ANNEX A

GLOSSARY

ABOVEGROUND BIOMASS

All living biomass above the soil including stem, stump, branches, bark, seeds, and foliage.

Note: In cases where forest understorey is a relatively small component of the aboveground biomass carbon pool, it is acceptable for the methodologies and associated data used in some tiers to exclude it, provided the tiers are used in a consistent manner throughout the inventory time series as specified in Chapter 5.

ABSOLUTE ERROR

Maximum tolerable error which is defined as an actual range independent of the value of the variable being estimated.

ACTIVITY

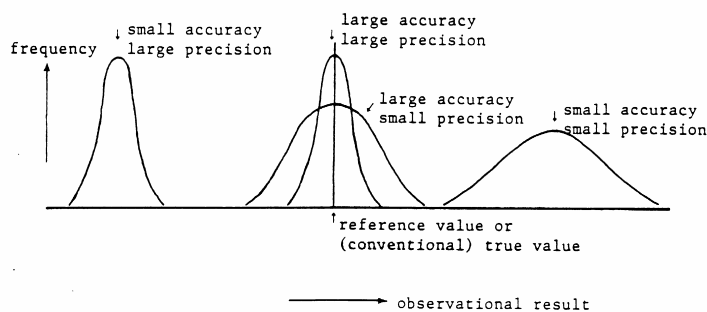A practice or ensemble of practices that take place on a delineated area over a given period of time.

ACCOUNTING

The rules for comparing emissions and removals as reported with commitments.

ACCURACY

Inventory definition: Accuracy is a relative measure of the exactness of an emission or removal estimate. Estimates should be accurate in the sense that they are systematically neither over nor under true emissions or removals, so far as can be judged, and that uncertainties are reduced so far as is practicable. Appropriate methodologies conforming to guidance on *good practices* should be used to promote accuracy in inventories. (FCCC/SBSTA/1999/6/Add. 1)

Statistical definition: Accuracy is a general term which describes the degree to which an estimate of a quantity is unaffected by bias due to systematic error. It should be distinguished from precision as illustrated below.

ACTIVITY DATA

Inventory definition: Data on the magnitude of human activity resulting in emissions or removals taking place during a given period of time.

In the LULUCF sector, data on land areas, management systems, lime and fertilizer use are examples of activity data.

AFFORESTATION[1]

The direct human-induced conversion of land that has not been forested for a period of at least 50 years to forested land through planting, seeding and/or the human-induced promotion of natural seed sources.

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[1] In the context of the Kyoto Protocol, as stipulated by the Marrakesh Accords, cf. paragraph 1 of the Annex to draft decision -/CMP.1 (Land use, land-use change and forestry) contained in document FCCC/CP/2001/13/Add.1, p.58.

ANTHROPOGENIC

Man-made, resulting from human activities. In the *IPCC Guidelines*, anthropogenic emissions are distinguished from natural emissions. Many of the greenhouse gases are also emitted naturally. It is only the man-made increments over natural emissions which may be perturbing natural balances.

In this *LULUCF-GPG*, all emissions and removals of managed lands are seen as anthropogenic.

ARITHMETIC MEAN

Statistical definition: The sum of the values divided by the number of values.

BASIC WOOD DENSITY

Ratio between oven dry mass and fresh stem-wood volume without bark. It allows the calculation of woody biomass in dry matter mass.

BELOWGROUND BIOMASS

All living biomass of live roots. Fine roots of less than (suggested) 2mm diameter are sometimes excluded because these often cannot be distinguished empirically from soil organic matter or litter.

BIAS

Inventory definition: A systematic error of the observation method, whose value in most cases is unknown. It can be introduced by using measuring equipment that is improperly calibrated, by selecting items from a wrong population or by favouring certain elements of a population, etc.

BIOMASS

Organic material both aboveground and belowground, and both living and dead, e.g., trees, crops, grasses, tree litter, roots etc. Biomass includes the pool definition for above - and below - ground biomass.

BIOMASS ACCUMULATION RATES

Net build up of biomass, i.e., all increments minus all losses. When carbon accumulation rate is used, only one further conversion step is applied: i.e., the use of 50% carbon content in dry matter (default value).

The biomass accumulation rates can be calculated using Equation 3.2.4 in Chapter 3 of this report.

BIOMASS EXPANSION FACTOR (BEF)

A multiplication factor that expands growing stock, or commercial round-wood harvest volume, or growing stock volume increment data, to account for non-merchantable biomass components such as branches, foliage, and non-commercial trees.

BACK-CASTING

The opposite of forecasting. Predicting conditions in the past from current conditions.

BOREAL

See *polar/boreal*.

BOTTOM-UP MODELLING

A modelling approach which starts from processes at a detailed scale (i.e., plot/stand/ecosystems scale) and provides results at a larger, aggregated scale (regional/national/continental/global).

BURNING/FIRE COMPLETENESS

The share of the total amount of biomass in a given unit or area which burns in a fire. Often used in combination with combustion efficiency.

CANOPY COVER

The percentage of the ground covered by a vertical projection of the outermost perimeter of the natural spread of the foliage of plants. Cannot exceed 100%. (Also called crown closure)

Same as *crown cover*.

CARBON ACCUMULATION RATES

See *biomass accumulation rates*.

CARBON BUDGET

The balance of the exchanges of carbon between carbon pools or between one specific loops (e.g., atmosphere – biosphere) of the carbon cycle. The examination of the budget of a pool or reservoir will provide information whether it is acting as a source or a sink.

CARBON CYCLE

All parts (pools) and fluxes of carbon; usually thought of as a series of the four main pools of carbon interconnected by pathways of exchange. The four pools are atmosphere, biosphere, oceans and sediments. Carbon exchanges from pool to pool by chemical, physical and biological processes.

CARBON FLUX

Transfer of carbon from one pool to another in units of measurement of mass per unit of area and time (e.g., tonnes C ha^{-1} yr^{-1}).

CARBON POOL

The reservoir containing carbon.

CARBON RESERVE

Prefer to use carbon stock. See *carbon stock*.

CARBON STOCK

The quantity of carbon in a pool.

CARBON STOCK CHANGE

The carbon stock in a pool can change due to the difference between additions of carbon and losses of carbon. When the losses are larger than the additions, the carbon stock becomes smaller, and thus the pool acts as a source to the atmosphere; when the losses are smaller than the additions, the pools acts as a sink to the atmosphere.

CLOSED FORESTS

Forests characterised by canopy cover higher than 40%.

CARBON DIOXIDE EQUIVALENT

A measure used to compare different greenhouse gases based on their global warming potentials (GWPs). The GWPs are calculated as the ratio of the radiative forcing of one kilogramme greenhouse gas emitted to the atmosphere to that from one kilogramme CO_2 over a period of time (usually 100 years).

CENSUS

Data collected by interrogation of (human) population. Usually the total population of interest is interviewed (but sometimes sampled).

CHRONOSEQUENCE

Chronosequences consist of measurements taken from similar but separate locations that represent a temporal sequence in land use or management, for example, years since deforestation. Efforts are made to control all other between-site differences (e.g., by selecting areas with similar soil type, topography, previous vegetation). Chronosequences are often used as a surrogate for experimental studies or measurements repeated over time at the same location.

COEFFICIENT OF VARIATION

Statistical definition: The coefficient of variation, v_x is the ratio of the population standard deviation, σ_x, and mean, μ_x, where $v_x = \sigma_x / \mu_x$. It also frequently refers to the sample coefficient of variation, which is the ratio of the sample standard deviation and sample mean.[2]

COMBUSTION EFFICIENCY

The fraction of the combusted carbon that is released in the form of CO_2.

COMMERCIAL HARVEST

See *fellings*.

COMPARABILITY

Inventory definition: Comparability means that estimates of emissions and removals reported by Parties in inventories should be comparable among Parties. For this purpose, Parties should use the methodologies and formats agreed by the Conference of the Parties (COP) for estimating and reporting inventories.

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[2] 'Coefficient of variation' is the term, which is frequently replaced by 'error' in a statement like 'the error is 5%'.

COMPLETENESS

Inventory definition: Completeness means that an inventory covers all sources and sinks for the full geographic coverage, as well as all gases included in *the IPCC Guidelines* in addition to other existing relevant source/sink categories which are specific to individual Parties (and therefore may not be included in the *IPCC Guidelines*).

CONFIDENCE

Inventory definition: The term 'confidence' is used to represent trust in a measurement or estimate. Having confidence in inventory estimates does not make those estimates more accurate or precise; however, it will eventually help to establish a consensus regarding whether the data can be applied to solve a problem. This usage of confidence differs substantially from the statistical usage in the term confidence interval.

CONFIDENCE INTERVAL

Statistical definition: A confidence interval is the range in which it is believed that the true value of a quantity lies. The level of belief is expressed by the probability, whose value is related to the size of the interval. It is one of the ways in which uncertainty can be expressed (see *estimation*, statistical definition).

In practice a confidence interval is defined by a probability value, say 95%, and confidence limits on either side of the mean value x. In this case the confidence limits L_1 and L_2 would be calculated from the probability density function such that there was a 95% chance of the true value of the quantity being estimated by x lying between L_1 and L_2. Commonly L_1 and L_2 are the 2.5 percentile and 97.5 percentile respectively.

Example: 'An emission is between 90 and 100 kt with a probability of 95%.' Such a statement can be provided when the confidence interval is calculated (the numerical values in this example are arbitrarily chosen).

CONFUSION MATRIX

The conventional technique that establishes a matrix showing, for any given classification of land, the probability of misclassification by one of the other candidate classifications.

CONSISTENCY

Inventory definition: 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 year and all subsequent years and if consistent data sets are used to estimate emissions or removals from sources or sinks. Under certain circumstances referred to in paragraphs 10 and 11 of FCCC/SBSTA/1999/6/Add.1, an inventory using different methodologies for different years can be considered to be consistent if it has been recalculated in a transparent manner taking into account any *good practices*.

Statistical definition: A statistical estimator for a parameter is said to be consistent, if the estimator tends towards the parameter as the size of the sample used for the estimator increases – i.e., precision is improved by an increasing number of observations.

CONVERSION

Change of one land use to another.

CORRELATION

Statistical definition: Mutual dependence between two quantities. See *correlation coefficient*.

CORRELATION COEFFICIENT

Statistical definition: A number lying between –1 and +1, which measures the mutual dependence between two variables which are observed together. A value of +1 means that the variables have a perfect direct straight line relation; a value of –1 means that there is a perfect inverse straight line relation; and a value of 0 means that there is no straight line relation. It is defined as the covariance of the two variables divided by the product of their standard deviations.

COUNTRY-SPECIFIC DATA

Data for either activities or emissions that are based on research carried out on domestic sites.

COVARIANCE

Statistical definition: The covariance between two variables is a measure of the mutual dependence between two variables.

The sample covariance of paired samples of random variables X and Y is calculated using the following formula:

$s_{xy}^2 = \frac{1}{n}\sum_{i}^{n}(x_i - \overline{x})(y_i - \overline{y})$ where $x_i, y_i, i = 1,...,n$ are items in the sample and $\overline{x}$ and $\overline{y}$ are <u>sample means</u>.

CROPLAND

This category includes arable and tillage land, and agro-forestry systems where vegetation falls below the threshold used for the forest land category, consistent with the selection of national definitions.

CROPLAND MANAGEMENT[3]

The system of practices on land on which agricultural crops are grown and on land that is set aside or temporarily not being used for crop production.

CROSS-CUTTING ISSUES

Matters that arise in more than one part of the *good practice guidance*. In this report identifying and quantifying uncertainties, sampling, methodological choice – identification of key categories, quality assurance and quality control, time series consistency and recalculation, and verification are addressed in a separate chapter called "Cross-cutting Issues".

CROWN COVER

See *canopy cover*.

DEAD WOOD

Includes all non-living woody biomass not contained in the litter, either standing, lying on the ground, or in the soil. Dead wood includes wood lying on the surface, dead roots, and stumps larger than or equal to 10 cm in diameter or any other diameter used by the country.

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[3] In the context of the Kyoto Protocol, as stipulated by the Marrakesh Accords, cf. paragraph 1 of the Annex to draft decision -/CMP.1 (Land use, land-use change and forestry) contained in document FCCC/CP/2001/13/Add.1, p.58.

DECISION TREE

Inventory definition: A decision tree is a flow chart describing the specific ordered steps which need to be followed to develop an inventory or an inventory component in accordance with the principles of *good practice*.

DEFORESTATION[4]

The direct human-induced conversion of forested land to non-forested land.

DISTURBANCES

Processes that reduce or redistribute carbon pools in terrestrial ecosystems.

DRY (FOREST)

Moisture regimes for boreal and temperate zones are defined by the ratio of mean annual precipitation (MAP) and potential evapotranspiration (PET): Dry (MAP/PET < 1) and Wet (MAP/PET > 1); and for tropical zones by precipitation alone: Dry (MAP < 1,000 mm), Moist (MAP: 1,000-2,000 mm) and Wet (MAP > 2,000 mm).

DRY BIOMASS

See *dry matter*.

DRY MATTER (d.m.)

Dry matter refers to biomass that has been dried to an oven-dry state, often at 70ºC.

EMISSIONS

The release of greenhouse gases and/or their precursors into the atmosphere over a specified area and period of time.

EMISSION FACTOR

Inventory definition: A coefficient that relates the activity data to the amount of chemical compound which is the source of later emissions. 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.

ERROR

Statistical definition: In statistical usage, the term 'error' is a general term referring to the difference between an observed (measured) value of a quantity and its 'true' (but usually unknown) value and does not carry the (pejorative) sense of a mistake or blunder.

ERROR MATRIX

See *confusion matrix*.

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[4] In the context of the Kyoto Protocol, as stipulated by the Marrakesh Accords, cf. paragraph 1 of the Annex to draft decision -/CMP.1 (Land use, land-use change and forestry) contained in document FCCC/CP/2001/13/Add.1, p.58.

ESTIMATION

Inventory definitions: The process of calculating emissions.

Statistical definition: Estimation is the assessment of the value of a quantity or its uncertainty through the assignment of numerical observation values in an estimation formula, or estimator. The results of an estimation can be expressed as follows:

- a point estimation which provide a number which can be used as an approximation to a parameter (such as the sample standard deviation which estimates the population standard deviation), or
- an interval estimate specifying a confidence level.

Example: A statement like 'The total emission is estimated to be 100 kt and its coefficient of variation is 5%' is based upon point estimates of the sample mean and standard deviation, whereas a statement such as 'The total emission lies between 90 and 110 kt with probability 95%' expresses the results of estimation as a confidence interval.

EXPERT JUDGEMENT

Inventory definition: A carefully considered, well-documented qualitative or quantitative judgement made in the absence of unequivocal observational evidence by a person or persons who have a demonstrable expertise in the given field.

EXTREME VALUE

Statistical definition: The extreme values of a sample are the maximum and minimum values of the sample. The statistical theory of extreme values is concerned with estimating the distributions of these extreme values for large numbers of sampled values.

FELLINGS

Standing volume of all trees live or dead, measured overbark to a specified minimum diameter at breast height that are felled during the reference period, including those parts of trees that are not removed from the forest. Removals are a subset of fellings (the commercial part destined for processing).

FERMENTED HORIZON (F)

A horizon consisting of partly decomposed litter in which macroscopically recognisable parts of plants remain. Fine organic matter, consisting of macro-fauna excrements is almost always existing, but is less in substance than the recognisable plant material.

FOREST[5]

Forest is a minimum area of land of 0.05 – 1.0 hectares with tree crown cover (or equivalent stocking level) of more than 10 – 30 per cent with trees with the potential to reach a minimum height of 2 – 5 metres at maturity *in situ*. A forest may consist either of closed forest formations where trees of various storeys and undergrowth cover a high portion of the ground or open forest. Young natural stands and all plantations which have yet to reach a crown density of 10 – 30 per cent or tree height of 2 – 5 metres are included under forest, as are areas normally forming part of the forest area which are temporarily unstocked as a result of human intervention such as harvesting or natural causes but which are expected to revert to forest.

Remark: Forests are not defined for reporting under the Convention. The *IPCC Guidelines* encourage countries to use detailed ecosystem classifications in the calculations and in reporting broad specified categories to ensure consistency and comparability of national data across countries.

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[5] In the context of the Kyoto Protocol, as stipulated by the Marrakesh Accords, cf. paragraph 1 of the Annex to draft decision -/CMP.1 (Land use, land-use change and forestry) contained in document FCCC/CP/2001/13/Add.1, p.58.

FOREST INVENTORY

System for measuring the extent, quantity and condition of a forest, usually by sampling.

FOREST LAND

This category includes all land with woody vegetation consistent with thresholds used to define forest land in the national GHG inventory, sub-divided at the national level into managed and unmanaged and also by ecosystem type as specified in the *IPCC Guidelines*.[6] It also includes systems with vegetation that currently falls below, but is expected to exceed, the threshold of the forest land category.

FOREST MANAGEMENT[7]

A system of practices for stewardship and use of forest land aimed at fulfilling relevant ecological (including biological diversity), economic and social functions of the forest in a sustainable manner.

GOOD PRACTICE

Inventory definition: *Good Practice* is a set of procedures intended to ensure that greenhouse gas inventories are accurate in the sense that they are systematically neither over nor underestimates so far as can be judged, and that uncertainties are reduced so far as possible.

Good Practice covers choice of estimation methods appropriate to national circumstances, quality assurance and quality control at the national level, quantification of uncertainties and data archiving and reporting to promote transparency.

GRASSLAND

This category includes rangelands and pasture land that is not considered as cropland. It also includes systems with vegetation that fall below the threshold used in the forest land category and is not expected to exceed, without human intervention, the thresholds used in the forest land category. This category also includes all grassland from wild lands to recreational areas as well as agricultural and silvo-pastural systems, subdivided into managed and unmanaged, consistent with national definitions.

GRAZING LAND MANAGEMENT[8]

The system of practices on land used for livestock production aimed at manipulating the amount and type of vegetation and livestock produced.

GRID CELL

The unit of land defined by the boundaries of an imaginary grid imposed on a map. May also be called a raster cell or a pixel.

GROSS ANNUAL INCREMENT

The average annual increment of volume over the reference period of all trees measured to a specified minimum diameter at breast height (varies by country). Includes increment of trees which have been felled or die.

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[6] Forest management has particular meaning under the Marrakesh Accords, which may require subdivision of the managed forest as described in Chapter 4.

[7] In the context of the Kyoto Protocol, as stipulated by the Marrakesh Accords, cf. paragraph 1 of the Annex to draft decision -/CMP.1 (Land use, land-use change and forestry) contained in document FCCC/CP/2001/13/Add.1, p.58.

[8] In the context of the Kyoto Protocol, as stipulated by the Marrakesh Accords, cf. paragraph 1 of the Annex to draft decision -/CMP.1 (Land use, land-use change and forestry) contained in document FCCC/CP/2001/13/Add.1, p.58.

GROUND TRUTH

A term used for data obtained by measurements on the ground, usually as validation for, e.g., satellite data.

GROWING STOCK

The living tree component of the standing volume (measured in m^3 overbark).

HIGH ACTIVITY CLAY (HAC) SOILS

Soils with high activity clay (HAC) minerals are lightly to moderately weathered soils which are dominated by 2:1 silicated clay minerals (in FAO classification included: Vertisols, Chernozems, Phaezems, Luvisols).

HARMONISATION OF DEFINITIONS

In this context it is meant to standardize or to increase comparability and/or convergence between definitions.

HUMUS HORIZON (H)

Horizon consisting by far of finely distributed organic matter (but still on top of the mineral soil horizons). Macroscopically recognisable parts of plants remain, but occur to much lesser extent than the finely distributed organic matter. The horizon can contain mineral soil particles.

INCREMENT

See *gross* and *net annual increment*.

INVENTORIES CONSISTENT WITH GOOD PRACTICE

Those inventories which contain neither over- nor underestimates so far as can be judged, and in which uncertainties are reduced as far as is practicable.

IMPROVED PASTURES/GRASSLAND/RANGELAND

Land subject to intensive, controlled grazing often subject to fertilisation and/or regular re-establishment of the grass cover.

KEY CATEGORY

A category that is prioritised within the national inventory system because its estimate has a significant influence on a country's total inventory of direct greenhouse gases in terms of the absolute level of emissions, the trend in emissions, or both.

KEY SOURCE

See *key category*.

LAND COVER

The type of vegetation covering the earth's surface.

LAND USE

The type of activity being carried out on a unit of land.

In *GPG-LULUCF* this term is used for the broad land-use categories defined in Chapter 2. It is recognized that these land categories are a mixture of land cover (e.g,, Forest, Grassland, Wetlands) and land use (e.g., Cropland Settlements) classes.

LFH LAYERS

Soil horizons. For details see individual definitions under litter horizon, fermented horizon and humus horizon.

LITTER

Includes all non-living biomass with a diameter less than a minimum diameter chosen by the country (for example 10 cm), lying dead, in various states of decomposition above the mineral or organic soil. This includes litter, fumic, and humic layers. Live fine roots (of less than the suggested diameter limit for belowground biomass) are included in litter where they cannot be distinguished from it empirically.

LITTER HORIZON (L)

A horizon consisting of relatively fresh dead plant material, it may be colourised, but does not contain excrements from soil fauna. It is not or only partly fragmented.

LOGNORMAL DISTRIBUTION

Statistical definition: The lognormal distribution is an asymmetric distribution, which starts from zero, rises to a maximum and then tails off more slowly to infinity. It is related to the normal distribution: X has a lognormal distribution if ln (X) has a normal distribution.

The PDF of the lognormal distribution is given by:

$$f(x) = \frac{1}{\sigma_l x \sqrt{2\pi}} e^{-\frac{(\ln x - \mu_l)^2}{2\sigma_l^2}} \;,\; \text{for } 0 \le x \le \infty\,.$$

The parameters required to specify the function are: μ_l the mean of the natural log transform of the data; and σ_l^2 the variance of the natural log transform of the data. The data and information that the inventory compiler can use to determine the input parameters are: mean $= \mu$; variance $= \sigma^2$; and the relationships:

$$\mu_l = \ln \frac{\mu^2}{\sqrt{(\sigma^2 + \mu^2)}}$$

and

$$\sigma_l = \sqrt{\ln\left(\frac{\sigma^2}{\mu^2} + 1\right)}\,.$$

LOW ACTIVITY CLAY (LAC) SOILS

Soils with low activity clay (LAC) minerals are highly weathered soils dominated by 1:1 clay mineral and amorphous iron and aluminium oxides (in FAO classification included: Acrisols, Nitosols, Ferrasols).

MANAGED FOREST

All forests subject to some kind of human interactions (notably commercial management, harvest of industrial round-wood (logs) and fuelwood, production and use of wood commodities, and forest managed for amenity value or environmental protection if specified by the country), with defined geographical boundaries.

MANAGED GRASSLAND

Grasslands on which human-induced activities are carried out, such as grazing or hay removal.

MEAN

Statistical definition: The mean, population mean, expectation or expected value is, broadly speaking, a measure of a central value around which values sampled from a probability distribution tend to lie. The sample mean or arithmetic average is an estimator for the mean. It is an unbiased and consistent estimator of the population mean (expected value) and is itself a random variable with its own variance value. The sample mean is the sum of values divided by the number of values:

$$\bar{x} = \frac{1}{n}\sum_i^n x_i \quad (x_i, \text{ where } i = 1,\ldots, n \text{ are items of a sample}).$$

MEDIAN

Statistical definition: The median or population median is a value which divides the integral of a probability density function (PDF) into two halves. For symmetric PDFs, it equals the mean. The median is the 50th population percentile.

The sample median is an estimator of the population median. It is the value that divides an ordered sample into two equal halves. If there are $2n + 1$ observations, the median is taken as the $(n + 1)^{th}$ member of the ordered sample. If there are $2n$, it is taken as being halfway between the nth and $(n + 1)^{th}$.

METADATA

Information about data; i.e., the description of which parameters and variables are stored in a database: their location, time of recording, accessibility, representativeness, owner, etc.

MODEL

Statistical definition: 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.

Example: the relationship that emissions equal an emission factor times an activity level is a simple model. The term 'model' is also often used in the sense of a computer software realisation of a model abstraction.

MOIST (FOREST)

Moisture regimes for boreal and temperate zones are defined by the ratio of mean annual precipitation (MAP) and potential evapotranspiration (PET): Dry (MAP/PET < 1) and Wet (MAP/PET > 1); and for tropical zones by precipitation alone: Dry (MAP < 1,000 mm), Moist (MAP: 1,000-2,000 mm) and Wet (MAP > 2,000 mm).

MONTE CARLO METHOD

Inventory definition: The principle of Monte Carlo analysis is to perform the inventory calculation many times by electronic computer, each time with the uncertain emission factors or model parameters and activity data chosen randomly (by the computer) within the distribution on uncertainties specified initially by the user. Uncertainties in emission factors and/or activity data are often large and may not have normal distributions. In

this case the conventional statistical rules for combining uncertainties become very approximate. Monte Carlo analysis can deal with this situation by generating an uncertainty distribution for the inventory estimate that is consistent with the input uncertainty distributions on the emission factors, model parameters and activity data.

NET ANNUAL INCREMENT

Average annual volume over the given reference period of gross increment minus natural mortality, of all trees to a specified minimum diameter at breast height.

NET-NET ACCOUNTING

The carbon sink or source in the reporting year minus the carbon sink or source in the base year. This is the accounting method for grazing land management, cropland management and revegetation under Article 3.4.

NORMAL DISTRIBUTION

Statistical definition: The normal (or Gaussian) distribution has the PDF given in the following equation and is defined by two parameters (the mean μ and the standard σ deviation) .

$$f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{(x-\mu)^2}{2\sigma^2}} , \text{ for } -\infty \leq x \leq \infty.$$

OPEN FORESTS

Forests characterised by crown cover between 10 and 40% (FAO), or below the canopy cover threshold as adopted by the Party.

ORGANIC SOILS

Soils are organic if they satisfy the requirements 1 and 2, or 1 and 3 below (FAO, 1998):

1. Thickness of 10 cm or more. A horizon less than 20 cm thick must have 12 percent or more organic carbon when mixed to a depth of 20 cm;
2. If the soil is never saturated with water for more than a few days, and contains more than 20 percent (by weight) organic carbon (about 35 percent organic matter);
3. If the soil is subject to water saturation episodes and has either:
    (i) At least 12 percent (by weight) organic carbon (about 20 percent organic matter) if it has no clay; or
    (ii) At least 18 percent (by weight) organic carbon (about 30 percent organic matter) if it has 60 percent or more clay; or
    (iii) An intermediate, proportional amount of organic carbon for intermediate amounts of clay.

OTHER LAND (AS A LAND-USE CATEGORY)

This category includes bare soil, rock, ice, and all unmanaged land areas that do not fall into any of the other five categories. It allows the total of identified land areas to match the national area, where data are available.

PASTURE

Grassland managed for grazing.

PEAT SOIL (ALSO HISTOSOL)

A typical wetland soil with a high water table and an organic layer of at least 40 cm thickness (poorly drained organic soil).

PERCENTILE

Statistical definition: The kth percentile or population percentile is a value which separates the lowest k^{th} part of the integral of the probability density function (PDF) – i.e., an integral of a PDF tail from the kth percentile towards lower probability densities.

PERENNIAL CROPS

Multiple year crops, includes trees and shrubs, in combination with herbaceous crops e.g., agroforestry, or orchards, vineyards and plantations such as cocoa, coffee, tea, oil palm, coconut, rubber trees, and bananas, except where these lands meet the canopy cover threshold criteria for forest land.

POLAR/BOREAL

Mean annual temperature (MAT) is less than 0 ^{o}C.

POOL/CARBON POOL

A reservoir. A system which has the capacity to accumulate or release carbon. Examples of carbon pools are forest biomass, wood products, soils and the atmosphere. The units are mass.

POPULATION

Statistical definition: The population is the totality of items under consideration. In the case of a random variable, the probability distribution is considered to define the population of that variable.

PRACTICE

An action or set of actions that affect the land, the stocks of pools associated with it or otherwise affect the exchange of greenhouse gases with the atmosphere.

PRECISION

Inventory definition: Precision is the inverse of uncertainty in the sense that the more precise something is, the less uncertain it is.

Statistical definition: Closeness of agreement between independent results of measurements obtained under stipulated conditions (see also *accuracy*).

PROBABILITY

Statistical definition: A probability is a real number in the scale 0 to 1 attached to a random event. There are different ways in which probability can be interpreted. One interpretation considers a probability as having the nature of a relative frequency (i.e., the proportion of all outcomes corresponding to an event), whilst another interpretation regards a probability as being a measure of degree of belief.

PROBABILITY DENSITY FUNCTION

Statistical definition: A probability density function (PDF) is a mathematical function which characterizes the probability behaviour of population**.** It is a function f(x) which specifies the relative likelihood of a continuous random variable X taking a value near x, and is defined as the probability that X takes a value between x and $x+dx$, divided by dx where dx is an infinitesimally small number.

PROBABILITY DISTRIBUTION

Statistical definition: A function giving the probability that a random variable takes any given value or belongs to a given set of values. The probability on the whole set of values of the random variable equals 1.

PROPAGATION OF UNCERTAINTIES

Statistical definition: The rules for propagation of uncertainties specify how to algebraically combine the quantitative measures of uncertainty associated with the input values to the mathematical formulae used in inventory compilation, so as to obtain corresponding measures of uncertainty for the output values. See Chapter 6, Quantifying Uncertainties in Practice, and Annex 1, Conceptual Basis for Uncertainty Analysis of *GPG2000*.

QUALITY ASSURANCE

Inventory definition: Quality Assurance (QA) activities include a planned system of review procedures conducted by personnel not directly involved in the inventory compilation/development process to verify that data quality objectives were met, ensure that the inventory represents the best possible estimate of emissions and sinks given the current state of scientific knowledge and data available, and support the effectiveness of the quality control (QC) programme.

QUALITY CONTROL

Inventory definition: Quality Control (QC) is a system of routine technical activities, to measure and control the quality of the inventory as it is being developed. The QC system is designed to:

(i)   Provide routine and consistent checks to ensure data integrity, correctness, and completeness;

(ii)   Identify and address errors and omissions;

(iii)   Document and archive inventory material and record all QC activities.

QC activities include general methods such as accuracy checks on data acquisition and calculations and the use of approved standardised procedures for emission calculations, measurements, estimating uncertainties, archiving information and reporting. Higher tier QC activities include technical reviews of source categories, activity and emission factor data, and methods.

RADAR DATA

Remotely-sensed data from the microwave portion of the electromagnetic spectrum, sent from and collected by aircraft or satellite after reflection from the target.

RANDOM ERROR

See *systematic and random errors*.

RANDOM VARIABLE

Statistical definition: A variable that may take any of the values of a specified set of values and with which is associated a probability distribution. A random variable which may take only isolated values is said to be 'discrete.' A random variable that may take any value within a finite or infinite interval is said to be 'continuous'.

RASTER DATA

Information stored on regular grid of points.

RASTER IMAGES

Raster data means information stored on a regular grid of points, as opposed to polygon data, which is information stored as the coordinates of an outline area sharing a common attribute.

REFORESTATION[9]

Direct human-induced conversion of non-forested land to forested land through planting, seeding and/or the human-induced promotion of natural seed sources, on land that was forested but that has been converted to non-forested land. For the first commitment period, reforestation activities will be limited to reforestation occurring on those lands that did not contain forest on 31 December 1989.

RELATIVE ERROR

Maximum tolerable error which is a fraction of the value of the variable being estimated.

REMOTELY SENSED DATA

Data generally acquired by means of scanners or cameras onboard aircraft or satellites.

REMOTE SENSING

Practice of acquiring and using data from satellites and aerial photography to infer or measure land cover/use. May be used in combination with ground surveys to check the accuracy of interpretation.

REMOVALS

Removals are a subset of fellings (the commercial part destined for processing). The 'Removals' term should only be used in this forestry context, not as synonym for carbon sink.

REPORTING

The process of providing estimates to the UNFCCC.

RESOLUTION

Smallest unit of land about which land cover or use can be determined. High resolution means the resolvable land units are small.

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[9] In the context of the Kyoto Protocol, as stipulated by the Marrakesh Accords, cf. paragraph 1 of the Annex to draft decision -/CMP.1 (Land use, land-use change and forestry) contained in document FCCC/CP/2001/13/Add.1, p.58.

RESERVOIRS

Water bodies regulated for human activities (energy production, irrigation, navigation, recreation etc.) where substantial changes in water area due to water level regulation occur. The term should not be used in the context of a carbon reservoir.

REVEGETATION[10]

A direct human-induced activity to increase carbon stocks on sites throught the establishment of vegetation that covers a minimum area of 0.05 hectares and does not meet the definitions of afforestation and reforestation contained here.

SAMPLE

Statistical meaning: A sample is a finite set of observations drawn from a population.

SANDY SOILS

Includes all soils (regardless of taxonomic classification) having > 70% sand and < 8 % clay (based on standard textural measurements (in FAO classification include: Arenosols, sandy Regosols)).

SEASONAL (FOREST)

Semi-deciduous forests with a distinct wet and dry season and rainfall between 1,200 and 2,000 mm per year.

SENSITIVITY

Statistical definition: A sensitivity is a measurement of how responsive one quantity is to a change in another related quantity. The sensitivity of a quantity Y that is affected by changes in another quantity X, is defined as the change in Y divided by the change in X that caused the changes in Y.

SENSITIVITY ANALYSIS

Statistical definition: Sensitivity analysis is a study of a model algorithm to determine how sensitive (or stable) it is to variations of its input data or underlying assumptions. It is performed by varying input values or model equations and observing how the model output varies correspondingly. The aim of such a sensitivity analysis can include:

- Observing the range of output values corresponding to input variables lying within 'reasonable' ranges; and

- Calculating finite difference approximations for elasticities and sensitivities as required by some methodologies for studying error propagation within a system.

SEQUESTRATION

The process of increasing the carbon content of a carbon pool other than the atmosphere. It is preferred to use the term "sink".

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[10] In the context of the Kyoto Protocol, as stipulated by the Marrakesh Accords, cf. paragraph 1 of the Annex to draft decision -/CMP.1 (Land use, land-use change and forestry) contained in document FCCC/CP/2001/13/Add.1, p.58.

SETTLEMENTS

This category includes all developed land, including transportation infrastructure and human settlements of any size, unless they are already included under other categories. This should be consistent with the selection of national definitions.

SIMPLE RANDOM SAMPLE

Statistical definition: A sample of *n* items chosen from a population such that every possible sample has the same probability of being chosen.

SINK

Any process, activity or mechanism which removes a greenhouse gas, an aerosol, or a precursor of a greenhouse gas from the atmosphere. Notation in the final stages of reporting is the negative (-) sign.

SKEWNESS

Statistical definition: Skewness is a measure of asymmetry of a PDF. It is a simple function of two moments of the PDF, given by:

$\gamma = \dfrac{\mu_3}{\mu_2^{3/2}} = \dfrac{\mu_3}{\sigma^3}$ where μ_2, μ_3, and σ are central moments. Symmetric distributions have $\gamma = 0$. The same name

is frequently used for sample skewness, in which case both population moments are replaced by sample moments.

SOIL ORGANIC MATTER

Includes organic carbon in mineral and organic soils (including peat) to a specified depth chosen by the country and applied consistently through the time series. Live fine roots (of less than the suggested diameter limit for below-ground biomass) are included with soil organic matter where they cannot be distinguished from it empirically.

SOURCE

Any process or activity which releases a greenhouse gas, an aerosol or a precursor of a greenhouse gas into the atmosphere. Notation in the final stages of reporting is the positive (+) sign.

SPATIAL INTERPOLATION

Inference about the characteristics of land from known information on surrounding land locations.

SPATIALLY EXPLICIT

Mapped or otherwise geographically referenced.

SPODIC SOILS

Soils exhibiting strong podzolization (in FAO classification includes many Podzolic groups).

STANDARD DEVIATION

Statistical definition: The population standard deviation is the positive square root of the variance. It is estimated by the sample standard deviation that is the positive square root of the sample variance.

STANDING VOLUME

Volume of standing trees, living or dead, above stump measured overbark to a predefined top diameter. Includes all trees with diameter above a given diameter at breast height (dbh). The minimum dbh and the top diameter vary by country and are usually country defined.

STATISTIC

Statistical definition: A statistic is a function of the sample random variables.

STATISTICS

Statistical definition: Statistics can refer either in a general sense to the compilation of data, frequently about human activities, or in a more specific sense to the branch of science concerned with the systematic numerical treatment of data derived from aggregates of items.

SYSTEMATIC AND RANDOM ERRORS

Statistical definition: Systematic error is the difference between the true, but usually unknown, value of a quantity being measured, and the mean observed value as would be estimated by the sample mean of an infinite set of observations. The random error of an individual measurement is the difference between an individual measurement and the above limiting value of the sample mean.

SYSTEMATIC ERROR

Statistical definition: See *systematic and random errors*.

TEMPERATE, COLD

Mean annual temperature (MAT) is between $0 - 10\ ^{o}C$.

TEMPERATE, WARM

Mean annual temperature (MAT) is between $10 - 20\ ^{o}C$.

TIME SERIES

Statistical definition: A time series is series of values which are affected by random processes and which are observed at successive (usually equidistant) points in time.

TOP-DOWN MODELLING

A modelling approach which aims to infer processes and parameters at a smaller scale from measurements taken at an aggregated scale (regional/national/continental/global).

TRANSPARENCY

Inventory definition: 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.

TREND

Inventory definition: 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.

TROPICAL

Mean annual temperature (MAT) is more than 20 $^{\circ}$C.

UNCERTAINTY

Statistical definition: An uncertainty is a parameter, associated with the result of measurement that characterises the dispersion of the values that could be reasonably attributed to the measured quantity (e.g., the sample variance or coefficient of variation).

Inventory definition: A general and imprecise term which refers to the lack of certainty (in inventory components) resulting from any causal factor such as unidentified sources and sinks, lack of transparency, etc.

UNCERTAINTY ANALYSIS

Statistical definition: An uncertainty analysis of a model aims to provide quantitative measures of the uncertainty of output values caused by uncertainties in the model itself and in its input values, and to examine the relative importance of these factors.

UNIFORM DISTRIBUTION

Statistical definition: A random variable with a uniform or rectangular distribution is confined to lie within a range over which all values are equally probable. If the upper and lower limits of the range are a and b respectively, the PDF is a flat function from a to b (the two parameters defining the PDF).

The PDF of a uniform distribution is given by:

$$f(x) = \begin{cases} \dfrac{1}{b-a} & \text{for } a \leq x \leq b \\ 0 & \text{elsewhere} \end{cases}$$

where

$$\mu = \frac{a+b}{2}$$

is the mean and

$$\sigma^2 = \frac{(b-a)^2}{12}$$

is the variance.

VALIDATION

Inventory definition: Validation is the establishment of sound approach and foundation. In the context of emission inventories, validation involves checking to ensure that the inventory has been compiled correctly in line with reporting instructions and guidelines. It checks the internal consistency of the inventory. The legal use of validation is to give an official confirmation or approval of an act or product.

VARIABILITY

Statistical definition: This refers to observed differences attributable to true heterogeneity or diversity in a population. Variability derives from processes which are either inherently random or whose nature and effects are influential but unknown. Variability is not usually reducible by further measurement or study, but can be characterised by quantities such as the sample variance.

VARIANCE

Statistical definition: The variance or population variance is a parameter of a PDF, which expresses the variability of the population. It is the second central moment of a random variable. The sample variance is defined as a measure of dispersion, which is the sum of the squared deviations of observations from their average, divided by one less than the number of observations.

$$s^2 = \frac{1}{n-1} \sum_{i}^{n} (x_i - \bar{x})^2$$

VARIANCE OF SAMPLE MEAN

Statistical definition: The mean of a sample taken from a population is itself a random variable with its own characteristic behaviour and its own variance. For such sample means, the appropriate estimate of the variance is not the sample variance, which estimates the variability associated with a single simple value, but a lower value, equal to the sample variance divided by the sample size.

VERIFICATION

Inventory definition: Verification refers to the collection of activities and procedures that can be followed during the planning and development, or after completion of an inventory that can help to establish its reliability for the intended applications of that inventory.

Typically, methods external to the inventory are used to check the truth of the inventory, including comparisons with estimates made by other bodies or with emission and uptake measurements determined from atmospheric concentrations or concentration gradients of these gases.

WALL-TO-WALL MAPPING

Complete spatial coverage of a land area, e.g., by satellite data.

WET (FOREST)

Moisture regimes for boreal and temperate zones are defined by the ratio of mean annual precipitation (MAP) and potential evapotranspiration (PET): Dry (MAP/PET < 1) and Wet (MAP/PET > 1); and for tropical zones by precipitation alone: Dry (MAP < 1,000 mm), Moist (MAP: 1,000-2,000 mm) and Wet (MAP > 2,000 mm).

WETLANDS

This category includes land that is covered or saturated by water for all or part of the year (e.g., peatland) and that does not fall into the forest land, cropland, grassland or settlements categories. This category can be

subdivided into managed and unmanaged according to national definitions. It includes reservoirs as a managed sub-division and natural rivers and lakes as unmanaged sub-divisions.

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