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Glossary of Environment Statistics

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PREFACE

The preparation of a glossary of terms in environment statistics was requested in 1990 at the second meeting of the Intergovernmental Working Group on the Advancement of Environment Statistics. The Group felt that there was a need for statisticians to have a tool of quick reference for terms and definitions relevant to environmental data production and use. A first draft of the glossary was prepared by Mr. P. P. Sangal, former Director of the Central Statistical Organization of India, as consultant to the United Nations. The draft was presented and discussed at the fourth meeting of the Working Group in 1995.

Different versions of the glossary were circulated for comments to a large number of organizations and experts in the field. Many experts were also directly consulted on specific questions. Contributions were received from Uwe Barg, Frode Brunvoll, Augusto Curti, Arthur Dahl, Jean-Marc Faures, Moustafa Salem Gaafar, Edward Gillin, David Heath, Mary Jane Holupka, Klaus Janz, Gianna Marciani-Politi, John McLenaghan, Vivian Milczarski, Chaudhary Atta Muhammad, Heiner Naeve, Alexander Pflügler, Katja Remane, Philip Smith, Thirong Patrick So, Jo Taylor, Leon Tromp and André Vanoli.

This invaluable assistance in the preparation of the glossary is gratefully acknowledged. The final version of the glossary was prepared by a group of United Nations Statistics Division staff members, Peter Bartelmus, Kathy Gieri, Reena Shah and Donald Shih, with the secretarial assistance of Ella Price.

The glossary consists of almost 1,200 terms. It covers the areas of environment statistics, environmental and sustainable development indicators, and environmental accounting, which constitute the scope of the United Nations Statistics Division's work programme in the field of environment. In selecting the terms, the focus has been on the requirements of environmental statisticians, with some reference to the possible use of environmental data in management and policy analysis. While catering to the needs of data producers, the glossary might thus also be useful for data users.

Of course, the glossary is not exhaustive and it is far from perfect. Relatively arbitrary decisions had to be made in limiting its scope and coverage. Purely ecological terms and detailed technical descriptions of environmental facilities were omitted as were most of the related terms in economic statistics. Also, descriptions were held down to a minimum, as the glossary has been designed as a quick-reference tool rather than as a detailed thesaurus.

Methodologies in the field of environment statistics are relatively new and continuously changing. New concepts are emerging but many definitions are controversial and reflect a lack of broad agreement. In cases where terms were not "common knowledge" and had to be cited from a specific publication, direct reference to particular authors has been made. The full list of references that were used in producing particular citations and, more generally, in the overall preparation of the glossary is given at the end of the publication.

The glossary presents items in alphabetical order for easy access. An attempt has been made to provide self-contained definitions, so that the user's search for further items or additional material on a particular item can be kept

to a minimum. However, in many cases cross-references to indicate synonyms or related issues could not be avoided. Where more than one description for a particular term is given, the descriptions are numbered consecutively using arabic numerals.

The glossary represents work in progress. Further comments on this first attempt to present a list of terms and definitions that could be useful for work in environment statistics are not only welcome but may be deemed essential for future revisions.

CONTENTS

UNITS OF MEASUREMENT USED

Acidity	pH (level)
Area	ha (hectare) km^2 (square kilometre)
Concentration	p.p.m (parts per million) p.p.b (parts per billion) p.p.t (parts per trillion)
Length	mm (millimetre) cm (centimetre) km (kilometre)
Noise	dB (decibel)
Percentage	per cent
Radiation	curie
Temperature	°C (centigrade)
Volume	m^3 (cubic metre) l (litre) ml (millilitre)
Weight/mass	mg (milligram)

A

Abatement: *see* pollution abatement.

Abiotic: non-living.

Absorption: 1. photosynthetic interception of light; 2. capacity of environmental media to dispose of wastes and residuals.

Accountability: responsibility for the deterioration of the natural environment, implying the allocation of environmental costs to the economic activities that cause such deterioration. *See also* polluter-pays principle *and* user-pays principle.

Acid Deposition: any form of deposition on water, land and other surfaces that increases their acidity by contamination with acid pollutants, such as sulphur dioxide, nitrates and other acids. The deposition can be either dry (as in the adsorption of acid pollutants to particles) or wet (as in acid precipitation).

Acidification: increase of hydrogen ions, usually expressed as the pH value of environmental media.

Acid Precipitation: any form of precipitation (rain, snow, hail or fog) whose acidity has been increased through the uptake of acid pollutants from the air.

Acid Rain: *see* acid precipitation.

Activated Carbon: highly adsorbent form of carbon used to remove odours and toxic substances from liquid or gaseous emissions. In industrial waste-water treatment, it is used to remove dissolved organic matter from waste water. It is also used in motor vehicle evaporative control systems. *See also* adsorption.

Activated Sludge: sludge containing a high degree of active bacterial mass that is mixed with primary effluent or raw waste water and kept in suspension by aeration and/or agitation to eliminate organic material from the waste water. After decantation, the sludge is recycled into the aeration tank.

Activation: generation of an appropriate bacterial mass in sludge, under aerobic conditions, that is capable of eliminating and/or adsorbing organic matter from sewage.

Active Ingredient (in pesticides): specific chemical that kills or controls target pests. Pesticides are regulated primarily on the basis of active ingredients.

Adaptation: changes in an organism's structure or habits that help it to adjust to its surroundings.

Adapted Products: products that are less polluting, at the time of their consumption and/or scrapping, than equivalent traditional products. In most cases, such products are more costly, and their production and consumption are usually encouraged by fiscal and other incentives.

Adsorption: process in which a special solid surface is able to collect gases or vapours. In adsorption, the molecules of gas or liquid adsorbed contract and adhere to the surface of the solid in an extremely thin layer.

Advanced Treatment Technology (waste water): process capable of reducing specific constituents in waste water not normally achieved by other treatment options. It covers all unit operations that are not considered to be mechanical or biological, for example, chemical coagulation, flocculation and precipitation, break-point chlorination, stripping, mixed-media filtration, micro-screening, selective ion exchange, activated carbon adsorption, reverse osmosis, ultrafiltration and electroflotation. Advanced treatment processes may be used in conjunction with mechanical and biological treatment operations. *See also* biological treatment technology *and* mechanical treatment technology.

Aeration: addition of air to water resulting in a rise of its dissolved oxygen level. Specifically, aeration is applied in waste water treatment. In that case, aeration is used to maintain an appropriate oxygen concentration in the waste water in order to promote biological oxidation and to keep the activated sludge in suspension.

Aeration Tank: tank in which the sewage is brought into intense contact with activated sludge, and in which a high oxygen concentration is maintained by means of aerators that keep the sludge in suspension.

Aerobic: occurring or living in the presence of free or dissolved oxygen.

Aerobic Biological Oxidation: waste treatment using aerobic organisms in the presence of air or oxygen as agents for reducing the pollution load.

Aerosol: system of solid or liquid particles suspended in a gaseous medium, having a negligible falling velocity.

Aerosol Propellant: any (liquefied) gas that is used as the driving force in the expulsion of a liquid such as an aerosol spray from a container. Examples are nitrous oxide, carbon dioxide and halogenated hydrocarbons. The halogenated propellants such as chloro-fluorocarbons pose a threat to the earth's ozone layer and their use has been banned in many countries.

Afforestation: artificial establishment of forests by planting or seeding in an area of non-forest land.

Afterburner: burner located in or near incinerators so that the combustion gases may be made to pass through its flame in order to remove smoke and odours. It may be attached to or separated from the incinerator itself.

Agenda 21: the plan of action to achieve sustainable development that was adopted by world leaders at the United Nations Conference on Environment and Development held in Rio de Janeiro, Brazil, in June 1992 (United Nations, 1993b).

Agent Orange: toxic herbicide and defoliant used in the Viet Nam conflict.

Agricultural Land: land including arable land, land under permanent crops and land under permanent meadows and pastures.

Agricultural Pollution: liquid and solid wastes from all types of farming activities, including run-off from pesticide and fertilizer use, and from

feedlots; erosion and dust from ploughing; animal manure and carcasses; and crop residues and debris.

Agricultural Run-off: water that flows from agricultural fields. Agricultural run-off is a major source of pesticides in water.

Agricultural Waste: waste produced as a result of various agricultural operations. It includes manure and other wastes from farms, poultry houses and slaughterhouses; harvest waste; fertilizer run-off from fields; pesticides that enter into water, air or soils; and salt and silt drained from fields. *See also* agricultural pollution.

Agroecology: study of the relation of agricultural crops and environment.

Agroforestry: collective term for land-use systems and technologies in which woody perennials (trees, shrubs, palms, bamboos and so forth) are deliberately used on the same land management unit as agricultural crops and/or animals, in some form of either spatial arrangement or temporal sequence.

Agrology: branch of agriculture that deals with the origin, structure, analysis and classification of soils, especially in their relation to crop production.

Agronomy: science of soil management and crop production.

Air Basin: geographical region all of whose features (hills, bodies of water) determine a common atmospheric interaction for that region.

Airborne Disease: disease that is generally transmitted by nasopharyngeal discharges and by respiratory secretions, through coughing and sneezing, though it may also be conveyed through close contact. Respiratory diseases include the common childhood infections, measles, whooping cough, chickenpox, mumps, diphtheria and acute sore throat, as well as diseases of the respiratory tract, influenza and other acute viral infections, the pneumonias, and pulmonary tuberculosis (WHO, 1992).

Airborne Particulates: *see* suspended particulate matter.

Air-conditioning: process used for controlling the temperature, humidity and cleanliness of the air and bringing them to certain specified levels in rooms and buildings.

Air Contaminant: *see* air pollutants.

Air Curtain: method of mechanical containment of oil spills. Air is bubbled through a perforated pipe causing an upward water flow that retards the spreading of oil. Air curtains are also used as barriers to prevent fish from entering a polluted body of water.

Air Filter: device that catches the dust from air passing through it on a mesh of textile fabric, felt wire, paper and so forth, rather than through the use of dust arresters.

Air Pollutants: substances in air that could, at high enough concentrations, harm human beings, animals, vegetation or material. Air pollutants may thus include forms of matter of almost any natural or artificial composition capable of being airborne. They may consist of solid particles, liquid droplets or gases, or combinations of these forms. *See also* hazardous air pollutants.

Air Pollution: the presence of contaminant or pollutant substances in the air that do not disperse properly and that interfere with human health or welfare, or produce other harmful environmental effects.

Air Pollution Control: steps taken to maintain a standard of purity of air for good public health; for protection of plant and animal life, and property; for visibility; and for safe ground and air transportation. *See also* protection of ambient air.

Air Pollution Episode: the high concentration of air pollutants due to temperature inversion and low winds. It may give rise to serious, and sometimes fatal, illness. *See also* inversion.

Air Pollution Index (API): quantitative measure that describes ambient air quality. The index is obtained by combining figures for various air pollutants into a single measurement.

Air Pollution Sources: activities that result in air pollution including agricultural activities, combustion processes, dust producing processes, manufacturing activities, nuclear energy-related activities, spray-painting, printing, dry-cleaning and so on.

Air Quality Criteria: levels of, and length of exposure to, pollution resulting in adverse effects on human health and well-being.

Air Quality Index: *see* air pollution index.

Air Quality Monitoring: *see* monitoring.

Air Quality Standards: levels of air pollutants prescribed by regulations that may not be exceeded during a specified time in a defined area.

Aitken Nuclei: very small particles that exist in high concentrations in the atmosphere and are generally produced by combustion processes.

Alar: trade name for daminozide, a pesticide that makes apples redder, firmer and less likely to drop off trees before growers are ready to pick them. It is also used, to a lesser extent, on peanuts, tart cherries, grapes and other fruits.

Aldrin: toxic insecticide. Because of its high activity and long persistence, it was widely used in the 1950s, but is now prohibited in several countries.

Algae: simple rootless plants that grow in sunlit waters. The decomposition/ breakdown of dead algae generally affects water quality adversely by reducing levels of dissolved oxygen. Algae serve as food for fish and small aquatic animals.

Algal Bloom: rapid and significant increase in one or a few species of planktonic algae, stimulated by input of nutrients. *See also* blue-green algae *and* eutrophication.

Algicide: chemical highly toxic to algae, used to control the growth of algal blooms.

Alkalinity: capacity of aqueous media to react with hydroxyl ions. Alkalinity is the factor representing the acid-neutralizing capacity of an aqueous system.

Alkalinization: soil degradation caused by the accumulation of alkaline water-soluble salts.

Allergy: sensitivity to substances such as pollen, food or hair resulting in pathological conditions in certain people; it may also be caused by mental or environmental conditions.

Allotrophic: receiving (as do lakes or ponds) organic material by drainage from adjacent land.

Alpine Area: the part of a mountain above the tree line, but below the permanent snow.

Ambient: surrounding, environmental.

Ambient Concentration: measure of environmental quality indicating the amount of pollutants found per unit volume in different environmental media.

Anadromous Species: fish that spend their adult life in the sea but swim upriver to freshwater spawning grounds in order to reproduce.

Anaerobic: occurring or living in the absence of oxygen.

Anaerobic Biological Treatment: reduction of organic matter in waste, utilizing anaerobic organisms.

Anaerobic Decomposition: organic breakdown in the absence of air.

Anaerobic Respiration: chemical breakdown of food substances in the absence of oxygen.

Ancillary Activity: supporting activity undertaken within an enterprise (establishment) in order to create the conditions under which the principal or secondary activities can be carried out. It may include significant environmental protection by industry.

Antagonism: opposing effects produced by drugs, hormones and other substances on living systems.

Antarctic Ozone Hole: *see* ozone hole.

API: *see* air pollution index.

Apparent Consumption: proxy measure for consumption of a product or material, defined as production plus imports minus exports of the product or material.

Appropriate Technology: *see* environmentally sound technologies.

Aquaculture: the farming of aquatic organisms including fish, molluscs, crustaceans and aquatic plants. Farming implies some sort of intervention in the rearing process to enhance production, such as regular stocking, feeding, protection from predators and so forth. It also implies individual or corporate ownership of the stock being cultivated.

Aquifer: underground geologic formation, or group of formations, containing groundwater that can supply wells and springs. *See also* groundwater reservoir.

Archipelago: 1. group of islands; 2. sea with many islands.

Area Source: source of non-natural air pollution released over a relatively small area that cannot be classified as a point source. Such sources may include vehicles and other small fuel combustion engines.

Arid Zone: area with less than 250 millimetres (mm) of yearly rainfall. The term may include a reference to bioclimatic factors.

Artificial Recharge: introduction of surface water into an underground aquifer through recharge wells.

Artificial Watercourse: artificially constructed watercourse that serves instream uses (transportation, among others), purposes of water management, irrigation and so forth.

Artificial Water Impoundment: body of water impounded by a dam, used for the supply of drinking water, electricity generation, irrigation or animal husbandry. Watercourses serving as part of a reservoir system are included.

Asbestos: mineral fibre that can pollute air or water and cause cancer or asbestosis when inhaled.

Asbestosis: disease associated with chronic exposure to asbestos fibres. The disease makes breathing progressively more difficult and can lead to death.

A-scale Sound Level: measurement of sound approximating the sensitivity of the human ear, used to record the intensity or annoyance of sounds. *See also* decibel.

Assets: *see* natural assets. *See also* tangible assets *and* economic assets.

Assimilation: ability of natural systems to safely absorb waste and residuals. *See also* absorption.

Association: *see* interaction.

Atmosphere: mass of air surrounding the earth, composed largely of oxygen and nitrogen.

Atmospheric Absorption: absorption by the earth's atmosphere of most of the X-rays and ultraviolet and infrared radiation emitted by the sun, except visible light. It prevents the earth's surface from becoming too hot.

Atmospheric Assimilation: process that helps to maintain concentrations of various substances in different atmospheric regions.

Atmospheric Dispersion: process of dilution of gaseous or smoke pollution in the atmosphere.

Atomic Energy: 1. internal energy of an atom absorbed by the atom when it was formed; 2. energy derived from the nuclear transformation (fission or fusion) of atoms.

Atomic Wastes: *see* nuclear waste pollution.

Attenuation: process by which a compound is reduced in concentration over time, through adsorption, degradation, dilution or some other transformation.

Attrition: wearing or grinding down of a substance by friction. It is a contributory factor in air pollution, for example, from dust.

Automobile Air Pollution: emissions from cars and other vehicular traffic consisting chiefly of carbon monoxide, nitrogen oxides, unburnt gasoline, carbon dioxide and lead.

Avoidance Costs: actual or imputed costs for preventing environmental deterioration by alternative production and consumption processes, or by the reduction of or abstention from economic activities.

B

Background Concentration: ambient concentration of pollutants, such as carbon dioxide and other greenhouse gases, measured by background stations.

Background Radiation: radiation from sources other than the one being examined. It augments the signals of measuring devices.

Background Station: station to monitor background concentration levels of air polluting substances that are significant for a given region or for the globe as a whole. Regional stations are located far enough away from industry and urban areas not to pick up day-by-day fluctuations in pollution levels. The purpose is to measure long-term changes in the composition of the atmosphere. *See also* baseline station.

Bacteria: single-celled micro-organisms. Some are useful in pollution control because they break down the organic matter in water and land. Other bacteria may cause disease.

Bacteria Denitrification: reduction of nitrates and nitrites from the soil by denitrifying bacteria that survive under anaerobic conditions in soils and the lower layer of manure pits.

Bacterial Count: public hygiene coefficient for water that defines the permissible number of bacteria in a given volume of water according to the use of that water.

Bacterial Leaching: use of bacteria for extracting metals from mines by dissolving the ore.

Bacterial Purity: term referring to the maximum number of permissible *Escherichia coli* or other coliform bacteria in drinking water.

Bank Filtration: induced infiltration of river water through bankside gravel strata (by pumping from wells sunk into the gravel strata to create a hydraulic gradient) for the purpose of improving water quality.

Baseline Station: station that monitors pollution at very remote sites, for example, at the south pole. *See also* background station.

Battery (in agriculture): series of cages, compartments or structures for raising or fattening poultry or livestock.

Beamhouse Wastes: wastes obtained in the tanning industry from the curing, fleshing, washing, dehairing, bating, pickling and degreasing of hides.

Beef Cattle Feedlot: enclosure where cattle are kept. Feedlots are a potential hazard to the environment as they cause water pollution, and degradation of the lands and plants receiving polluted water.

Bench Terrace: embankment constructed along sloping land for the purpose of controlling erosion.

Benthos: plants and animals living at the bottom of a body of water.

Benzopyrene: carcinogenic hydrocarbon present in cigarette smoke.

Bilharzia: *see* schistosomiasis.

Biochemical Oxygen Demand (BOD): dissolved oxygen required by organisms for the aerobic decomposition of organic matter present in water.

Biocide: chemical substance required for killing unwanted organisms (pests, weeds and so forth).

Bioclimatology: scientific study of the relationship between organisms and climate.

Biocoenosis: association of different organisms, both plants and animals, belonging to well-defined characteristic species that is determined by the conditions of the local environment or ecosystem.

Biocontrol: *see* biological pest control.

Biocycle: cycle through which energy and essential substances are transferred among species and between the biotic and abiotic segments of the environment.

Biodegradable: capable of decomposing rapidly under natural conditions. *See also* biodegradation.

Biodegradation: process by which organic substances are decomposed by micro-organisms (mainly aerobic bacteria) into simpler substances such as carbon dioxide, water and ammonia.

Biodiversity: the range of genetic differences, species differences and ecosystem differences in a given area.

Biodiversity Convention: *see* United Nations Conference on Environment and Development (United Nations Environment Programme, 1992).

Biodiversity Indices: measures of species diversity expressed as ratios between numbers of species and "importance values" (numbers, biomass, productivity and so on) of individuals (Odum, 1971). The term may also refer to genetic diversity and diversity of habitats or communities.

Bioecology: branch of biology that studies the relationship among different living organisms and their environment.

Biogas: mixture of methane and carbon dioxide in the ratio of 7:3 that is produced by the treatment of animal dung, industrial wastes and crop residues. It is used as an alternative source of energy.

Biogeochemical Cycle: natural pathways of circulation of the essential elements of living matter.

Bioleaching: *see* bacterial leaching.

Biological Accumulation: accumulation of elements and compounds of harmful substances in the tissues of living organisms.

Biological Benchmark: population level or fitness of plant or animal species used as a benchmark for measuring pollution in natural systems (habitats). *See also* biological indicator.

Biological Clock: physiological mechanism in an organism to measure time.

Biological Diversity: *see* biodiversity.

Biologic Erosion: erosion of soil as a result of soil's being exposed to water or wind by the burrowing of rodents, and/or the destruction of vegetation by insects.

Biological Indicator: organism, species or community whose characteristics show the presence of specific environmental conditions. Other terms used are *indicator organism, indicator plant* and *indicator species.*

Biological Pest Control: use of predatory or parasitic organisms instead of highly pollutant chemicals to reduce the number of harmful animals or plants, as in, for example, the destruction of the citrophilus mealy bug by parasitic species of the chalcid wasp; the predation of beetles on the cottony-cushion scale; and the control of Japanese beetles by *Bacillus popilliae.*

Biological Pesticides: pesticides composed of biological substances, as opposed to the chemical substances used in conventional pesticides.

Biological Sewage Treatment: *see* biological treatment technology.

Biological Spectrum: percentage distribution of the various categories of life forms of plants in a particular area.

Biological Treatment Technology: waste-water treatment employing aerobic and anaerobic micro-organisms that results in decanted effluents and separate sludge containing microbial mass together with pollutants. Biological treatment processes are also used in combination or in conjunction with mechanical and advanced unit operations. *See also* advanced treatment technology *and* mechanical treatment technology.

Biological Waste: waste containing mostly natural organic materials (remains of plants, animal excrement, biological sludge from waste-water treatment plants, and so forth).

Biolysis: phenomenon in which living organisms are responsible for the decomposition of organic matter. *See also* biodegradation.

Biomass: total living weight (generally in dry weight) of all organisms in a particular area or habitat. It is sometimes expressed as weight per unit area of land or per unit volume of water.

Biome: vegetation belt/region on the earth's surface determined by its distinct climatic conditions.

Biometeorology: study of the interrelationships between life and weather.

Biometrics: application of statistical analysis to biological data.

Biomonitoring: use of living organisms to test the suitability of effluents for discharge into receiving waters and the quality of such waters downstream from the discharge.

Bionomics: study of the mode of life of organisms in their natural habitat and their adaptations to their surroundings.

Bioproductivity: rate at which energy is stored in an ecosystem or part thereof during a given period of time.

Biosphere: thin stratum of the earth's surface and upper water layer that contains the total mass of living organisms that process and recycle the energy and nutrients available from the environment.

Biota: living component of an ecosystem.

Biotope: area that is inhabited by a definite group of living organisms.

Blackfly: *see* onchocerciasis.

Black Weevil: *see* rice weevil.

Bloom: *see* algal bloom *and* eutrophication.

Blue-green Algae: primitive photosynthetic organisms comprising 1,500 or fewer species. In addition to being photosynthetic, many species can also fix atmospheric nitrogen, that is, transform the gaseous nitrogen of the air into compounds that may be used by living cells. They are also called cyanophytes. Cyanophyte blooms are especially common in waters that have been polluted by nitrogen wastes.

BOD: *see* biochemical oxygen demand.

Body Burden: total load of contaminatory material that may be present in living beings in a particular type of environment.

Botanical Pesticide: plant-produced chemical used in pest control. Examples include nicotine and strychnine.

Brackish Water: water containing salts at a concentration significantly lower than that of sea water. The concentration of total dissolved salts is usually in the range of 1,000-10,000 milligrams per litre (mg/l).

Breakbone Fever: *see* dengue fever.

Building Codes: building regulations concerning materials, structural design, construction practices, safety, building services (lighting, ventilation, electricity, heating/air conditioning, escalators, plumbing, water supply, drainage and so forth) and specifications for appropriate administrative and technical control.

Built-up and Related Land: land under houses, roads, mines, quarries or any other facilities, including their auxiliary spaces, deliberately installed so that human activities may be pursued. Included are also certain types of open land (non-built-up land) that is closely connected with these activities, such as waste tips, derelict land in built-up areas, junkyards, and city parks and gardens. Land occupied by scattered farm buildings, yards and their annexes is excluded.

C

Caesium: metallic element, some isotopes of which are radioactive.

Cancer: *see* carcinoma.

Canopy: branches and leaves of woody plants that are developed some distance above the ground.

Cap: layer of clay or some other highly impermeable material installed over the top of a closed landfill to prevent entry of rainwater and minimize production of leachate.

Capacity of Treatment Installation: maximum amount of waste materials that can be treated during one year according to usual standards and technology in a particular treatment plant or installation. Capacity can be expressed in terms of the daily volume of waste water treated, the population equivalent (for waste-water treatment) or the weight that can be treated.

Capital Accumulation (environmental accounting): environmentally adjusted concept of capital formation that accounts for depletion and degradation of natural capital. The concept may also include discoveries or transfers (from the environment into the economic system) of natural resources, and the effects of disasters and natural growth.

Cap Rock: impermeable upper seal over an underground reserve of natural gas or crude oil.

Carbon Adsorber: add-on control device that uses activated carbon to adsorb volatile organic compounds (VOCs) from a gas stream. The VOCs are later recovered from the carbon.

Carbon Cycle: 1. natural circulation of carbon which is exchanged among large carbon reserves in the land, the ocean, the biosphere and the atmosphere; 2. circulation of carbon through ecosystems in the course of which carbon atoms from carbon dioxide are incorporated into organic compounds formed by green plants during photosynthesis.

Carbon Dioxide (CO_2): colourless, odourless and non-poisonous gas that results from fossil fuel combustion and is normally a part of ambient air. It is also produced in the respiration of living organisms (plants and animals), and considered to be the main greenhouse gas, contributing to climate change.

Carbon Monoxide (CO): colourless, odourless and poisonous gas produced by incomplete fossil fuel combustion. Carbon monoxide combines with the haemoglobin of human beings, reducing its oxygen carrying capacity, with effects harmful to human beings.

Carbon Sink: pool (reservoir) that absorbs or takes up released carbon from another part of the carbon cycle. For example, if the net exchange between the biosphere and the atmosphere is towards the atmosphere, the biosphere is the source and the atmosphere is the sink.

Carbon Tax: instrument of environmental cost internalization. It is an excise tax on the producers of raw fossil fuels based on the relative carbon content of those fuels.

Carcinogen: agent that can cause or aggravate cancer, including chemicals, radiation and viruses.

Carcinogenesis: the production of cancer.

Carcinoma: cancerous growth or malignant tumour of the epithelial tissues (the tissues forming the outer layer of the body surface and lining the whole passage along which food passes through the body and other hollow structures).

Carnivore: meat-eating animal.

Carnivorous Plant: any plant especially adapted for capturing insects and other tiny animals by means of ingenious pitfalls and traps (also called an insectivorous plant).

Carrying Capacity: maximum number of animals of one or more species that can be supported by a particular habitat or area through the most unfavourable period of the year. The carrying capacity is different for each species in a habitat because of particular food, shelter, and social requirements and because of competition from other species that may have similar requirements. Attempts have been made to apply carrying capacity analysis to the human population in particular territories. *See also* ecological footprint.

Car Wrecks: *see* shredding residues.

Catalytic Converter: device fitted to the exhaust of motor cars to reduce air pollution by either oxidation or reduction processes.

Catalytic Incineration: process in which precious metals such as platinum and palladium are used as catalytic agents for disposal of gaseous wastes (volatile organic compounds) that contain low concentrations of combustible material and air. The fact that catalytic incinerators require lower temperature than conventional thermal incinerators results in fuel and cost savings.

Catchment Area: area from which rainwater drains into river systems, lakes and seas. *See also* drainage basin.

Cation: the ion in an electrolysed solution that migrates to the cathode. It is positively charged.

Cation Exchange Capacity (CEC): measure of potential of the soil to absorb nutrient cations; guide to agriculturists regarding the application, in terms of quantity and frequency, of cation-rich fertilizers to the soil.

Caustic Scrubbing: chemical process of removing sulphur dioxide from flue gases by treating them with sodium hydroxide and lime.

Caustic Soda: a strong alkaline substance (sodium hydroxide) used as a cleaning agent in some detergents.

CBA: *see* cost-benefit analysis.

CEC: *see* cation exchange capacity.

Centrifugal Collector: mechanical system using centrifugal force to remove aerosols from a gas system or to dewater sludge.

CEPA: *see* classification of environmental protection activities.

Cesium: *see* caesium.

Cesspit: well or pit in which night-soil and other refuse is stored; constructed with either tight or porous walls.

Cetacea: order of marine mammals including whales, dolphins and porpoises.

CFCs: *see* chloro-fluorocarbons.

Channelization: straightening and deepening of streams so that water therein will move faster. Flood reduction or marsh drainage tactics can interfere with waste assimilation capacity and disturb fish and wildlife habitats.

Characteristic Species: species that are localized within a group and provide the most typical expression of the group's ecology.

Charcoal: solid residue consisting mainly of carbon obtained by the destructive distillation of wood in the absence of air.

Check Irrigation: method of irrigation in which a large field is divided into small compartments or checks, into which water is then flooded.

Chemical Mutagens: chemical substances that can cause congenital defects in future generations.

Chemical Oxygen Demand (COD): index of water pollution measuring the mass concentration of oxygen consumed by the chemical breakdown of organic and inorganic matter.

Chemical Toilet: special type of dry vault toilet in which sewage is decomposed by the addition of caustic chemicals such as quicklime.

Chemical Treatment (of hazardous waste): treatment methods that are used to effect the complete breakdown of hazardous waste into non-toxic gases or, more

frequently, to modify the chemical properties of the waste, for example, through reduction of water solubility or neutralization of acidity or alkalinity.

Chemosterilant: pesticide chemical that controls pests by destroying their ability to reproduce.

Chilling Effect: lowering of the earth's temperature because of accumulation of particles in the air blocking the sun's rays.

Chimney Effect: vertical movement of localized gases and air due to temperature differences.

Chlorinated Hydrocarbons: class of persistent, broad-spectrum insecticides that linger in the environment and accumulate in the food chain. Among them are dichlorodiphenyltrichloroethane (DDT), aldrin, dieldrin, heptachlor, chlordane, lindane, endrin, mirex, hexachloride and toxaphene. Another example is trichloroethylene which is used as an industrial solvent.

Chlorination: the application of chlorine to drinking water, sewage or industrial waste in order to disinfect or oxidize undesirable compounds.

Chlorine Loading: total amount of chlorine in the atmosphere, which is a measure of potential damage to the ozone layer.

Chloro-fluorocarbons (CFCs): inert, non-toxic and easily liquefied chemicals used in refrigeration, air-conditioning, packaging and insulation, or as solvents and aerosol propellants. Because CFCs are not destroyed in the lower atmosphere, they drift into the upper atmosphere where their chlorine components destroy ozone. They are also among the greenhouse gases that may affect climate change. *See also* aerosol propellant.

Chlorophyll: group of green pigments found in plants and essential for photosynthesis.

Cholera: intestinal disease generally caused by faecal contamination of water and food.

Chromium: heavy metal used in the manufacture of alloys and electroplating. It is a multivalent element that in hexavalent form can be toxic in drinking water if concentration exceeds 50 milligrams per litre.

Chronic Toxicity: capacity of a substance to cause long-term poisonous human health effects.

Chutes: conduit pipes used to carry refuse to incineration plants.

Cladophora Blanket Weed: green weed (alga) usually found in water rich in nutrients, where it looks like a green blanket.

Classification of Environmental Protection Activities (CEPA): draft classification proposed within the framework of the United Nations methodology for integrated environmental and economic accounting (United Nations, 1993a). *See also* environmental protection.

Clean Products: *see* adapted products.

Clean Technology: installation or a part of an installation that has been adapted in order to generate less or no pollution. In clean as opposed to "end-of-pipe" technology, the environmental equipment is integrated into the production process. *See also* environmentally sound technologies.

Clean-up: *see* environmental clean-up.

Clear-cutting: forest management technique that involves harvesting all the trees in one area at one time.

Climate: condition of the atmosphere at a particular location (microclimate) or region over a long period of time. It is the long-term summation of atmospheric elements - such as solar radiation, temperature, humidity, precipitation type (frequency and amount), atmospheric pressure and wind (speed and direction) - and their variations.

Climate Change: term frequently used in reference to global warming due to greenhouse gas emissions from human activities. *See also* greenhouse effect.

Climate Convention: *see* United Nations Conference on Environment and Development (United Nations, 1992).

Climate Index: *see* greenhouse climate response index.

Climate Protection: *see* protection of climate and the ozone layer.

Climatological Statistics: statistics dealing with long-term weather conditions.

Climax System: ecosystem that has evolved into a stabilized steady-state system with maximum biomass.

Climosequence: series of climatic data of different stations for a given region or country.

Closed Ecological System: ecosystem that provides for the maintenance of life through complete reutilization of available material, in particular by means of cycles wherein exhaled carbon dioxide, fuel and other waste matter are converted, chemically or by photosynthesis, into oxygen, water and food.

Cloud Forest: forest in a mountainous region where cloudiness and condensation occur regularly.

Cloud Seeding: technique for promoting rainfall by the introduction of sea salt, dry ice, zinc or silver iodine into the clouds.

Coagulation: process of (primary) waste-water treatment whereby coagulants such as hydrolysing salts of aluminium and iron are added to the water and a hydrolysis reaction leads to the formation of water-insoluble iron and aluminium hydroxides which settle as suspended particles.

Coastal Lagoons: sea-water bodies situated at the coast, but separated from the sea by land spits or similar land features. Coastal lagoons are open to the sea in restricted spaces.

Coastal Protection: steps required to prevent erosion of the coast. The stabilization of beaches or dunes is achieved by mechanical or vegetational means, or through erecting heavy sea walls or revetments.

Coastal Zone: lands and waters adjacent to the coast that exert an influence on the uses of the sea and its ecology or, inversely, whose uses and ecology are affected by the sea.

COD: *see* chemical oxygen demand.

Coffin: thick-walled lead container used for transporting radioactive material.

Coke Oven Emissions: toxic emissions released at various stages in the production and use of coke, and causing cancers in human beings.

Cold Desert: desert covered with snow or ice.

Coliform Index: rating of water purity based on faecal bacteria count.

Coliform Organism: micro-organism found in the intestinal tract of human beings and animals. Its presence in water indicates faecal pollution and potentially dangerous bacterial contamination. *See also Escherichia coli.*

Collection of Waste: *see* waste collection.

Collector: device for removing contaminants from air and other gases. *See also* cyclone collector.

Combined Sewer: *see* sewer.

Combustion: burning or rapid oxidation, accompanied by the release of energy in the form of heat and light. It is a basic cause of air pollution.

Combustion Equipment: equipment used for burning fuel or any combustible material. Examples are incinerators, boilers, different types of furnaces, fly-ash collectors and so forth.

Command-and-control Policy: environmental policy that relies on regulation (permission, prohibition, standard setting and enforcement) as opposed to financial incentives, that is, economic instruments of cost internalization.

Comminution: mechanical shredding or pulverizing of waste. It is used in solid waste or waste-water treatment.

Common Property Resources (environmental): natural resources owned and managed collectively by a community or society rather than by individuals.

Community of Species: assemblage of organisms characterized by a distinctive combination of species occupying a common environment and interfacing with one another.

Community Structure: proportion of various species in a community.

Compact: firmly packed (soil).

Compaction: reduction of solid waste by rolling and tamping.

Compaction Ratio: ratio obtained by dividing the original volume of solid waste by its final volume after compaction.

Complete Fertilizer: fertilizer containing nitrogen, phosphoric acid and potash.

Compost: mixture of organic garbage and degradable trash with soil, in which bacteria in the soil break down the garbage and trash into organic fertilizer.

Composting: process of reducing vegetable and animal refuse, either by natural biological decomposition of organic material in the presence of air or by controlled mechanical methods, for the purpose of increasing and maintaining soil fertility.

Compression: process of compaction of refuse in which volume is reduced by about 80 per cent.

Conditionally Renewable (Natural) Resources: *see* renewable natural resources.

Conditioning: *see* environmental conditioning.

Conditioning of Radioactive Wastes: operation that transforms radioactive waste into a safe condition for transport, storage and/or disposal.

Confined Aquifer: aquifer in which groundwater is confined under pressure significantly greater than atmospheric pressure.

Confined Water Well: well whose sole source of supply is confined groundwater.

Conifers: trees that have needlelike leaves and typically bear cones, for example, pine and spruce.

Conservation: management of human use of organisms or ecosystems to ensure that such use is sustainable (IUCN/WWF, 1991).

Conservation of Mass: term referring to the first law of thermodynamics which states that matter is neither created nor destroyed by any physical process. *See also* materials and energy balances.

Consumer Services: *see* environmental services.

Consumption Residues: wastes resulting from the final consumption of goods or services rather than from their production or distribution.

Consumption Services: *see* environmental services.

Contact Pesticide: chemical that kills pests on contact with the body rather than by ingestion.

Containment: retention of hazardous material so as to ensure that it is effectively prevented from dispersing into the environment, or released only at an acceptable level. Containment may occur in specially built containment spaces.

Contaminant: any physical, chemical, biological or radiologic substance or matter that has an adverse effect on air, water, land/soil or biota. The term is frequently used synonymously with *pollutant*.

Contingent Valuation: method of valuation used in cost-benefit analysis and environmental accounting. It is conditional (contingent) on the construction of hypothetical markets, reflected in expressions of the willingness to pay for potential environmental benefits or for the avoidance of their loss.

Controlled Environmental Housing (in agriculture): buildings where livestock is housed under controlled environmental conditions of temperature, humidity, ventilation or lighting.

Coolant: liquid or gas used to reduce the heat generated by power production in nuclear reactors, electric generators, various industrial and mechanical processes, and automobile engines.

Cooling Tower: structure that helps to remove heat from water used as a coolant, for example, in plants generating electric power.

Corrosion: dissolving and wearing away of metal, caused by a chemical reaction, for example, between water and water contacting pipes, chemicals touching a metal surface, or two metals in contact.

Cosmic Rays: high-energy ionizing radiation from outer space.

Cost-benefit Analysis: assessment of the direct economic and social costs and benefits of a proposed project for the purpose of project or programme selection. The cost-benefit ratio is determined by dividing the projected benefits of the programme by the projected costs. A programme having a high benefit-cost ratio will take priority over others with lower ratios.

Cost Internalization: incorporation of negative external effects, notably environmental depletion and degradation, into the budgets of households and enterprises by means of economic instruments, including fiscal measures and other (dis)incentives.

Counterurbanization: movement of city dwellers to suburban areas resulting in the creation of new urban areas. This is a phenomenon usually observed in industrialized countries.

Creaming: selective cutting of the best (from a commercial point of view) trees. It need not be restricted to the best trees in a stand but may also extend to the best stands in a larger area.

Critical Load: quantitative estimate of the level of exposure of natural systems to pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur.

Crop Rotation: practice of growing different crops in succession on the same land.

Crustaceans: group of mainly marine invertebrates, including lobsters, crabs and shrimps, with hard shells.

Cultigen: plant that is grown only under cultivation, for example, cabbage, or a group of such plants.

Curie: quantitative measure of radioactivity equal to 3.7×10^{10} disintegrations per second.

Cybernetics: science of communication and control mechanisms in systems.

Cyclone Collector: device that uses centrifugal force to pull particles/ residuals from polluted air or water.

D

Dam: *see* artificial water impoundment.

Damage Cost: cost incurred by repercussions (effects) of direct environmental impacts (for example, from the emission of pollutants) such as the degradation of land or human-made structures and health effects. In environmental accounting, it is part of the costs borne by economic agents. *See also* environmental costs.

dB: *see* decibel.

DDD: dichlorodiphenyldichloroethane, insecticide highly toxic to fish.

DDT: dichlorodiphenyltrichloroethane, insecticide highly toxic to biota, including humans. This is a persistent biochemical which accumulates in the food chain.

Dead Stock: equipment such as tractors and implements required to carry out farm operations.

Debt-for-nature Swap: arrangement by which an indebted developing country undertakes, in exchange for cancellation of a portion of its foreign debt, to establish local currency funds to be used to finance a conservation programme.

Decay: *see* decomposition.

Dechlorination: removal of chlorine from a substance by chemically replacing it with hydrogen or hydroxide ions in order to detoxify the substance involved.

Decibel (dB): unit of sound measurement on a logarithmic scale, with sound approximately doubling in loudness for every increase of 10 decibels.

Deciduous Forest: forest composed primarily of broad-leaved trees that shed all their leaves during one season. Such forests are found in three middle-latitude regions with a temperate climate characterized by a winter season and year-round precipitation: eastern North America, western Eurasia, and north-eastern Asia.

Declaration on the Human Environment: issued by the United Nations Conference on the Human Environment, held in Stockholm, Sweden, from 5 to 16 June 1972.

Declivity: downward sloping of land surface.

Decomposer Organism: bacterium or fungus that breaks down parts of dead plants or animals into simpler substances.

Decomposition: breakdown of organic matter by aerobic bacteria or fungi that changes the chemical make-up and physical appearance of the materials affected.

Deep Ecology: holistic approach to the environment that stresses the intrinsic equality of species, including human beings.

Defensive Environmental Costs: actual environmental protection costs incurred in preventing or neutralizing a decrease in environmental quality, as well as the expenditures necessary to compensate for or repair the negative effects (damage) of environmental deterioration. Such costs include expenditures required to mitigate environment-related health and other welfare effects on human beings. *See also* environment-related defensive activities.

Defensive Expenditure: *see* defensive environmental costs.

Defoliant: herbicide that removes leaves from trees and growing plants.

Deforestation: clearing of tree formations and their replacement by non-forest land uses.

Degradation: *see* environmental degradation.

Degradation Costs: costs reflecting the qualitative deterioration of the natural environment by economic activities. *See also* environmental costs *and* damage cost.

Dendrocoelum Lacteum: flatworm found in polluted water, used as a biochemical indicator of pollution levels.

Dengue Fever: infectious viral disease of the tropics, causing fever and acute pains in the joints.

Denitrification: natural source of dinitrogenoxide (N_2O) from the bacterial or chemical reduction of nitrates in water or soil, producing first nitrites, then nitrogen.

Denudation: 1. erosion by rain, frost, wind or water of the solid matter of the earth. The term often implies the removal of soil down to the bedrock; 2. removal, by natural or artificial means, of all vegetation and organic matter.

Depletion (in natural resource accounting): for renewable resources, the part of the harvest, logging, catch and so forth above the sustainable level of the resource stock; for non-renewable resources, the quantity of resources extracted.

Depletion Costs: monetary value of the quantitative depletion (beyond replenishment or regeneration) of natural assets by economic activities. Depletion of natural resources results from their uses as raw materials in production or directly in final (household) consumption.

Deposit-refund System: surcharge on the price of potentially polluting products. When pollution is avoided by returning the products or their residuals, a refund of the surcharge is granted. *See also* economic instruments.

Derelict Land: land damaged by extractive or other industrial processes and then abandoned.

Desalinization: 1. removal of salt from ocean or brackish water. It is achieved by various methods, for example, distillation, electrodialysis, ion

exchange, multiple-effect distillation, reverse osmosis hyperfiltration, solar evaporation and vapour compression; 2. removal of salt from soil by artificial means, usually leaching. It is also known as desalination.

Desert: region where vegetation is scarce or absent because of deficient rainfall or edaphic aridity.

Desertification: land degradation in arid, semi-arid and dry sub-humid areas resulting from various factors, including climatic variations (drought) and human activities (overexploitation of drylands).

Desiccant: chemical agent that absorbs moisture. Some desiccants are capable of drying out plants or insects, thereby causing their death.

Designer Bugs: popular term for microbes developed through biotechnology that can degrade specific toxic chemicals at their source in toxic waste dumps or in groundwater.

Desludging: removal of sludge from sedimentation tanks, septic tanks and so forth.

Desulphurization: removal of sulphur from fossil fuels to reduce pollution.

Detergent: synthetic washing agent that helps to remove dirt and oil. It may contain compounds that kill useful bacteria and encourage algae growth in receiving waters when those compounds are discharged as part of waste water.

Detritus: unconsolidated sediments composed both of inorganic and of dead or decaying organic material.

Development: *see* human development *or* sustainable development.

Dew Point: temperature at which cooled air becomes saturated with water vapour and condensation takes place resulting in the formation of dew. The dew point varies with the relative humidity and temperature of the air.

Diapause: period of no development and reduced metabolism in the life cycle of organisms due to unfavourable environmental conditions.

Diatomaceous Earth: chalklike material (fossilized diatoms) used to filter out solid wastes in waste-water treatment plants. It is also used as an active ingredient in some powdered pesticides.

Diffuse Emission: pollution infiltrating the atmosphere from a large non-point source, for example, dust from a slag heap.

Digester: closed tank in waste-water treatment plants that decreases the volume of solids and stabilizes raw sludge by bacterial action.

Digestion: biochemical decomposition of organic matter, resulting in partial gasification, liquefaction and mineralization of pollutants.

Dike: low wall that can act as a barrier to prevent a spill from spreading.

Dilution: method of disposing of industrial waste or plant effluent by discharge into a stream or other body of water.

Dilution Ratio: ratio of the volume of water in a water body to the whole volume of incoming waste. This factor affects the waste assimilation capacity of the water body.

Dioxin: synthetic organic chemical of the chlorinated hydrocarbon class. It is one of the most toxic compounds known to humans whose harmful effects, even in extremely minute concentrations, include induction of cancer and birth defects. It has become a widespread pollutant because of the use of certain dioxin-containing herbicides.

Direct Discharger: municipal or industrial facility that emits pollutants through a defined conveyance or system. It constitutes a point source of pollution.

Direct Incineration: incineration of all refuse received often including non-flammable material.

Discharge: release of substances (residuals of production and consumption) into water or soil.

Discounting (of natural assets): determining the present value (net worth) of assets by applying a discount rate to the expected net benefits from future uses of those assets. The discount rate reflects the social preferences for current (as compared with future) uses.

Disease Vector: *see* vector.

Disinfection: effective killing by chemical and physical processes of all organisms capable of causing infectious diseases. Chlorination is the disinfection method commonly employed in sewage treatment processes, water supplies, wells and swimming pools.

Disinfestation: destruction of parasites, insects, vermin or rodents or hindering of their growth by physical or mechanical means.

Dispersant: chemical agent used to break up concentrations of organic material such as spilled oils.

Dispersion: *see* atmospheric dispersion.

Disposal of Waste: waste elimination techniques comprising landfills, containment, underground disposal, dumping at sea and all other disposal methods.

Dissolved Oxygen (DO): amount of gaseous oxygen (O_2) actually present in water expressed in terms either of its presence in the volume of water (milligrams of O_2 per litre) or of its share in saturated water (percentage).

Dissolved Solids: disintegrated organic and inorganic material contained in water. Excessive amounts make water unsuitable for drinking or for use in industrial processes.

DNA: deoxyribonucleic acid, chief constituent of chromosomes.

DO: *see* dissolved oxygen.

Domestication: process by which plants, animals or microbes selected from the wild adapt to a special habitat created for them by humans.

Dose (radiology): quantity of energy or radiation absorbed. *See also* effective dose equivalent.

Dose-effect Relationship: the relationship between the dose of harm-producing substances or factors and the severity of their effect on exposed organisms or matter.

Dose-response Relationship: changes in the prevalence or incidence of a given effect associated with changes in the level of a possible cause.

Dosimeter: instrument that measures exposure to radiation.

Downwash: drawing downward of chimney gases by a system of vortices or eddies within the lee of a chimney when the wind is blowing.

Drainage Basin: area from which all precipitation flows to a single stream or a set of streams. It is also called a catchment area or watershed.

Dredging: removal of mud from the bottom of water bodies for deepening through the use of special mechanical devices. Dredging disturbs the ecosystem and can kill aquatic life. Dredging of contaminated muds can expose aquatic life to heavy metals and other toxic materials.

Dredging Sludge: sludge obtained from dredging of rivers, river mouths, harbours and coastal areas.

Drift-net Fishing: type of fishing involving very long nets that drift with the winds and currents, thus creating a webbing curtain in which fish are enmeshed. It may result in (a) commercially important species' being unusable when landed owing to a long soak time or damage by predators and (b) incidental by-catch of non-targeted fish and other animals.

Drinking Water Standards: standards determining the quality of drinking water in the context of prevailing environmental, social, economic and cultural conditions, with reference to the presence of suspended matter, excess salts, unpleasant taste and all harmful microbes. Meeting of those standards does not necessarily imply purity.

Drip Irrigation: water-saving technique of surface irrigation through pipes made of plastics. It delivers the water drop by drop to plants through tiny holes, and prevents waterlogging of soils.

Driving Force-state-response Framework: framework for indicators for sustainable development adapted from the pressure-state-response framework. *See also* framework for indicators of sustainable development.

Drought: prolonged absence or marked deficiency of precipitation which may contribute to desertification.

Dry Tundra: dry, treeless, flat region with arctic climate and vegetation that may or may not be grazed by domestic animals.

Dual Flushing System: water flushing system that can release either 4.5 or 9 litres at will. It constitutes a means of saving water.

Dual Purpose Sewer: sewer that conveys both foul sewage and surface water.

Dual Supply System: system incorporating two water supplies, one for flushing and another for drinking and cooking. It is often used in countries where drinking water is scarce.

Duff: decomposed and partly decomposed vegetable matter, making up part of the forest floor. It is composed of litter or humus.

Dump: site used to dispose of solid wastes without environmental controls.

Dumping: waste disposal in an uncontrolled manner.

Dumping at Sea: disposal of hazardous and non-hazardous substances in the open sea.

Dune Stabilization: activities that aim at stabilizing dunes mainly by the planting of plant species.

Dust: particles light enough to be suspended in air.

Dust Arrester: device for catching dust, usually from flue gases. Consequently, much of the dust caught is fly ash.

Dust Burden: weight of dust suspended in a unit volume of air. Expressed in grams per cubic metre at standard temperature and pressure.

Dust Devil: *see* dust whirl.

Dust Whirl: small, intense vertical disturbance in which large volumes of dust and debris are carried upwards; it usually occurs in arid and semi-arid regions.

Dyeing Wastes: waste generated when wool, cotton or synthetic fibres are dyed. The spent dye liquors contribute 15-30 per cent of the biochemical oxygen demand (BOD) load from textile manufacturing.

Dyke: *see* dike.

Dystrophic Water: shallow body of water that contains much humus and/or organic matter. The highly acidic water impairs fish life.

E

Earthquake: sudden shaking or trembling of the earth caused by faulting or volcanic activity.

Earth Summit: *see* United Nations Conference on Environment and Development.

Earthwatch: general term for the global environmental assessment efforts of the United Nations system as coordinated by the United Nations Environment Programme to improve the gathering and sharing of environmental information and provide early warning of environmental problems requiring international action.

Ebb: falling tide.

Ecodevelopment: development at regional and local levels, consistent with the potentials of the area involved, with attention given to the adequate and rational use of natural resources, technological styles and organizational forms that respect the natural ecosystems and local social and cultural patterns (UNEP, 1975). The term is also used to describe an integrated approach to environment and development.

Eco Domestic Product: *see* environmentally adjusted net domestic product.

***E. Coli*:** *see Escherichia coli*.

Ecological Amplitude: limits of environmental conditions within which an organism can live and function.

Ecological Balance: equilibrium between, and harmonious coexistence of, organisms and their environment.

Ecological Dominance: exertion of a major controlling influence of one or more species upon all other species by virtue of their number, size, productivity or related activities.

Ecological Equilibrium: *see* ecological balance.

Ecological Ethics: moral principles governing the human attitude towards the environment, and rules of conduct for environmental care and preservation.

Ecological Footprint: land (and water) area of the planet or particular area required for the support either of humankind's current lifestyle or the consumption pattern of a particular population. It is the inverse of the carrying capacity of a territory.

Ecological Impact: effect of human activities and natural events on living organisms and their non-living environment. *See also* environmental impact.

Ecological Statistics: application of statistical methods to the description and monitoring of ecosystems. Such monitoring may require modelling (beyond statistical measurement) which is the subject of the related domain of statistical ecology.

Ecology: totality or pattern of relationships between organisms and their environment.

Economic Assets: assets recorded in the balance sheets of conventional national accounts. The 1993 System of National Accounts (Commission of the European Communities and others, 1993) defines economic assets as entities (a) over which ownership rights are enforced by institutional units, individually or collectively and (b) from which economic benefits may be derived by their owners by holding or using them over a period of time.

Economic Entomology: study of insects with particular reference to pests affecting agricultural crops and the control of their population.

Economic Injury Level: level of pest abundance above which it is cost-effective to control the pests.

Economic Instruments: fiscal and other economic incentives and disincentives to incorporate environmental costs and benefits into the budgets of households and enterprises. The objective is to encourage environmentally sound and efficient production and consumption through full-cost pricing. Economic instruments include effluent taxes or charges on pollutants and waste, deposit-refund systems and tradable pollution permits. *See also* cost internalization.

Economic Rent: *see* rent.

Ecoregion: homogeneous area of one or more ecosystems that interact with relatively self-contained human activities.

Ecosphere: the biosphere, together with all the ecological factors that operate upon organisms.

Ecosystem: system in which the interaction between different organisms and their environment generates a cyclic interchange of materials and energy.

Ecotourism: travel undertaken to witness the unique natural or ecological quality of particular sites or regions, including the provision of services to facilitate such travel.

Ecozone: *see* ecoregion.

Edaphic Characters: the physical and chemical conditions of the soil.

EDP: *see* environmentally adjusted net domestic product.

EEZ: *see* exclusive economic zone.

Effective Dose Equivalent: measurement of radioactivity that expresses the variety of dose equivalents for different organs of the body as a single number. It is commonly referred to as a "dose", and is measured in sieverts. It provides an indication of the risk to health from any given exposure to radiation.

Effluent: liquid waste product (whether treated or untreated) discharged from an industrial process or human activity that is discharged into the environment.

Effluent Charge: fee or tax to be paid on discharges into the environment, based on the quantity and/or quality of discharged pollutants. *See also* economic instruments.

Effluent Standards: maximum amount of pollutants permitted in effluents.

EIA: *see* environmental impact assessment.

Ekistics: science dealing with human settlements and involving research and experience in architecture, engineering, town planning and sociology.

Electrodialysis: process that uses electric currents and an arrangement of permeable membranes to remove minerals from water. It is often used to desalinize salty or brackish water.

Emergency Episode: *see* air pollution episode.

Emission: discharge of pollutants into the atmosphere from stationary sources such as smokestacks, other vents, surface areas of commercial or industrial facilities and mobile sources, for example, motor vehicles, locomotives and aircraft.

Emission Damage: effects of (air) pollution on buildings, monuments, organisms and ecosystems.

Emission Factor: ratio between the amount of pollution generated and the amount of a given raw material processed. The term may also refer to the ratio between the emissions generated and the outputs of production processes.

Emission Inventory: listing, by source, of the amounts of pollutants actually or potentially discharged. Such an inventory is used to establish and put forth emission standards.

Emission Standard: maximum amount of polluting discharge legally allowed from a single source, mobile or stationary.

Endangered Species: taxa in danger of extinction and whose survival is unlikely if causal factors continue operating. Included are taxa whose numbers have been drastically reduced to a critical level or whose habitats have been so drastically impaired that they are deemed to be in immediate danger of extinction. Also included are those that possibly are already extinct, in so far as they definitely have not been seen in the wild in the past 50 years.

Endemic Disease: disease that is only, or regularly, found among a specified population or in a specified locality.

Endemic Species: species restricted to a specified region or locality.

End-of-pipe Protection: added technical installations for environmental control of emissions. They operate independently from the production process or are an identifiable part added on to production facilities. *See also* clean technology.

Energy Balances: *see* materials and energy balances.

Energy Budget: record of the flow of energy through a system.

Energy Conversion Factors: specific coefficients used to determine equivalence between units of mass and volume, energy and work and power; conversion factors are also used to convert quantities of energy production and consumption from their original physical units into a common unit of measurement. *See also* equivalent factors.

Energy Sources: all solid, liquid and gaseous fuels; electricity; uranium; steam and hot water; and the traditional fuels such as fuelwood, charcoal, vegetal and animal wastes. *See also* new and renewable energy sources.

Energy Valuation: energy theory of valuation. It attempts to replace monetary valuation, for example, in accounting or project costing by energy values. The underlying theory is based on the view that, in the final analysis, all goods are generated by solar energy.

ENI: *see* environmentally adjusted national income.

Enrichment: addition of nitrogen, phosphorous and carbon compounds or other nutrients into a water body, thereby increasing the potential for growth of algae and other aquatic plants. Most frequently, enrichment results from the inflow of sewage effluents or from agricultural run-off.

Entomology: study of insects.

Entropy: 1. thermodynamic property of matter related to the amount of energy that can be transferred from one system to others in the form of work; 2. quantitative measure of a physical system's natural tendency towards increased disorder. It has also been proposed as an environmental indicator of the ultimate limits to economic growth (Georgescu-Roegen, 1971).

Environment: the totality of all the external conditions affecting the life, development and survival of an organism.

Environmental Accounting: 1. national accounting: physical and monetary accounts of environmental assets and the costs of their depletion and degradation; 2. corporate accounting: the term usually refers to environmental auditing, but may also include the costing of environmental impacts caused by the corporation. *See also* System of integrated Environmental and Economic Accounting.

Environmental Assets: *see* natural assets.

Environmental Assimilation: *see* assimilation.

Environmental Clean-up: action taken to deal with the release of a hazardous substance that could affect humans and/or the environment. The term *clean-up* is sometimes used interchangeably with the terms *remedial action, response action* or *corrective action* as opposed to the terms *preventive action* or *anticipatory action*. *See also* environmental restoration *or* environmental protection.

Environmental Conditioning: modification of the environment of one or more organisms by their activities, including reaction and co-action (liberation of oxygen, for example, by water plants in an aquarium).

Environmental Costs: costs connected with the actual or potential deterioration of natural assets due to economic activities. Such costs can be viewed from two different perspectives, namely as (a) costs caused, that is, costs associated with economic units actually or potentially causing environmental deterioration by their own activities or as (b) costs borne, that is, costs incurred by economic units independently of whether they have actually caused the environmental impacts. *See also* defensive environmental costs *and* damage cost.

Environmental Debt: accumulation of past environmental impacts of natural resource depletion and environmental degradation, owed to future generations.

Environmental Degradation: deterioration in environmental quality from ambient concentrations of pollutants and other activities and processes such as improper land use and natural disasters.

Environmental Disease: disease that is, at least in part, caused or aggravated by living conditions, climate and water supply or other environmental conditions. Environmental factors that may affect health include psychological, biological, physical and accident-related factors. Environmental diseases include in particular communicable diseases, such as respiratory diseases, and

vector-borne diseases such as malaria, schistosomiasis and onchocerciasis. *See also* airborne disease *and* waterborne disease.

Environmental Effect: result of environmental impacts on human health and welfare. The term is also used synonymously with *environmental impact.*

Environmental Expenditures: capital and current expenditures related to characteristic activities and facilities specified in classifications of environmental protection activities.

Environmental Externalities: economic concept of uncompensated environmental effects of production and consumption that affect consumer utility and enterprise cost outside the market mechanism. As a consequence of negative externalities, private costs of production tend to be lower than its "social" cost. It is the aim of the "polluter/user-pays" principle to prompt households and enterprises to internalize externalities in their plans and budgets. *See also* economic instruments.

Environmental Functions: environmental services, including spatial functions, waste disposal, natural resource supply and life support. *See also* environmental services.

Environmental Health Indicators: indicators that describe the link between environment and health by measuring the health effect due to exposure to one or several environmental hazards.

Environmental Impact: direct effect of socio-economic activities and natural events on the components of the environment. *See also* environmental effect.

Environmental Impact Assessment (EIA): analytical process that systematically examines the possible environmental consequences of the implementation of projects, programmes and policies.

Environmental Impact Statement: document prepared by an agency on the environmental impacts of its project/programme proposals. *See also* environmental impact assessment.

Environmental Indicator: parameter, or a value derived from parameters, that points to, provides information about and/or describes the state of the environment, and has a significance extending beyond that directly associated with any given parametric value. The term may encompass indicators of environmental pressures, conditions and responses (OECD, 1994).

Environmental Labelling: indication of the environmental impact-related characteristics of a product, typically on the package containing the product, by private or public institutions.

Environmentally Adjusted National Income (ENI): environmental accounting aggregate. It is obtained by adding to environmentally adjusted net domestic product (EDP) the net income received from abroad. The additional deduction of the net cost of cross-boundary pollution has also been suggested.

Environmentally Adjusted Net Domestic Product (EDP): environmental accounting aggregate. It is obtained by subtracting the costs of natural resource depletion and environmental degradation from net domestic product (NDP).

Environmentally Sound Technologies: techniques and technologies capable of reducing environmental damage through processes and materials that generate fewer potentially damaging substances, recover such substances from emissions prior to discharge, or utilize and recycle production residues. The assessment of these technologies should account for their interaction with the socio-economic and cultural conditions under which they are implemented.

Environmental Media: abiotic components of the natural environment, namely, air, water and land.

Environmental Protection: any activity to maintain or restore the quality of environmental media through preventing the emission of pollutants or reducing the presence of polluting substances in environmental media. It may consist of: (a) changes in characteristics of goods and services, (b) changes in consumption patterns, (c) changes in production techniques, (d) treatment or disposal of residuals in separate environmental protection facilities, (e) recycling and (f) prevention of degradation of the landscape and ecosystems. *See also* protection against natural hazards *and* classification of environmental protection activities.

Environmental Quality: state of environmental conditions in environmental media, expressed in terms of indicators or indices related to environmental quality standards.

Environmental Quality Standard: limit for environmental disturbances, in particular from ambient concentration of pollutants and wastes, that determines the maximum allowable degradation of environmental media.

Environmental Refugee: person displaced owing to environmental causes, notably land loss and degradation, and natural disaster.

Environmental Restoration: reactive environmental protection. It includes (a) reduction or neutralization of residuals, (b) changes in the spatial distribution of residuals, (c) support of environmental assimilation and (d) restoration of ecosystems, landscape and so forth. *See also* environmental protection.

Environmental Restructuring: permanent structural change in the environment, resulting from infrastructure development such as settlements, transport, energy development and environmental rehabilitation.

Environmental Risk Assessment: *see* risk assessment

Environmental Services: qualitative functions of natural non-produced assets of land, water and air (including related ecosystem) and their biota. There are three basic types of environmental services: (a) disposal services which reflect the functions of the natural environment as an absorptive sink for residuals, (b) productive services which reflect the economic functions of providing natural resource inputs and space for production and consumption and (c) consumer or consumption services which provide for physiological as well as recreational and related needs of human beings.

Environment-related Defensive Activities: activities that may include (a) preventive environmental protection, (b) environmental restoration, (c) avoidance of damage from repercussions of environmental deterioration and (d) treatment of damages caused by environmental repercussions. *See also* defensive environmental costs.

Environment Statistics: statistics that describe the state and trends of the environment, covering the media of the natural environment (air/climate, water, land/soil), the biota within the media, and human settlements. Environment statistics are integrative in nature, measuring human activities and natural events that affect the environment, the impacts of these activities and events, social responses to environmental impacts, and the quality and availability of natural assets. Broad definitions include environmental indicators, indices and accounting.

Epicentre: point on the earth's surface directly above the focus of an earthquake.

Epidemic: widespread outbreak of a disease that affects a large number of individuals at a particular time.

Epidemiology: study of the occurrence of infectious diseases, their origin and pattern of spread through a population.

Epilimnion: upper layer of water in a body of water.

Equilibrium: *see* ecological balance.

Equity: *see* intergenerational equity.

Equivalent Factors: factors used to convert quantities from their original physical units into a common accounting unit for the purpose of aggregating energy sources or assessing "contributions" to environmental problems from diverse sources (for example, the contribution of different pollutants to global warming).

Erosion: wearing away and transport of the soil by wind or running water, glaciers or waves. Erosion occurs naturally but is often intensified by human land-clearing activities related to farming, residential or industrial development.

Erosion Control: *see* protection against erosion.

Erosion Index: *see* universal soil loss equation.

***Escherichia Coli (E. Coli)*:** bacilliform (rod-shaped) bacterium living in the intestinal tracts of humans and other warm-blooded animals. Its presence in water indicates faecal pollution. There is a maximum number of coliforms (coli number) above which water is no longer suitable for drinking or bathing.

Estuary: generally broad portion of a river or stream near its outlet that is influenced by the marine water body into which it flows. The demarcation line is generally the mean tidal level.

Ethology: science of animal behaviour.

Eugenics: science of improving the human race by genetic means.

European System for the Collection of Economic Information on the Environment (SERIEE): system consisting mainly of data on environmental protection expenditure and economic data on the use and management of natural resources. Links to physical data such as the amount of waste and other pollutants generated or avoided, and the use of water and other resources, are to be

established in parallel as far as possible. The System is designed to form a series of satellite accounts of the national accounts.

Eutrophication: slow ageing process during which a lake or estuary evolves into a bog or marsh and eventually disappears. During eutrophication, the lake becomes so rich in nutritive compounds (especially nitrogen and phosphorus) that algae and other microscopic plant life become superabundant, thereby choking the lake and causing it to eventually dry up. Eutrophication is accelerated by discharges of nutrients in the form of sewage, detergents and fertilizers into the ecosystem.

Evaporation Ponds: areas where sewage sludge is dumped and allowed to dry out.

Evapotranspiration: combined loss of water by evaporation from the soil or surface water and transpiration from plants and animals.

Evolution: one of the fundamental theories of modern biology which postulates that changes in species through time are the result of natural selection acting on the genetic variation that is present among the individuals of any given species.

Exclusive Economic Zone (EEZ): concept adopted at the Third United Nations Conference on the Law of the Sea (1982), whereby a coastal State assumes jurisdiction over the exploration and exploitation of marine resources in its adjacent section of the continental shelf, taken to be a band extending 200 miles from the shore.

Exhaust Gases: gases produced by the burning of petrol (gasoline) in combustion engines. Exhaust gases are harmful to human beings, plants and animals.

Existence Value: value of knowing that a particular species, habitat or ecosystem does and will continue to exist. Such value is independent of any use that the valuer may or may not make of the resource.

Exotic Species: species not native to a particular area. It may pose a risk to endemic species.

Exposure: condition of being unprotected in an environment containing harm-producing substances or factors. It is measured in terms of level and duration.

Externalities: *see* environmental externalities.

Extinct Species: species not definitely located in the wild during the past 50 years.

F

Faecal Coliform Bacteria: *see* coliform organism.

Faeces: waste matter discharged from the bowels.

Fallow Agricultural Land: arable land not under rotation that is set aside for a period of time ranging from one to five years before it is cultivated again; or land, usually under permanent crops, meadows or pastures, that is not being used for such purposes for a period of at least one year. Arable land that is normally used for the cultivation of temporary crops, but temporarily used for grazing, is included.

Farmstead: entity comprising the main building, adjacent yards, kitchen, garden and family orchard on a farm.

Fascicle: cluster of leaves or fruits.

Fault: break or fracture in the upper crusting of the earth, involving permanent dislocation and displacement within the earth's crust. Earthquakes often occur along fault lines.

Fauna: all animal life.

FDES: *see* Framework for the Development of Environment Statistics.

Feedlot: relatively small confined area for the controlled feeding of animals. It tends to concentrate large amounts of animal wastes that cannot be absorbed by the soil and hence may be carried to nearby streams or taken by rainfall run-off.

Fen: type of wetland that accumulates peat deposits. Less acidic than bogs, fens derive most of their water from the underground, so that they are rich in calcium and magnesium.

Fermentation: incomplete breakdown of food molecules, especially sugars, in the absence of oxygen.

Fertilizers: organic or inorganic substances containing chemical elements that improve the growth of plants and the fertility of the soil. The percentage content of nutrients in organic fertilizers (manures) is relatively low. In inorganic or mineral fertilizers, the nutrients are inorganic salts, obtained by extraction and/or physical and chemical processes. The three primary plant nutrients are nitrogen, phosphorus and potassium.

FGD: *see* flue gas desulphurization.

Field Capacity: amount of water held in a soil after gravitational water has drained away.

Filtration: treatment process for removing solid particulate matter from water by passing it through porous media such as sand or artificially produced filters. This process is often used to remove particles that contain pathogenic organisms.

FISD: *see* Framework for Indicators of Sustainable Development.

Fish Farming: *see* aquaculture.

Flaring: burning of waste gases through a flare stack or other device before releasing them into the air.

Flash Flood: flood of short duration with a relatively high peak discharge.

Flocculation: process by which clumps of solids in water or sewage are made to increase by biological or chemical action so that they can be separated from the water.

Flora: all plant life.

Flue: passage for conducting combustion gases in an incinerator installation. It is also called a chimney.

Flue Gas: vented air coming out of a chimney after combustion in the burner. It can include nitrogen oxides, carbon oxides, water vapour, sulphur oxides, particles and other chemical pollutants.

Flue Gas Desulphurization (FGD): a technology that uses sorbents, usually lime or limestone, to remove sulphur dioxide from the gases produced by burning fossil fuels. Flue gas desulphurization is the state-of-the-art technology in use by major sulphur dioxide emitters, for example, powerplants.

Fluorides: gaseous, solid or dissolved compounds containing fluorine that result from industrial processes. Excessive amounts in food can lead to fluorosis.

Fluorocarbon: gas used as a propellant in aerosols. It contributes to the destruction of the ozone layer in the stratosphere, thereby allowing harmful forms of solar radiation to reach the earth's surface.

Fluorosis: excess fluorine in the body, which may result in changes in the skeleton and ossification of tendons and ligaments. Exposure results from outdoor pollution (in air and water) and indoor pollution (in the insecticide, aluminium-mining and phosphate-fertilizer industries).

Flux (in nuclear science): the amount of radiation per unit volume of space multiplied by the mean velocity of the radiation.

Fly Ash: non-combustible residual particles from the combustion process, carried by flue gas.

Fogging: application of a pesticide by rapidly heating the liquid chemical so that it forms very fine droplets resembling smoke or fog. The process may be used to destroy mosquitoes, blackflies and similar pests.

Foliage: the leaves of a plant, collectively.

Food Chain: sequence of organisms each of which uses the next lower member of the sequence as a food source.

Food Web: network of many interlinked food chains.

Forest Cover: all the trees and other woody plants (underbrush) covering the ground in a forest. It includes (a) trees and all shrubs, (b) herbs and shrubs growing thereunder or in openings in the forest or brush fields, (c) litter or fallen leaves, branches, fallen trees and other vegetable material on the forest floor and (d) the rich humus of partially decayed vegetable matter at the surface and top layer of the soil.

Forest Functions: (a) environmental functions of forest or other wooded areas that include protection of the soil against erosion, water flow control, air

purification, wind shelter, noise abatement, preservation of habitats, protection of species of fauna and flora, preservation of wildlife forage grounds and other biological uses, (b) economic functions of the production of timber and other forestry products and recreational activities and (c) social functions, for example, of an aesthetic or religious nature.

Fossil Fuels: coal, oil and natural gas. They are derived from the remains of ancient plant and animal life.

Foyn's Process: electrolytic treatment of sewage.

Framework for Indicators of Sustainable Development (FISD): conceptual framework for environmental, social and economic indicators that addresses the concerns of potential data users as reflected in Agenda 21 (United Nations, 1993b) of the United Nations Conference on Environment and Development with the information categories of the framework for environmental data production (FDES). It was developed by the United Nations Statistics Division in 1994.

Framework for the Development of Environment Statistics (FDES): conceptual framework that assists in the development, coordination and organization of environment statistics and related socio-economic and demographic statistics. It was developed by the United Nations Statistics Division in 1984, and is based on stress-response principles of environmental impacts.

Free Acceleration Test: most popular method for roadside testing of commercial vehicles for pollution control. The engine is rapidly accelerated in neutral gear, and the smoke emitted is measured directly and continuously by an approved smoke meter.

Freshwater: naturally occurring water having a low concentration of salts. It is generally accepted as suitable for abstraction and treatment to produce potable water.

Fuelwood: all wood in the rough used for fuel purposes. It is a common non-commercial biological fuel.

Fugitive Emissions: emissions not caught by a capture system.

Full-cost Pricing: *see* economic instruments.

Fume: tiny particles trapped in vapour within a gas system.

Fumigant: pesticide that is burnt and evaporated to kill pests. It is used in buildings and greenhouses.

Fungi: moulds, mildews, yeasts, mushrooms and puffballs. The fungi are a group of organisms that lack chlorophyll (in other words, they are not photosynthetic) and are usually non-mobile, filamentous and multicellular. Some grow in the ground; others attach themselves to decaying trees and other plants. Fungi obtain their nutrition from decomposing organic matter. Some cause disease; others stabilize sewage and break down solid wastes in composting.

Fungicide: pesticide that is used to control, prevent and destroy fungi.

G

Game Refuge: enclosure erected for the purpose of preventing hunting and fishing and preserving game animals, birds and habitat.

Gamma Radiation: type of radiation comprising true rays of energy, in contrast to alpha and beta radiations. Its properties are similar to those of X-rays and other electromagnetic waves. It comprises the most penetrating waves of radiant nuclear energy but can be blocked by dense materials such as lead.

Gangue: waste minerals in an ore. Essentially, it is an economic term, as materials that constitute gangue in one mine may, in higher concentration or under different economic conditions, represent a valuable component.

Gas Cleaning Plant: pollution control facility, including dust arresters, sulphur dioxide absorbers and wet scrubbers.

Gas Flaring: *see* flaring.

Gasification: conversion of solid fuel such as coal into a gas for use as fuel.

Gene: hereditary factor, transmitted from generation to generation of plants and animals, that is responsible for the determination of a particular characteristic, for example, colour, height or sex.

Genecology: study of the genetics of plant and animal populations in relation to their environment.

Genetic Effects (of radiation): inheritable changes, chiefly mutations, produced by the absorption of ionizing radiations. On the basis of present knowledge, these effects are additive and irreversible.

Genetic Engineering: process of inserting new genetic information into existing cells for the purpose of modifying one of the characteristics of an organism.

Genetic Resources: genetic material of plants, animals or micro-organisms of value as a resource for future generations of humanity.

Genuine Progress Indicator (GPI): alternative to gross domestic product (GDP) that purports to measure economic welfare (Cobb, Halstead and Rowe, 1995). It is based on the Index of Sustainable Economic Welfare (ISEW).

Genuine Saving: measure of the effort to create new wealth. It is the residual of gross domestic product (GDP) less consumption, depreciation of produced assets, and the costs of drawing down natural resources (World Bank, 1995).

Geographical Information System (GIS): information system that can input, process, analyse and visualize geographically referenced data in order to support decision-making processes.

Geologic Hazard: extreme natural events in the crust of the earth that pose a threat to life and property, for example, earthquakes, volcanic eruptions, tsunamis (tidal waves) and landslides.

Geomorphology: study of the earth's form and its evolution, both of which owe much to the action of water in rivers and glaciers.

Germicide: compound that kills disease-causing micro-organisms.

GIS: *see* geographical information system.

Glaciers and Perpetual Snow: large mass of perennial ice or snow that forms on land. Glaciers occupy about 11 per cent of the earth's land surface and hold roughly three fourths of its freshwater. Approximately 99 per cent of glaciers are concentrated in the Antarctic and Greenland.

Global Commons: natural assets outside national jurisdiction such as the oceans, outer space and the Antarctic.

Global Warming: phenomenon believed to occur as a result of the build-up of carbon dioxide and other greenhouse gases. It has been identified by many scientists as a major global environmental threat. *See also* greenhouse effect.

GPI: *see* genuine progress indicator.

Green Accounting: popular term. *See* environmental accounting.

Green Ban: ban imposed on construction in the inner part of a city so as to protect the urban natural environment.

Green Belt: zone near a city that is restricted as regards any further extension of urban area. It serves as a buffer separating sources of pollution from the city population.

Green GDP: popular term for environmentally adjusted gross domestic product. *See also* environmentally adjusted net domestic product.

Greenhouse Climate Response Index: index developed by the National Climatic Data Center of the United States of America that includes the following variables: much-above-normal temperature, much-above-normal precipitation in the cool months, extreme or severe drought in the warm months, a much-greater-than-normal proportion of annual precipitation falling on days having more than 50.8 millimetres of precipitation, and reduced day-to-day temperature swings.

Greenhouse Effect: warming of the earth's atmosphere caused by a build-up of carbon dioxide and other greenhouse or trace gases that act like a pane of glass in a greenhouse, allowing sunlight to pass through and heat the earth but preventing a counterbalancing loss of heat radiation.

Greenhouse Gases: carbon dioxide, nitrous oxide, methane, ozone and chloro-fluorocarbons occurring naturally and resulting from human (production and consumption) activities, and contributing to the greenhouse effect (global warming).

Green Revolution: increase in crop yields based on cultivation of high-response varieties of wheat, rice, maize and millet, and intensive use of fertilizers, pesticides, irrigation and machinery.

Ground-level Ozone: ozone present as a secondary pollutant in the lower atmosphere, where its formation can be enhanced by other pollutants. It is highly toxic at levels above 0.1 parts per million (p.p.m.). *See also* ozone.

Ground-level Pollution: weight of a pollutant per unit volume in the region of the air between the ground and a height of about two metres above it.

Groundwater: freshwater beneath the earth's surface (usually in aquifers) supplying wells and springs. Because groundwater is a major source of drinking water, there is a growing concern over leaching of agricultural and industrial pollutants or substances from underground storage tanks.

Groundwater Protection: *see* protection of soil and groundwater.

Groundwater Reservoir: reservoir under the earth's surface that obtains its water through infiltration and percolation.

Groundwater Run-off: groundwater that is discharged into a stream channel as spring or percolated water. *See also* run-off.

Groundwater Surface: *see* water table.

Guano: 1. artificial manure, especially that made from fish; 2. natural fertilizer from the excrement of sea fowl.

Gully: gash cut into a slope of soil or loose, unconsolidated sediment by the concentration of rainfall run-off in a channel. It represents one of the most destructive forms of erosion.

H

Habitat: place where an organism or population (human, animal, plant, micro-organism) lives.

HABITAT Conference: United Nations Conference on Human Settlements. The first conference was held in Vancouver, British Columbia, 31 May-11 June 1976; the second conference was held in Istanbul, 3-14 June 1996.

Habitat Diversity: range of habitats present in a region. *See also* biodiversity.

Habitat Protection: *see* protection of species and habitats.

Half-life: the time during which radioactivity or some other property of substances falls to half of its original value.

Halogenated Hydrocarbon: compound formed when the hydrogen in a hydrocarbon molecule, such as methane, is replaced by any of the halogens (fluorine, chlorine, bromine and iodine). Their breakdown in the stratosphere releases chlorine and bromine which take part actively in the destruction of stratospheric ozone. The best known group of halogenated hydrocarbons are the chloro-fluorocarbons (CFCs). The brominated compounds are referred to as halons.

Halons: *see* halogenated hydrocarbons.

Hard Water: alkaline water containing dissolved salts that interfere with some industrial processes and prevent soap from lathering.

Hazardous Air Pollutants: air pollutants that may reasonably be expected to cause or contribute to irreversible illness or death. They include asbestos, beryllium, mercury, benzene, coke oven emissions, radionuclides and vinyl chloride.

Hazardous Substance: any substance that poses a threat to human health and the environment. Hazardous substances are toxic, corrosive, ignitable, explosive or chemically reactive.

Hazardous Wastes: wastes that, owing to their toxic, infectious, radioactive or flammable properties pose a substantial actual or potential hazard to the health of humans and other living organisms and the environment.

Hazardous Waste Treatment (two categories of treatment can be distinguished): (a) physical hazardous waste treatment: an approach including phase separation, such as through lagooning, filtration or centrifugation, and solidification into hard material allowing for landfill disposal; (b) thermal hazardous waste treatment: high-temperature oxidation of wastes that converts them into gases and solid residues.

Haze: state of atmospheric obscurity due to the presence of fine dust particles in suspension.

Haze Coefficient: measure of visibility interference.

HCFCs: *see* hydrochloro-fluorocarbons.

HDI: *see* human development index.

Health: "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity", as defined by the World Health Organization (WHO). Methodology to assess health according to the above definition is not yet available, and at present health is generally assessed in terms of mortality and morbidity.

Heathland: uncultivated open land, covered with vegetation, often consisting to a considerable degree (25 per cent or more) of ligneous and semi-ligneous plants (heather, furze and so forth), as well as herbaceous plants of generally low pastoral value.

Heat Island: phenomenon arising from a difference in mean annual temperature of 1 degree centigrade or more between a city and its hinterland.

Heat Sink: part of the environment large or cool enough to absorb large quantities of heat. Natural systems use water, air and soil as heat sinks.

Heavy Metals: potentially toxic metals used in industrial processes, for example, arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc. They may damage plant and animal life at low concentrations and tend to accumulate in the food chain.

Herbicide: substance used to control weeds or the growth of undesirable grass or plants.

Herbivore: animal that feeds on plants.

Heterotrophic Bacteria: bacteria that depend upon the decomposition of organic substances for their food.

High-density Polyethylene: material that produces toxic fumes when burned. It is used in the manufacturing of plastic bottles and other products.

High-level Radioactive Waste: waste generated in the fuel cells of a nuclear reactor. It is typically stored at reactor sites and nuclear fuel reprocessing plants. In the absence of shielding, it represents a serious health threat.

Holding Pond: pond or reservoir, usually made of earth, for storing polluted run-off.

Holistic Ecology: *see* deep ecology.

Homeostasis: capability of ecosystems to resist change and interference through self-regulation and self-maintenance (regeneration).

Host: organism lived on by a parasite. In many diseases, humans act as host to a parasitic worm.

Hotelling Rent: net return realized from the sale of a natural resource under particular conditions of long-term market equilibrium. It is defined as the revenue received minus all marginal costs of resource exploitation, exploration and development including a normal return to fixed capital employed; the Hotelling Rent is used as a measure of natural resource depletion in environmental accounting.

Household Waste: waste material usually generated in the residential environment. Waste with similar characteristics may be generated in other economic activities and can thus be treated and disposed of together with household waste.

Human Capital: productive wealth embodied in labour, skills and knowledge.

Human Development: process of enlarging people's choices. Their three essential choices are to lead a long and healthy life, to acquire knowledge and to have access to the resources needed for a decent standard of living. Additional choices, highly valued by many people, range from political, economic and social freedom to opportunities for being creative and productive and enjoying personal self-respect and guaranteed human rights (UNDP, 1995).

Human Development Index (HDI): measure based on three indicators: (a) longevity, as measured by life expectancy at birth, (b) educational attainment, as measured by a combination of adult literacy (two-thirds weight) and combined primary, secondary and tertiary enrolment ratios (one-third weight) and (c) standard of living, as measured by real gross domestic product (GDP) per capita (in purchasing power parity) (UNDP, 1995).

Human Health: *see* health.

Human Settlements: integrative concept that comprises (a) physical components of shelter and infrastructure and (b) services to which the physical elements provide support, that is to say, community services such as education, health, culture, welfare, recreation and nutrition.

Humic Water: water strong in acids of vegetable origin.

Humification: process of decay in which plant or animal remains are so thoroughly decomposed that their initial structures or shapes can no longer be recognized.

Humus: organic constituent of soil made up of decomposing plant and animal substances.

Hybrid: organism resulting from a cross between two unlike plants or animals.

Hydrobiology: the study of aquatic plants and animals.

Hydrocarbons: compounds of hydrogen and carbon in various combinations that are present in petroleum products and natural gas. Some hydrocarbons are major air pollutants, some may be carcinogenic and others contribute to photochemical smog.

Hydrochloro-fluorocarbons (HCFCs): compounds used as replacements for chloro-fluorocarbons (CFCs) in refrigeration because they are less active ozone depleters.

Hydrogenation: process of adding hydrogen to vegetable oil under pressure at a temperature of around 170 degrees centigrade that converts harmful saturated fats into unsaturated ones.

Hydrogeology: branch of geology that deals with the occurrence of groundwater.

Hydrograph: graph showing the variation over time of some hydrologic data such as stage in the hydrologic cycle, discharge, velocity and sediment load.

Hydrologic Cycle: succession of stages undergone by water in its passage from the atmosphere to the earth and its return to the atmosphere. The stages include evaporation from the land or sea or inland water, condensation to form clouds, precipitation, accumulation in the soil or in bodies of water, and re-evaporation.

Hydrology: 1. science that deals with the waters above and below the land surfaces of the earth, their occurrence, circulation and distribution, both in time and in space, their biological, chemical and physical properties, and their interaction with the environment including their relation to living beings; 2. science that deals with the processes governing the depletion and replenishment of the water resources of the land areas of the earth including the various phases of the hydrologic cycle.

Hydrolysis: decomposition by chemical reaction with water.

Hydroponics: cultivation of plants in water with added fertilizers, the soil substrate thereby being completely replaced.

Hydropower: electricity generation using the power of falling water.

Hypertrophic: excessively loaded with nutrients. *See also* eutrophication.

Hypolimnion: water that is remote from surface influences and has a relatively small temperature gradient. In eutrophic lakes, this lower layer of water has

no oxygen and is loaded with toxic and decaying materials.

I

Idle Land: land that was cultivated but is now in a state of disuse; abandoned land; fallow land.

Imhoff Tank: tank in which sedimentation treatment for sewage is combined with anaerobic biological treatment.

Immunity: resistance to disease, usually specific to one disease or the pathogen that causes it.

Impoundment: body of water formed through collection of water, as by a dam.

Incineration: controlled burning of solid, liquid or gaseous waste materials at high temperatures.

Incineration at Sea: disposal of waste by burning at sea on specially designed incinerator ships. Ocean incineration includes the burning of organo-chlorine compounds and other toxic wastes that are difficult to dispose of.

Incineration with Recovery of Energy: incineration in which evolving thermal energy is used for the production of steam, hot water or electric energy.

Incinerator: furnace for burning wastes under controlled conditions.

Incipient Lethal Level (LD_{50}): threshold level of exposure to toxic substances beyond which 50 per cent of a population or of organisms cannot survive.

Index of Sustainable Economic Welfare (ISEW): measure of broadly defined economic welfare. It applies a number of adjustments to personal consumption adding desirable services such as household production and subtracting regrettable expenditures, for example, for commuting, automobile accidents, and water, air, soil and noise pollution and other welfare losses, for example, from unemployment (Daly and Cobb, 1989).

Indicator: *see* biological indicator *and* environmental indicator.

Indicators of Sustainable Development: *see* sustainable development indicators.

Indoor Air Pollution: chemical, biological and physical contamination of indoor air. It may result in adverse health effects. In developing countries, the main source of indoor air pollution is biomass smoke which contains suspended particulate matter (SPM), nitrogen dioxide (NO_2), sulphur dioxide (SO_2), carbon monoxide (CO), formaldehyde and polycyclic aromatic hydrocarbons (PAHs). In industrialized countries, in addition to NO_2, CO, and formaldehyde, radon, asbestos, mercury, human-made mineral fibres, volatile organic compounds, allergens, tobacco smoke, bacteria and viruses are the main contributors to indoor air pollution.

Industrial Wastes: liquid, solid and gaseous wastes originating from the manufacture of specific products.

Infant Mortality Rate: annual number of deaths of infants under age 1 per 1,000 live births. It is used as an indicator of the probability of dying between birth and exactly one year of age.

Infiltration: flow of water through the soil surface into a porous medium.

Inflow: entry of extraneous rainwater into a sewer system from sources other than infiltration, such as basement drains, manholes, storm drains and street washing.

Influent: water, waste water or other liquid flowing into a reservoir, basin or treatment plant.

Informal Settlements: 1. areas where groups of housing units have been constructed on land that the occupants have no legal claim to, or occupy illegally; 2. unplanned settlements and areas where housing is not in compliance with current planning and building regulations (unauthorized housing).

Inorganic Matter: substances of mineral origin that are not characterized by primarily carbon-based structures.

Inorganic Pesticides: compounds like sulphates, arsenates, chlorides of lead, copper and so forth used for agricultural pest control.

In-process Modification: modification of production processes aimed at reducing pollution (through clean technologies). *See also* clean technology.

Insecticide: substance that destroys or controls insect pests.

Insectivorous Plant: *see* carnivorous plant.

Instream Aeration: introduction of air into a body of water to speed up the breakdown of the sewage effluents that it receives.

Instream Use: non-withdrawal use, that is, use of water taking place within a stream channel, for example, in hydroelectric power generation, navigation, fish farming and recreation.

Integrated Pest Management: strategy relying on natural mortality factors, such as natural enemies, weather and crop management, that seeks to promote tactics that disrupt these factors as little as possible while enhancing their effectiveness.

Intensive Agriculture: agricultural practices that produce high output per unit area, usually by intensive use of manure, agrochemicals, mechanization and so on. *See also* green revolution.

Interaction (between species): positive and negative associations between species that favour or inhibit mutual growth and evolution of populations. It may take the form of competition, predation, parasitism, commensalism or mutualism.

Intergenerational Equity: issue of sustainable development referring, within the environmental context, to fairness in the intertemporal distribution of the endowment with natural assets or of the rights to their exploitation.

Internalization: *see* cost internalization.

Interspecific Association: *see* interaction.

Inversion: atmospheric condition caused by a layer of warm air preventing the rise of the cool air trapped beneath it. Inversion prevents the rise of pollutants that might otherwise be dispersed. *See also* air pollution episode.

Invertebrate: animal that does not have a backbone or spinal column.

Ionization: process of adding or removing one or more electrons from an atom.

Ionosphere: layer of the upper atmosphere extending upwards from about 80 kilometres above the earth's surface in which atoms tend to be ionized by incoming solar radiation.

Irradiation: exposure to radiation of wavelengths shorter than those of light (gamma, X-ray, or ultraviolet) for medical purposes or the destruction of bacteria in milk or other food.

Irreversibility (of environmental damage): permanent loss of environmental assets or environmental quality, requiring preventive action rather than restoration or clean-up.

Irrigation: artificial application of water to land to assist in the growing of crops and pastures. It is carried out by spraying water under pressure (spray irrigation) or by pumping water onto the land (flood irrigation).

ISEW: *see* index of sustainable economic welfare.

Isobar: line joining places of equal barometric pressure on a map.

Isotherm: line joining points of the same temperature on a map.

Isotope Cemeteries: *see* radioactive waste.

IUCN: World Conservation Union (formerly the International Union for Conservation of Nature and Natural Resources), located in Gland, Switzerland. It aims to provide knowledge and guidance about conservation and the sustainable use of natural resources.

IUCN Red List: *see* red list of threatened animals.

L

Lacustrine: living or growing in or beside a lake.

Lagoon: *see* sewage lagoon.

Lahar: deposit formed by mudflow or water-saturated volcanic ash.

Lake Classification: biological classification of lakes based on the amount of available food and trophic levels. It categorizes lakes according to three types: (a) eutrophic (rich in nutrients), (b) oligotrophic (poor in nutrients)

and (c) mesotrophic/dystrophic (having a humus-type bottom deposit but poor mineralization).

Land Classification: land categories, reflecting quality classes, capability classes or grade, depending upon the characteristics of the land and/or its potential for agricultural use.

Land Cover: *see* vegetation cover.

Land Degradation: reduction or loss of the biological or economic productivity and complexity of rain-fed cropland, irrigated cropland, or range, pasture, forest or woodlands resulting from natural processes, land uses or other human activities and habitation patterns such as land contamination, soil erosion and the destruction of the vegetation cover.

Land Drainage: removal of excess water from fields through the construction of channels or conduits. It improves crop growth through aeration and root development, checks weed growth and reduces the incidence of plant diseases.

Landfill: final placement of waste in or on the land in a controlled or uncontrolled way according to different sanitary, environmental protection and other safety requirements.

Land Improvement: alteration in the qualities of land that improves its potential for land use.

Land Reclamation: gain of land from the sea, or wetlands, or other water bodies, and restoration of productivity or use to lands that have been degraded by human activities or impaired by natural phenomena.

Landslide: downward mass movement of earth or rock on unstable slopes.

Land Tenure: right to the exclusive occupancy and use of a specified area of land.

Land Use: *see* land-use classification *and* multiple land use.

Land-use Classification: classification providing information on land cover, and the types of human activity involved in land use. It may also facilitate the assessment of environmental impacts on, and potential or alternative uses of, land. The classification, developed by the Economic Commission for Europe, consists of seven main categories: (a) agricultural land, (b) forest and other wooded land, (c) built-up and related land, excluding scattered farm buildings, (d) wet open land, (e) dry open land with special vegetation cover, (f) open land without, or with insignificant, vegetation cover and (g) waters.

Larva: immature form of many invertebrate animals.

Larvicide: pesticide that kills larvae.

LD_{50}: *see* incipient lethal level.

Leachate: liquid that results from water trickling through wastes, agricultural pesticides, or fertilizers. Leaching may occur in farm areas, feedlots and landfills, and may result in hazardous substances' entering surface water, groundwater or soil.

Leaching: the process of removal of alkali and soluble salts from soil by profuse irrigation and drainage.

Lead: heavy metal whose compounds are highly poisonous to health. Its use in gasoline, paints and plumbing compounds has been generally reduced.

Life Expectancy (at birth): the number of years a newborn infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life.

Life-support System: part of an ecosystem that determines the existence, abundance and evolution of a particular population. The term frequently refers to the functions of natural systems essential to human survival, including the provision of oxygen, food, water and so forth.

Limestone Scrubbing: process for removing sulphur dioxide from flue gases by passing them through a limestone-and-water solution.

Limification: *see* liming.

Liming: addition of lime to water or soil for the purpose of reducing the effects of acid deposits.

Limnetic: inhabiting marshes, lakes or ponds.

Limnology: study of the physical, chemical, meteorological and biological aspects of freshwaters.

Liner: 1. relatively impermeable barrier designed to prevent leakage from a landfill. Liner materials include plastics and dense clay; 2. insert or sleeve for sewer pipes to prevent leakage or infiltration.

Line Transect Sampling: method for estimating the size of animal populations that involves an observer's moving along a straight line through a study area and noting the distance from the line of all animals seen. It could also be used in principle with plants, although in practice alternative sampling schemes have been found to be more convenient.

Liquefaction: conversion of the insoluble organic matter in wastes to a soluble state, thereby effecting a reduction in their solid contents.

Liquid Manure: farmyard manure slurry obtained by mixing urine and faeces with litter.

Lithosphere: upper layer of the earth, including the earth's crust and upper mantle.

Load Capacity: *see* critical load.

Loading: the quantity of polluting material discharged into a body of water.

Logging: process of harvesting trees, sawing them into appropriate lengths and transporting them to a sawmill.

Long-range Transport of Air Pollutants (LRTAP): atmospheric transport of air pollutants within a moving air mass for a distance greater than 100 kilometres.

Low-level Radioactive Wastes: a subcategory of radioactive wastes comprising those that, because of their low radionuclide content, do not require shielding during normal handling and transportation.

LRTAP: *see* long-range transport of air pollutants.

M

Maintenance (Cost) Valuation (environmental accounting): method of measuring imputed environmental (depletion and degradation) costs caused by economic activities of households and industries. The value of the maintenance cost depends on the avoidance, restoration, replacement or prevention activities chosen.

Malaria: disease caused by the protozoan plasmodium and transmitted by the bite of an infected anopheles mosquito. The disease is rare in the industrialized world but fairly common in many tropical countries.

Manure: organic material used to fertilize land, usually consisting of barnyard and stable refuse (livestock excreta), with or without accompanying litter such as straw, hay or bedding.

Marginal Land: land of poor quality with regard to agricultural use, and unsuitable for housing and other uses.

Marginal Settlements: housing units that, lacking basic amenities, are not considered fit for human habitation. *See also* informal settlements.

Mariculture: harvesting of marine organisms through ocean farming.

Marine Park: permanent marine reservation for the conservation of species. It constitutes an extension, to the undersea world, of the concept of the terrestrial national park.

Marine Pollution: direct or indirect introduction by humans of substances or energy into the marine environment (including estuaries), resulting in harm to living resources, hazards to human health, hindrances to marine activities including fishing, impairment of the quality of sea water and reduction of amenities.

Market Instruments: *see* economic instruments.

Market Valuation: 1. market price valuation applied in national accounts; 2. value of natural resources and of their depletion and degradation, imputed in environmental accounting and estimated on the basis of expected market returns. *See also* discounting (of natural assets) *and* Hotelling rent.

Marsh: type of wetland that does not accumulate appreciable peat deposits and is dominated by herbaceous vegetation. Marshes may be either fresh- or saltwater, and tidal or non-tidal. *See also* wetland.

Materials and Energy Balances: accounting tables that provide information on the material input into an economy delivered by the natural environment, the

transformation and use of that input in economic processes (extraction, conversion, manufacturing, consumption) and its return to the natural environment as residuals (wastes). The accounting concepts involved are founded on the first law of thermodynamics, which states that matter (mass/energy) is neither created nor destroyed by any physical process.

Maximum Sustainable Yield: maximum use that a renewable resource can sustain without impairing its renewability through natural growth or replenishment.

McKelvey Box: two-dimensional scheme that combines criteria of increasing geologic assurance (undiscovered/possible/probable/proved reserves) with those of increasing economic feasibility (subeconomic "resources" as compared with economic "reserves" depending on price and cost levels and available extraction technologies).

Measure of Economic Welfare (MEW): adjusted measure of total national output, including only the consumption and investment items that contribute directly to economic well-being. Calculated as additions to gross national product (GNP), including the value of leisure and the underground economy, and deductions such as environmental damage. It is also known as net economic welfare (NEW) (Samuelson and Nordhaus, 1992).

Mechanical Erosion Control: use of such produced structures to control erosion as terraces, dams, retards, baffles and so forth, in contrast with vegetative control.

Mechanical Treatment Technology: waste-water treatment of a physical and mechanical nature that results in decanted effluents and separate sludge. Mechanical processes are also used in combination with biological and advanced unit operations. Mechanical treatment includes processes such as sedimentation and flotation. *See also* biological treatment technology *and* advanced treatment technology.

Medium: *see* environmental media.

Mercury: heavy metal that can accumulate in the environment and is highly toxic if breathed or swallowed.

Methane (CH_4): colourless, non-poisonous and flammable gaseous hydrocarbon created by anaerobic decomposition of organic compounds. Methane is a potent greenhouse gas.

MEW: *see* measure of economic welfare.

Microbes: minute organisms such as viruses, bacteria, fungi and protozoa, some of which cause disease. They are also called microbiota or micro-organisms.

Microbial Metallurgy: use of bacteria for separating metals from ores.

Microbiology: science of microbes, including bacteriology, cytology, enzymology, mycology and virology.

Microclimate: climatic structure of a small area.

Micro-organisms: *see* microbes.

Mine Tailings: *see* tailings.

Mining Wastes: mining-related by-products of two types: (a) mining-and-quarrying extraction wastes which are barren soils removed from mining and quarrying sites during the preparation for mining and quarrying and do not enter into the dressing and beneficiating processes and (b) mining-and-quarrying dressing and beneficiating wastes which are obtained during the process of separating minerals from ores and other materials extracted during mining-and-quarrying activities. These wastes occupy valuable land and cause harm to stream life when they are deposited near the drainage area of a stream.

Mire: marsh or bog.

Miticide: pesticide used for killing mites on animals or humans.

Mixed Cropping: system of sowing two or three crops together on the same land, one being the main crop and the others the subsidiaries.

Mixed Farm: farm on which both crop production and livestock-keeping are practised simultaneously.

Mobile Source: moving source of air pollution, such as an automobile.

Monetary Environmental Accounting: *see* environmental accounting.

Monitoring: continuous or frequent standardized measurement and observation of the environment (air, water, land/soil, biota), often used for warning and control.

Monitoring Station: facility to measure emissions or ambient concentrations of pollutants.

Monitoring Well: observation well, drilled at hazardous waste management facilities for the purpose of testing the quality of the groundwater beneath the site.

Monoculture: repeated cultivation of a single crop on a given area of land.

Muck Soils: earth produced from decaying plants.

Mudflats: areas of mud that do not support any vegetation and are often covered by water.

Mulch: layer of material consisting of wood chips, straw, leaves and so forth. It is used to cover soil for the purpose of holding moisture, preventing weed growth, protecting plants and enriching the soil.

Mulch Farming: system of farming in which plant residues are not ploughed into the ground, but left on the surface.

Multiple Cropping: system of cultivating different crops simultaneously on the same land.

Multiple Land Use: use of land for more than one purpose, for example, grazing of livestock, recreation and timber production. The term may also apply to the use of associated bodies of water for recreational purposes, fishing and water supply.

Municipal Wastes: wastes produced by residential, commercial and public services sectors that are collected by local authorities for treatment and/or disposal in a central location.

Mutagen: factor that can cause a change in genetic properties. *See also* chemical mutagens.

Mutation: characteristic(s) possessed by an individual not acquired from either parent but capable of being transmitted to progeny.

Mycology: branch of botany consisting in the study of fungi.

N

NAP: *see* net above-ground productivity.

National Estate: components of the cultural and natural environment that are of great national value and need to be preserved for the benefit of the community. Some components like the Great Barrier Reef belong to the global world heritage. Such components possess aesthetic, historical, scientific, social, cultural, ecological or other special values and include parks and reserves, beaches, coastlines, certain forests, rare species, buildings and gardens of special merit, sites of archaeological interest, museums and so forth. *See also* natural patrimony.

National Parks: large natural areas not materially altered by human activity where extractive resource uses are not allowed and whose purpose is to protect nature and scenic areas of national and international significance for scientific, educational and recreational use.

Natural Assets: assets of the natural environment. These consist of biological assets (produced or wild), land and water areas with their ecosystems, subsoil assets and air.

Natural Capital: natural assets in their role of providing natural resource inputs and environmental services for economic production.

Natural Disaster: sudden calamitous event as in the case of earthquakes, tsunamis, floods, volcanic eruptions, cyclones and landslides, or ongoing misfortune as in conditions or processes such as drought and desertification.

Natural Disaster Protection: *see* protection against natural hazards.

Natural Gas: mixture of hydrocarbon compounds and small quantities of non-hydrocarbons, existing in the gaseous phase or in solution with oil in natural underground reservoirs.

Natural Habitat: *see* habitat.

Natural Heritage: *see* natural patrimony.

Natural Patrimony: from the French *patrimoine naturel*, totality of natural assets, including those of a historical or cultural value.

Natural Patrimony Accounting: French accounting system that attempts to include all components of nature that can be quantitatively or qualitatively changed by human activity (Theys, 1989). It includes the description of non-renewable resources, environmental media and living organisms of ecosystems, agents that may affect natural assets and systems, and impacts of human beings on nature, both in monetary and in physical terms.

Natural Pollutant: pollutant created by substances of natural origin such as volcanic dust, sea salt particles, photochemically formed ozone, and products of forest fibres, among others.

Natural Resource Accounting: accounting system that deals with stocks and stock changes of natural assets, comprising biota (produced or wild), subsoil assets (proved reserves), water and land with their aquatic and terrestrial ecosystems. It is frequently used in the sense of physical accounting as distinguished from monetary (environmental) accounting. *See also* environmental accounting *and* physical accounting.

Natural Resources: natural assets (raw materials) occurring in nature that can be used for economic production or consumption. *See also* renewable natural resources *and* non-renewable natural resources.

Natural Selection: natural process by which organisms that adapt to their environment survive while those that do not adapt become eliminated progressively.

Net Above-ground Productivity (NAP): accumulation of biomass in above-ground parts of plants (trunks, branches, leaves, flowers, fruits) over a specified period.

Net Abstraction of Water: difference between water abstracted and water returned. *See also* water abstraction.

Net Duty of Water: quantity of water needed for producing a given crop.

Net Economic Welfare (NEW): *see* measure of economic welfare.

Net Price: valuation used in environmental accounting to estimate the economic value of a natural resource and its depletion. It is defined as the actual market price of a natural resource output minus all marginal exploitation costs including a normal return to capital.

Neutralization: decreasing of the acidity or the alkalinity of a substance through the addition of an alkaline or acidic material respectively.

Neutral Soil: soil whose surface is neither acidic nor alkaline in reaction. For strict neutrality, the pH value should be 7.0.

NEW: *see* measure of economic welfare.

New and Renewable Energy Sources: energy sources including solar energy, geothermal energy, wind power, hydropower, ocean energy (thermal gradient, wave power and tidal power), biomass, draught animal power, fuelwood, peat, oil shale and tar sands.

Niche: appropriate combination of conditions for the survival of a given species.

Nickel Carbonyl: highly poisonous volatile liquid formed by the reaction of hot carbon monoxide and nickel. It is found in the emissions of automobiles. The vapour can cause lung cancer.

Night-soil: contents of cesspools and so forth removed at night, especially for use as manure.

Nitrate: nitrogen-containing compound that can exist in the atmosphere or as a dissolved gas in water. It may produce harmful effects on humans and animals.

Nitric Oxide (NO): gas formed by combustion under high pressure and high temperature in an internal combustion engine. It changes into nitrogen dioxide in the ambient air and contributes to photochemical smog.

Nitrification: biological process involving the conversion of nitrogen-containing organic compounds into nitrates and nitrites. It is part of the nitrogen cycle and considered to be beneficial since it converts organic nitrogen compounds into nitrates that can be absorbed by green plants.

Nitrites: nitrous oxide salts used in food preservation.

Nitrogenous Oxygen Demand (NOD): quantitative measure of the amount of dissolved oxygen required for the biological oxidation of nitrogenous material, for example, nitrogen in ammonia, and organic nitrogen in waste water.

Nitrogen Oxide (NO_x): product of combustion from transportation and stationary sources. It is a major contributor to acid depositions and the formation of ground-level ozone in the troposphere.

Nitrous Oxide (N_2O): relatively inert oxide of nitrogen produced as a result of microbial action in the soil, use of fertilizers containing nitrogen, burning of timber, and so forth. This nitrogen compound may contribute to greenhouse and ozone-depleting effects.

NOD: *see* nitrogenous oxygen demand.

Noise: audible sound from traffic, construction and so on that may generate unpleasant and harmful effects (hearing loss). It is measured in decibels.

Noise Abatement: activity to reduce the emission of noise or vibrations from a given source, or to protect persons and built-up structures from exposure to noise and vibrations.

Noise Pollution: sound at excessive levels that may be detrimental to human health.

Noise Zoning: classification of areas according to the intensity of the noise levels that are acceptable for particular activities.

Non-point Source of Pollution: pollution sources that are diffused and without a single point of origin or not introduced into a receiving stream from a specific outlet. The pollutants are generally carried off the land by storm-water run-off. The commonly used categories for non-point sources are agriculture, forestry, urban areas, mining, construction, dams and channels, land disposal and saltwater intrusion.

Non-renewable Natural Resources: exhaustible natural resources such as mineral resources that cannot be regenerated after exploitation.

Nuclear Energy: *see* atomic energy.

Nuclear Power Plant: facility that converts atomic energy into usable power. In a nuclear electric power plant, heat produced by a reactor is generally used to drive a turbine which in turn drives an electric generator.

Nuclear Radiation: *see* radiation.

Nuclear Waste Pollution: pollution created by mishandling and inappropriate storage of spent nuclear fuel rods, and pieces of protective clothing and tools that have become contaminated, and by insecure transportation of highly radioactive material over long distances to a processing plant.

Nuclear Winter: widespread climatic cooling caused by the probable effect of nuclear warfare on such atmospheric conditions as would reduce the amount of sunlight reaching the earth's surface.

Nutrient: substance, element or compound necessary for the growth and development of plants and animals.

Nutrient Cycle: repeated pathway of a particular nutrient or element from the environment through one or more organisms and back to the environment. Examples include the carbon cycle, the nitrogen cycle and the phosphorus cycle.

O

Observation Well: *see* monitoring well.

Occupational Health Hazards: hazards of exposure to pollution, noise and vibrations in the working environment. Exposure limits are promoted by the International Labour Organization (ILO).

Ocean Dumping: deliberate disposal of hazardous wastes at sea from vessels, aircraft, platforms or other human-made structures. It includes ocean incineration and disposal into the seabed and sub-seabed.

Ocean Incineration: *see* incineration at sea.

Offstream Fish Farming: breeding, rearing and farming of fish, as well as cultivation of oysters for pearls or food, in offstream freshwater, brackish water or saline water.

Offstream Use of Water: water withdrawn or diverted from a groundwater or surface-water source for public water supply, industry, irrigation, livestock, thermoelectric power generation or other uses.

Oil Dark: odorous, coloured, dense liquid that is a water pollutant, and also an air pollutant when burnt.

Oil Fingerprinting: method that identifies oil spills so that they can be traced back to their sources.

Oil Spill: oil, discharged accidentally or intentionally, that floats on the surface of water bodies as a discrete mass and is carried by the wind, currents and tides. Oil spills can be partially controlled by chemical dispersion, combustion, mechanical containment and adsorption. They have destructive effects on coastal ecosystems.

Onchocerciasis: disease caused by infestation with the filarial worm *Onchocerca volvulus*, which is transmitted to humans through the bite of the blackfly of the genus *Simulium*. The vector of the disease, which is also known as river blindness, is a major public health problem in many tropical countries. The severity of onchocerciasis is usually greatest in rural settlements near rivers and streams which are the breeding sites of the blackfly.

Oncogenic: causing tumours, either benign or malignant.

Opacity: amount of light obscured by particulate pollution in the air. Evaluation of smoke density is based on opacity according to the Ringelmann chart.

Open Burning: outdoor burning of wastes such as lumber, scrapped cars, textiles, sawdust and so forth.

Open Dump: uncovered site used for disposal of waste without environmental controls.

Open Land: non-built-up land with no, or with insignificant, vegetation cover.

Organic Compounds: compounds containing carbon (excluding carbonates, bicarbonates, carbon dioxide and carbon monoxide) that form the basis of living matter. In domestic sewage, organics are mainly metabolic wastes of faeces or urine plus grease, detergents and so forth.

Organic Farming: farming system that avoids the use of artificial fertilizers, pesticides or herbicides and uses organic manures and organic methods of crop rotation.

Organic Fertilizers: fertilizers derived from animal products and plant residues containing sufficient nitrogen.

Organism: any living plant, animal or human being.

Organophosphates: a group of phosphorus-containing pesticide chemicals intended to control insects. Examples are malathion and parathion.

Osmosis: diffusion of solvents through a semi-permeable membrane into a more concentrated solution. This is the process by which the water in soil passes into the cells of the root hairs of plants.

Outfall Sewer: pipe or conduit used to carry either raw sewage or treated effluent to a final point of discharge into a body of water.

Overgrazing: grazing by livestock or wildlife to the point where the grass cover is depleted, leaving bare, unprotected patches of soil. As a result,

water and wind cause erosion, especially on clay soils, and the growth of poisonous plants and thorny shrubs may increase.

Overland Flow: waste-water cleansing technique that allows the waste water to flow over a sloped surface. As the water so flows, the contaminants are removed and the water is collected for reuse at the bottom of the slope.

Overlay (in mapping): combining of two or more map themes for the same area so as to form a new map of combined theme characteristics.

Overpopulation: exceeding of certain threshold limits of population density when environmental resources fail to meet the requirements of individual organisms regarding shelter, nutrition and so forth. It gives rise to high rates of mortality and morbidity. *See also* carrying capacity.

Overpumping: extraction of groundwater in excess of supply to a basin or aquifer, resulting in depletion of water resources. Overpumping of a well can lead to the intrusion of saline water if the well is near the sea coast.

Oxidant: oxygen-containing substance that reacts chemically with other substances in the air to produce new substances. Oxidants are the primary contributors to photochemical smog.

Oxidation: use of oxygen to break down organic waste or chemicals, such as cyanides, phenols and organic sulphur compounds, in sewage by bacterial and chemical means.

Oxidation Pond: human-made lake or body of water in which waste is consumed by bacteria. It is generally used with other waste treatment processes. An oxidation pond is basically the same as a sewage lagoon.

Ozone (O_3): pungent, colourless, toxic gas that contains three atoms of oxygen in each molecule. It occurs naturally at a concentration of about 0.01 parts per million (p.p.m.) of air. Levels of 0.1 p.p.m. are considered to be toxic. In the stratosphere, ozone provides a protective layer shielding the earth from the harmful effects of ultraviolet radiation on human beings and other biota. In the troposphere, it is a major component of photochemical smog, which seriously affects the human respiratory system.

Ozone Depletion: destruction of ozone in the stratosphere, where it shields the earth from harmful ultraviolet radiation. Its destruction is caused by chemical reactions in which oxides of hydrogen, nitrogen, chlorine and bromine act as catalysts.

Ozone Hole: seasonal decrease in the total ozone column, 15-20 kilometres above the Antarctic.

Ozone Layer: *see* ozonosphere.

Ozone Layer Protection: *see* protection of climate and the ozone layer.

Ozonosphere: lower region of the stratosphere, 15-25 kilometres above the earth's surface, in which there is an appreciable ozone concentration. It is also termed the ozone layer.

P

PAHs: *see* polycyclic aromatic hydrocarbons.

PAN: *see* peroxyacetyl nitrate.

Pandemic Disease: disease that is widely spread throughout an area, a nation or the world.

Parasite: organism living in or on another and benefiting thereby at the expense of its host.

Particulate Loadings: mass of particles per unit volume of air or water.

Particulate Removal: removal of particulate air pollutants from their gaseous media, using gravitational, centrifugal, electrostatic and magnetic forces, thermal diffusion or other techniques.

Particulates: fine liquid or solid particles, such as dust, smoke, mist, fumes or smog, found in air or emissions. *See also* suspended particulate matter.

Pasteurization: destruction of all pathogenic organisms by the application of heat.

Pathogen: micro-organism that can cause disease in other organisms. It may be present in sewage, run-off from animal farms, swimming pools, contaminated shellfish and so forth.

PCBs: *see* polychlorinated biphenyls.

Peat Soil: predominantly organic soil derived from partially decomposed plant remains that accumulate under waterlogged conditions.

Percolating Filter: *see* trickling filter.

Percolation: flow of a liquid through an unsaturated porous medium. One example is the flow of water in soil under the action of gravity.

Perennial: plant that lives from year to year, becoming dormant after one growing season and sending up new shoots for the next growing season.

Permanent Crops: crops that, after each harvest, do not have to be planted for several years.

Permanganate of Potash: chemical used as a disinfectant, fungicide and oxidizing agent.

Permeability: rate at which air and water pass through soil or other material in a specified direction.

Peroxyacetyl Nitrate (PAN): component of photochemical smog, injurious to plants at a concentration of more than 0.05 parts per million (p.p.m.).

Persistence: length of time that a compound is able to remain in the environment after being introduced into it. Some compounds may persist indefinitely.

Pest: species, viruses, bacteria and other micro-organisms considered harmful to the health of human beings, crops and other living organisms.

Pesticide: any substance or mixture of substances that is used to prevent, destroy or control pests - including vectors of human or animal disease, and unwanted species of plants or animals. Pesticides may cause harm during, or otherwise interfere with, the production, processing, storage, transport or marketing of food, agricultural commodities, wood and wood products or animal feedstuffs - or that may be administered to animals so as to control insects, arachnids or other pests in or on their bodies.

Phenols: organic compounds that are by-products of petroleum refining, tanning, textile dyeing and so forth. They are germicides and act as disinfectants. They may produce taste and odour problems in low concentrations in water, and are toxic to aquatic and human life in higher concentrations.

Phosphorus: element that, while being essential to life as a key nutrient factor, nevertheless contributes to the eutrophication of lakes and other bodies of water.

Photochemical Air Pollution: pollution caused by the reaction of unsaturated and saturated hydrocarbons, aromatics and aldehydes (emitted owing to the incomplete combustion of fuels) with light. It causes eye irritation.

Photochemical Smog: *see* photochemical air pollution *and* smog.

Photosynthesis: chemical process carried on by green plants through which light energy is used to produce glucose from carbon dioxide and water, and oxygen is released as a by-product.

pH Value: measure of the acidity or alkalinity of a liquid. A pH value in the range of 0 to 7 indicates acidity, a pH value in the range of 7 to 14 indicates alkalinity, and a pH value of 7 signifies neutrality.

Physical Accounting: natural resource and environmental accounting of stocks and changes in stocks in physical (non-monetary) units, for example, weight, area or number. Qualitative measures, expressed in terms of quality classes, types of uses or ecosystem characteristics, may supplement quantitative measures. The combined changes in asset quality and quantity are called volume changes.

Physical Pollution: pollution caused by colour (change), suspended solids, foaming, temperature conditions or radioactivity.

Phytotoxic: injurious to plants.

Pigouvian Tax: tax levied on an agent causing an environmental externality (environmental damage) as an incentive to avert or mitigate such damage.

Plankton: floating or weakly swimming plant and animal life in water, often microscopic in size.

Plastics: non-metallic chemoreactive compounds moulded into rigid or pliable materials, fabrics and so forth. Their disposal poses an environmental problem because they are not biodegradable and the incineration of some plastics releases hazardous gases.

Plumes: substances emitted by chimneys in various path shapes and in varying concentrations.

Point Source of Pollution: anthropogenic source of emissions that is located at an identifiable point in space. The term covers stationary sources such as sewage treatment plants, powerplants, other industrial establishments, and similar buildings and premises of small spatial extension.

Poised Stream: river that neither erodes nor deposits sediments.

Poison: substance that can cause disturbances of structure or function, leading to injury or death when absorbed in relatively small amounts by human beings, plants or animals.

Pollutant: substance that is present in concentrations that may harm organisms (humans, plants and animals) or exceed an environmental quality standard. The term is frequently used synonymously with *contaminant*.

Polluter-pays Principle: principle according to which the polluter should bear the cost of measures to reduce pollution according to the extent of either the damage done to society or the exceeding of an acceptable level (standard) of pollution.

Pollution: 1. presence of substances and heat in environmental media (air, water, land) whose nature, location, or quantity produces undesirable environmental effects; 2. activity that generates pollutants.

Pollution Abatement: technology applied or measure taken to reduce pollution and/or its impacts on the environment. The most commonly used technologies are scrubbers, noise mufflers, filters, incinerators, waste-water treatment facilities and composting of wastes.

Pollution of Poverty: environmental problems that result from the lack of development rather than from the development process itself. These problems include poor water quality, inadequate housing and sanitation, malnutrition and disease.

Polychlorinated Biphenyls (PCBs): group of organic compounds used in the manufacture of plastics, as lubricants, and dielectric fluids in transformers, in protective coating for wood, metal and concrete, and in adhesives, wire coating and so forth. They are highly toxic to aquatic life and persist in the environment for long periods of time. They can accumulate in food chains and may produce harmful side-effects at high concentrations.

Polycyclic Aromatic Hydrocarbons (PAHs): class of hydrocarbons of high molecular weight emitted as a result of processes occurring in motor vehicles and other processes of incomplete combustion. PAHs are toxic in high concentrations, and some are believed to be carcinogenic.

Polysaprobe: organism capable of surviving in highly polluted waters.

Polyvinyl Chloride (PVC): plastic that releases hydrochloric acid when burnt. It may cause harmful effects. Its industrial precursor, vinylchloride monomer, is a potent carcinogen.

Population Density: total number of inhabitants per square unit of surface area.

Population Equivalent (in waste-water monitoring and treatment): amount of oxygen-demanding substances whose oxygen consumption during biodegradation equals the average oxygen demand of the waste water produced by one person. For practical calculations, it is assumed that one unit equals 54 grams of BOD per 24 hours.

Population Vulnerability Analysis (PVA): assessment of the probability of extinction of a population or species.

Potable Water: water that is safe for drinking and cooking according to defined standards. *See also* drinking water standards.

p.p.m./p.p.b./p.p.t.: parts per million/parts per billion/parts per trillion, measures of the concentrations of pollutants in air, water, soil, human tissue, food or other products.

Precipitation: 1. rain or snow falling from the atmosphere and deposited on land or water surfaces; 2. forced removal of particles from flue gases or waste water.

Precipitation-effectiveness Ratio: total amount of precipitation (rain or snow) received from the atmosphere divided by the amount of water evaporated during a given period.

Predation: relationship between two species of animals in which one (the predator) actively hunts and lives off the meat and other body parts of the other (the prey).

Preliminary Treatment: removal of large solids, oils, fat and other material from sewage so as to protect waste-water treatment facilities engaged in further treatment.

Pressure-state-response Framework: framework proposed for environmental indicators and indicators of sustainable development. *See also* framework for indicators of sustainable development.

Primary Energy Consumption: direct use at the source, or supply to users without transformation, of crude energy, that is, energy that has not been subjected to any conversion or transformation process.

Process Weight: total weight of all materials, including fuels, introduced into a manufacturing process. It is used to calculate the allowable rate of emission of pollutant matter from the process.

Product Flow Accounts: descriptions of the origin and destination of raw materials and intermediate products in different economic transformation processes leading to a final product.

Protected Area: legally established land or water area under either public or private ownership that is regulated and managed to achieve specific conservation objectives.

Protection against Erosion: activity aiming at protecting soils against erosion whether from wind, water or gravitation (falling rocks, landslides and so forth). These activities may take the form of planting, maintenance of protective vegetation, terracing of slopes or measures against desertification. *See also* mechanical erosion control.

Protection against Natural Hazards: activities of environmental protection, involving the erection, maintenance and operation of anti-erosion structures; water development; mudflow; landslide and avalanche prevention structures; coastal erosion prevention structures (dune stabilization); flood protection structures; fire protection structures; terraces on steep slopes; protective strips of woodland; and similar facilities.

Protection of Ambient Air: environmental protection activity involving the construction, maintenance and operation of facilities for the reduction of emissions into ambient air, or of concentrations in the air, of air pollutants through the use of particulate emission collectors, gaseous emission control devices or other technical means.

Protection of Ambient Water: environmental protection activity including the construction, maintenance and operation of sewerage systems, and waste-water and sewage sludge treatment plants, as well as the restoration of polluted surface waters and similar efforts.

Protection of Climate and the Ozone Layer: measures to control the emissions of greenhouse gases and gases that adversely affect the stratospheric ozone layer (carbon dioxide, methane, nitrous oxide, chloro-fluorocarbons and halons).

Protection of Soil and Groundwater: environmental protection activity involving the construction, maintenance and operation of installations for the decontamination of polluted soils, the cleansing of groundwater and the protection against the infiltration of pollutants.

Protection of Species and Habitats: environmental protection activity comprising the conservation of threatened species of fauna and flora and the protection of ecosystems/habitats that are essential to the well-being of significant species of fauna and flora.

Proved Reserves: such estimated quantities of mineral deposits, at a specific date, as analysis of geologic engineering data demonstrates with reasonable certainty to be recoverable in the future under the same economic and operational conditions.

Putrescible Waste: plant or animal residues that undergo quick degradation by bacteriological action causing odours and attracts flies.

PVA: *see* population vulnerability analysis.

PVC: *see* polyvinyl chloride.

Pyrolysis: breakdown of organic substances in the absence of oxygen through the application of extreme heat.

Q

Quality of Life: notion of human welfare (well-being) measured by social indicators rather than by "quantitative" measures of income and production.

R

RAD: *see* radiation absorbed dose.

Radiation: emission and propagation of electromagnetic waves, such as those of light or alpha, beta and gamma rays. The term generally denotes the emissions from the nucleus of an atom (nuclear radiation). *See also* secondary radiation.

Radiation Absorbed Dose (RAD): unit of measurement of any kind of radiation absorbed by human beings.

Radioactive Decay: process of transformation or disintegration of a radionuclide resulting in the release of radiation.

Radioactive Waste: material that contains or is contaminated with radionuclides at concentrations greater than those established as "exempt" by the competent authorities. To avoid persistent harmful effects, long-term storage is necessary, for which purpose so-called "isotope cemeteries" and abandoned quarries are used.

Radioactivity: spontaneous emission by radionuclides of ionizing radiation.

Radioecology: study of effects of radiation on species of plants and animals in natural communities.

Radon: colourless, naturally occurring, radioactive inert gas formed by radioactive decay. At higher than normal concentrations, it may have serious health effects, such as causing of lung cancer.

Rainforest: luxuriant forest, generally composed of tall, broad-leaved evergreen trees, found in regions where annual rainfall exceeds 1,800 millimetres.

Rain Shadow: area in which there is little or no rainfall because it is located to the leeward side of mountains, the opposite side being exposed to moisture-laden winds.

Rainwater: water that falls to earth as precipitation from atmospheric humidity. It may contain undesirable quantities of nitrogen, sulphur and heavy metals which give rise to problems of "acid rain".

Range Management: use of grazing land to ensure consistent livestock production and, at the same time, conserve range resources.

Rare Species: taxa with small world populations that, though not at present endangered or vulnerable, are at risk. These taxa are localized within restricted geographical areas or habitats or thinly scattered over a more extensive range.

Raw Sewage: untreated domestic or commercial waste water.

Recharge: process by which water is added from outside to the zone of saturation of an aquifer.

Recharge Area: area in which water reaches the zone of saturation from surface infiltration. It is also referred to as recharge groundwater.

Recreational Land: land used for purposes of recreation, for example, sports fields, gymnasiums, playgrounds, public parks and green areas, public beaches and swimming pools, and camping sites.

Recuperative Incineration: *see* incineration with recovery of energy.

Recycling: processing and use of wastes in production and consumption processes, for example, melting of scrap iron so that it can be converted into new iron products.

Red List of Threatened Animals: listing of animals threatened with extinction. The 1994 IUCN Red List, compiled by the World Conservation Monitoring Centre, includes more than 6,000 animal species known to be at risk.

Red Tide: proliferation of marine plankton that is toxic and often fatal to fish. This natural phenomenon is stimulated by phosphorus and other nutrients that are discharged into waterways by human beings. The colour of the tide can be red, yellow, green or brown.

Reforestation: artificial or natural re-establishment of forest in an area that was previously under forest cover.

Refuse: *see* solid waste.

Refuse Reclamation: conversion of solid wastes into useful products, for example, composting organic waste to make soil conditioners, and separating aluminium and other metals for melting and recycling.

Regeneration: *see* homeostasis.

REM: *see* roentgen equivalent man.

Remote Sensing: recording of images of the Earth's surface from aircraft and satellites and processing and analysing of these images to obtain information needed for inventories of natural resources, assessments of natural disasters, preparation of maps, and so forth.

Renewable Natural Resources: natural resources that, after exploitation, can return to their previous stock levels by natural processes of growth or replenishment. Conditionally renewable resources are those whose exploitation eventually reaches a level beyond which regeneration will become impossible. Such is the case with the clear-cutting of tropical forests.

Rent: net return on a production factor whose supply is perfectly inelastic (available only as a fixed amount) such as land. It is also called pure economic rent. *See also* Hotelling rent.

Reserves: *see* McKelvey box.

Reservoir: place where water is collected and stored in large quantities for use when required.

Residual: amount of a pollutant that remains in the environment after a natural or technological process has taken place.

Resilience: capacity of a natural system to recover from disturbance.

Resistance: ability of plants and animals to withstand poor environmental conditions and/or attacks by chemicals or disease. *See also* homeostasis.

Respiratory Disease: *see* airborne disease.

Restoration Costs: actual and imputed expenditures for activities aiming at the restoration of depleted or degraded natural systems, partly or completely counteracting (accumulated) environmental impacts of economic activities. *See also* environmental restoration.

Restorative Crops: crops that help in maintaining the fertility of the soil, for example, pulses and legumes.

Reuse: use of materials or products more than once, for example, refilling of bottles.

Rice Weevil: hole-boring insect creating damage notably to stored grain.

Richter Scale: scale with a range extending from 0 to 10 for measuring the strength of an earthquake.

Ringelmann Chart: series of shaded illustrations used to measure the opacity of air pollution emissions. The chart shades range from light grey to black and serve in the setting and enforcing of emission standards.

Rio Declaration on Environment and Development: *see* United Nations Conference on Environment and Development (United Nations, 1993b).

Riparian: land adjacent to a stream.

Riparian Habitat: areas adjacent to rivers and other water bodies that have a high density and large variety of plants and animal species relative to nearby uplands.

Risk Analysis: method of evaluating the probability of the adverse effects of a substance, industrial process, technology or natural process.

Risk Assessment (of pollution): quantitative and qualitative evaluation of the risk posed to human health and/or the environment by the actual or potential presence of and exposure to particular pollutants.

Risk Management: process of evaluating alternative regulatory and non-regulatory responses to risk and selecting among them. The selection

process necessarily requires the consideration of legal, economic and social factors.

River Basin: total land area drained by a river and its tributaries.

River Blindness: *see* onchocerciasis.

River-regulating Reservoir: upstream impounding reservoir that helps in flood control and releases water when river levels are low.

Rock Weathering: *see* weathering.

Rodenticide: pesticide used to destroy rodents (rats, mice and squirrels, among others).

Roentgen: measure of radioactive dose/exposure. It is the quantity of X- or gamma radiation, producing ions that carry one electrostatic unit of electricity of either positive or negative charge in one millilitre (ml) of dry air.

Roentgen Equivalent Man (REM): unit of dose equivalent to that quantity of ionizing radiation that produces in the human body the same biological effect as one roentgen of X-rays or gamma rays.

Roundwood: wood in the rough, that is, wood in its natural state as felled or otherwise harvested, with or without bark, round, split roughly squared or in some other form (for example, roots, stumps, burls and so forth).

Royalty: payment for the use of assets, including certain intangible assets, such as patents, and tangible ones, notably subsoil assets. Royalties paid for the use of subsoil assets are also called rents.

Run-off: portion of rainfall, melted snow or irrigation water that flows across the ground's surface and is eventually returned to streams. Run-off can pick up pollutants from air or land and carry them to receiving waters.

S

Saline Soil Reclamation: *see* desalinization.

Salinity: salt content of environmental media.

Salinization: increase in salt concentration in an environmental medium, notably soil. It is also known as salination.

Salt Water Intrusion: mixing of saltwater with freshwater. It can occur in either surface-water or groundwater bodies.

Sanitary Landfill: *see* landfill.

Sanitary Sewage: domestic wastes from bathrooms, kitchen and so on.

Sanitation: improvement of environmental conditions in households that affect human health by means of drainage and disposal of sewage and refuse.

Saprobe: fungus living on dead or decaying organic matter.

Saprobic Water Classification: biological classification of water quality according to five categories: (a) oligosaprobic: clear, with no or only slight pollution and high dissolved oxygen (DO) content, (b) p-mesosaprobic: moderately polluted with still high DO content, (c) x-mesosaprobic: polluted with not very high DO content, (d) polysaprobic: strongly polluted, with negligible DO content and (e) antisaprobic: so polluted that no living organism is capable of living in the water.

Satellite System (of national accounts): additional or parallel accounting system that expands the analytical capacity of national accounts, without overburdening or disrupting the central system. It may provide additional information, apply complementary or alternative concepts, extend the coverage of costs and benefits of human activities and link physical with monetary data. The System of integrated Environmental and Economic Accounting (SEEA) constitutes a satellite system of the System of National Accounts (SNA).

Saturated Soil: subsurface area in which all pores and cracks are filled with water to the capacity of the soil. *See also* waterlogging.

Schistosomiasis: disease contracted through exposure to water containing a species of water snail that acts as host to flukes of the genus *Schistosoma* at their first larval stage. The disease leads to malfunctioning and deterioration of the liver, heart, spleen, bladder and kidneys. It is also known as bilharzia.

Scrap: discarded or rejected materials that result from manufacturing or fabricating operations and are suitable for reprocessing.

Scrubber: an air pollution device that uses a spray of water or reactant to reduce or remove pollution from air.

Scum Collector: mechanical device for collecting in sedimentation tanks, dirt, froth and impurities from the surface of the water.

Secondary Air Pollution: pollution caused by reactions in air already polluted by primary emissions (from factories, automobiles and so forth). An example of secondary air pollution is photochemical smog.

Secondary Radiation: radiation originating from the absorption of previous radiation in matter. It may be in the form either of electromagnetic waves or of moving particles.

Secondary Treatment: second step in most waste treatment systems during which bacteria consume the organic parts of the wastes. This is accomplished by bringing the sewage, bacteria and oxygen together in trickling filters or within an activated sludge process. Secondary treatment removes all floating and settleable solids and about 90 per cent of the oxygen-demanding substances and suspended solids. Disinfection by chlorination is the final stage of the secondary treatment process. *See also* tertiary treatment.

Sedimentation: settling of matter to the bottom of a liquid or water body, notably a reservoir.

Sedimentation Tank: holding area for waste water where floating wastes are skimmed off and settled solids are pumped to incinerators, digesters, filters or other means of disposal.

SEEA: *see* System of integrated Environmental and Economic Accounting.

Selective Cutting: cutting down of selected trees in a forest so that growth of other trees is not affected. This is done according to criteria regarding minimum tree size for harvesting, specifications of the number, spacing and size classes of residual trees per area, and allowable cut. *See also* creaming.

Semi-arid Zones: areas where mean annual rainfall is between about 250 and 600 millimetres (mm), rainfall seasonal and variable, and potential evaporation high.

Semi-confined Aquifer: aquifer that is partially confined by a soil of low permeability through which recharge and discharge can occur.

Septic Tank: underground tank receiving waste water directly from the home. Organic sewage/waste is decomposed by bacteria and settles down in the tank; effluents flow out of the tank into the ground; and the sludge is periodically pumped out.

SERIEE: *see* European System for the Collection of Economic Information on the Environment.

Sewage: organic waste and waste water produced by residential and commercial establishments.

Sewage Effluent Standards: standards prescribed at sewage works that provide information on biochemical oxygen demand (BOD), suspended solids and ammoniacal nitrogen with a view to obtaining the desired quality of effluents.

Sewage Farm: land onto which sewage or sewage effluent is generally poured. It may include crop land.

Sewage Lagoon: shallow pond, usually human-made, where sunlight, bacteria and oxygen interact to help purify waste water. The term is synonymous with *sewage oxidation pond* and *stabilization pond*.

Sewage Oxidation Pond: *see* sewage lagoon.

Sewer: channel or conduit that carries waste water, sewage and storm water from their source to a treatment plant or receiving stream. A sanitary sewer conveys household and commercial wastes, a storm sewer transports rain run-off and a combined sewer is used for both purposes.

Sewerage Network: system of collectors, pipelines, conduits and pumps to evacuate waste water (rainwater, domestic and other waste water) from any of the points of generation either to a municipal sewage treatment plant or to a point where waste water is discharged into surface water.

Sheet Erosion: removal of soil in thin layers from sloping land under the influence of surface run-off water.

Shifting Agriculture: system of cultivation in which a plot of land is cleared and cultivated for a short period of time, then abandoned and allowed to revert

to producing its normal vegetation while the cultivator moves on to another plot.

Shifting Cultivation: *see* shifting agriculture *and* slash-and-burn agriculture.

Shredding: process of reducing materials to small pieces. It is essential for fast mechanical composting and decomposition of organic material.

Shredding Residues: wastes whose disposal is characterized by shredding, for example, wrecked cars and discarded household appliances.

Sievert: *see* effective dose equivalent.

Silt: fine particles of sand and rock that can be picked up by the air or by water and deposited as sediments. *See also* sedimentation.

Silviculture: management of forest land for timber.

Sink: receptacle medium for pollutants and wastes. *See also* carbon sink.

Sinking: controlling of oil spills through use of an agent to trap the oil and sink it to the bottom of the body of water in which the agent and the oil are to be biodegraded.

Skimming: mechanical removal of oil or scum from the surface of water.

Slack: coal dust or small pieces of coal.

Slag: by-product of metallurgic and combustion processes consisting mainly of mixed oxides of silicon, sulfur, phosphorus and aluminium. It is used as road material, as ballast and as a source of phosphate fertilizers.

Slash-and-burn Agriculture: method of cultivation whereby areas of the forest are burnt and cleared for planting. When soil fertility declines, cultivation shifts to a new plot.

Sleeping Sickness: *see* trypanosome *and* tsetse fly.

Slow Sand Filtration: purification of surface water for domestic use by passing it very slowly through sand beds which results in the satisfactory removal of chemical and biological pollutants from the water. It is a very old form of filtration but still used frequently today.

Sludge: muddy, semi-solid deposits remaining after most liquids have been removed from waste water (possibly through filtration and chemical treatment). *See also* activated sludge.

Sludge Digestion: final biochemical reduction stage in sewage treatment in which organic matter is broken down and stabilized by bacteria and other micro-organisms.

Sludge Disposal: handling of sludge in any of several ways: (a) use on farmland to improve the soil, (b) use as a fill on low-lying land, (c) dumping into the sea, (d) use in industry, and (e) incineration.

Slums: areas of older housing that are deteriorating in the sense of their being underserviced, overcrowded and dilapidated.

Slurry: watery mixture of insoluble matter that results from certain pollution control techniques.

Smelting: separation of metal from its ore by a process involving heating, in which oxides of the metal are generally reduced by carbon in a furnace called a smelter. It is a cause of pollution from fuel combustion.

Smog: combination of smoke and fog in which products of combustion such as hydrocarbons, particulate matter and oxides of sulphur and nitrogen occur in concentrations that are harmful to human beings and other organisms.

Smoke: particles suspended in air after incomplete combustion of materials.

SNA: *see* System of National Accounts.

Social Cost: *see* environmental externalities.

Social Indicators: *see* quality of life.

Soft Detergents: cleaning agents that are biodegradable.

Soft Pesticides: biodegradable (non-persistent) pesticides.

Soil: loose and unconsolidated outer layer of the earth's crust, made up of small particles of different sizes.

Soil Aeration: renewal of air or other gases in the soil.

Soil Conditioner: organic material such as humus or compost that facilitates the passage of water through soil and the distribution of fertilizer material and also provides a better medium for the growth of soil bacteria.

Soil Conservation: protection of soil from erosion and other types of deterioration, so as to maintain soil fertility and productivity. It generally includes watershed management and water use. *See also* protection of soil and groundwater.

Soil Creep: slow downward movement of soil on slopes under the force of gravity.

Soil Drainage: removal of surplus water from soil.

Soil Erosion: *see* erosion.

Soil Erosion Index: *see* universal soil loss equation.

Soil Injection: mechanical placement of herbicide beneath the soil surface with minimum disturbance of soil.

Soil Morphology: study of the constitution of the soil, including texture, structure and other properties.

Soil Sealing: isolation of the soil from the atmosphere, hydrosphere and biosphere by human impact, affecting local climates, soil functions, water balances and habitat.

Solid Waste: useless and sometimes hazardous material with low liquid content. Solid wastes include municipal garbage, industrial and commercial waste, sewage sludge, wastes resulting from agricultural and animal husbandry operations and other connected activities, demolition wastes and mining residues.

Solid Waste Disposal: ultimate disposition or placement of refuse that is not salvaged or recycled.

Solid Waste Management: supervised handling of waste material from generation at the source through the recovery processes to disposal.

Solifluction: gradual movement of wet soil and so forth down a slope. *See also* soil creep.

Soot: carbon dust formed by incomplete combustion.

Soot Fall: large particles drawn into the atmosphere by high-velocity exhaust gases. Because of their size, these particles do not remain suspended in the atmosphere and become deposited on the surrounding terrain.

Sorption: process of removal of gaseous and particulate matter from emissions and cleaning up of oil spills that includes both adsorption and absorption. It is used in many pollution control systems.

Species: all the individuals and populations of a particular kind of organism, maintained by biological mechanisms that result in their breeding only with their own kind.

SPM: *see* suspended particulate matter.

Spoil: dirt or rock removed from its original location because of its impact on the composition of the soil. It occurs in strip mining or dredging.

Squatter Settlements: areas of housing units that have been constructed or erected on land to which the occupants do not have a legal claim. *See also* informal settlements.

Stability (of ecosystem): capability of a natural system to apply self-regulating mechanisms so as to return to a steady state after an outside disturbance. *See also* resilience.

Stabilization Pond: *see* sewage lagoon.

Stack: chimney, that is, a vertical pipe or flue installed in buildings and factories to remove exhaust gases and suspended particulate matter.

Standard: *see* environmental quality standard *and* emission standard.

Stationary Source: non-moving emitter of pollution.

Statistical Ecology: *see* ecological statistics.

Sterilization: use of radiation or chemicals to damage body cells needed for reproduction. It is utilized in pest control.

Stockholm Declaration: *see* Declaration on the Human Environment.

Storm Sewer: system of pipes (separate from sanitary sewers) that carries only rain run-off from buildings and land surfaces.

Storm Tank: tank for storage and partial treatment of excess storm sewage prior to its disposal in a body of water. It is usually situated near sewage treatment works.

Storm Water: 1. water obtained from precipitation; 2. overland flow that enters sewers.

Stratification: vertical layering of ecological communities and environmental media. For instance, strata in forest may consist of herbs, shrubs, understory trees and overstory tree layers.

Stratopause: boundary between the stratosphere and mesosphere at a height of about 50 kilometres above the earth's surface.

Stratosphere: upper layer of the atmosphere (above the troposphere), between approximately 10 to 50 kilometres above the earth's surface.

Stream Bank Erosion: erosion of river beds due to undercutting by fast-flowing streams during sudden floods. It can be controlled by providing vegetative or mechanical protection of erodible banks.

Stream Bank Management: growth and protection of vegetation on river banks.

Stream Flow Regulations: method of water quality management in which stored good-quality water is added to a stream during times of deteriorating water quality.

Stress-response Environmental Statistical System: statistical system, developed by Statistics Canada, distinguishing among measures that exert stress on the environment (stress and stressor statistics), measures of the effects on the environment (environmental response) and measures of policy response (collective and individual responses). *See also* Framework for the Development of Environment Statistics (FDES).

Strip Mining: process in which rock and topsoil strata overlying mineral deposits are removed by mechanical means.

Stumpage Value: economic value of a standing tree, equivalent to the amount concessionaires earn when a log is sold to the sawmill or the exporter, less the cost of logging. It is used as the net-price valuation in environmental accounting.

Subsoil Assets: developed and undeveloped reserves of mineral deposits located on or below the earth's surface.

Sullage: run-off or sewage waste water. Rich in plant nutrients, it is used for certain crops such as vegetables, sugarcane and fodder.

Sulphur Dioxide (SO_2): heavy, pungent, colourless gas formed primarily by the combustion of fossil fuels. It is harmful to human beings and vegetation, and contributes to the acidity in precipitation.

Surface Run-off: *see* run-off.

Surface Water: all water naturally open to the atmosphere, including rivers, lakes, reservoirs, streams, impoundments, seas, estuaries and so on. The term also covers springs, wells or other collectors of water that are directly influenced by surface waters.

Surveillance System: system for monitoring environmental quality in order to detect areas of pollution concentration in time for remedial measures.

Suspended Particulate Matter (SPM): finely divided solids or liquids that may be dispersed through the air from combustion processes, industrial activities or natural sources.

Suspended Solids: small particles of solid pollutants in sewage that contribute to turbidity and resist separation by conventional means.

Sustainability: the concept refers to (a) use of the biosphere by present generations while maintaining its potential yield (benefit) for future generations; and/or (b) non-declining trends of economic growth and development that might be impaired by natural resource depletion and environmental degradation.

Sustainable Development: development that meets the needs of the present without compromising the ability of future generations to meet their own needs (World Commission on Environment and Development, 1987). It assumes the conservation of natural assets for future growth and development.

Sustainable Development Indicators: indicators that measure progress made in sustainable growth and development.

Sustainable Economic Growth: in operational terms, upward trend in environmentally adjusted net domestic product (EDP) under certain conditions and assumptions (Bartelmus, 1994).

Sustainable Income: (frequently used as a synonym for) environmentally adjusted national income.

Sustainable Yield: *see* maximum sustainable yield.

Swamp: type of wetland with water standing permanently or for a considerable period of time and with a dense cover of native vegetation. Swamps may be freshwater or saltwater, and tidal or non-tidal.

Symbiosis: mutually beneficial relationship involving continuous intimate contact between interacting species.

Synecology: study of the relationships of organisms with their environment.

Synergism: cooperative interaction of two or more chemicals, drugs or other substances, or phenomena, producing a greater total effect than the sum of their individual effects.

Synthetic Manure: organic material such as leaves, grass and so forth to which mineral fertilizer and lime have been added to help decomposition.

System of integrated Environmental and Economic Accounting (SEEA): satellite system of the System of National Accounts (SNA) proposed by the United Nations

(1993a) for the incorporation of environment concerns (environmental costs, benefits and assets) into national accounts.

System of National Accounts (SNA): revised (1993) system adopted worldwide for conventional economic (national) accounting (Commission of the European Communities and others, 1993).

T

Tailings: wastes separated out during the processing of crops and mineral ores, including residues of raw materials.

Tangible Assets: assets including human-made (produced) non-financial assets and non-produced natural assets, and excluding intangible (non-produced) assets such as patents or goodwill. *See also* natural assets.

Taxon (plural: taxa): unit (group) of organisms used in taxonomy.

Taxonomy: classification of fossil and living organisms according to their evolutionary relationships.

Technology: *see* environmentally sound technologies.

Temperature Inversion: *see* inversion.

Teratogen: substance causing birth defects.

Terracing: cutting of small level patches of ground into the slopes in hilly areas for the purpose of growing crops. Walls and banks are built around these small patches to retain water and prevent soil erosion.

Tertiary Treatment: advanced treatment process, following secondary treatment of waste water, that produces high-quality water. Tertiary treatment includes removal of nutrients such as phosphorus and nitrogen and practically all suspended and organic matter from waste water. *See also* secondary treatment.

Thermal Oxidation: incineration.

Thermal Pollution: discharge of heated effluents from industrial processes such as electric power generation, atomic power stations and other factories at temperatures that can affect the life process of aquatic organisms.

Tidal Flat: level, muddy surface bordering an estuary, alternately submerged and exposed to the air by changing tidal levels.

Tidal Marsh: low, flat marshland traversed by channels and tidal hollows and subject to tidal inundation. Normally, the only vegetation present are salt-tolerant bushes and grasses.

Tolerance: 1. ability of an organism to endure unfavourable environmental conditions; 2. amount of a chemical in food considered safe for humans or animals.

Topography: physical feature of a surface area, including its relief or relative elevations, and the position of human-made and natural features.

Total Suspended Particulate Matter (TSPM): *see* suspended particulate matter.

Toxicity: ability of a substance to cause poisonous effects resulting in severe biological harm or death after exposure to, or contamination with, that substance.

Toxic Pollutants: materials contaminating the environment that cause death, disease and/or birth defects in the organisms that ingest or absorb them. The quantities and length of exposure necessary to cause these effects can vary widely.

Trace Elements: elements that occur in very small quantities in living organisms. These elements include lead, silver, iron, zinc, nickel, cobalt and manganese. Some trace elements are essential for life processes, while others are detrimental. Even beneficial elements may be toxic at higher levels.

Tradable Pollution Permits: rights to sell and buy actual or potential pollution in artificially created markets. *See also* economic instruments.

Transboundary Pollution: pollution that originates in one country but, by crossing the border through pathways of water or air, is able to cause damage to the environment in another country.

Transpiration: the evaporation of water into the atmosphere from the surface of plant leaves.

Trash: 1. leaves, stalk and husk left on the ground after harvest; 2. dry solid waste generated in domestic premises and offices.

Trickling Filter: coarse biological treatment system in which waste water is trickled over a bed of stones or other material covered with bacterial growth. The bacteria break down the organic waste in sewage and produce clean water.

Trophic Levels: classification of natural communities or organisms according to their place in the food chain. Green plants (producers) can be roughly distinguished from herbivores (consumers) and carnivores (secondary consumers).

Tropical Forest: type of forest found in areas with high regular rainfall and no more than two months of low rainfall, and consisting of a completely closed canopy of trees that prevents penetration of sunlight to the ground and discourages ground-cover growth.

Tropopause: boundary between the troposphere and the stratosphere located at a height of about 10 kilometres above the earth's surface.

Troposphere: layer of the atmosphere extending about 10 kilometres upward from the earth's surface.

Truncated Soil Profile: soil profile where the surface soil has been removed by erosion.

Trypanosome: protozoan of the genus *Trypanosoma* that causes sleeping sickness.

Tsetse Fly: dipterous (two-winged) insect of the genus *Glossina* that transmits sleeping sickness caused by trypanosomes.

TSPM: *see* total suspended particulate matter.

Tsunami: transliteration of Japanese term meaning "storm wave", giant ocean wave produced by a seismic disturbance beneath the ocean floor.

Tundra: type of ecosystem dominated by lichens, mosses, grasses and dwarf woody plants. It is found at high latitudes (arctic tundra) or high altitudes (alpine tundra). The arctic tundra possesses a permanently frozen subsoil, usually very wet.

Turbidity: hazy or cloudy condition of water due to the presence of suspended particles.

U

Ultraviolet Rays: radiation in the wavelength range between visible light and X-rays, divided into wave length bands A, B, C. Much of the ultraviolet radiations in bands B and C are prevented from reaching the earth's surface by the ozone layer present in the atmosphere.

UNEP: United Nations Environment Programme, international organization established in 1972 to catalyse and coordinate activities to increase scientific understanding of environmental change and develop environmental management tools.

United Nations Conference on Environment and Development: conference held in 1992 in Rio de Janeiro (also referred to as the Earth Summit). The Conference adopted the Rio Declaration on Environment and Development (United Nations, 1993b), an action plan termed Agenda 21 (United Nations, 1993b) and the Non-legally Binding Authoritative Statement of Principles for a Global Consensus on the Management, Conservation and Sustainable Development of All Types of Forests (Forest Principles) (United Nations, 1993b). The Conference also presented for signature by Governments the United Nations Framework Convention on Climate Change (United Nations, 1992) and the Convention on Biological Diversity (UNEP, 1992).

Universal Soil Loss Equation: equation used as an erosion index in which soil loss (in short tons per acre) is defined as the mathematical product $R\ K\ L\ S\ C\ P$, where R is the rainfall erosivity index, K the soil erodibility factor, L the slope length factor, S the slope steepness factor, C the crop management factor and P the conservation factor.

UNSD: United Nations Statistics Division (formerly, United Nations Statistical Office), body responsible for the collection, compilation and dissemination of international statistical data, the improvement of statistical methodology, substantive support for technical cooperation in statistics and the promotion of coordination in international statistical work.

Uranium: radioactive heavy-metal element used in nuclear reactors and for the production of nuclear weapons. Its isotopes (reflecting different atomic mass) are U-233, U-235 and U-238.

Urbanization: 1. increase in the proportion of a population living in urban areas; 2. process by which a large number of people becomes permanently

concentrated in relatively small areas, forming cities. *See also* counterurbanization.

Urban Run-off: storm water from city streets and adjacent domestic or commercial properties that contains litter, and organic and bacterial wastes.

Urban Sprawl: expansion of an urban area to accommodate its growing population.

User Cost: concept proposed for the valuation of the depletion of mineral deposits (El Serafy, 1989), according to which a time-bound stream of net revenues from the sale of an exhaustible natural resource is converted into a permanent income stream by investing part of the revenues, that is, the user cost allowance, over the lifetime of the resource. The remaining amount of the revenue is regarded as true income.

User-pays Principle: variation of the polluter-pays principle that calls upon the user of a natural resource to bear the cost of running down natural capital.

V

Valuation of Natural Assets: methods of applying a monetary value to natural assets in environmental accounting that include (a) market valuation, (b) direct non-market valuation such as the assessment of the willingness to pay for environmental services (contingent valuation) and (c) indirect non-market valuation, for example, costing of environmental damage or of compliance with environmental standards. *See also* market valuation, maintenance (cost) valuation *and* contingent valuation.

Vector (in disease transmission): organism that carries a pathogen from an infected to an uninfected individual, for example, the mosquito (vector for malaria).

Vegetation Cover: all trees, shrubs, herbs, deciduous plants and so forth that cover an area or region.

Venting of Landfill: emission of gas from controlled tips consisting by volume of 50 per cent methane and 50 per cent carbon dioxide, sometimes with some nitrogen.

Vinyl Chloride: gaseous chemical compound used in producing plastics. Prolonged exposure to its vapours has been linked to several forms of cancer.

VOB: *see* volume over bark.

VOCs: *see* volatile organic compounds.

Volatile Organic Compounds (VOCs): organic compounds that evaporate readily and contribute to air pollution mainly through the production of photochemical oxidants.

Volume Over Bark (VOB): measure of timber stocks, gross volume in cubic metres per hectare over bark of free bole (from stump or buttresses to crown point of

first main branch) of all living trees more than (usually) 10 centimetres in diameter at breast height.

Vulnerability: measure of the extent to which a community, structure, service or geographical area is likely to be damaged or disrupted, on account of its nature or location, by the impact of a particular disaster hazard.

Vulnerability Analysis: process of estimating the vulnerability to potential disaster hazards of specified elements at risk.

Vulnerable Species: taxa of various types, including (a) taxa believed likely to move into the "endangered" category in the near future if the relevant causal factors continue to operate. These factors may include overexploitation, extensive destruction of habitat and other environmental disturbances, (b) taxa with populations that have been seriously depleted and whose ultimate security has not yet been assured and (c) taxa with populations that are still abundant but are under threat from severe adverse factors throughout their range.

W

Washout: removal by falling precipitation of pollutants from the air layer below the clouds.

Waste: materials that are not prime products (that is, products produced for the market) for which the generator has no further use in terms of his/her own purposes of production, transformation or consumption, and of which he/she wants to dispose. Wastes may be generated during the extraction of raw materials, the processing of raw materials into intermediate and final products, the consumption of final products, and other human activities. Residuals recycled or reused at the place of generation are excluded. *See also* biological waste, solid waste, industrial wastes *and* household waste.

Waste Absorption: *see* absorption.

Waste Collection: collection and transport of waste to the place of treatment or discharge by municipal services or similar institutions, or by public or private corporations, specialized enterprises or general government. Collection of municipal waste may be selective, that is to say, carried out for a specific type of product, or undifferentiated, in other words, covering all kinds of waste at the same time.

Waste Disposal: *see* disposal of waste.

Waste Management: characteristic activities include (a) collection, transport, treatment and disposal of waste, (b) control, monitoring and regulation of the production, collection, transport, treatment and disposal of waste and (c) prevention of waste production through in-process modifications, reuse and recycling.

Waste Stabilization Pond: large shallow pond in which raw water or sewage effluent is treated through the action of algae and bacteria. *See also* sewage lagoon.

Waste Water: used water, typically discharged into the sewage system. It contains matter and bacteria in solution or suspension.

Waste-water Treatment: process to render waste water fit to meet environmental standards or other quality norms. Three broad types of treatment may be distinguished: mechanical, biological and advanced.

Water Abstraction: removal of water from any source, either permanently or temporarily. Mine water and drainage water are included. Water abstractions from groundwater resources are defined as the difference between the total amount of water withdrawn from aquifers and the total amount charged artificially or injected into aquifers. *See also* net abstraction of water.

Water-based Disease: *see* waterborne disease.

Waterborne Disease: disease that arises from infected water and is transmitted when the water is used for drinking or cooking (for example, cholera or typhoid). It is to be distinguished from water-based and water-related diseases. Water-based diseases are those in which water provides the habitat for host organisms of parasites ingested (for example, schistosomiasis). Water-related diseases are those in which insect vectors rely on water as habitat but transmission is not through direct contact with water (for example, malaria or onchocerciasis).

Water Conservation: preservation, control and development of water resources, both surface and groundwater, and prevention of pollution.

Water Cycle: sequence of climatological events. The heat of the sun evaporates water from land and water surfaces; vapour, being lighter than air, rises until it reaches the cooler upper air level where it condenses into clouds; further condensation produces precipitation that falls to earth as rain, sleet or snow; some of the water is retained by the soil and some run-off returns to rivers, lakes and oceans.

Water Erosion: erosion of soil by water. It occurs in any of three forms: sheet, rill and gully erosion.

Water Hyacinth: aquatic plant of genus *Eichhornia* that may clog lakes and slow-flowing streams because of its rapid reproduction.

Water Lily: aquatic plant of the family Nymphaeaceae, with broad, flat floating leaves and large, cup-shaped floating flowers. It provides food for fish and wildlife, but may cause drainage problems because of its rapid growth.

Waterlogging: natural flooding and overirrigation that brings water at underground levels to the surface. As a consequence, displacement of the air occurs in the soil with corresponding changes in soil processes and an accumulation of toxic substances that impede plant growth.

Water Mining: depletion (beyond replenishment) of water bodies, notably aquifers.

Water Pollution: presence in water of harmful and objectionable material - obtained from sewers, industrial wastes and rainwater run-off - in sufficient concentrations to make it unfit for use.

Water Quality: physical, chemical, biological and organoleptic (taste-related) properties of water.

Water Quality Classes: categories of water quality that encompass the overall state of the pollution or cleanliness of water. *See also* saprobic water classification.

Water Quality Criteria: specific levels of water quality desired for identified uses, including drinking, recreation, farming, fish production, propagation of other aquatic life, and agricultural and industrial processes. *See also* drinking water standards.

Water Quality Index: weighted average of selected ambient concentrations of pollutants usually linked to water quality classes.

Water Quality Monitoring: *see* monitoring.

Water-related Disease: *see* waterborne disease.

Watershed: land area that drains into a stream. *See also* drainage basin.

Water Supply System: system for the collection, transmission, treatment, storage and distribution of water from source to consumers, for example, homes, commercial establishments, industry, irrigation facilities and public agencies for water-related activities (fire-fighting, street flushing and so forth). *See also* dual supply system.

Water Table: level below which water-saturated soil is encountered. It is also known as groundwater surface.

Water Treatment: 1. (prior to first use) process to render water withdrawn from any source suitable for first use; 2. waste-water treatment by mechanical, biological and advanced procedures.

Water Use: use of water by agriculture, industry, energy production and households, including in-stream uses such as fishing, recreation, transportation and waste disposal.

Water Withdrawal: *see* water abstraction.

Weather: day-to-day or sometimes even instantaneous changes of atmospheric conditions over a given place or area. In contrast, climate encompasses the statistical ensemble of all weather conditions during a long period of time over that place or area. Atmospheric conditions are measured by the meteorological parameters of air temperature, barometric pressure, wind velocity, humidity, clouds and precipitation.

Weathering: disintegration of rocks into small soil particles through the physical and chemical action of atmospheric agents, for example, rain, water, frost, wind, temperature changes, plant and animals.

Weil's Disease: leptospirosis, disease transmitted by urine of rodents. It poses particular risks to sewer workers.

Wetland: area of low-lying land where the water table is at or near the surface most of the time. Wetlands include swamps, bogs, fens, marshes and estuaries.

Wildlife Habitat: *see* habitat.

Wildlife Refuge: area designated for the protection of wild animals, within which hunting and fishing are either prohibited or strictly regulated.

Wildlife Reserve: area of land reserved for occupancy by wild animals.

Willingness to Pay: *see* contingent valuation.

Wind Erosion: erosion of the soil as a direct result of high-velocity wind. It generally occurs in dry areas devoid of vegetation.

Wind Strip Cropping: soil conservation measure consisting of the planting of tall-growing and low-growing crops in alternately arranged straight and long but relatively narrow parallel strips, laid across the direction of prevailing wind regardless of land contour.

World Conservation Strategy: strategy published by the International Union for Conservation of Nature and Natural Resources (IUCN) (currently the World Conservation Union), United Nations Environment Programme (UNEP) and the World Wide Fund for Nature (WWF) in 1980 with the objectives of (a) maintaining essential ecological processes and life support systems, (b) preserving genetic diversity and (c) ensuring the sustainable utilization of species and ecosystems. An updated version entitled *Caring for the Earth: A Strategy for Sustainable Living* (IUCN/WWF, 1991) was published in 1991.

World Conservation Union: *see* IUCN.

World Heritage: *see* national estate.

WWF: World Wide Fund for Nature (formerly World Wildlife Fund). It aims to conserve nature and ecological processes by preserving biodiversity, ensuring sustainable use of natural resources and promoting the reduction of pollution and wasteful use of resources and energy.

Y

Yellow Fever: infectious disease of the tropics and subtropics, caused by a virus and transmitted by a mosquito. It can be fatal but may be prevented by vaccination with attenuated viruses.

Yield: 1. total volume of water flow from a drainage basin over a stipulated long period of time, for example, annual yield; 2. (of renewable resources) *see* maximum sustainable yield.

Z

Zero Population Growth (ZPG): absence of population growth in which equal birth and death rates create a stable human population.

Zoning: process in physical planning, or the results thereof, in which specific functions or uses are assigned to certain areas (for example, industrial zones, residential areas).

ZPG: *see* zero population growth.

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