

**aa** See BLOCK LAVA.

**abiotic** Not living, non-biological, usually describing factors in an ecosystem: atmospheric gases, humidity, salinity, soil mineral particles, water, and so on. An **abiotic environment** is one without any life. M. Gray (2003) argues that abiotic diversity is valuable, but threatened by human agency, which can destroy, damage, or pollute physical systems.

**ablation** Loss of snow and ice from a glacier by \*sublimation, melting, and evaporation; and from the \*calving of icebergs, and avalanches. In temperate and subpolar regions melting is the major form of ablation; in the Antarctic, it is calving. The rate of loss varies with air temperature, relative humidity, wind speed, insolation, aspect, and the nature of the surface. In snowfields, ablation includes snow removed by the wind, and is affected by aspect, depth of snow, and the nature of the underlying surface.

The **ablation sub-system**, where annual ablation exceeds annual accumulation, lies between the \*firn line and the glacier snout. Where ablation occurs at the edges of glaciers, debris accumulates to form **ablation moraine/ablation till**. An **ablation valley** is a subsidiary valley formed beneath the crest of a lateral moraine and the valley side. Iturrizaga (2001) *Geogr. J.* **54** notes that 'true ablation valleys' can result from differences in \*insolation, and may act in the development of lateroglacial moraine valleys.

**aborigine** A member of an indigenous people existing in a land before invasion or colonization from outside. For Canadian aboriginal peoples, see *Atlas of Urban Original Peoples*; for Australian, the Aboriginal Environments Research Centre, U. Adelaide; for Bolivian, Denevan (1966) *Nat. Tech. Info. Service*.

**abrasion** Also known as corrasion, this is the grinding away of bedrock by fragments of rock which may be incorporated in ice (\*glacial abrasion), water (marine abrasion, \*fluvial abrasion), or wind (\*aeolian abrasion). In fluvial environments, the main agent of abrasion is the \*bed load. The mass of solid material removed varies with the size, density, and velocity of the particles, and the density of the vector bearing these particles. See Sklar and Dietrich (2004) *Water Resour. Res.* **40** on a model for bedrock abrasion.



- Sklar on the efficiency of particle abrasion in rivers.

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**abrasion platform** See SHORE PLATFORM.

**abrasion terrace** A former \*shore platform, now above sea level, either through \*tectonic uplift of the mainland, or \*eustatic lowering of sea level—and thus indicative of an emergent coastline. See Hanß in A. Alsharhan et al. (1998) for a discussion of coastal terraces.

**absolute drought** In the UK, a period of fifteen days on none of which more than 0.25 mm of rain falls. National definitions vary with climate; in Libya, droughts are recognized only after two years without rain. These arbitrary definitions give no indication of the impact of drought.



- Provides more definitions of drought.

**absolute humidity** The density of the water vapour present in a mixture of air and water vapour. Cold air cannot contain as much water vapour as warm air, so has a lower absolute humidity than warm air. Low absolute humidity results in more evaporation than in air with high absolute humidity. See also RELATIVE HUMIDITY.

**absolute plate motion** The movement of a crustal plate in relation to a fixed point, such as a hot spot. See Gripp and Gordon (1990) *Geophys. Res. Letts* 17 for calculations of absolute plate motion.



- Shows an absolute plate motion calculator.

**abstraction** The selection and conceptualization of a phenomenon, or some aspect of it; a way of viewing a real world object, usually a simplification—such as a \*model. **Data abstraction** captures the essential information needed to describe a spatial phenomenon and is fundamental in \*geographic information science.

See Smaalen in M. J. Kraak and M. Molenaar, eds (1996) for a hierarchical rule for geographic information abstraction.

**abundance** The total number of individuals of a certain species present in an area, generally estimated by sampling methods (such as capture–recapture), and which may vary according to competition, predation, and resources.

An **index of abundance** is a relative measure of the size of a population or sub-unit of the population, such as a year class. The abundance, for example, of fish may be measured as number/weight of fish caught per standard unit of fishing effort, in a given area, and for a given time span, and then compared to earlier data. See Pearce and Ferrier (2001) *Biol. Conserv.* 98, 1 on modelling the relative abundance of species for regional conservation planning.

**abyssal, abysso-** At depths of over 3000 m below sea level, hence **abyssopelagic zone**—that part of deep lakes, oceans, or seas characterized by specific forms of plankton and nekton which inhabit open water—and

**abyssobenthic zone**—the bottom of a deep lake, ocean, or sea. An **abyssal plain** is the deep sea-floor, formed of abyssal deposits, with a gradient of less than 1 in 10000. The Canada Abyssal Plain, lying between Canada and the Alpha ridge, is the largest of the Arctic sub-basins, with an average depth of 3658 m. **Abyssal hills**, which interrupt an abyssal plain, are 50–250 m high. See Kitchell et al. (1978) *Palaeobiol.* 4, 2 on **abyssal** traces and megafauna.

**accelerator** A factor which increases the momentum of a boom or slump in an economy, so that a small change in demand, for example, may lead to a greater industrial growth (or decline). Mehta and Theodore's study (in L. Simmons, ed. 2004) of 'temping' agencies as 'accelerators of churning in low-wage labour markets' is an interesting example.

**access** A. Sen (1999) measures **access to advantage** by one's access to basic needs: satisfying goods—like food; freedoms—as in a labour market; and capabilities. S. W. Allard (2004), in an examination of access to social services in three American cities, finds that poor populations in urban centres generally have greater spatial access to social services than poor populations in the suburbs, and that the potential demand for services is much greater in central city areas than in suburban areas.

**accessibility** The ease of approach to one location from other locations: in terms of the distance travelled, the cost of travel, or the time taken. Accessibility relies on location, where the relativity of space is estimated in relation to transport infrastructures (J.-P. Rodrigue 2006) and distance, derived from the \*connectivity between locations. It is a key element in \*transport geography.

**Topological accessibility** is measured in relation to a system of nodes and paths (transportation network), assuming that accessibility is significant only to specific elements of a transport system, such as airports or ports.

**Contiguous accessibility** is a measurable attribute of every location, as space is considered in a contiguous manner. See Miller and Wu (2000) *GeoInformatica* 4, 2) on \*GIS software for **space-time accessibility** measures.

**Physical accessibility** is the spatial separation of people from the supply of goods and services; see, for example, Orcao and Diez-Cornago (2007) *Area* 39, 3 on physical access to health services in Spain, and Gage and Calixte (2006) *Pop. Studs.* 60, 3 on maternal health services in Haiti. **Social accessibility** is the ability of an individual to reach a resource or location, as affected by class structures, income, age, educational background, gender, or race. See Parks (2004) *Econ. Geog.* 80, 2 on social accessibility in Los Angeles, and the UK Transport Studies Group's *Social Accessibility Mapping Project*.

**accordant** Complying with; thus, **accordant drainage** has evolved in conformity with the underlying geological structure: domes show a radial pattern, for example. The **law of accordant junctions** (Playfair's law) states that tributaries join a stream or river at the same elevation as that of the larger

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watercourse; there is no sudden 'drop' in the level of the tributary, which is therefore \*graded to the level of the junction. See Niemann et al. (2001) *ESPL* **26**, 12 for a quantitative evaluation of Playfair's law. **Accordant summits** are hill or mountain tops of approximately the same elevation, whose presence has been seen as confirmation of the cycle of erosion theory (Ojany (1978) *Geo. J.* **2**, 5).

**accreting margin** See CONSTRUCTIVE MARGIN.

**accretion 1.** The growth of land by the offshore deposition of sediment, forming \*spits and \*tombolos. Accretion is most active in \*estuaries, particularly within the tropics. See Robin et al. (2007) *U. Caen Coastal Morphodynamics Gp.* on \*swash bar and hook spit formation.

**2.** The increase in size of a continent by the addition of **accretion terranes**. A **tectonostratigraphic terrane** is a fault-bounded geologic entity characterized by a distinctive geologic history that differs markedly from that of adjacent terranes (Hamilton (1990) *Phil. Trans. R. Soc. London A* **331**).

**3.** The growth of a landform by the addition of deposits; \*seif dunes grow by accretion. See H. S. Edgell (2006).

**4.** The increase in size of particles by additions to the exterior, as in the formation of \*hailstones. See Zheng and List (1995) *Procs Conf. Cloud Phys.*

**acculturation** The adaptation to, and adoption of, a new culture. This may occur simultaneously as two cultures meet, but occurs more often as an immigrant group takes to the behaviour patterns and standards of the receiving group. A major example is acculturation among African Americans; see H. Landrine and E. Klonoff (1996), and Sclemper (2007) *J. Hist. Geog.* **33**, 2 on acculturation at the regional scale.

**accumulated temperature** From a specific date, the length of time for which mean daily temperatures have been above, or below, a stated temperature; the total time for which temperatures varied from that standard. Bartholomew and Williams (2005) *Crop Sci.* **45** illustrate the response of cool-season grass to accumulated temperature.

**accumulation 1.** The input of ice to a glacier. Weaver (1975) *Arct. & Alpine Res.* **7**, 3 suggests that it is greatest in shaded uplands. The **accumulation zone (accumulation sub-system)** is between the source and the \*firn line, where the input of snow, firn, and ice exceeds \*ablation. For snowfall in an accumulation zone to emerge as ice at the glacier snout takes about 100 years (Tuffen et al. (2002) *Sed. Geol.* **149**).

**2.** The reinvestment of surplus value, in the form of capital, in order to increase that capital. Accumulation is a key feature of \*capitalism because, in order to remain in business, capitalists have not only to preserve the value of their capital, but to add to it. 'The accumulation of [a] firm's net worth determines the growth rate of capital and the growth rate of the economy' (Chatelain (2004) *Econ. Letts.* **85**). D. Harvey (1982) argues that the obligatory

accumulation of capitalism has fostered \*uneven development. Somel (2004) *ERC W. Paper* 0411 argues that the terms of trade between North and South help maintain a gap in capital accumulation. See also Hart-Landsberg and Burkett (2006) *Hist. Materialism* **14**, 3 on China and the dynamics of transnational accumulation.

Smith's views on accumulation and phases of capitalist development (2005, *Hist. Materialism* **13**, 4) are contested by O'Brien (2007) *Hist. Materialism* **15**, 1.

**acidification** A soil-forming process whereby organic acids (from humus) increase hydrogen ion concentration, as in the transformation of \*brown-earth soils into acid brown earth, in humid temperate forest regions. For the Model of Acidification of Groundwaters in Catchments (MAGIC), see Cosby (1995) *Hydrol. & Earth Sys. Scis* **2**, 4. See also Koptsik et al. (2001) *Water Air & Soil Poll.* **139** on soil acidification in boreal forests.

**acid rain** When \*fossil fuels are burned, dioxides of sulphur and nitrogen are released into the air; these dissolve in atmospheric water to form acid rain. In addition, nitrogen oxides combine with volatile organic compounds to form ground-level smog. These pollutants lead to the acidification of lakes and streams (making some of them incapable of supporting aquatic life), impair visibility, weaken forests, and degrade buildings.

Industrial development has discharged increasing quantities of such atmospheric pollutants; in the USA, the electric power industry accounts for around 70% of total annual SO<sub>2</sub> emissions and slightly over 20% of total annual Nitrogen Oxide emissions (US EPA Acid Rain Prog. 2006 Prog. Rept). See Xu and Sudo (1997) *Fuel & Energy Abstr.* **38**, 4 on acid rain in China. Oxides of sulphur and nitrogen may also be 'exported'; more than half of Taiwanese acid rain is from mainland China (Govt. Info. Office, Rep. China (Taiwan)). However, the UK Environment Agency and the US Environmental Protection Agency both record sharp falls in atmospheric sulphur dioxide. See also K. Satake (2000).

**acid soil** Soil with a pH under 7, such as \*podzols and \*brown earths. Acidity in a soil may be due to the \*leaching out of cations when \*precipitation exceeds \*evapotranspiration. Other factors include the nature of the vegetation (and thus the \*humus) and of the parent rock. Adams and Evans (1989) *Eur. J. Soil Sci.* **40**, 3 propose a model of soil acidification.

**acre** A unit of area, defined in British law as 4840 square yards (about 0.4 hectares).

**actant** A person, creature, or object playing an active role. Smith (2007) *PHG* **31**, 4 claims that actant networks 'fold the spaces and times of cities in ways that question the privileging of geometrical space . . . and linear time . . . in explanations of global and world cities'.

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**actinometer** A device that may be used to record \*insolation at the earth's surface.

**action space** The area in which an individual moves and makes decisions about her or his life. 'The living city is the principal locus of action space and enabler of social change, as well as the source of fundamental concepts in economic theory' (Ikeda (2007) *Rev. Austrian Econ.* **20**, 4). See also Susilo and Kitamura (2005) *Transport. Res. Record* 1902/2005.

**active layer** A highly mobile layer, periodically thawing, located above the \*permafrost in \*tundra regions, and ranging in depth from a few centimetres to 3 m. Its thickness depends on slope angle and aspect, drainage, rock and/or soil type, depth of snow cover, and ground-moisture conditions; clearing vegetation will increase the depth and mobility of the active layer. See Zhang et al. (2006) *Nat. Snow & Ice Data Center* on active layers in the Russian Arctic, and M. Lecki (2006). The mobility of the active layer is due to the tundra vegetation, which scarcely binds it together, so that it moves on slopes as gentle as 2°. Thawing may occur daily or only in summer; on refreezing, the active layer may expand, especially if \*silt-sized particles predominate.

\*Periglacial processes in the active layer include \*frost heaving, \*frost thrusting, \*ice wedging, \*gelifluction, and the formation of \*patterned ground. See THERMOKARST.

**active margin** Also called Pacific margin, this is a type of destructive \*plate margin characterized by \*ocean trenches, \*earthquakes, \*andesitic \*volcanic chains, and young \*fold mountains (Schellart and Lister (2005) *Earth & Planet. Sci. Lett.* **231**).

**active volcano** A volcano known to have erupted in recent times, or which is likely to erupt. Examples include Mt Etna, Sicily; see Behncke et al. (2004) *Geomorph.* **63**, 3–4.

**activity segregation** The \*spatial separation of the sexes during the working day, as in a mining village, where the mines were an exclusively male preserve and the kitchen an exclusively female one. 'The gender division of labour helps to reinforce activity segregation where men and women . . . use space differently and unequally . . . this has meant that men are free to inhabit the public sphere and public spaces, while women's lives have been restricted to the private spaces of the home' (M. Longan (no date) U. Valparaiso).

**activity space** The space we live in from day to day; that part of \*action space with which an individual interacts daily. There seems to be a hierarchy of activity spaces for most people, increasing in spatial extent: from family space, to \*neighbourhood, economic space, and then urban space. Newsome et al. (1998) *Transport.* **25**, 4 present a model of urban activity space.

**actor–network theory (ANT)**, insists that researchers should refute all pre-given distinction between classes of possible actors, rejecting artificial

divides such as local/global, agency/structure, natural/social, and so on, and focusing on network building and network consolidation. Humans and non-humans alike are treated as possible actors; each giving meaning to any situation. The basis of every action and decision depends on the actor's subjective interpretations, which are made and mutually adjusted in interaction with others.

Smith (2003) *PHG* 27, 5 argues that neither global networks, nor space and time, are static and fixed, but are made, remade, and unmade. He describes the way, with ANT, global cities can be viewed and researched as intermediaries in networks. For a clear demonstration of the application of ANT to a geographical topic, see Johannessen (2005) *Tourist Studs.* 5, 2.

**adaptive environmental management** A management style that sees technocentric resource extraction as based on irrational, biophysically oversimplified, and short-term tactics. It recognizes non-linear feedback, and dynamic and unpredictable effects, and stresses a pragmatic and heuristic approach. See Noble in B. Mitchell, ed. (2001).

**adaptive radiation** 'The evolution of diversity within a rapidly multiplying lineage. It can cause a single ancestral species to differentiate into an impressively vast array of species inhabiting a variety of environments' (D. Schluter 2000). Kassen et al. (2004) *Nature* 431, 7011 argue that the ecological gradient may limit the size of adaptive radiations.

**adiabat** A line plotted on a thermodynamic diagram, usually on a \*tephigram, showing as a continuous sequence the temperature and pressure states of a parcel of air with changing height. An **adiabatic change** is a change in temperature, pressure, or volume, involving no transfer of energy to or from another material or system. In an adiabatic process, compression is accompanied by warming, and expansion by cooling. An **adiabatic temperature change** thus results from a pressure change. The speed at which the temperature of rising air falls with altitude is the **adiabatic lapse rate**. Dry, rising air expands with height. The energy needed for this expansion comes from the air itself in the form of heat.

The resulting change in temperature is expressed in the equation:

$$\frac{Dt}{dz} = \frac{-g}{Cp}$$

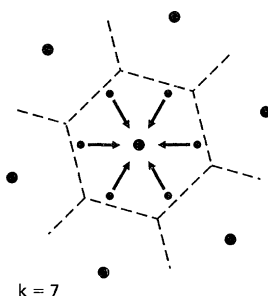
where  $Dt$  is the temperature change,  $g$  is the acceleration due to gravity,  $dz$  is the height change, and  $Cp$  is the specific heat of the air parcel. This change is the **dry adiabatic lapse rate** (DALR): 9.84 °C/1000 m. The temperature change sustained by any parcel of dry air is calculated using Poisson's equation.

If the rising air becomes saturated to \*dew point, condensation of vapour will begin. This condensation is accompanied by the release of \*latent heat,

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which partly offsets the cooling with height, so that the rate of cooling of moist air—the **saturated adiabatic lapse rate (SALR)**—is lower than the DALR. In the lower \*troposphere, the vapour content of air is high so the latent heat of condensation is high; SALRs may be as low as 5 °C/1000 m. In the cold, dry, high troposphere, though, there is little vapour ready for condensation, so the SALR may be close to the DALR. Quantitative expressions of the SALR are therefore quite complex. See B. Haurwitz (2007).

**administrative principle** W. Christaller (1933; trans. C. W. Baskin 1966) proposes that, in a region with a highly developed system of central administration, settlement is so arranged that one major centre administers six centres of lesser rank, each of which, in turn, oversees a further six centres. The number of settlements, from highest rank downwards thus follows the sequence 1, 7, 49, 343 . . . This hierarchy is known as  $k = 7$ .



**Administrative principle**

**adret** The sunny slopes of a hill or valley side; warmer because they receive more \*insolation. In the Northern Hemisphere adret slopes face south; in the Southern Hemisphere, north. Beckford and Barker (2007) *Geog. J.* **173**, 2 note that the Jamaican landscape categories ‘front ridge’ and ‘back ridge’ are a local tropical variant of adret and \*ubac slopes.

**adsorption** In \*soil science, the addition of ions or molecules to the electrically charged surface of a particle of clay or humus. In this way, minerals become bonded to soil particles (M. Ashman and G. Puri 2002). An **adsorption complex** is an ‘organic and inorganic substance in soil that can absorb ions or molecules’ (K. Peverill et al. 1999).

**advanced capitalism** A key feature of advanced capitalism is the possession of capital by fewer and fewer owners. M. Castells (2002) stresses the fundamental importance of collective consumption in advanced capitalism. See R. Hernandez (2002) on the mobility of workers under advanced capitalism.

**advanced economy (economically advanced economy)** ‘A term used by the International Monetary Fund (IMF) for the top group in its hierarchy:

advanced economies, countries in transition, and developing countries. It includes: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Hong Kong, Iceland, Ireland, Israel, Italy, Japan, South Korea, Luxembourg, Netherlands, NZ, Norway, Portugal, Singapore, Spain, Sweden, Switzerland, Taiwan, UK, and USA' (CIA (2007) *World Factbook, appendix B*). The IMF also includes Cyprus and Slovenia (IMF (2007) *WEO Groups & Aggregates Info.*).

**advection** The 'horizontal transport of energy and mass by parcels of air in convective flow systems' (Sivertsen (2007) *EMS7/ECAM8 Abstracts 4*). In meteorology, the term usually means the horizontal transfer of heat. **Advection transfers** occur in air streams, ocean currents, and surface \*run-off, partly redressing the \*insolation imbalance between the tropics and the poles. For **advection fog**, see FOG.

**aeolian** Of the wind: aeolian processes include erosion, transport, and deposition, and work best with sparse, or absent vegetation. Baas (2007) *Geomorph.* **91**, 3-4 describes aeolian sand transport as 'a classic dissipative process with non-linear dynamics'. **Aeolian landforms** include desert \*zeugen and \*yardangs. See I. Livingstone, ed. (1998).

**aeration zone** The zone between the soil-moisture zone and the capillary zone, just above the water-table, which acts as a dispenser and buffer in the infiltration of groundwater flow (Diankov and Nitcheva (2005) *Bulgarian Acad. Scis*). See also Sobotovich et al. (1991) *Atom. Energy* **70**, 6 on the reduction of groundwater contamination since Chernobyl, 1986.

**aerobic** Describing any living organism which depends on atmospheric oxygen to release energy from foodstuffs during respiration. *Compare with ANAEROBIC.*

**aerological diagram** A chart plotting the factors which determine the movement of air. Variations of temperature, pressure, dry and saturated \*adiabatic lapse rates, and \*saturated mixing ratio lines are plotted against height in a \*tephigram. An adiabatic chart may be used to predict the \*convective condensation level.

**aerosol** A suspension of droplets or particles in a gas; more precisely, of particles with a maximum diameter of 1  $\mu\text{m}$  (\*fog and \*mist are thus aerosols). In meteorology, the term is often used to describe the particles suspended within the air, such as minute fragments of sea-salt, dust, organic matter, and smoke. These enter the atmosphere by natural processes such as vulcanicity, and by human agency such as burning \*fossil fuels. Aerosols absorb heat and may act as \*condensation nuclei. NASA posts a daily global aerosol map on the web.

**affect** A non-conscious, but intense, experience. Shouse (2005) *MC J.* **8**, 6 explains that 'feelings are *personal* and *biographical*, emotions are *social*, and

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affects are *prepersonal*'—in other words, affect is our unconscious response which precedes our conscious feelings and decisions. 'The importance of affect', Shouse explains, is that 'in many cases the message consciously received may be of less import to the receiver of that message than his or her non-conscious affective resonance with the source of the message'. See Thrift (2004) *Geografiska B* **86**, 1, Ash and Thrift (2005) *Antipode* **37**, Tolia-Kelly (2006) *Area* **38**, 2, and Thien (2005) *Area* **37** for consideration of affect in geography.

**afforestation** Planting trees. Tree-planting can stabilize soils by increasing \*interception and reducing \*run-off, reduce flooding through the reduction of silting, improve soil fertility, and provide timber and firewood. See Zhang et al. (2007) *Indus. Rept.* 1/07, eWater CRC.

**aftershock** A smaller tremor or series of tremors occurring after an \*earthquake. Aftershocks result from static stress changes and 'dynamic' stresses (transient, oscillatory stress changes), that can weaken faults. Such dynamically weakened faults may fail after the seismic waves have passed, and might even cause earthquakes that would not otherwise have occurred (Kilb et al. (2003) *Nature* **408**). See also Johnson et al. (2008) *Nature* **451**.

**age dependency** The dependency of people too young or too old to be employed full-time on the contributions of those in full employment. 'The actual dependency burden is determined not just by the sizes of the various functional age groups, but also by a host of social, cultural, and institutional factors' (Yap et al. (2005) *J. Cross-Cult. Gerontol.* **20**, 4).

**ageing, geographies of** Spatial variations in demographic ageing, and the distribution of the elderly at local, regional, and national scales, are key issues in geographies of ageing: see Ferry et al. (2006) *EPRC* on variations within the EU, and van Steen and Pellenbarg (2006) *Tijdschrift* **97**, 1 & 2 on the Netherlands.

Mulder (2007) *Pop. Space & Place* **13**, 4 notes that when elderly people change residence they more often move closer to their children than further away. 'However, adult children changing residence move towards or away from their parents equally frequently.' See also Williams et al. (2000) *Tourism Geog.* **2**, 1 on international retirement migration.

Sunley (2000) *TIBG* **25**, 4 reports a North–South divide in income and benefit take-up among pensioners in the UK, with lower private pension coverage in low-income areas. 'The social status of people throughout life is reflected in the way their deaths are perceived and in the practices concerned with their dying' (Lloyd (2004) *Ageing & Soc.* **24**, 2).

**Agenda 21** A set of proposals, made at the 1992 UN Conference on Environment and Development, Rio de Janeiro, to promote \*sustainable development. It sets out environmental strategies for managing coasts, oceans, and water, monitoring and reducing chemical waste, eradicating radioactive