocarbons (HCFCs), ozone (O_3), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6). (UNFCC)

[11] https://olis.oregonlegislature.gov/liz/2021R1/Downloads/MeasureDocument/HB2021/Enrolled
[12] Ibid.

Greenhouse Gas Inventory

Greenhouse Gas Inventory is a process that accounts for all human-caused emissions and removals of greenhouse gases (GHG) associated with a specific entity (e.g., a country, a company). The inventory essentially acts as a climate change balance sheet, tracking the total volume of GHG emitted from sources like fossil fuel consumption and agricultural production alongside the volume of GHG removed by sequestration in plants and soils or through technological means. (WRI/USCA)

Greenhouse Gas Flux

The change in storage of greenhouse gas emissions from one time point to the next.

Inorganic Carbon

Carbon derived from mineral matter (e.g., minerals, rocks, and non-biological sediment processes).

Intercropping

The practice of growing two or more crops in close proximity: in the same row or bed, or in rows or strips that are close enough for biological interaction. Mixed cropping, companion planting, relay cropping, interseeding, overseeding, underseeding, smother cropping, planting polycultures, and using living mulch are all forms of intercropping (SARE).

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). 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, or other properties of the climate system and may thus have a radiative forcing and/or other impacts on climate, locally or globally. (IPCC2)

Leakage

Increased emissions outside of project boundaries as a result of project activities that are intended to reduce or remove GHG emissions (e.g., if net carbon sequestration results in lower productivity, expansion of land under agricultural production may result, increasing emissions and representing leakage).

LULUCF/ AFOLU
IPCC-defined sector referring to Agriculture, Forestry, and Other Land Use (IPCC2).

Measurement, Reporting and Verification
A system or protocol for tracking specific methods and outcomes, transparently communicating specific information, and validating that the information is accurate and complete. Often abbreviated as MRV.

Methane (CH_4)
A hydrocarbon that is a greenhouse gas with a global warming potential most recently estimated at 25 times that of carbon dioxide (CO_2). Methane is produced through anaerobic (without oxygen) decomposition of waste in landfills, flooded rice fields, animal digestion, decomposition of animal wastes, production and distribution of natural gas and petroleum, coal production, and incomplete fossil fuel combustion. The GWP is from the IPCC's Fourth Assessment Report (AR4).

Metric Ton
The tonne (t) or metric ton, sometimes referred to as a metric tonne, is an international unit of mass. A metric ton is equal to a Megagram (Mg), 1000 kilograms, 2204.6 pounds, or 1.1023 short tons.

Million Metric Tons (MMT)
Common measurement used in GHG inventories. It is equal to one Teragram (Tg).

Model
A model is a quantitatively-based abstraction of a real-world situation which may simplify or neglect certain features to better focus on its more important elements. (IPCC)

Natural and Working Lands (NWL)

(a) Lands:

(A) Actively used by an agricultural owner or operator for an agricultural operation, including but not limited to active engagement in farming or ranching;

(B) Producing forest products;

(C) Consisting of forests, woodlands, grasslands, sagebrush steppes, deserts, freshwater and riparian systems, wetlands, coastal and estuarine areas or the submerged and submersible lands within Oregon's territorial sea and marine habitats associated with those lands;

(D) Used for recreational purposes, including, but not limited to, parks, trails, greenbelts and other similar open space lands; or

(E) Consisting of trees, other vegetation and soils in urban and near-urban areas, including, but not limited to, urban watersheds, street trees, park trees, residential trees and riparian habitats; and

(b) Lands described in paragraph (a) of this subsection that are:

(A) Held in trust by the United States for the benefit of any of the nine federally recognized Indian tribes in this state;

(B) Held in trust by the United States for the benefit of individual members of any of the nine federally recognized Indian tribes in this state;

(C) Within the boundaries of the reservation of any of the nine federally recognized Indian tribes in this state; or

(D) Otherwise owned or controlled by any of the nine federally recognized Indian tribes in this state.[13]

Natural climate solution

An activity that enhances or protects the ability of natural and working lands to sequester and store carbon, or reduces greenhouse gas emissions from natural and working lands, while maintaining or increasing climate resilience, human well-being and biodiversity.[14]

Natural Lands Conservation

Avoided loss of natural ecosystem functions from both deliberate and unintended but anticipated conversion and degradation.

Natural Sources

Non-manmade emission sources, including biological and geological sources, wildfires, and windblown dust. (CARB)

Nature-based Solutions

Actions to protect, sustainably use, manage and restore natural or modified ecosystems, which address societal challenges, effectively and adaptively, providing human well-being and biodiversity benefits".[15]

[13] SB 530 (Natural Climate Solutions Bill) Oregon 2023 legislative session

[14] SB 530 (Natural Climate Solutions Bill) Oregon 2023 legislative session

[15] IUCN Global Standard for Nature-based Solutions™ page 2

Net-Zero
A target of completely negating the amount of greenhouse gases produced by human activity, to be achieved by reducing emissions and implementing methods of absorbing carbon dioxide from the atmosphere (net0.com).

Nitrogen Fixation
Conversion of atmospheric nitrogen gas into forms useful to plants and other organisms by lightning, bacteria, and blue-green algae; it is part of the nitrogen cycle. (UNFCC)

Nitrogen Oxides (NO_x)
Gases consisting of one molecule of nitrogen and varying numbers of oxygen molecules. Nitrogen oxides are produced in the emissions of vehicle exhausts and from power stations. In the atmosphere, nitrogen oxides can contribute to formation of photochemical ozone (smog), can impair visibility, and have health consequences; they are thus considered pollutants. (NASA)

Nitrous Oxide (N_2O)
A powerful greenhouse gas with a global warming potential of 298 times that of carbon dioxide (CO_2). Major sources of nitrous oxide include soil cultivation practices, especially the use of commercial and organic fertilizers, manure management, fossil fuel combustion, nitric acid production, and biomass burning. (AR4)

Permanence
In the context of land-based carbon offset projects, permanence is a condition in which carbon emissions that are reduced or removed from the atmosphere remain out of the atmosphere long-term. (Verra)

- **Carbon Market Permanence:** A requirement in many carbon markets that any issued carbon credits in that market represent long-term reductions in emissions or removals that are durable (i.e., that measures are in place to mitigate the risk that the reduction or removal may be reversed).
- **Ecosystem Permanence:** Evaluates to what degree the health of the ecosystem can be self-sustained under human and environmental pressures, including climate change, pollution and natural disasters. Indicators include non-native species (weeds), climate change adaptation, soil sealing, and many others. (Dendra)

Photosynthesis
The process by which plants take carbon dioxide from the air (or bicarbonate in water) to build carbohydrates, releasing oxygen in the process. There are several pathways of photosynthesis

with different responses to atmospheric carbon dioxide concentrations. (IPCC2)

Protection – Natural Lands
Vegetative communities that have been protected from development through acquisition or regulatory mechanisms and are managed for conservation purposes.

Radiative Forcing
A change in the balance between incoming solar radiation and outgoing infrared (i.e., thermal) radiation. Without any radiative forcing, solar radiation coming to the Earth would continue to be approximately equal to the infrared radiation emitted from the Earth. The addition of greenhouse gases to the atmosphere traps an increased fraction of the infrared radiation, reradiating it back toward the surface of the Earth and thereby creates a warming influence. (UNFCC)

Reforestation
Planting of forests on lands that have previously contained forests but that have been converted to some other use. (IPCC2)

Regenerative Agriculture
Holistic farming systems that, among other benefits, improve water and air quality, enhance ecosystem biodiversity, produce nutrient-dense food, and store carbon to help mitigate the effects of climate change. These farm systems are designed to work in harmony with nature, while also maintaining and improving economic viability. The top five principles include: minimizing soil disturbance, keeping soil covered, increasing plant diversity, keeping living roots in the soil and integrating animals into the farm.[16]

Resilience
The ability to prepare for, respond to, and recover from disruptions.[17]

Respiration
The process whereby living organisms convert organic matter to carbon dioxide, releasing energy and consuming molecular oxygen. (IPCC2)

Restoration – Natural Lands
The process of returning the land to health using scientific knowledge and recognized techniques to create an ecosystem that supports a diversity of native plants and animals. The

[16] Regenerative Agriculture - Chesapeake Bay Foundation (cbf.org)
[17] OWEB's climate resolution

goal of natural lands restoration is to return a degraded ecosystem to its historic trajectory. (SER)

Reversal
A loss in carbon that was previously sequestered, due to clearing, weather or management practices. Reversal risk is directly related to permanence.

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. (USEPA1)

Sink
Any process, activity or mechanism that removes a greenhouse gas, an aerosol or a precursor of a greenhouse gas or aerosol from the atmosphere in an amount that exceeds the rate of greenhouse gas respiration or release from the process, activity, or mechanism. (IPCC2)

Soil Health
The continued capacity of soil to function as a vital living ecosystem that sustains plants, animals, and humans.[18]

Source
Any process, activity or mechanism that releases a greenhouse gas, an aerosol or a precursor of a greenhouse gas or aerosol into the atmosphere. (IPCC2)

Sustainable Agriculture
Seeks to sustain farmers, resources and communities by promoting farming practices and methods that are profitable, environmentally sound and good for communities.[19]

Total Carbon
Sum of organic and inorganic carbon (e.g., total soil carbon is the sum of soil organic carbon and soil inorganic carbon).

Tidal wetland restoration
Reestablishing complex structure and natural processes in degraded or converted tidal wetlands including full tidal flooding, sediment delivery and retention, recruitment of plant

[18] NRCS
[19] SARE

propagules leading to the establishment of native plant communities, nutrient processing, water quality maintenance, carbon sequestration and other ecosystem services.

Tidal wetlands
Coastal wetlands subject to regular or irregular tidal flooding by saline, brackish or fresh water (e.g., mudflats, seagrass beds, emergent marshes, scrub-shrub tidal wetlands, and forested tidal wetlands).

Tidal wetland conservation
Avoided loss of tidal wetlands (mudflats, eelgrass beds, emergent marshes, scrub-shrub tidal wetlands, and forested tidal wetlands) from both deliberate (e.g., wetland fills) and unintended but anticipated (e.g., sea level rise) conversion and degradation.

Total Organic Gases (TOG)
Gaseous organic compounds, including reactive organic gases and the relatively unreactive organic gases such as methane. (CARB)

Transparency
Transparency means that the assumptions and methodologies used for an inventory should be clearly explained to facilitate replication and assessment of the inventory by users of the reported information. The transparency of inventories is fundamental to the success of the process for the communication and consideration of information. (IPCC)

Trend
The trend of a quantity measures its change over a time period, with a positive trend value indicating growth in the quantity, and a negative value indicating a decrease. It is defined as the ratio of the change in the quantity over the time period, divided by the initial value of the quantity, and is usually expressed either as a percentage or a fraction. (IPCC)

Verification
The process whereby an accredited third-party verifier examines or reviews a proposed carbon sequestration or storage project, including the methodology and attendant emission reduction or removal calculations, to ensure that the proposed practices are actually occurring at a specified location according to project specifications and that greenhouse gas stocks and fluxes are being properly accounted for.