CHAPTER - 29

ENVIRONMENT ISSUES AND HEALTH EFFECTS

29.1 TOXICOLOGY EFFECTS

Eco-toxicology is "a study of the effects of released pollutants on the environment and on the biota that inhabit it.

Rem

It gives an indication of biological damage. It is an estimate of the amount of radiation of any type which produces the same biological injury in man as that resulting from the absorption of a given amount of X-ray radiation or gamma radiation.

Iodine - 131

Iodine - 131 produced by nuclear tests is passed to vegetation and then appears in milk of the cattle that consume the contaminated vegetation and is passed to humans. Iodine-131 causes serious damage to thyroid gland, especially among children.

About 99% of long-term radioactivity from either strontium or radium taken into the human body is found in the bones.

Lead

Lead is highly toxic to plants and animals including man. Lead generally affects children more severely than adults. Lead poisoning causes a variety of symptoms. These include liver and kidney damage, reduction in hemoglobin formulation, mental retardation and abnormality in fertility and pregnancy. Symptoms of chronic lead-poisoning are of three general types.

Gastrointestinal troubles - most common in industrial workers includes intestinal stress.

Neuromuscular effects - collectively called lead palsy, and impairment of muscle metabolism resulting into residual paralysis and muscular atrophy.

Central nervous system effects - CNS syndrome - a panoply of nervous system disorders, they may lead to delirium, convulsions coma and death.

Mercury

This is the most common and most toxic in water bodies. It occurs in water as monomethyl mercury. Most industrial effluents have mercury. Methyl mercury vapours cause fatal poisoning.

High levels of mercury in fish stocks have been found, mainly in coastal areas. Mumbai, Kolkata, Karwar (in Karnataka) and North Koel (in Bihar) are some of the severely affected areas.

The recent popularity of energy efficient compact to fluorescent lamps or CFLs has added another dimension to the controversy.

Toxicity of mercury is much greater than any other substance, about 1000 times more potent than colchicines.

Fluorine

It occurs in nature as fluoride, in air, soil and water. Fluorisis is a common problem in several states of the country due to intake of high fluoride content water. Fluorides cause dental fluorisis, stiffness of joints (particularly spinal cord) causing humped back. Pain in bones and joint and outward bending of legs from the knees is called Knock-Knee syndrome. In cattle, fluoride intake causes staining, mottling and abrasion of teeth, lameness and decrease in milk production.

DDT

Toxic pesticides as BHC, PCB, DDT etc., are not easily degraded and are long-lasting in the environment. Their concentration therefore goes on increasing in water and soil with successive applications.

DDT was sprayed for many years on marshes to control mosquitoes.

The DDT has bio-magnified from water to fish eating birds and humans. DDT is known to depress the activity of estrogen, the female sex hormone and testosterone, male sex hormone. Fish die due to eating of DDT-killed insects; turtles die because of eating DDT-killed fish and so on. DDT deposited in butter fat of milk is a potential danger to infants.

The end result of DDT use is that whole population of predatory birds such as the fist hawk (osprey) and of detritus feeders as fiddler crab are wiped out. Birds are more vulnerable as DDT interferes with egg shell formation by causing a breakdown in steroid hormones which results in fragile eggs that break before the young can hatch.

LEAD IN PAINTS

- Modern houses are full of harmful chemicals. One of them is lead, present in paints.
- Though several countries have banned the use of this substance India is yet to do so, which is why paint makers use them.
- Inhaling lead dust like opening or closing windows is the most common source of lead poisoning.
- The human body is not designed to process lead. Young children are particularly vulnerable to lead as it can damage the central nervous system and the brain.
- If lead is so poisonous why do paint makers continue to use it? Using lead susbtitutes increases the cost and also reduces paint performance.

TRANSFAT

- Transfats are formed during the process of addition of hydrogen atoms to oils, a process which industry prefers as it keeps the oil from turning rancid and ensures a longer shelf life. (E.g trans-fatty acid in vanaspati).
- Transfats are associated with a host of serious health problems ranging from diabetes to heart disease to cancer.
- The health ministry in 2008 came out with a notification for labelling food including trans fats.
- Junk food high in transfats, salt and sugar, junk food gives no nutrition. In fact, getting addicted to it is making the young vulnerable to hypertension, heart diseases, diabetes and obesity.

HIGH CAFFEINE IN ENERGY DRINKS

- Energy drinks are in controversy because of its high caffeine content. Most of these brands have upto 320 ppm of caffeine in them. These drinks are marketed as an instant source of energy.
- The manufacturers claim that it is the combination of caffeine, taurine, glucoronolactone, vitamins, herbal supplements, and sugar or sweeteners that gives the energy.
- According to study reports, it is the sugar that gives the energy rush, the caffeine only gives a 'feeling' of energy.
- Energy drinks fall under the category of 'Proprietary foods' in the Prevention of Food Adulteration (PFA) Act of 1954.
- An amendment in the PFA act 2009 ensured that caffeine in energy drinks should be capped at 145 ppm, the limit that was set for carbonated beverages.
- However, Red Bull managed to get a stay order on the amendment of the PFA act in 2010 and since then the energy drink market is expanding unregulated.
- The Food Safety and Standards Authority of India (FSSAI) is currently making regulations on energy drinks.

PESTICIDE IN HUMAN BLOOD

- Pesticides are commonly used in India but this comes at great cost to human health. It found that 15 different pesticides in the 20 blood samples tested from four villages in Punjab.

TESTING OF PESTICIDE TOXICITY

- All pesticides are tested to establish toxicity – a dose necessary to produce a measurable harmful effect, it is usually established through tests on mice, rats, rabbits and dogs.
- Results are then extrapolated on humans, and safe exposure levels predicted.
- The value commonly used to measure acute toxicity is LD 50 (a lethal dose in the short term; the subscript 50 indicates the dose is toxic enough to kill 50 per cent of lab animals exposed to the chemical). LD 50 values are measured zero onwards; the lower the LD 50 the more acutely toxic the pesticide.

- To illustrate, comparison of DDT – most used in India up to the early 1990s – with monocrotophos, currently most used.
- DDT' S LD 50 is 113 mg/kg; monocrotophos, 14 mg/kg. But never forget that lower LD 50 means higher acute toxicity.
- Pesticides once ingested, accumulate in the body fat or pass through. Organochlorine pesticides, for instance, accumulate in body fat and blood lipids. These fat-soluble chemicals persist in the body for many years.

29.2 DISEASES CAUSED BY ENVIRONMENTAL DEGRADATION

a) Minamata disease

- Minamata disease was first discovered in Minamata city in Kumamoto prefecture, Japan in 1956.
- It was caused by the release of methyl mercury in the industrial wastewater from the Chisso Corporation's chemical factory, which continued from 1932 to 1968.
- It is also referred to as Chisso-Minamata disease, is a neurological syndrome caused by severe mercury poisoning.
- Symptoms include ataxia, numbness in the hands and feet, general muscle weakness, narrowing of the field of vision and damage to hearing and speech. In extreme cases, insanity, paralysis, coma, and death follow within weeks of the onset of symptoms. A congenital form of the disease can also affect fetuses in the womb.
- This highly toxic chemical bioaccumulated in shellfish and fish in Minamata Bay and the Shiranui Sea, which when eaten by the local populace resulted in mercury poisoning. While cat, dog, pig, and human deaths continued over more than 30 years, the government and company did little to prevent the pollution.

b) Yokkaichi asthma

- Disease occurred in the city of Yokkaichi in Mie Prefecture, Japan between 1960 and 1972.
- The burning of petroleum and crude oil released large quantities of sulfur oxide that caused severe smog, resulting in severe cases of chronic obstructive pulmonary disease, chronic bronchitis, pulmonary emphysema, and bronchial asthma among the local inhabitants.

c) Itai-itai disease

- Itai-itai disease was the documented case of mass cadmium poisoning in Toyama Prefecture, Japan, starting around 1912.
- The cadmium poisoning caused softening of the bones and kidney failure.
- The cadmium was released into rivers by mining companies in the mountains. The mining companies were successfully sued for the damage

d) Blue baby syndrome

- It is believed to be caused by high nitrate contamination in ground water resulting in decreased oxygen carrying capacity of hemoglobin in babies leading to death.
- The groundwater is thought to be contaminated by leaching of nitrate generated from fertilizer used in agricultural lands and waste dumps.
- It may also be related to some pesticides (DDT, PCBs etc), which cause eco toxicological problems in the food chains of living organisms, increasing BOD, which kills aquatic animals.

e) Pneumoconiosis

- The coal miners are frequently caught by the black lung disease, which is also called as Pneumoconiosis
- Pneumoconiosis is caused due to the deposit of coal dust in the lungs of coal miners, leads to a serious lung disease called as Black Lung disease.

f) Asbestosis

- Workers working in the asbestos industry are caught by the serious lung disease called as asbestosis.

G) Silicosis

- It is caused due to the deposit of silica in the lungs of workers working in silica industries or at the sand blasting sites

h) Emphysema

- The breaking down of sensitive tissue of lungs due to air pollution and smoke of cigarette is called as Emphysema. Once this disease happens, the lungs cannot expand and contract properly

I) Sick Building Syndrome (SBS)

- Sick building syndrome (SBS) is a combination of ailments (a syndrome) associated with an individual's place of work or residence.
- Most of the sick building syndrome is related to poor indoor air quality.
- Sick building causes are frequently pinned down to flaws in the heating, ventilation, and air conditioning (HVAC) systems. Other causes have been attributed to contaminants produced by out gassing of some types of

building materials, volatile organic compounds (VOC), molds, improper exhaust ventilation of ozone, light industrial chemicals used within, or lack of adequate fresh-air intake air filtration

29.4 MISCELLANEOUS TOPICS

CHIPKO MOVEMENT

- It is a social-ecological movement that practised the Gandhian methods of satyagraha and non-violent resistance, through the act of hugging trees to protect them from falling.
- The modern Chipko movement started in the early 1970s in the Garhwal Himalayas of Uttarakhand, with growing awareness towards rapid deforestation.
- The landmark event in this struggle took place on March 26, 1974, when a group of peasant women in Reni village, Hemwalghati, in Chamoli district, Uttarakhand, India, acted to prevent the cutting of trees and reclaim their traditional forest rights that were threatened by the contractor system of the state Forest Department.
- Their actions inspired hundreds of such actions at the grassroots level throughout the region.
- By the 1980s the movement had spread throughout India and led to formulation of people-sensitive forest policies, which put a stop to the open felling of trees in regions as far reaching as Vindhyas and the Western Ghats.
- The first recorded event of Chipko however, took place in village Khejarli, Jodhpur district, in 1730 AD, when 363 Bishnois, led by Amrita Devi sacrificed their lives while protecting green Khejri trees, considered sacred by the community, by hugging them, and braved the axes of loggers sent by the local ruler, today it is seen an inspiration and a precursor for Chipko movement of Garhwal.

APPIKO MOVEMENT

- Appiko movement was a revolutionary movement based on environmental conservation in India.
- The Chipko movement in Uttarakhand in the Himalayas inspired the villagers of the district of Karnataka province in southern India to launch a similar movement to save their forests.
- In September 1983, men, women and children of Salkani "hugged the trees" in Kalase forest. (The local term for "hugging" in Kannada is appiko.)
- Appiko movement gave birth to a new awareness all over southern India.

International Standards and Environment

- The ISO 14000 environmental management standards exist to help organizations
  - Minimize how their operations (processes etc.) negatively affect the environment (i.e. cause adverse changes to air, water, or land)
  - Comply with applicable laws, regulations, and other environmentally oriented requirements,
  - Continually improve in the above.
- ISO 14000 is similar to ISO 9000 quality management in that both pertain to the process of how a product is produced, rather than to the product itself.
- As with ISO 9000, certification is performed by third-party organizations rather than being awarded by ISO directly.
- The ISO 19011 audit standard applies when auditing for both 9000 and 14000 compliance at once.
- List of ISO 14000 series standards
  - ISO 14001 Environmental management systems—Requirements with guidance for use
  - ISO 14004 Environmental management systems—General guidelines on principles, systems and support techniques
  - ISO 14015 Environmental assessment of sites and organizations
  - ISO 14020 series (14020 to 14025) Environmental labels and declarations
  - ISO 14030 discusses post production environmental assessment
  - ISO 14031 Environmental performance evaluation—Guidelines
  - ISO 14040 series (14040 to 14049), Life Cycle Assessment, LCA, discusses pre-production planning and environment goal setting.
  - ISO 14050 terms and definitions.
  - ISO 14062 discusses making improvements to environmental impact goals.
  - ISO 14063 Environmental communication —Guidelines and examples
  - ISO 14064 Measuring, quantifying, and reducing Greenhouse Gas emissions.
  - ISO 19011 which specifies one audit protocol

The National Wastelands Development Board (NWDB)

- The National Wastelands Development Board (NWDB) was set up under the Ministry of Environment & Forests in 1985 with the objective of
- to increase tree and other green cover on wastelands,
- to prevent good land from becoming wasteland, and
- to formulate within the overall nodal policy, perspective plans and programmes for the management and development of the wastelands in the country.
- In 1992, the Board was transferred to the Ministry of Rural Development, putting under a New Department of Wastelands Development under the charge of a Minister of State.

Bioassay

- Bioassay is a test in which organisms are used to detect the presence or the effects of any other physical factor, chemical factor, or any other type of ecological disturbance.
- Bioassays are very common in pollution studies. Bioassays can be conducted by using any type of organisms. However, the fish and insect bioassays are very common.
- The aim is to find out either lethal concentration or effective concentration causing mortality or other effects.
- Ultimately they are to be used for determination of safe concentration of a chemical or maximum acceptable toxicant concentration (MATC).
- The organism is exposed to different concentrations of a toxicant for a definite period and mortality, behavioral change or other signals of distress are noted periodically.
- Out of three types, static bioassay test is designed, where the organisms are exposed to the same toxicant solution for the whole experimental period. The other two are, renewal bioassay and flow-through bioassays.

Flagship species

- A flagship species is a species chosen to represent an environmental cause, such as an ecosystem in need of conservation. These species are chosen for their vulnerability, attractiveness or distinctiveness in order to engender support and acknowledgement from the public at large. Thus, the concept of a flagship species holds that, by giving publicity to a few key species, the support given to those species will successfully leverage conservation of entire ecosystems are all species contained therein.
- Example: Indian tiger, African elephant, giant panda of China, mountain gorilla of Central Africa, orangutan of Southeast Asia and the leatherback sea turtle.

Keystone species

- Keystone species is a species whose addition to or loss from an ecosystem leads to major changes in abundance or occurrence of at least one other species. Certain species in an ecosystem is considered more important in determining the presence of many other species in that ecosystem.
- All top predators (Tiger, Lion, Crocodile, Elephant) are considered as keystone species because it regulates all other animals' population indirectly. Hence top predators are given much consideration in conservation.
- Key stone species deserves special attention from the conservation point of view. Conservation of keystone species encourages conservation of all other relevant species associated with this.
- If keystone species is lost, it will result in the degradation of whole ecosystem. For example certain plant species (ebony tree, Indian-laurel) exclusively depends upon bats for its pollination. If the bat population is reduced then regeneration of particular plants becomes more difficult. This changes the vegetation structure which adversely influence on the dependant animals.

Indicator species

- Indicator species is a species whose presence indicates the presence of a set of other species and whose absence indicates the lack of that entire set of species.
- An indicator species is any biological species that defines a trait or characteristic of the environment. For example, a species may delineate an ecoregion or indicate an environmental condition such as a disease outbreak, pollution, species competition or climate change. Indicator species can be among the most sensitive species in a region, and sometimes act as an early warning to monitoring biologists.
- Many indicator species of the ocean systems are fish, invertebrates, periphyton, macrophytes and specific species of ocean birds (like the Atlantic Puffin). Amphibian indicates chemicals, global warming and air pollution. Lichens are indicators of air quality and are sensitive to sulfur dioxide.

Foundation species

- Foundation species is a dominant primary producer in an ecosystem both in terms of abundance and influence. Example: kelp in kelp forests and corals in coral reefs.

Charismatic megafauna

- These are large animal species with widespread popular appeal that environmental activists use to achieve conservation goals well beyond just those species. Examples include the Giant Panda, the Bengal Tiger, and the Blue Whale.

Umbrella species

- Umbrella species is a wide-ranging species whose requirements include those of many other species. The protection of umbrella species automatically extends protection to other species. These are species selected for making conservation related decisions, typically because protecting these species indirectly protects the many other species that make up the ecological community of its habitat.

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GLOSSARY

- **Warm-blooded** is a term to describe animal species which have a relatively higher blood temperature, and maintain thermal homeostasis primarily through internal metabolic processes. Examples: Mammals and birds.
- **Cold-blooded** is a term often used to refer to animals that do not use their metabolism to maintain body temperature. Examples: reptiles, insects, arachnids, amphibians and fish
- **Aestivation** is a state of animal dormancy, characterized by inactivity and a lowered metabolic rate that is entered in response to high temperatures and arid conditions. It takes place during times of heat and dryness, the hot dry season, which is often but not necessarily the summer months. Invertebrate and vertebrate animals are known to enter this state to avoid damage from high temperatures and the risk of desiccation. Both terrestrial and aquatic animals undergo aestivation.
- **Hibernation** is a state of inactivity and metabolic depression in animals, characterized by lower body temperature, slower breathing, and lower metabolic rate. Hibernating animals conserve food, especially during winter when food supplies are limited, tapping energy reserves, body fat, at a slow rate. It is the animal's slowed metabolic rate which leads to a reduction in body temperature and not the other way around.
- **Reforestation** Is the restocking of existing forests and woodlands which have been depleted
- **Afforestation** is the establishment of a forest or stand of trees in an area where there was no forest
- **Deforestation** Is the removal of a forest or stand of trees where the land is thereafter converted to a non forest use.
- **Forest cover** is the presence of trees on lands more than one hectare in area with a tree canopy of more than 10 percent, irrespective of ownership and legal status.
- **Tree cover** comprises the tree patches outside forest area and exclusive of forest cover that has less than a minimum map-able area of one hectare.
- **Agroforestry** Is an integrated approach of using the interactive benefits from combining trees and shrubs with crops and livestock. It combines agricultural and forestry technologies to create more diverse, productive, profitable, healthy and sustainable land-use systems.
- **Habitat fragmentation** is the emergence of discontinuities (fragmentation) in an organism's preferred environment (habitat), causing population fragmentation.
- **Habitat destruction** - The process in which natural habitat is rendered functionally unable to support the species present. In this process, the organisms which previously used the site are displaced or destroyed, reducing biodiversity
- **Habitat conservation** is a land management practice that seeks to conserve, protect and restore, habitat areas for wild plants and animals, especially conservation reliant species, and prevent their extinction, fragmentation or reduction in range
- **Oligotrophic Lake** is a lake with low primary productivity, the result of low nutrient content. These lakes have low algal production, and consequently, often have very clear waters, with high drinking-water quality
- **Eutrophic lake** is a lake has high primary productivity due to excessive nutrients and is subject to algal blooms resulting in poor water quality. The bottom waters of such bodies are commonly deficient in oxygen, ranging from hypoxic to anoxic.
- **Mesotrophic lakes** is a lake with an intermediate level of productivity, greater than oligotrophic lakes, but less than eutrophic lakes. These lakes are commonly clear water lakes and ponds with beds of submerged aquatic plants and medium levels of nutrients
- **Mull soil** is one characterised by large soil animals (especially plentiful earthworms), incorporation of organic matter through the topsoil and active bacterial decomposition.
- **Mor soil** is on the other hand characterised by smaller soil animals, the buildup of a litter layer on top and decomposition mainly led by fungi

- **Calcifuge** is a plant that does not tolerate alkaline soil.
- **Calcicole or Calciphyte** is a plant that does not tolerate acidic soil.
- **Ecotopes** are the smallest ecologically-distinct landscape features in a landscape mapping and classification system. As such, they represent relatively homogeneous, spatially-explicit landscape functional units that are useful for stratifying landscapes into ecologically distinct features for the measurement and mapping of landscape structure, function and change.
- **Ecozones** delineate large areas of the Earth's surface within which organisms have been evolving in relative isolation over long periods of time, separated from one another by geographic features, such as oceans, broad deserts, or high mountain ranges, that constitute barriers to migration
- **Productivity** or production refers to the rate of generation of biomass in an ecosystem.
- **Photoheterotrophs** are heterotrophic organisms that use light for energy, but cannot use carbon dioxide as their sole carbon source. Consequently, they use organic compounds from the environment to satisfy their carbon requirements. They use compounds such as carbohydrates, fatty acids and alcohols as their organic food
- **Chemotrophs** are organisms that obtain energy by the oxidation of electron donors in their environments
- **Phototrophs** are the organisms (usually plants) that carry out photosynthesis to acquire energy. They use the energy from sunlight to convert carbon dioxide and water into organic materials to be utilized in cellular functions such as biosynthesis and respiration.
- **Hemotrophs** are organisms that obtain energy by the oxidation of electron donors in their environments
- **Lithotroph** is an organism that uses an inorganic substrate to obtain reducing equivalents for use in biosynthesis or energy conservation via aerobic or anaerobic respiration
- **Lithophiles** are micro-organisms that can live within the pore interstices of sedimentary and even igneous rocks to depths of several kilometers.
- **Organotroph** is an organism that obtains hydrogen or electrons from organic substrates
- **Mixotroph** is a microorganism that can use a mix of different sources of energy and carbon.
- **Photic zone** or Euphotic zone is the depth of the water in a lake or ocean that is exposed to sufficient sunlight for photosynthesis to occur.
- **Biological pump** is the sum of a suite of biologically-mediated processes that transport carbon from the surface euphotic zone to the ocean's interior.
- **Standing crop** is the quantity or total weight or energy content of the organisms which are in a particular location at a particular time.
- **Endolith** is an organism that lives inside rock, coral, animal shells, or in the pores between mineral grains of a rock.
- **Detritivores** are heterotrophs that obtain nutrients by consuming detritus (decomposing organic matter). By doing so, they contribute to decomposition and the nutrient cycles. They should be distinguished from other decomposers, such as many species of bacteria, fungi and protists, unable to ingest discrete lumps of matter, instead live by absorbing and metabolising on a molecular scale. However, the terms detritivore and decomposer are often used interchangeably
- **Carrying capacity** of a biological species in an environment is the maximum population size of the species that the environment can sustain indefinitely, given the food, habitat, water and other necessities available in the environment
- **Brackish water** is water that has more salinity than fresh water, but not as much as seawater. It may result from mixing of seawater with fresh water.
- **Gene pool** is the complete set of unique alleles in a species or population
- **Genetic erosion** is a process whereby an already limited gene pool of an endangered species of plant or animal diminishes even more when individuals from the surviving population die off without getting a chance to meet and breed with others in their endangered low population.
- **Bioterrorism** is terrorism involving the intentional release or dissemination of biological agents. These agents are (bacteria, viruses, or toxins), and may be in a naturally occurring or a human-modified form.
- **Bioleaching** is the extraction of specific metals from their ores through the use of living organisms. This is much cleaner than the traditional heap leaching using cyanide. Bioleaching is one of several applications within bio hydrometallurgy and several methods are used to recover copper, zinc, lead, arsenic, antimony, nickel, molybdenum, gold, silver, and cobalt.
- **Biochemical oxygen demand** or B.O.D. is the amount of dissolved oxygen needed by aerobic biological organisms in a body of water to break down organic material

present in a given water sample at certain temperature over a specific time period.

- **Microclimate** is a local atmospheric zone where the climate differs from the surrounding area. The term may refer to areas as small as a few square feet or as large as many square miles.
- **Biopiracy** is the theft of genetic materials especially plants and other biological materials by the patent process. Biopiracy is a situation where indigenous knowledge of nature, originating with indigenous people, is exploited for commercial gain without permission from and with no compensation to the indigenous people themselves.
- **BioWeb** is the connotation for a network of web-enabled biological devices (e.g. trees, plants, and flowers) which extends an internet of things to the Internet of Living Things of natural sensory devices. The BioWeb devices give insights to real-time ecological data and feedback to changes in the environment
- **Biomass** is the amount of living or organic matter present in an organism. Biomass pyramids show how much biomass is present in the organisms at each tropic level, while productivity pyramids show the production or turnover in biomass.
- **Ecological footprint** is a measure of human demand on the Earth's ecosystems. It is a standardized measure of demand for natural capital that may be contrasted with the planet's ecological capacity to regenerate
- **Algal bloom** is a rapid increase or accumulation in the population of algae in an aquatic system. Algal blooms may occur in freshwater as well as marine environments.
- **Carbon footprint** is a measurement of all greenhouse gases we individually produce and has units of tonnes (or kg) of carbon dioxide equivalent. A carbon footprint is made up of the sum of two parts, the primary footprint and the secondary footprint.
- **The primary footprint** is a measure of our direct emissions of CO_2 from the burning of fossil fuels including domestic energy consumption and transportation (e.g. car and plane). We have direct control of these.
- **The secondary footprint** is a measure of the indirect CO_2 emissions from the whole lifecycle of products we use - those associated with their manufacture and eventual breakdown. To put it very simply – the more we buy the more emissions will be caused on our behalf.
- **Carbon diet** refers to reducing the impact on climate change by reducing greenhouse gas (principally CO_2) production, without lowering their standard of living
- **Greenhouse debt** or carbon debt is the measure to which an individual person, incorporated association, business enterprise, government instrumentality or geographic community exceeds its permitted greenhouse footprint and contributes greenhouse gases that contribute to global warming and climate change
- **Biocapacity** is the capacity of an area to provide resources and absorb wastes. When the area's ecological footprint exceeds its biocapacity, unsustainability occurs.
- **Global hectare** is a measurement of biocapacity of the entire earth - one global hectare is a measurement of the average biocapacity of all hectare measurements of any biologically productive areas on the planet.
- **Carbon credit** and carbon markets are a component of national and international attempts to mitigate the growth in concentrations of greenhouse gases (GHGs). One carbon credit is equal to one metric tonne of carbon dioxide, or in some markets, carbon dioxide equivalent gases. Carbon trading is an application of an emissions trading approach.
- **Oil spill** is a release of a liquid petroleum hydrocarbon into the environment due to human activity, and is a form of pollution. The term often refers to marine oil spills, where oil is released into the ocean or coastal waters
- **Gene banks** help preserve genetic material, be it plant or animal. In plants, this could be by freezing cuts from the plant, or stocking the seeds. In animals, this is the freezing of sperm and eggs in zoological freezers until further need.
- **Biobank** is a cryogenic storage facility used to archive biological samples for use in research and experiments
- **Xerosere** is a plant succession which is limited by water availability. It includes the different stages in a xerarch succession. Xerarch succession of ecological communities originated in extremely dry situation such as sand deserts, sand dunes, salt deserts, rock deserts etc
- **Earth Hour** is a global event organized by WWF and is held on the last Saturday of March annually, asking households and businesses to turn off their non-essential lights and other electrical appliances for one hour to raise awareness towards the need to take action on climate change.
- **Bioprospecting** is an umbrella term describing the discovery of new and useful biological samples and mechanisms, typically in less-developed countries, either with or without the help of indigenous knowledge, and

with or without compensation. In this way, bioprospecting includes biopiracy and also includes the search for previously unknown compounds in organisms that have never been used in traditional medicine.

- **Poaching** is the illegal taking of wild plants or animals contrary to local and international conservation and wildlife management laws. Violations of hunting laws and regulations are normally punishable by law and, collectively, such violations are known as poaching.
- **Hunting** is the practice of pursuing any living thing, usually wildlife, for food, recreation, or trade. In present-day use, the term refers to lawful hunting, as distinguished from poaching, which is the killing, trapping or capture of the hunted species contrary to applicable law.
- **Wildlife** includes all non-domesticated plants, animals and other organisms. Domesticating wild plant and animal species for human benefit has occurred many times all over the planet, and has a major impact on the environment, both positive and negative.
- **Wild crafting** is the practice of harvesting plants from their natural, or "wild" habitat, for food or medicinal purposes. It applies to uncultivated plants wherever they may be found, and is not necessarily limited to wilderness areas. Ethical considerations are often involved, such as protecting endangered species.
- **Conservation biology** is the scientific study of the nature and status of Earth's biodiversity with the aim of protecting species, their habitats, and ecosystems from excessive rates of extinction.
- **Extinction** is the end of an organism or of a group of organisms (taxon), normally a species.
- **Holocene extinction** refers to the extinction of species during the present Holocene epoch (since around 10,000 BC
- **Wildlife corridor** or Green corridor is an area of habitat connecting wildlife populations separated by human activities (such as roads, development, or logging). This allows an exchange of individuals between populations, which may help prevent the negative effects of inbreeding and reduced genetic diversity (via genetic drift) that often occur within isolated populations.
- **Biolink zones** are a land use category developed for biodiversity conservation and landscape adaptation under changing climates
- **Zero-emissions vehicle**, or ZEV, is a vehicle that emits no tailpipe pollutants from the onboard source of power.
- **Ocean de-oxygenation** is a term that has been suggested to describe the expansion of oxygen minimum zones in the world's oceans as a consequence of anthropogenic emissions of carbon dioxide. Oceanographers and others have discussed what phrase best describes the phenomenon to non-specialists.
- **Plasticulture** refers to the practice of using plastic materials in agricultural applications. The plastic materials themselves are often and broadly referred to as "ag plastics." Plasticulture ag plastics include soil fumigation film, irrigation drip tape/tubing, nursery pots and silage bags, but the term is most often used to describe all kinds of plastic plant/soil coverings. Such coverings range from plastic mulch film, row coverings, high and low tunnels, to plastic greenhouses.
- **Nanotoxicology** is the study of the toxicity of nanomaterials. Because of quantum size effects and large surface area to volume ratio, nanomaterials have unique properties compared with their larger counterparts.

CLIMATE CHANGE -

- **"Climate change"** means a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.
- **"Greenhouse gases"** means those gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and re-emit infrared radiation.
- **"Source"** means any process or activity which releases a greenhouse gas, an aerosol or a precursor of a greenhouse gas into the atmosphere.
- **"Reservoir"** means a component or components of the climate system where a greenhouse gas or a precursor of a greenhouse gas is stored.
- **"Sink"** means any process, activity or mechanism which removes a greenhouse gas, an aerosol or a precursor of a greenhouse gas from the atmosphere.

Adaptation

- Adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities.

Adaptation Fund

- The Adaptation Fund was established to finance concrete adaptation projects and programmes in develop-

ing country Parties to the Kyoto Protocol that are particularly vulnerable to the adverse effects of climate change.

- The Adaptation Fund is financed from the share of proceeds on the clean development mechanism project activities and other sources of funding. The share of proceeds amounts to 2% of certified emission reductions (CERs) issued for a CDM project activity.
- The Adaptation Fund is supervised and managed by the Adaptation Fund Board (AFB). The AFB is composed of 16 members and 16 alternates and meets at least twice a year.
- Upon invitation from Parties, the Global Environment Facility (GEF) provides secretariat services to the AFB and the World Bank serves as trustee of the Adaptation Fund, both on an interim basis.

Adaptation Committee

- As part of the Cancun Adaptation Framework, Parties established the Adaptation Committee to promote the implementation of enhanced action on adaptation in a coherent manner under the Convention through the following functions:
- Providing technical support and guidance to the Parties
- Sharing of relevant information, knowledge, experience and good practices
- Promoting synergy and strengthening engagement with national, regional and international organizations, centres and networks
- Providing information and recommendations, drawing on adaptation good practices, for consideration by the COP when providing guidance on means to incentivize the implementation of adaptation actions, including finance, technology and capacity-building
- Considering information communicated by Parties on their monitoring and review of adaptation actions, support provided and received

Alliance of Small Island States (AOSIS)

- An ad hoc coalition of low-lying and island countries.
- These nations are particularly vulnerable to rising sea levels and share common positions on climate change.
- The 43 members and observers are American Samoa, Antigua and Barbuda, Bahamas, Barbados, Belize, Cape Verde, Comoros, Cook Islands, Cuba, Dominica, Dominican Republic, Federated States of Micronesia, Fiji, Grenada, Guam, Guinea-Bissau, Guyana, Haiti, Jamaica, Kiribati, Maldives, Marshall Islands, Mauritius, Nauru, Netherlands Antilles, Niue, Palau, Papua New Guinea, Samoa, Sao Tome and Principe, Seychelles, Singapore, Solomon Islands, St. Kitts & Nevis, St. Lucia, St. Vincent and the Grenadines, Suriname, Timor-Leste, Tonga, Trinidad and Tobago, Tuvalu, US Virgin Islands, and Vanuatu.

Bali Action Plan (BAP)

- Included in the Bali Road Map, agreed at the Conference of the Parties in Bali, Indonesia in 2007 (COP13), introduced AWG-LCA.

Bali Road Map

- The Bali Road Map was adopted at the 13th Conference of the Parties and the 3rd Meeting of the Parties in December 2007 in Bali.
- The Road Map is a set of a forward-looking decisions that represent the work that needs to be done under various negotiating "tracks" that is essential to reaching a secure climate future.
- It includes the Bali Action Plan, which charts the course for a new negotiating process designed to tackle climate change, with the aim of completing this by 2009.
- It also includes the AWG-KP negotiations, the launch of the Adaptation Fund, the scope and content of the Article 9 review of the Kyoto Protocol, as well as decisions on technology transfer and on reducing emissions from deforestation.

Biomass fuels or biofuels

- A fuel produced from dry organic matter or combustible oils produced by plants.
- These fuels are considered renewable as long as the vegetation producing them is maintained or replanted, such as firewood, alcohol fermented from sugar, and combustible oils extracted from soy beans.
- Their use in place of fossil fuels cuts greenhouse gas emissions because the plants that are the fuel sources capture carbon dioxide from the atmosphere.

Carbon market

- A popular (but misleading) term for a trading system through which countries may buy or sell units of greenhouse-gas emissions in an effort to meet their national limits on emissions, either under the Kyoto Protocol or under other agreements, such as that among member states of the European Union.

- The term comes from the fact that carbon dioxide is the predominant greenhouse gas, and other gases are measured in units called "carbon-dioxide equivalents."

Cartagena Group

- A collection of 27 countries seeking ambitious outcomes from the UNFCCC process and low carbon domestic output. Founded in 2010.
- Participating countries include Antigua and Barbuda, Australia, Bangladesh, Belgium, Colombia, Costa Rica, Ethiopia, France, Germany, Ghana, Indonesia, Malawi, Maldives, Marshall Islands, Mexico, Netherlands, New Zealand, Norway, Peru, Samoa, Spain, Tanzania, Thailand, Timor-Leste, Uruguay, UK and the European Commission.

Certified emission reductions (CER)

- A Kyoto Protocol unit equal to 1 metric tonne of CO_2 equivalent. CERs are issued for emission reductions from CDM project activities.
- Two special types of CERs called temporary certified emission reduction (tCERs) and long-term certified emission reductions (lCERs) are issued for emission removals from afforestation and reforestation CDM projects.

Clean Development Mechanism (CDM)

- A mechanism under the Kyoto Protocol through which developed countries may finance greenhouse-gas emission reduction or removal projects in developing countries, and receive credits for doing so which they may apply towards meeting mandatory limits on their own emissions.

"CO_2 equivalent"?

- GHG emissions/removals can be expressed either in physical units (such as grams, tonnes, etc.) or in terms of CO_2 equivalent (grams CO_2 equivalent, tonnes CO_2 equivalent, etc.).
- The conversion factor from physical units to CO_2 equivalent is the Global Warming Potential (GWP) of the corresponding GHG.
- If X Gg of CH_4 is to be expressed in terms of CO_2 equivalent, then it is multiplied by 21, which is GWP of CH_4 over 100 years timescale.

Coalition for Rainforest Nations

- A voluntary grouping of largely developing nations with rainforests which addresses issues surrounding environmental sustainability specific to tropical rainforests.
- Participation does not necessarily imply that countries adhere to any specific domestic policies or negotiating positions within the international context.
- At September 2011, the group included Argentina, Bangladesh, Belize, Cameroon, Central African Republic, Chile, Congo, Costa Rica, Cote d'Ivoire, DR Congo, Dominica, Dominican Republic, Ecuador, Equatorial Guinea, El Salvador, Fiji, Gabon, Ghana, Guatemala, Guyana, Honduras, Indonesia, Jamaica, Kenya, Lesotho, Liberia, Madagascar, Malaysia, Nicaragua, Nigeria, Pakistan, Panama, Papua New Guinea, Paraguay, Samoa, Sierra Leone, Solomon Islands, Suriname, Thailand, Uruguay, Uganda, Vanuatu and Vietnam.
- Countries participate on a voluntarily basis primarily through unified negotiating positions, workshops and collaborative programs.

Emission reduction unit (ERU)

- A Kyoto Protocol unit equal to 1 metric tonne of CO_2 equivalent. ERUs are generated for emission reductions or emission removals from joint implementation projects.

Emissions trading

- One of the three Kyoto mechanisms, by which an Annex I Party may transfer Kyoto Protocol units to, or acquire units from, another Annex I Party.
- An Annex I Party must meet specific eligibility requirements to participate in emissions trading.

Fugitive fuel emissions

- Greenhouse-gas emissions as by-products or waste or loss in the process of fuel production, storage, or transport, such as methane given off during oil and gas drilling and refining, or leakage of natural gas from pipelines

Global warming potential (GWP)

- An index representing the combined effect of the differing times greenhouse gases remain in the atmosphere and their relative effectiveness in absorbing outgoing infrared radiation.

Greenhouse gases (GHGs)

- The atmospheric gases responsible for causing global warming and climate change. The major GHGs are carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N2o).
- Less prevalent --but very powerful -- greenhouse gases are hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF6).

"Hot air"

- Refers to the concern that some governments will be able to meet their targets for greenhouse-gas emissions under the Kyoto Protocol with minimal effort and could then flood the market with emissions credits, reducing the incentive for other countries to cut their own domestic emissions.

Intergovernmental Panel on Climate Change (IPCC)

- Established in 1988 by the World Meteorological Organization and the UN Environment Programme, the IPCC surveys world-wide scientific and technical literature and publishes assessment reports that are widely recognized as the most credible existing sources of information on climate change.
- The IPCC also works on methodologies and responds to specific requests from the Convention's subsidiary bodies. The IPCC is independent of the Convention.

Land use, land-use change, and forestry (LULUCF)

- A greenhouse gas inventory sector that covers emissions and removals of greenhouse gases resulting from direct human-induced land use, land-use change and forestry activities.

Least Developed Countries Fund

- The LDCF was established to support a work programme to assist Least Developed Country Parties (LDCs) carry out, inter alia, the preparation and implementation of national adaptation programmes of action (NAPAs).
- The Global Environment Facility (GEF), as the entity that operates the financial mechanism, has been entrusted to operate this fund.

Protocol

- An international agreement linked to an existing convention, but as a separate and additional agreement which must be signed and ratified by the Parties to the convention concerned.
- Protocols typically strengthen a convention by adding new, more detailed commitments.

Quantified Emissions Limitation and Reduction Commitments (QELROs)

- Legally binding targets and timetables under the Kyoto Protocol for the limitation or reduction of greenhouse-gas emissions by developed countries.

Registries, registry systems

- Electronic databases that tracks and records all transactions under the Kyoto Protocol's greenhouse-gas emissions trading system (the "carbon market") and under mechanisms such as the Clean Development Mechanism.
- "Registry" may also refer to current discussions on a system for inscribing nationally appropriate mitigation actions.

Rio Conventions

- Three environmental conventions, two of which were adopted at the 1992 "Earth Summit" in Rio de Janeiro: the United Nations Framework Convention on Climate Change (UNFCCC), and the Convention on Biodiversity (CBD), while the third, the United Nations Convention to Combat Desertification (UNCCD), was adopted in 1994.
- The issues addressed by the three treaties are related -- in particular, climate change can have adverse effects on desertification and biodiversity -- and through a Joint Liaison Group, the secretariats of the three conventions take steps to coordinate activities to achieve common progress.

Rio+20

- The United Nations Conference on Sustainable Development, to be held in Rio de Janeiro, Brazil, on June 4-6, 2012.
- The first UN Conference on Sustainable Development was the "Earth Summit", held in 1992, and it spawned the three "Rio Conventions"-- the UNFCCC, the UNCCD, and the UNCBD.

Special Climate Change Fund (SCCF)

- The Special Climate Change Fund (SCCF) was established under the Convention in 2001 to finance projects

relating to: adaptation; technology transfer and capacity building; energy, transport, industry, agriculture, forestry and waste management; and economic diversification.

- The Global Environment Facility (GEF), as an operating entity of the financial mechanism, has been entrusted to operate the SCCF.

"Spill-over effects" (also referred to as "rebound effects" or "take-back effects")

- Reverberations in developing countries caused by actions taken by developed countries to cut greenhouse-gas emissions.
- For example, emissions reductions in developed countries could lower demand for oil and thus international oil prices, leading to more use of oil and greater emissions in developing nations, partially off-setting the original cuts.
- Current estimates are that full-scale implementation of the Kyoto Protocol may cause 5 to 20 per cent of emissions reductions in industrialized countries to "leak" into developing countries.

Umbrella group

- A loose coalition of non-European Union developed countries formed following the adoption of the Kyoto Protocol.
- Although there is no formal membership list, the group usually includes Australia, Canada, Iceland, Japan, New Zealand, Norway, the Russian Federation, Ukraine, and the United States.

2 degrees C goal

- A 2 degrees Celsius/Centigrade rise in global temperatures from pre-industrial levels is the highest rise we can afford if we want a 50% chance of avoiding the worst effects of climate change.
- The current concentration of carbon dioxide in the atmosphere is 370 parts per million
- The concentration of carbon dioxide equivalent in the atmosphere that the world must stay at or under to stay true to the 2 degrees Celsius goal is 450 parts per million.

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