

CLIMAQ-H GLOSSARY

(October 2021 version)

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Adverse effects of climate change: Climate change causes changes in environment or biota such as flood, global warming, glacial retreat and more. Hence, adverse effects of climate change mean significant negative effects on composition, resilience or productivity of natural and managed ecosystems or on the operation of socio-economic systems or on human health and well-being due to climate change (United Nations, 1992).

All cause death: The authorized medical practitioners (physicians or coroners) classify deaths according to the International Statistical Classification of Diseases and Related Health Problems (ICD) (<https://www.who.int/classifications/icd/en/>). All cause death includes all those diseases, morbid conditions or injuries which either resulted in or contributed to death and the circumstances of the accident or violence which produced any such injuries (World Health Organization Geneva, 2004). The mortality rate (or death rate) is the measure of the number of deaths (in general, or due to a specific cause) in a particular population, scaled to the size of that population, per unit of time.

Ammonia (NH₃): NH₃ is a chemical compound of nitrogen and hydrogen. It contributes significantly to the formation of so-called secondary particulate matter and the associated health risks. (United Nations Economic and Social Council, 2021).

Baseline incidence per health endpoint: Incidence measures the number of new cases of a particular disease in a population within a specified time interval (usually 1 year). Not to be confused with prevalence, which is the number of cases (or percentage) in a population that is affected with a particular disease at a specified given time.

Business as usual (BAU): BAU is a country's usual development trajectory without any further adoption of climate-related policies, including those that may have been proposed under the Paris Climate Agreement.

Climate change: Human activity attributes directly or indirectly to modify the climate. Climate change is defined as a long-term alternation of the composition of the global atmosphere. Furthermore, natural climate variability is observed over comparable time periods (United Nations, 1992).

CO₂ equivalent: Carbon dioxide equivalent (CO₂ -eq) is a metric measure used to compare the emissions from various greenhouse gases based upon their global warming potential by converting other gases to the equivalent amount of carbon dioxide. For example, the global warming potential for methane over 100 years is 28 (IPCC, 2014). This means that emissions of one million metric tons of methane is equivalent to emissions of 28 million metric tons of carbon dioxide (OECD, 2001a).

Concentration Response Function: Concentration-response function relates exposure (inhalation dose) to a substance to the resulting changes in body function or health (response) (Agency for Toxic Substances and Disease Registry, 2021).

Confidence interval (CI): CI is the computed interval with a given probability, 68%, 95% and IQR, that the true value of a variable such as a mean, proportion, or rate is contained within the interval (Prüss-Üstün et al., 2003).

Counterfactual: Reference level of ambient air pollution against which health impacts are calculated. Four categories of counterfactual values can be hypothesized: theoretical minimum (exposure distribution that results in minimum population risk), plausible minimum (exposure distribution that is imaginable), feasible minimum (exposure distribution that has been observed in a population), and cost-effective minimum (COMEAP, 2010; Murray & Lopez, 1999; Prüss-Üstün et al., 2003).

Cut off: Concentration value below which one chooses not to quantify the health impacts.

Disability Adjusted Life Year (DALY): DALY is calculated by combining mortality and morbidity into a single metric and which is a sum of years lived with disability due to premature death (YLD) and years of life lost due to disability (YLL) (WHO, 2013). ► **Years Lived with Disability (YLD):** YLD is the component of the DALY that measures the lost years of healthy life through living in states of less than full health (Prüss-Üstün et al., 2003). ► **Years of Life Lost (YLL):** YLL is the component of the DALY that measures the years lost through premature mortality (Prüss-Üstün et al., 2003).

Discount rate: Discount rate is an interest rate used to convert a future value to its present value (OECD 2001b).

Expected Life Years Remaining: Expected life remaining (ELR) is the estimated remaining number of years a person in a specific age group can expect to live. For a newborn, the ELR is identical to the life expectancy at birth. If the level of exposure changes, the ELRs change as well. For example, a decrease in exposure level results in an ELR increase.

Geometric mean: A measure of central tendency. This is calculated by adding the logarithms of the individual values, calculating their arithmetic mean, and converting back by taking the antilogarithm (Prüss-Üstün et al., 2003). The geometric mean of a normal or lognormal distribution is the median (50th percentile) of the independent variable of concern.

Geometric Standard Deviation (GSD): Description of how disperse the geometric standard deviation of a set of quantitative observations around the geometric mean (Dodge, 2008).

Gross Domestic Product (GDP):

GDP represents a total measure of production equal to the sum of the gross values added by all resident producers during the specific period (commonly one year) in a country. The sum of the final uses of goods and services (all uses except intermediate consumption) measured in purchasers' prices but the value of goods and services imported, or the amount of primary incomes distributed by resident producer units is excluded in the measure (OECD, 2019).

Greenhouse gases: Those gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and re-emit infrared radiation and trap the Sun's heat in the atmosphere, which causes the global warming. The representative greenhouse gases are CO₂, CH₄, N₂O, HFCs, PFCs and SF₆.

Health co-benefit: The health gains and reduced health risks that result from implementing climate mitigation and adaptation measures across various sectors, including the agriculture, energy, housing, health and transportation sectors.

Health Cost: Health cost considers health treatment expenditures (costs of medication, doctor visits and hospitalization), economic losses due to worker absenteeism (GDP productivity losses), and wellbeing.

Health Endpoint: Health effect/outcome resulting from exposure to a risk factor, for example air pollution.

Hospital Admissions: Hospital admissions are recorded by diagnosis. Usually, hospital admissions rates are calculated per 100,000 persons per year.

Infant mortality rate: Number of infant (< 1 year) deaths per 1000 live births.

Life Expectancy: Life expectancy at a given age is the average number of years a person at that age is expected to live under the mortality pattern prevalent in the population.

Life years gained: Life years gained represent the the number of years gained because of postponed premature mortality.

Morbidity: Morbidity is the occurrence of illness that alters health and quality of life (Agency for Toxic Substances and Disease Registry, 2021).

Nationally Determined Contributions (NDCs): NDCs outline a country's action plan to reduce their greenhouse gas (GHG) emissions in order to reach the goals of the Paris Agreement. Countries determine the target of the reduction of GHG emissions of their own accord by considering their responsibilities and contributions on GHG emissions.

Nitrogen Oxides (NO_x): NO_x is a representative air pollutant, which causes smog or acid rain, and affects human health such as respiratory diseases. NO_x is a common term of nitrogen oxide (NO) and nitrogen dioxide (NO₂). Nitrogen oxides result from combustion of fossil or biofuels, especially at high temperatures.

Monte-Carlo analysis: Monte-Carlo method employs a repeated random sampling to calculate approximate values, probabilistically. Computer algorithms are required to generating pseudo-random variables with the given probability distribution (United Nations, 2000).

Particulate matter (PM): PM is a complex mixture of small particles of different sizes and liquid droplets suspended in the atmosphere. Particulate matter is made up of a number of components, including carbonaceous matter, acids (such as nitrates and sulphates), organic chemicals, heavy metals, soil and dust particles, and sea salt. For purposes of air quality and health studies, PM is typically measured in two size ranges: PM₁₀ and PM_{2.5}. ► **PM₁₀** Particulate matter with an aerodynamic diameter less than or equal to a nominal 10 micrometers. ► **PM_{2.5}** Fine particulate matter with an aerodynamic diameter less than or equal to 2.5 micrometers. PM_{2.5} is included in PM₁₀. ► **Primary Particle** A particle that is emitted directly from a source. ► **Secondary Particle** A particle (e.g. sulphate or nitrate) that is formed in the atmosphere from the oxidation of gaseous precursors like sulphur dioxide, nitrogen oxides, and volatile organic compounds or through the transformation of directly emitted particles. The acids resulting from the oxidation of these compounds attract water vapour to form tiny droplets (fine particles).

Prevented number of deaths: Number of postponed (averted or delayed) deaths due to some mitigation measure that affects air quality.

Post-neonatal infant mortality: Number of infant deaths between the ages 1 and 12 months.

Relative Risk: Relative Risk (RR) estimates the magnitude of an association between exposure and disease. It indicates the likelihood of developing the disease in the exposed group, PDE, relative to those who are not exposed, PDU. This likelihood is equal to PDE/PDU. For example, if we assume $RR = 1.062$ (95% CI=1.04-1.083) for all cause of mortality (adult age 30+ years) per $10 \mu\text{g}/\text{m}^3$ average annual increase in PM_{2.5}, this means a $10 \mu\text{g}/\text{m}^3$ increase in average annual PM_{2.5} is associated with a 6% increase in deaths from all causes (with a 95% uncertainty interval between 1% and 12%) (Ostro, 2004).

Restricted Activity Days (RAD): RAD is one where an individual misses work, spends the day in bed or is otherwise forced to significantly limit normal activity.

Statistical distributions: Impact and cost analysis in CLIMAQ-H apply distributions at every step. ► **Normal distribution:** Normal distribution is a representative probability distribution, which is known as Gaussian distribution and bell curve. ► **Log-Normal distribution:** The lognormal distribution is a continuous probability distribution of random variables that are constrained by zero but have a few very large values. The characteristic of the distribution is asymmetrical and positively skewed (Catherine Forbes, Merran Evans, Nicholas Hastings, 2011). ► **Triangular distribution:** It is one of continuous probability distributions, which has a triangle shape graph. The below example graphs illustrate the characteristics of each distribution, what mentioned in the text.

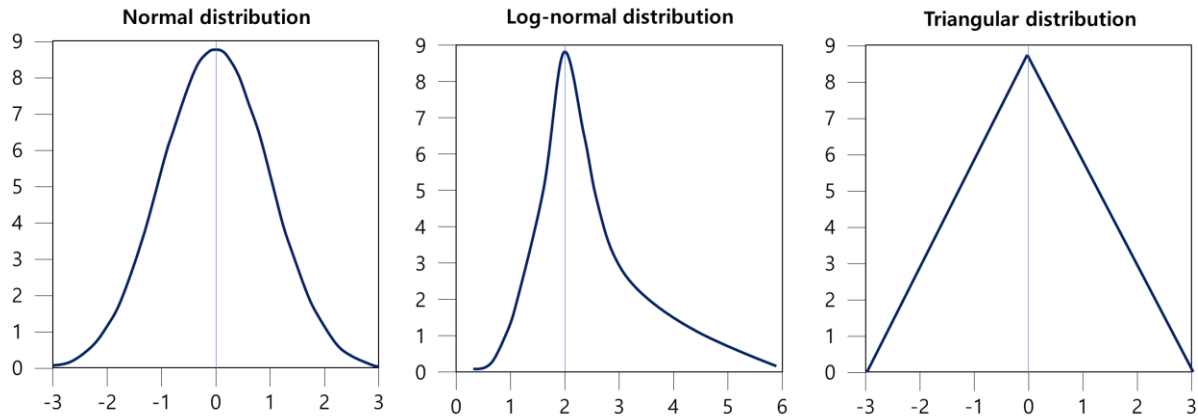


Figure 1 Types of distribution

Sulphur Dioxide (SO₂): Sulphur dioxide is derived from the combustion of sulphur-containing fossil fuels and is a major air pollutant in many parts of the world. Oxidation of sulphur dioxide, especially at the surface of particles in the presence of metallic catalysts, leads to the formation of sulphurous and sulfuric acids. Neutralization, by ammonia, leads to the production of bisulphates and sulphates (WHO European Centre for Environment and Health, 2006).

Stroke: A stroke is a serious life-threatening medical condition that happens when the blood supply to part of the brain is cut off.

The Paris Agreement: The Paris Agreement is a legal instrument that will guide the process for universally acting on climate change. It is a hybrid of legally binding and nonbinding provisions. The nationally determined contributions (NDC) may be binding at the national level. The Paris Agreement aims to limit global warming to below 2 degree Celsius above pre-industrial times, with a preference to limit the temperature change to as close as possible to 1.5 degree Celsius (UNFCCC, 2016).

Unit costs: The unit costs in economic evaluation are the prices associated per health case or episode. These costs might include hospital utilization costs, patient out-of-pocket expenditures, medicine costs, wages losses, welfare (intangible) costs (willingness to pay to avoid pain and suffering), and etc. Mortality is valued using the welfare methodology (e.g., value of a statistical life or life year, namely, the price paid for a small reduction in the probability of death, or for the extension of 1 year of life).

United Nations Framework Convention on Climate Change (UNFCCC): The UNFCCC is an international Convention with the objective to stabilize greenhouse gas concentrations to prevent dangerous anthropogenic interference with the climate system. The UNFCCC took effect in 1994 and 197 countries have ratified the Convention.

Urban adjustment coefficient (Country modifier factor): Urban adjustment coefficient is a downscaling factor applied to the change in the national concentration to capture the urban population-weighted exposure.

Work days lost: Number of workdays lost (work absenteeism) in the actively employed population (typically, ages 15-64 years) due to ill health.

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