Annex II

Glossary

Note: The definitions in this glossary refer to the use of the terms in the context of this report. A '→' indicates that the following term is also contained in this glossary. The glossary provides an explanation of specific terms as the lead authors intend them to be interpreted in this report.

Absorption (Refrigeration)
A process by which a material (the absorbent) extracts one or more substances (absorbates) from a liquid or gaseous medium that it is in contact with and changes chemically, physically or both. The process is accompanied by a change in entropy, which makes it a useful mechanism for a refrigeration cycle. Water-lithium bromine and ammonia-water →chillers are examples of absorption chillers.

Adjustment Time
See: →Lifetime in relation to atmospheric concentrations, or → response time in relation to the climate system.

Aerosol
A suspension of very fine solid or liquid particles in a gas. Aerosol is also used as a common name for a spray (or 'aerosol') can, in which a container is filled with a product and a propellant and is pressurized so as to release the product in a fine spray.

Age of Air
The length of time that a stratospheric air mass has been out of contact with the well-mixed →troposphere. The content of a unit element of air at a particular location and particular time of year in the →stratosphere can be thought of as a mixture of different air parcels that have taken different routes from the → tropopause to arrive at that location. The mean age of air at a specific location is defined as the average transit times of the elements since their last contact with the tropopause.

Alcohols
→Hydrocarbon derivatives in which at least one hydrogen atom has been replaced by an -OH group. Alcohols are sometimes used as solvents.

Annex B Countries/Parties (Kyoto Protocol)
The group of countries included in Annex B in the →Kyoto Protocol that have agreed to a target for their →greenhouse-gas emissions. It includes all the →Annex I countries (as amended in 1998) except Turkey and Belarus. See also: →Non-Annex I countries/parties.

Annex I Countries/Parties (Climate Convention)
The group of countries included in Annex I (as amended in 1998) to the →United Nations Framework Convention on Climate Change (UNFCCC). It includes all the developed countries in the Organisation of Economic Co-operation and Development (OECD), and →countries with economies in transition. By default, the other countries are referred to as →Non-Annex I countries. See also: →Annex B countries/parties.

Anthropogenic
Resulting from or produced by human beings.

Aqueous Cleaning
Cleaning parts of equipment with water, to which may be added suitable detergents, saponifiers or other additives.

Article 5(1) Countries (Montreal Protocol)
Developing countries that are →Party to the →Montreal Protocol. These countries are permitted a ten-year grace period in the phase-out schedule in the →Montreal Protocol compared with developed countries.

Atmosphere
The gaseous envelope surrounding the Earth. The dry atmosphere consists almost entirely of nitrogen (N_2) (78.1% volume →mixing ratio) and oxygen (O_2) (20.9% volume mixing ratio). The remaining 1% consists of trace gases, such as argon (Ar) (0.93% volume mixing ratio), helium (He), and radiatively active →greenhouse gases such as →carbon dioxide (CO_2) (0.037% volume mixing ratio in 2004) and →ozone (O_3). In addition, the atmosphere contains water vapour, whose amount is highly variable, clouds and both liquid and particulate aerosols. Most of the matter in the atmosphere occurs in the →troposphere immediately above the Earth's surface and the overlying →stratosphere.

Atmospheric Lifetime
A measure of the average time that a molecule remains intact once released into the →atmosphere. See also: →Lifetime.

Azeotrope (Refrigeration)
A →blend consisting of one or more →refrigerants of different volatilities that does not appreciably change in composition or temperature as it evaporates (boils) or condenses (liquefies) under constant pressure. Refrigerant blends assigned an R-500 series number designation by ANSI/ASHRAE 34 are azeotropes. Compare with: →Zeotrope.

Banks
Banks are the total amount of substances contained in existing equipment, chemical stockpiles, foams and other products not yet released to the atmosphere.

Baseline
A non-intervention →scenario used as a base in the analysis of intervention scenarios. See also: →Business-As-usual (BAU) Scenario.

Best Practice
For this Report, best practice is considered the lowest achievable value of halocarbon emission at a given date, using commercially proven technologies in the production, use, substitution, recovery and destruction of halocarbon or halocarbon-based products.

Blends/Mixtures (Refrigeration)
A mixture of two or more pure fluids. Blends are used to achieve properties that fit many refrigeration purposes. For example, a mixture of flammable and nonflammable components can result in a nonflammable blend. Blends can be divided into three categories: →azeotropic, →non-azeotropic and near-azeotropic blends.

Blowing Agent (Foams)
A gas, volatile liquid or chemical that generates gas during the foaming process. The gas creates bubbles or cells in the plastic structure of a foam.

Bottom-Up Models
A modelling approach that aggregates information from diverse sources, often including technological and engineering details in the analysis. Compare with: →Top-down models.

Business-As-Usual (BAU) Scenario (2015, This Report)
A →baseline scenario for the use of →halocarbons and their alternatives, which assumes that all existing regulation and →phase-out measures, including the →Montreal Protocol and relevant national regulations, continue to 2015. The usual practices (including end-of-life recovery) and emission rates are kept unchanged up to 2015.

Capital Costs
Costs associated with capital or investment expenditure on land, plant, equipment and inventories. Unlike labour and operating costs, capital costs are independent of the level of output for a given capacity of production.

Carbon Dioxide (CO_2)
A naturally occurring gas which occurs as a byproduct of burning →fossil fuels and biomass, as well as other industrial processes and land-use changes. It is the principal →anthropogenic →greenhouse gas that affects the Earth's radiative balance and is the reference gas against which other greenhouse gases are generally measured.

Catalyst
A chemical that acts to speed up or facilitate a chemical reaction, but is not physically changed or used up in the reaction.

Chiller
A cooling system that removes heat from one medium (water) and deposits it into another (ambient air or water).

Chlorine Loading
The total amount of chlorine (generally expressed as a →mixing ratio, or fraction of all air molecules), accounting for the amount of all chlorine-bearing substances and the number of atoms of chlorine in each substance.

Chlorocarbons
→Halocarbons containing carbon and chlorine atoms, but no other →halogen atoms.

Chlorofluorocarbons (CFCs)
→Halocarbons containing only chlorine, fluorine and carbon atoms. CFCs are both →ozone-depleting substances (ODSs) and →greenhouse gases.

Class A Fire (Fire Protection)
Fire in ordinary combustible materials, such as wood, cloth, paper, rubber and many plastics.

Class B Fire (Fire Protection)
Fire in flammable liquids, oils, greases, tars, oil-base paints, lacquers and flammable gases.

Class C Fire (Fire Protection)
Fire that involves energized electrical equipment where the electrical resistivity of the extinguishing media is of importance.

Clean Agent (Fire Protection)
An electrically non-conducting, volatile or gaseous fire-extinguishing agent that does not leave a residue upon evaporation.

Clean Development Mechanism (CDM)
Defined in Article 12 of the →Kyoto Protocol, the Clean Development Mechanism is intended to meet two objectives: (1) to assist →non-Annex I Parties in achieving sustainable development and in contributing to the ultimate objective of the convention; and (2) to assist →Annex I Parties in achieving compliance with their quantified emission limitation and reduction commitments. Certified emission reductions from Clean Development Mechanism projects undertaken in non-Annex I countries that limit or reduce →greenhouse-gas emissions, when certified by operational entities designated by the→Conference of the Parties/Meeting of the Parties, can be accrued to the investor (government or industry) from Parties in →Annex B. A share of the proceeds from the certified project activities is used to cover administrative expenses as well as to assist developing country Parties that are particularly vulnerable to the adverse effects of →climate change to meet the costs of adaptation.

Climate
Climate in a narrow sense is usually defined as the 'average weather', or more rigorously, as the statistical description in terms of the mean and variability of relevant quantities over a period of time ranging from months to thousands or millions of years. The classical period is 30 years, as defined by the → World Meteorological Organization (WMO). These quantities are most often surface variables such as temperature, precipitation, and wind. Climate in a wider sense is the state, including a statistical description, of the climate system.

Climate Change
Climate change refers to a statistically significant variation in either the mean state of the →climate or in its variability, persisting for an extended period (typically decades or longer). Climate change may be due to natural internal processes or external forcings, or to persistent →anthropogenic changes in the composition of the atmosphere or in land use.

Note that Article 1 of the →Framework Convention on Climate Change (UNFCCC) defines 'climate change' as 'a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability, observed over comparable time periods'. The UNFCCC thus makes a distinction between 'climate change' attributable to human activities altering the atmospheric composition, and 'climate variability' attributable to natural causes.

Climate Feedback
An interaction mechanism between processes in the →climate system occurring when the result of an initial process triggers changes in a second process that in turn influences the initial one. A positive feedback intensifies the original process, whereas a negative feedback weakens it.

Climate Scenario
A plausible and often simplified representation of the future climate, based on a coherent and internally consistent set of driving forces and key relations, that has been constructed for use in investigating the potential consequences of →anthropogenic →climate change, and often serves as input to impact models. Climate →projections often serve as the raw material for constructing climate scenarios, but climate scenarios usually require additional information, such as the baseline current climate. A *climate-change scenario* is the difference between a climate scenario and the current climate.

Climate Sensitivity
In IPCC Reports, *equilibrium climate sensitivity* refers to the equilibrium change in global mean surface temperature following a doubling of the atmospheric (→equivalent) →carbon dioxide (CO_2) concentrations. More generally, *equilibrium climate sensitivity* refers to the equilibrium change in surface air temperature following a unit change in →radiative forcing (in units of °C per (W m^{-2})).

In practice, the evaluation of the equilibrium climate sensitivity requires very long simulations with coupled general circulation models. The *effective climate sensitivity* is a related measure that circumvents this requirement. It is evaluated from model output for evolving non-equilibrium conditions. It is a measure of the strengths of the →feedbacks at a particular time and may vary with forcing history and climate state.

Climate System
The highly complex system that consists of five major components: the →atmosphere, the hydrosphere, the cryosphere, the land surface and the biosphere, as well as of the interactions between them. The climate system evolves over time under the influence of its own internal dynamics and because of external forcings, such as volcanic eruptions, solar variations and human-induced forcings (such as the changing composition of the atmosphere and land-use change).

Climate Variability
Variations in the mean state and other statistics (such as the standard deviation and the occurrence of extremes) of the → climate on all temporal and spatial scales beyond that of individual weather events. Climate variability may be caused by natural internal processes within the →climate system (internal variability), or by variations in natural or anthropogenic external forcings (external variability). See also: →Climate change.

CO_2-Equivalent
The amount of →carbon dioxide (CO_2) that would cause the same amount of →radiative forcing as a given amount of another →greenhouse gas. When used with concentrations this refers to the instantaneous radiative forcing caused by the greenhouse gas or the equivalent amount of CO_2. When used with emissions this refers to the time-integrated radiative forcing over a specified time horizon caused by the change in concentration produced by the emissions. See also: →Global warming potential.

Coefficient of Performance (COP) (Refrigeration)
A measure of the energy efficiency of a refrigerating system. It is defined as the ratio between the refrigerating capacity and the electric power consumed by the system. The COP is primarily dependant on the working cycle and the temperature levels (evaporating/condensing temperature) as well as on the properties of the →refrigerant, system design and size.

Column Ozone
The total amount of →ozone in a vertical column above the Earth's surface. Column ozone is measured in →Dobson units (DU).

Commercialization
A sequence of actions necessary to achieve market entry and general market competitiveness of new technologies, processes and products.

Compressor Discharge Temperature (Refrigeration)
The temperature of a gas at the high-pressure outlet from the compressor (superheated gas). The gas temperature is typically 30°C to 40°C higher than the condensing temperature at saturation pressure, mainly depending on the evaporating/condensing temperature, →refrigerant properties and the compressor energy efficiency.

Conference of the Parties (COP) (Climate Convention)
The supreme body of the →United Nations Framework Convention on Climate Change (UNFCCC), comprising countries that have ratified or acceded to the UNFCCC. See also: → Conference of the Parties/Meeting of the Parties and →Meeting of the Parties.

Conference of the Parties/Meeting of the Parties (COP/MOP) (Climate Convention)
The →Conference of the Parties of the →United Nations Framework Convention on Climate Change (UNFCCC) will serve as the →Meeting of the Parties (MOP), the supreme body of the →Kyoto Protocol, but only Parties to the Kyoto Protocol may participate in deliberations and make decisions.

Containment (Refrigeration)
The application of service techniques or special equipment designed to preclude or reduce loss of →refrigerant from equipment during installation, operation, service or disposal of refrigeration and air-conditioning equipment.

Controlled Substance
Under the →Montreal Protocol, any →ozone-depleting substance (ODS) that is subject to control measures, such as a → phase-out requirement.

Cost Effective
A criterion that specifies that a technology or measure delivers a good or service at equal or lower cost than current practice, or the least-cost alternative for the achievement of a given target.

Countries with Economies in Transition (CEITs)
Countries with national economies in the process of changing from a planned economic system to a market economy.

Destruction
Destruction of →ozone-depleting substances (ODSs) by approved destruction plants, in order to avoid their emissions.

Detergent
A product designed to render, for example, oils and greases soluble in water; usually made from synthetic →surfactants.

Dobson Unit (DU)
A unit to measure total →column ozone. The number of Dobson units is the thickness, in units of 10^{-5} m, that the ozone column would occupy if compressed into a layer of uniform density at a pressure of 1013 hPa and a temperature of 0°C. One DU corresponds to a column of ozone containing 2.69×10^{20} molecules per square meter. Although column ozone can vary greatly, 300 DU is a typical value.

Drop-In Replacement (Refrigeration)
The procedure for replacing →CFC refrigerants with non-CFC refrigerants in existing refrigerating, air-conditioning and heat-pump plants without doing any plant modifications. However, drop-in procedures are normally referred to as →retrofitting because plants need minor modifications, such as the change of lubricant, and the replacement of the expansion device and the desiccant material.

Dry Powder Inhaler (DPI) (Medical Aerosols)
An alternate technology to →metered dose inhalers (MDIs) that can be used if the medication being dispensed can be satisfactorily formulated as microfine powder, thus eliminating the use of a chemical propellant.

Emission Factor
The coefficient that relates actual →emissions to activity data as a standard rate of emission per unit of activity.

Emissions
The release of gases or →aerosols into the →atmosphere over a specified area and period of time.

Emission Scenario
A plausible representation of the future development of →emissions of substances that are potentially radiatively active (e.g., →greenhouse gases and →aerosols), based on a coherent and internally consistent set of assumptions about driving forces (such as demographic and socio-economic development, and technological change) and their key relationships. See also: → Scenario (generic) and →climate scenario.

The *IPCC Special Report on Emission Scenarios* (2000) presented emission scenarios, known as the →SRES scenarios, which have been used as a basis for the climate projections in the *IPCC Third Assessment Report* (2001) and in this report.

Energy Balance
Averaged over the globe and over long time periods, the energy budget of the →climate system must be in balance. Because the climate system derives all its energy from the Sun, this balance implies that, globally, the amount of incoming →solar radiation must on average be equal to the sum of the outgoing reflected solar radiation and the outgoing →thermal infrared radiation emitted by the climate system. A perturbation of this global radiation balance, be it →anthropogenic or natural, is called → radiative forcing.

Equivalent-CO_2
See →CO_2-Equivalent.

Equivalent Effective Stratospheric Chlorine (EESC)
An index of the amount of chlorine (Cl) and bromine (Br) that is present in the →stratosphere in forms that can contribute to the depletion of →ozone. The EESC value takes into account different fractional releases of chlorine or bromine from different halocarbons and the much higher efficiency of bromine in the catalytic removal of ozone. See also: →Chlorine loading.

Ethers
Organic compounds with formula R-O-R, where O is an oxygen atom and R is not a hydrogen atom (H).

Expansion Control Devices (Refrigeration)
A device, such as an expansion valve, expansion orifice, turbine or capillary tube, that is used to control the mass flow of a → refrigerant from the high-pressure side to the low-pressure side of a refrigeration system.

External Costs
The costs arising from any human activity when the agent responsible for the activity does not take full account of the negative impacts on others of his or her actions. Similarly, when the impacts are positive and not accounted for in the actions of the agent responsible, they are referred to as *external benefits*. Emissions of particulate pollution from an industrial installation affect the health of people in the vicinity, but this is not often considered, or is given inadequate weight, in private decision making and there is no market for such impacts. Such a phenomenon is referred to as an *externality*, and the costs it imposes are referred to as the external costs.

External Forcing
See: →Climate system.

Externality
See: →External costs.

Feedback
See: →Climate feedback.

Fluorinated Ethers
→Ethers in which one or more hydrogen atoms have been replaced by fluorine.

Fluorocarbons
→Halocarbons containing fluorine atoms, including →chlorofluorocarbons (CFCs), →hydrochlorofluorocarbons (HCFCs), →hydrofluorocarbons (HFCs), and →perfluorocarbons (PFCs).

Fluoroketones (FKs)
Organic compounds in which two fully fluorinated alkyl groups are attached to a carbonyl group (C=O).

Fossil Fuels
Carbon-based fuels derived from geological (fossil) carbon deposits. Examples include coal, oil and natural gas.

Framework Convention on Climate Change
See:→United Nations Framework Convention on Climate Change (UNFCCC).

Global Warming Potential (GWP)
An index comparing the climate impact of an emission of a greenhouse gas relative to that of emitting the same amount of →carbon dioxide. GWPs are determined as the ratio of the time-integrated →radiative forcing arising from a pulse emission of 1 kg of a substance relative to that of 1 kg of carbon dioxide, over a fixed time horizon. See also: →Radiative forcing.

Greenhouse Effect
→Greenhouse gases in the →atmosphere effectively absorb the →thermal infrared radiation that is emitted by the Earth's surface, by the atmosphere itself, and by clouds. The atmosphere emits radiation in all directions, including downward to the Earth's surface. Greenhouse gases trap heat within the surface-troposphere system and raise the temperature of the Earth's surface. This is called the *natural greenhouse effect*.
An increase in the concentration of greenhouse gases leads to increased absorption of infrared radiation and causes a →radiative forcing, or energy imbalance, that is compensated for by an increase in the temperature of the surface-troposphere system. This is the *enhanced greenhouse effect*.

Greenhouse Gases (GHGs)
The gaseous constituents of the →atmosphere, both natural and →anthropogenic, that absorb and emit radiation within the spectrum of the →thermal infrared radiation that is emitted by the Earth's surface, by the atmosphere and by clouds. This property causes the →greenhouse effect. The primary greenhouse gases in the Earth's atmosphere are water vapour (H_2O), →carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4) and →ozone (O_3). Moreover, there are a number of entirely →anthropogenic greenhouse gases in the atmosphere, such as the →halocarbons and other chlorine- and bromine-containing substances that are covered by the →Montreal Protocol. Some other trace gases, such as sulphur hexafluoride (SF_6), hydrofluorocarbons (HFCs), and perfluorocarbons (PFCs), are also greenhouse gases.

Halocarbons
Chemical compounds containing carbon atoms, and one or more atoms of the →halogens chlorine (Cl), fluorine (F), bromine (Br) or iodine (I). *Fully halogenated halocarbons* contain only carbon and halogen atoms, whereas *partially halogenated halocarbons* also contain hydrogen (H) atoms. Halocarbons that release chlorine, bromine or iodine into the →stratosphere cause →ozone depletion. Halocarbons are also →greenhouse gases. Halocarbons include →chlorofluorocarbons (CFCs), →hydrochlorofluorocarbons (HCFCs), →hydrofluorocarbons (HFCs), →perfluorocarbons (PFCs) and →halons.

Halogens
A family of chemical elements with similar chemical properties that includes fluorine (F), chlorine (Cl), bromine (Br) and iodine (I).

Halons
Fully halogenated →halocarbons that contain bromine and fluorine atoms.

Hermetic
An airtight sealed system.

Hermetic Compressors (Refrigeration)
Compressors whose motors are sealed within the →refrigerant loop and are often cooled by the flow of the →refrigerant-lubricant mixture directly over the motor windings.

Hydrocarbons (HCs)
Chemical compounds consisting of one or more carbon atoms surrounded only by hydrogen atoms.

Hydrochlorofluorocarbons (HCFCs)
→Halocarbons containing only hydrogen, chlorine, fluorine and carbon atoms. Because HCFCs contain chlorine, they contribute to →ozone depletion. They are also →greenhouse gases.

Hydrofluorocarbons (HFCs)
→Halocarbons containing only carbon, hydrogen and fluorine atoms. Because HFCs contain no chlorine, bromine or iodine, they do not deplete the →ozone layer. Like other halocarbons they are potent →greenhouse gases.

Hydrofluoroethers (HFEs)
Chemicals composed of hydrogen, fluorine and →ether, which have similar performance characteristics to certain →ozone-depleting substances (ODSs) that are used as solvents.

Implementation Costs
Costs involved in the implementation of →mitigation options. These costs are associated with the necessary institutional changes, information requirements, market size, opportunities for technology gain and learning, and economic incentives (grants, subsidies and taxes).

Intergovernmental Panel on Climate Change (IPCC)
The Intergovernmental Panel on Climate Change (IPCC) was jointly established by the →World Meteorological Organization (WMO) and the →United Nations Environment Programme (UNEP) in 1988 to assess scientific, technical and socio-economic information relevant for the understanding of climate change, its potential impacts and options for adaptation and mitigation. It is open to all Members of the UN and of WMO. The IPCC provides, on request, scientific, technical and socio-economic advice to the →Conference of the Parties (COP) to the →United Nations Framework Convention on Climate Change (UNFCCC). The IPCC has produced a series of Assessment Reports, Special Reports, Technical Papers, methodologies, and other products that have become standard works of reference and that are widely used by policymakers, scientists, and other experts.

Kyoto Protocol
The Kyoto Protocol to the →United Nations Framework Convention on Climate Change (UNFCCC) was adopted at the Third Session of the →Conference of the Parties (COP) to the UNFCCC in 1997 in Kyoto, Japan. It contains legally binding commitments, in addition to those included in the UNFCCC. Countries included in →Annex B of the Protocol (most OECD countries and →countries with economies in transition) agreed to reduce their →anthropogenic →greenhouse-gas emissions (specifically →carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), →hydrofluorocarbons (HFCs), →perfluorocarbons (PFCs) and sulfur hexafluoride (SF_6)) by at least 5% below 1990 levels in the commitment period 2008 to 2012. The Kyoto Protocol entered into force on 16 February 2005.

Life Cycle Assessment (LCA)
An assessment of the overall environmental impact of a product over its entire life cycle (manufacture, use and recycling or disposal).

Life Cycle Climate Performance (LCCP)
A measure of the overall global-warming impact of equipment based on the total related →emissions of →greenhouse gases over its entire life cycle. LCCP is an extension of the →total

equivalent warming impact (TEWI). LCCP also takes into account the direct fugitive emissions arising during manufacture, and the greenhouse gas emissions associated with their embodied energy.

Lifetime
Lifetime is a general term used for various time scales characterizing the rates of processes affecting the concentration of trace gases. The following lifetimes may be distinguished:

Turnover time (T) is the ratio of the mass (M) of a reservoir (e.g., a gaseous compound in the →atmosphere) and the total rate of removal (S) from the reservoir: $T = M/S$. Separate turnover times can be defined for each removal process.

Adjustment time or *response time* (T_a) is a time scale characterizing the decay of an instantaneous pulse input into the reservoir. The term *adjustment time* is also used to characterize the adjustment of the mass of a reservoir following a step change in the source strength. *Half-life* or *decay constant* is used to quantify a first-order exponential decay process. See: →Response time, for a different definition pertinent to climate variations. The term *lifetime* is sometimes used, for simplicity, as a surrogate for *adjustment time*.

In simple cases, such as CFC-11, where the global removal rate of the compound is proportional to the total mass of the reservoir, the adjustment time equals the turnover time: $T = T_a$. In more complex cases removal rates are not proportional to the reservoir mass – for example because of feedback effects – and this equality no longer holds.

Longwave Radiation
See: →Thermal infrared radiation.

Lower Flammability Limit (LFL)
'The minimum concentration of a combustible substance that is capable of propagating a flame through a homogeneous mixture of the combustible and gaseous oxidizer under the specified conditions of test' (ASTM Standard E 681-85). The conditions of test usually reported for →refrigerants are in dry air in ambient temperature and pressure.

Lubricant
Typically a substance introduced between moving surfaces to reduce the friction and wear between them.

Materials Safety Data Sheet (MSDS)
A safety advisory bulletin prepared by chemical producers for a specific →refrigerant or compound.

Meeting of the Parties (to the Kyoto Protocol) (MOP)
→Conference of the Parties to the →United Nations Framework Convention on Climate Change serving as the Meeting of the Parties (MOP) to the →Kyoto Protocol. It is the supreme body of the Kyoto Protocol. See also: →Conference of the Parties/Meeting of the parties (COP/MOP).

Meeting of the Parties (to the Montreal Protocol) (MOP)
The supreme body of the Montreal Protocol.

Metered Dose Inhalers (MDIs) (Medical Aerosols)
A method of dispensing inhaled pulmonary drugs. See also: → Dry powder inhaler (DPI).

Miscible
The ability of two liquids or gases to uniformly dissolve into each other. Immiscible liquids will separate into two distinguishable layers.

Mitigation
A human intervention to reduce the sources or enhance the sinks of →greenhouse gases.

Mixing Ratio
Mixing ratio, or *mole fraction,* is the ratio of the number of moles of a constituent in a given volume to the total number of moles of all constituents in that volume. It is usually reported for dry air. Typical values for long-lived →greenhouse gases range from µmol/mol (parts per million: ppm), nmol/mol (parts per billion: ppb), to fmol/mol (parts per trillion: ppt). Correcting the mixing ratio for the non-ideality of gases gives the *volume mixing ratio* (sometimes expressed in ppmv, etc.).

Mole Fraction
See: →Mixing ratio

Montreal Protocol
The Montreal Protocol on Substances that Deplete the Ozone Layer was adopted in Montreal in 1987 and subsequently adjusted and amended in London (1990), Copenhagen (1992), Vienna (1995), Montreal (1997) and Beijing (1999). It controls the consumption and production of chlorine- and bromine-containing chemicals (known as →ozone-depleting substances, ODSs) that destroy the stratospheric →ozone layer.

Multilateral Fund
Part of the financial mechanism under the →Montreal Protocol, established by the →Parties to provide financial and technical assistance to →Article 5 Parties.

Non-Annex I Parties/Countries (Climate Convention)
The countries that have ratified or acceded to the →United Nations Framework Convention on Climate Change (UNFCCC) that are not included in →Annex I of the Climate Convention.

Non-Azeotropic (Refrigeration)
A →blend or mixture where the compositions of coexisting liquid and vapour differ and condensation and evaporation occur over a range of temperatures. This effect can in some applications give improved performance in plants with heating/cooling demand with gliding temperatures. Heating of hot tap water is one example. Equipment has to be modified to use a non-azeotropic blend. See also: →zeotropic, →azeotropic.

Non-Condensable Gases (Refrigeration)
Gases with very low temperature boiling points, which are not easily condensed. Nitrogen and oxygen are the most common ones found in →chillers.

Nonlinearity
A process is called 'nonlinear' when there is no simple proportional relation between cause and effect. The →climate system contains many nonlinear processes, resulting in a system with potentially very complex behaviour. Such complexity may lead to rapid climate change.

Normal Boiling Point (NBP)
The boiling point of a compound at atmospheric pressure (1013 hPa).

Not-in-Kind Technologies (NIK)
Not-in-kind technologies achieve the same product objective without the use of →halocarbons, typically with an alternative approach or unconventional technique. Examples include the use of stick or spray pump deodorants to replace CFC-12 aerosol deodorants; the use of mineral wool to replace CFC, HFC or HCFC insulating foam; and the use of dry powder inhalers (DPIs) to replace CFC or HFC metered dose inhalers (MDIs).

One-Component Foam (OCF)
A foam in which the →blowing agent acts both as a frothing agent and as a propellant. These foams are primarily used for gap filling (to prevent air infiltration) rather than for thermal insulation per se. As such the use of blowing agent is fully emissive.

Open Drive (Refrigeration)
A compressor drive motor that is outside the →refrigerant loop and therefore not directly exposed to the circulating refrigerant.

Ozone
The triatomic form of oxygen (O_3), which is a gaseous →atmospheric constituent. In the →troposphere it is created by photochemical reactions involving gases occurring naturally and resulting from →anthropogenic activities (→'smog'). Tropospheric ozone acts as a →greenhouse gas. In the →stratosphere ozone is created by the interaction between solar → ultraviolet radiation and molecular oxygen (O_2). Stratospheric ozone plays a major role in the stratospheric radiative balance. Its concentration is highest in the →ozone layer.

Ozone-Depleting Substances (ODSs)
Substances known to deplete the stratospheric →ozone layer. The ODSs controlled under the →Montreal Protocol and its Amendments are →chlorofluorocarbons (CFCs), →hydrochlorofluorocarbons (HCFCs), →halons, methyl bromide (CH_3Br), carbon tetrachloride (CCl_4), methyl chloroform (CH_3CCl_3), hydrobromofluorocarbons (HBFCs) and bromochloromethane (CH_2BrCl).

Ozone Depletion
Accelerated chemical destruction of the stratospheric →ozone layer by the presence of substances produced by human activities.

Ozone Depletion Potential (ODP)
A relative index indicating the extent to which a chemical product may cause →ozone depletion compared with the depletion caused by CFC-11. Specifically, the ODP of an →ozone-depleting substance (ODS) is defined as the integrated change in total ozone per unit mass emission of that substance relative to the integrated change in total ozone per unit mass emission of CFC-11.

Ozone Layer
The layer in the →stratosphere where the concentration of → ozone is greatest. The layer extends from about 12 to 40 km. This layer is being depleted by →anthropogenic emissions of chlorine and bromine compounds. Every year, during the Southern Hemisphere spring, a very strong depletion of the ozone layer takes place over the Antarctic region. This depletion is caused by anthropogenic chlorine and bromine compounds in combination with the specific meteorological conditions of that region. This phenomenon is called the *Antarctic ozone hole*.

Party
A country that signs and/or ratifies an international legal instrument (e.g., a protocol or an amendment to a protocol), indicating that it agrees to be bound by the rules set out therein. Parties to the →Montreal Protocol or →Kyoto Protocol are countries that have signed and ratified these Protocols.

Perfluorocarbons (PFCs)
Synthetically produced →halocarbons containing only carbon and fluorine atoms. They are characterized by extreme stability, non-flammability, low toxicity, zero →ozone depleting potential and high →global warming potential.

Phase-Out
The ending of all production and consumption of a chemical controlled under the →Montreal Protocol.

Phase-Out Plan
The part of the Country Programme under the →Montreal Protocol that describes the strategy statement of a government defining the →phase-out time schedule for each controlled substance and the government actions to be taken for achieving phase-out. It contains a prioritized list of projects to be undertaken and takes into account the specific industrial, political and legislative situation in the country.

Polar Stratospheric Clouds (PSCs)
A class of clouds composed of particles, including nitric acid hydrates and ice, that occur at high altitudes (of about 15 to 30 km) in the polar →stratosphere. They occur when the temperature is very low (below about –95°C), such as in the Antarctic →polar vortex, and have been observed mainly over Antarctica

in the winter and spring, and occasionally over the Arctic. PSCs play a major role in →ozone depletion because chlorine is converted to forms that are highly reactive with ozone through chemical reactions on or within the cloud particles.

Polar Vortex
A dynamical structure that occurs during the polar winter in which →stratospheric air acquires a cyclonic circulation about the pole, with an area of relatively still air in its centre. The vortex core air (above 16 km in altitude) becomes effectively isolated from mid-latitude air. The polar vortex over Antarctica is usually colder and lasts longer (throughout the austral spring) than the polar vortex over the Arctic.

ppm, ppb, ppt
See: →Mixing ratio.

Precursors
Atmospheric compounds which themselves are not →greenhouse gasses or →aerosols, but which have an effect on greenhouse-gas or aerosol concentrations by taking part in physical or chemical processes regulating their production or destruction rates.

Present Value Cost
The sum of all costs over all time periods, with future costs discounted.

Projection (Generic)
A potential future evolution of a quantity or set of quantities, often computed with the aid of a model. Projections are distinguished from *predictions* in order to emphasize that projections involve assumptions concerning, for example, future socio-economic and technological developments that may or may not be realized, and are therefore subject to substantial uncertainty.

Propellant
The component of an →aerosol spray that acts as a forcing agent to expel the product from the aerosol canister.

Purge System (Refrigeration)
A device used on low-pressure chillers to expel air and other non-condensables from the circulating →refrigerant.

Push-Pull Method (Refrigeration)
A method for →recovering and →recycling →refrigerant from a system using a negative pressure (suction) on one side to pull the old refrigerant out and pumping recycled refrigerant vapour to the other side to push the old refrigerant through the system.

Radiative Efficiency
A measure of the efficiency of a gas in changing →radiative forcing. It is calculated as the marginal change in radiative forcing per unit increase in gas concentration and typically given in units of W m^{-2} ppb^{-1}.

Radiative Forcing
Radiative forcing is the change in the net irradiance (expressed in Watts per square meter: W m^{-2}) at the →tropopause due to an internal change or a change in the external forcing of the →climate system, such as a change in the concentration of → carbon dioxide (CO_2) in the atmosphere or in the output of the Sun. Usually radiative forcing is computed after allowing for stratospheric temperatures to readjust to radiative equilibrium, but with all tropospheric properties held fixed at their unperturbed values. Radiative forcing is called *instantaneous* if no change in stratospheric temperature is accounted for. See also: →Global warming potential.

Radiative Forcing Scenario
A plausible representation of the future development of →radiative forcing associated, for example, with →anthropogenic changes in atmospheric composition or in land-use, or with natural factors such as variations in →solar activity. Radiative forcing scenarios can be used as input into simplified climate models to compute climate projections.

Radical
A molecular entity possessing an unpaired electron.

Reclamation
Reprocessing and upgrading of a recovered controlled substance through mechanisms such as filtering, drying, distillation and chemical treatment in order to restore the substance to a specified standard of performance. Chemical analysis is required to determine that appropriate product specifications are met. It often involves processing off-site at a central facility.

Recovery
The collection and storage of controlled substances from machinery, equipment, containment vessels, etc., during servicing or prior to disposal without necessarily testing or processing it in any way.

Recycling
Reuse of a recovered controlled substance following a basic cleaning process such as filtering and drying. For →refrigerants, recycling normally involves recharge back into equipment and it often occurs ‘on-site’.

Refrigerant (Refrigeration)
A heat transfer agent, usually a liquid, used in equipment such as refrigerators, freezers and air conditioners.

Relief Valve (Refrigeration)
A device that vents refrigerant when the pressure in a →chiller becomes dangerously high. Newer relief valves have a resealing mechanism so that when the pressure of the chiller returns to a normal level they reseal and prevent further refrigerant loss.

Research, Development and Demonstration
Scientific or technical research and development of new pro-

duction processes or products, coupled with analysis and measures that provide information to potential users regarding the application of the new products or processes, such demonstration tests and studies of the feasibility of pilot plants and other pre-commercial applications.

Response Time (Climate System)
The response time or *adjustment time* is the time needed for the →climate system or its components to re-equilibrate to a new state, following a forcing resulting from external or internal processes. Different components of the climate system can have very different response times. The response time of the →troposphere is relatively short, from days to weeks, whereas the response time of the →stratosphere is typically a few months. The oceans have much longer response times, of decades to millennia, because of their large heat capacity. The response time of the strongly coupled surface-troposphere system is mainly determined by the oceans, and is therefore slow compared with that of the stratosphere. The biosphere can respond quickly, for example to droughts, but it can also respond very slowly to other imposed changes.

See: →Lifetime, for the definition of response time in relation to atmospheric concentrations.

Retrofit
The upgrading or adjustment of equipment so that it can be used under altered conditions; for example, of refrigeration equipment to be able to use a non-ozone depleting refrigerant in place of a →chlorofluorocarbon (CFC).

Saturated Vapour Pressure
The maximum vapour pressure of a substance at a given temperature when accumulated over its liquid or solid state in a confined space.

Scenario (Generic)
A plausible and often simplified description of how the future may develop, based on a coherent and internally consistent set of driving forces and key relationships. Scenarios may be derived from →projections, but are often based on additional information from other sources, sometimes combined with a 'narrative storyline'. See also: →SRES scenarios, →climate scenario and →emission scenarios.

Semi-Aqueous Cleaning
Cleaning with a non-water-based cleaner, followed by a water rinse.

Servicing (Refrigeration)
In the refrigeration sector, all kinds of work that may be performed by a service technician, from installation, operations, inspection, repair, retrofitting, redesign and decommissioning of refrigeration systems to handling, storage, recovery and recycling of refrigerants, as well as record-keeping.

Shortwave Radiation
See: →Solar radiation.

Smog
The buildup of high levels of pollution, generally in association with urban areas. Photochemical smog occurs in the →troposphere where sunlight causes chemical reactions in polluted air, one effect of which is the generation of →ozone.

Solar Radiation
Radiation emitted by the Sun, most of which is shortwave radiation at wavelengths less than about 1 μm and is determined by the temperature of the Sun. See also: →Ultraviolet radiation; compare with: →thermal infrared radiation.

Solvent
Any product (aqueous or organic) designed to clean a component or assembly by dissolving the contaminants present on its surface.

Specific Costs (of Abatement Options)
The difference in costs of an abatement option as compared with a reference case, expressed in relevant specific units. In this Report the specific costs of →greenhouse gas emission reduction options are generally expressed in US$ per tonne of avoided →CO_2-equivalents (US$/t$CO_2$-eq).

SRES Scenarios
→Emission scenarios developed by the IPCC Special Report on Emission Scenarios (2000).

Stratosphere
The highly stratified region of the →atmosphere above the →troposphere. It extends from an altitude of about 8 km in high latitudes and 16 km in the tropics to an altitude of about 50 km. This region is characterized by increasing temperature with altitude.

Stratospheric Polar Vortex
See: →Polar vortex

Surfactant
A product designed to reduce the surface tension of water. Also referred to as a tension-active agent/tenside. Detergents are made up principally from surfactants.

Technology and Economic Assessment Panel (TEAP)
A standing subsidiary body of the Parties to the →Montreal Protocol, which was established in 1988 under Article 6 of the Montreal Protocol and is coordinated by the →United Nations Environment Programme (UNEP) Ozone Secretariat. It comprises hundreds of experts from around the world. TEAP is responsible for conducting assessments and for reporting to the Parties on (a) the state of art of production and use technology, options to →phase-out the use of →ozone-depleting substances (ODSs), recycling, reuse and destruction techniques; and (b)

the economic effects of ozone layer modification and the economic aspects of technology.

Thermal Infrared Radiation
Radiation emitted by the Earth's surface, the →atmosphere and the clouds, with wavelengths longer than the wavelength of the red colour in the visible part of the spectrum. It is also known as terrestrial or longwave radiation. The spectrum of infrared radiation is distinct from that of →solar or shortwave radiation because of the large difference in temperature between the surface of the Sun and the Earth.

Thermoplastic
A material that can repeatedly become plastic on heating and harden on cooling. Compare with: →Thermosetting.

Thermosetting
A material that sets permanently on heating. Compare with: → Thermoplastic.

Threshold Limit Values (TLVs)
Exposure safety guidelines established by the American Conference of Governmental and Industrial Hygienists (ACGIH) based on an inhalation →time-weighted average. TLVs 'represent conditions under which it is believed that nearly all workers can be repeatedly exposed day after day without adverse effects.' For volatile substances, such as →refrigerants, TLVs are expressed as parts per million volume concentrations in air (ppm).

Time-Weighted Average (TWA)
A technique used to measure the average exposure of workers to a chemical over a given period of time.

Top-Down Models
A modelling approach that evaluates a system from aggregate variables. An example of a top-down model is that of applied macroeconomic theory and econometric techniques applied to historical data on consumption, prices, incomes and factor costs to model final demand for goods and services, and supply from main sectors, like the energy sector, transportation, agriculture and industry. Compare with: →Bottom-up models.

Total Equivalent Warming Impact (TEWI)
A measure of the overall global-warming impact of equipment based on the total related →emissions of →greenhouse gases during the operation of the equipment and the disposal of the operating fluids at the end-of-life. TEWI takes into account both direct fugitive emissions, and indirect emissions produced through the energy consumed in operating the equipment. TEWI is measured in units of mass of →CO_2 equivalent. See also: → Life cycle climate performance (LCCP).

Transitional Substance (Montreal Protocol)
Under the →Montreal Protocol, a chemical whose use is permitted as a replacement for →ozone-depleting substances (ODSs), but only temporarily because the substance's →ozone depletion potential (ODP) is non-zero.

Tropopause
The boundary between the →troposphere and the →stratosphere.

Troposphere
The lowest part of the →atmosphere above the Earth's surface, where clouds and 'weather' phenomena occur. The thickness of the troposphere is on average 9 km in high latitudes, 10 km in mid-latitudes, and 16 km in the tropics. Temperatures in the troposphere generally decrease with height.

Ultraviolet Radiation (UV)
Radiation from the Sun with wavelengths between visible light and X-rays. UV-B (280–320 nm), one of three bands of UV radiation, is harmful to life on the Earth's surface and is mostly absorbed by the →ozone layer.

United Nations Environment Programme (UNEP)
Established in 1972, UNEP is the specialized agency of the United Nations for environmental protection.

United Nations Framework Convention on Climate Change (UNFCCC)
An international convention whose ultimate objective is the 'stabilization of →greenhouse-gas concentrations in the atmosphere at a level that would prevent dangerous →anthropogenic interface with the →climate system'. The Convention was adopted on 9 May 1992 in New York and signed at the 1992 Earth Summit in Rio de Janeiro by more than 150 countries and the European Community. It contains commitments for all → Parties and entered into force in March 1994. See also: →Kyoto Protocol.

Venting (Refrigeration)
A service practice where the →refrigerant vapour is allowed to escape into the →atmosphere after the refrigerant liquid has been recovered.

Volatile Organic Compounds (VOCs)
Organic compounds that evaporate at their temperature of use. Many VOCs contribute to the formation of →tropospheric → ozone and →smog.

Voluntary Agreement
An agreement between a government authority and one or more private parties, as well as a unilateral commitment that is recognized by the public authority, to achieve environmental objectives or to improve environmental performance beyond compliance.

Voluntary Measures
Measures to reduce →greenhouse-gas emissions that are adopted by firms or other actors in the absence of government man-

dates. Voluntary measures help make climate-friendly products or processes more readily available or encourage consumers to incorporate environmental values in their market choices.

Well-Mixed Greenhouse Gases
→Greenhouse gases with lifetimes that are long compared with the mixing time between the two hemispheres (about 1 year), so that their mixing ratios do not have large gradients except, possibly, close to source regions.

World Meteorological Organization (WMO)
Established in 1950, WMO is the specialized agency of the United Nations for meteorology (weather and climate), operational hydrology and related geophysical sciences.

Zeotrope (Refrigeration)
A blend consisting of several →refrigerants of different volatilities that appreciably changes in composition or temperature as it evaporates (boils) or condenses (liquefies) at a given pressure. A refrigerant blend assigned an R-400 series number designation in ANSI/ASHRAE 34 is a zeotrope. Compare with: → Azeotrope